50th Annual Meeting

Orlando, Florida

January 25-29, 2014

ABSTRACT BOOK

The Society of Thoracic Surgeons

The Society of Thoracic Surgeons gratefully acknowledges the following sponsors for their support of the STS 50th Annual Meeting.

This list is accurate as of November 29, 2013.

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MISSION STATEMENT

The mission of The Society of Thoracic Surgeons is to enhance the ability of cardiothoracic surgeons to provide the highest quality patient care through education, research, and advocacy.

OVERALL MEETING OBJECTIVE

The overall objective of this meeting is to provide a forum for all cardiothoracic surgeons and their teams to learn the most up-to-date information on research, surgical techniques, patient management, and social, ethical, and political issues in order to maintain the highest level of care for the cardiothoracic patient.

STS CONTINUING MEDICAL EDUCATION (CME) MISSION STATEMENT

The continuing medical education mission of The Society of Thoracic Surgeons is to provide a forum for reporting results of scientific research and for updating information in the disciplines of cardiovascular, general thoracic and congenital heart surgery. The principal continuing education programs conducted by the Society include an annual scientific meeting, self-study programs, and other stand-alone meetings. The Annual Meeting is composed of peer-reviewed scientific abstracts, invited overview presentations, small group presentations, presentations on new technologies and video programs. The broad scope of topics related to cardiothoracic surgery is covered during each Annual Meeting. In addition to and separate from the national meeting, topical meetings are held that focus on relevant information needs of cardiothoracic surgeons. These educational sessions frequently highlight a multidisciplinary approach and include content relevant to cardiothoracic surgeons as well as other physicians and health care providers in related disciplines. STS programs are developed and provided with the intent of confirming existing knowledge base, imparting new knowledge, and promoting competence in the content areas covered for cardiothoracic surgeons, residents, and their allied health care providers.

Amended by the STS Board of Directors: January 25, 2009

FUTURE MEETINGS OF THE SOCIETY OF THORACIC SURGEONS

STS 51st Annual Meeting
January 24–28, 2015
San Diego, California

STS 52nd Annual Meeting
January 23–27, 2016
Phoenix, Arizona

The information in this Abstract Book is accurate as of December 11, 2013.

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FRIDAY, JANUARY 24, 2014

3:00 PM – 6:00 PM	Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

SATURDAY, JANUARY 25, 2014

7:00 AM – 6:00 PM	Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting
8:00 AM – 12:30 PM	STS/SCA: The Mitral Valve—Echo Anatomy for Surgical Decision Making
8:00 AM – 3:00 PM	STS/ACCP: Primer on Advanced and Therapeutic Bronchoscopy—Theory and Hands-on Session
1:00 PM – 2:30 PM	Cardiopulmonary Bypass Simulation Course
1:00 PM – 5:00 PM	STS/AATS Tech-Con 2014
5:00 PM – 6:30 PM	STS/AATS Tech-Con 2014 Reception

SUNDAY, JANUARY 26, 2014

7:00 AM – 6:30 PM	Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting
7:50 AM – 12:00 PM	Practice Management Summit
8:00 AM – 11:45 AM	STS/AATS Tech-Con 2014
8:00 AM – 12:00 PM	Acquired and Congenital Heart Surgery Symposium: Where the Roads Cross
8:00 AM – 4:30 PM	STS/AATS Cardiothoracic Critical Care Symposium: How to Successfully Establish a CT ICU
1:00 PM – 4:30 PM	Residents Symposium: Finding the Right Job and Transitioning to Practice
1:15 PM – 4:30 PM	Parallel Surgical Symposium: Congenital Parallel Surgical Symposium: General Thoracic STS/AATS Tech-Con 2014
2:30 PM – 4:30 PM	CT Surgery Interprofessional Education Symposium: TAVR Team Approach and Proven Safety Tools in Cardiac Surgery International Symposium: Surgical Management of Cardiothoracic Infections
4:00 PM – 6:30 PM	Scientific Posters Open
4:30 PM – 6:30 PM	Opening Reception in STS Exhibit Hall

MONDAY, JANUARY 27, 2014

6:30 AM – 5:00 PM	Registration: STS 50th Annual Meeting
7:00 AM – 7:15 AM	Opening Remarks
7:15 AM – 8:15 AM	J. Maxwell Chamberlain Papers
8:15 AM – 9:00 AM	Richard E. Clark Papers
9:00 AM – 4:30 PM	Scientific Posters Open Exhibits Open
9:00 AM – 9:30 AM	50th Anniversary Tribute
9:30 AM – 9:45 AM	Introduction of the President: David A. Fullerton
9:45 AM – 10:45 AM	Presidential Address: Douglas E. Wood
10:45 AM – 11:30 AM	BREAK—Visit Exhibits and Scientific Posters
11:30 AM – 12:30 PM	Adult Cardiac Session: Arrhythmia Adult Cardiac Session: Heart Failure Basic Science Research: Adult Cardiac Congenital Session: Adult Congenital Critical Care General Thoracic Session: New Techniques
12:30 PM – 1:15 PM	BREAK—Visit Exhibits and Scientific Posters
1:15 PM – 5:15 PM	Joint Council on Thoracic Surgery Education: Implementation of a Surgical Curriculum in Cardiothoracic Surgery ACC @ STS

New 50 Anniversary Tribute

1:30 PM – 3:30 PM	Adult Cardiac Session: Aortic
	Adult Cardiac Session: Ischemic
	Congenital Session: Pediatric Congenital I
	Considerations in Perioperative Management of Patients With Congestive Heart Failure
	General Thoracic Session: Lung Cancer I
	General Thoracic Session: Lung Transplantation
3:30 PM – 4:15 PM	BREAK—Visit Exhibits and Scientific Posters
4:15 PM – 5:15 PM	Surgical Motion Picture Matinees: Adult Cardiac, Congenital, and General Thoracic
	Late-Breaking Abstract Sessions—Clinical Trials and Quality Improvement
5:00 PM – 6:30 PM	Scientific Posters and Wine
5:30 PM – 6:30 PM	Business Meeting (STS Members Only)
7:00 PM – 10:30 PM	STS Social Event: The Wizarding World of Harry Potter™ at Universal's Islands of Adventure®

TUESDAY, JANUARY 28, 2014

6:30 AM – 4:30 PM	Registration: STS 50th Annual Meeting
7:00 AM – 8:00 AM	Early Riser Sessions
	Early Riser Health Policy Forum: Physicians Payment Sunshine Act Implementation—What CT Surgeons Need to Know
8:15 AM – 10:15 AM	Adult Cardiac Session: General I
	Adult Cardiac Session: Mitral Valve
	Congenital Session: Pediatric Congenital II
	General Thoracic Session: Esophageal
	General Thoracic Session: Lung Cancer II
	Patient Safety Symposium: Safely Adopting New Technology in Cardiothoracic Surgery
	STS/EACTS: Repair of Type A Aortic Dissection
9:00 AM – 4:30 PM	Scientific Posters Open
	Exhibits Open
10:15 AM – 11:00 AM	BREAK—Visit Exhibits and Scientific Posters
11:00 AM – 12:30 PM	Adult Cardiac Session: Aortic Valve
	Adult Cardiac Session: General II
	Basic Science Research: General Thoracic
	Cardiothoracic Surgical Education
	Clinical Trials: Reflections on Old and Plans for New
	Congenital Session: Pediatric Congenital III
	General Thoracic Session: Mediastinal/Pulmonary
	SVS @ STS
12:30 PM – 1:30 PM	Ethics Debate: Another Surgeon's Error—Must You Tell the Patient?
	Residents Luncheon
1:30 PM – 2:30 PM	C. Walton Lillehei Lecture: Shaf Keshavjee
2:30 PM – 3:15 PM	BREAK—Visit Exhibits and Scientific Posters
3:15 PM – 3:30 PM	50th Anniversary Tribute
3:30 PM – 3:45 PM	Award Presentations
3:45 PM – 4:30 PM	Hot Topics in Cardiothoracic Surgery
4:30 PM – 5:30 PM	Thomas B. Ferguson Lecture: Bassem Youssef

WEDNESDAY, JANUARY 29, 2014

6:30 AM – 9:30 AM	Registration: STS University
7:00 AM – 9:00 AM	STS University
9:30 AM – 11:30 AM	STS University (courses repeated)

CONTINUING MEDICAL EDUCATION CREDIT

STS 50th Annual Meeting

The Society of Thoracic Surgeons is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The Society of Thoracic Surgeons designates this live activity for a maximum of 37.25 *AMA PRA Category 1 Credits*™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

The American Board of Cardiovascular Perfusion designates this activity for 41.7 Category I CEUs.

Learning Objectives for the STS 50th Annual Meeting

Upon completion of this activity, participants should be able to:

- Review the results of clinical and laboratory investigations designed to reveal new knowledge of cardiothoracic disease or to develop new technology applicable to the management of cardiothoracic disease
- Evaluate the impact of new knowledge and the application of new technology on the treatment of cardiothoracic disease
- Discuss the importance of patient safety issues and how current strategies can be introduced into one's practice or institution
- Discuss surgical techniques in order to improve the standard of care within the specialty
- Examine how public policy can impact the treatment of one's patients
- Share and summarize information provided through small group discussions facilitated by leaders in cardiothoracic surgery

STS/AATS Tech-Con 2014

The Society of Thoracic Surgeons is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The Society of Thoracic Surgeons designates this live activity for a maximum of 9.0 *AMA PRA Category 1 Credits*™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

The American Board of Cardiovascular Perfusion designates this activity for 11.2 Category I CEUs.

Learning Objectives for STS/AATS Tech-Con 2014

Upon completion of this activity, participants should be able to:

- Introduce the newest therapies in both adult cardiac and general thoracic surgery and evaluate how these therapies will impact current and future practice
- Evaluate methods of more rapidly approving new technology
- Discuss the latest innovations, outcomes data, and controversies in thoracic aortic vascular surgery
- Critically assess the latest percutaneous valve technologies and their impact on cardiothoracic surgery
- Present current treatment options for esophageal disease
- Discuss new strategies and technologies for durable mechanical circulatory support

STS EDUCATION DISCLOSURE POLICY

As a sponsor of continuing medical education accredited by the Accreditation Council for Continuing Medical Education (ACCME), The Society of Thoracic Surgeons requires that any individual who is in a position to control the content of an educational activity must disclose all relationships with commercial interests (including known relationships of his or her immediate family, department, and partners). The ACCME defines a commercial interest as "any entity producing, marketing, reselling, or distributing health care goods or services consumed by, or used on, patients. The ACCME does not consider providers of clinical service directly to patients to be commercial interests." The question of whether a disclosed conflict situation could represent undue influence on the educational activity by a commercial interest or whether the disclosed information is sufficient to consider an abstract, presentation, or other educational enduring material to represent potentially biased information must be resolved prior to an individual's involvement in STS educational programming.

Required disclosures include (1) a financial interest of any amount (e.g., through ownership of stock, stock options, or bonds) (2) the receipt of any amount of cash, goods or services within the current 12-month period (e.g., through research grants, employment, consulting fees, royalties, travel, or gifts) or (3) a nonremunerative position of influence (e.g., as officer, director, trustee or public spokesperson). EXCLUDED from this disclosure requirement are blind trusts or other passive investments such as mutual funds. In the case of a financial or other relationship disclosure, the company, product/service, and specific nature of the relationship must be noted. Disclosure is mandatory for any person involved in the planning, management, presentation, and/or evaluation of STS educational activities.

Failure to disclose all relationships with commercial interests disqualifies the individual from being a planning committee member, a teacher, or an author of educational materials, and this individual cannot have any responsibility for the development, management, presentation, or evaluation of STS educational activities. This requirement is intended neither to imply any impropriety of such relationships nor to prejudice any individual planner, presenter or author. It is merely to identify such relationships through full disclosure, and to allow STS to assess and resolve potential influences on the educational activity prior to the planning and implementation of an educational activity. If no relationships with commercial interests exist, the individual must indicate this on the disclosure form.

Additionally, the fact that the presentation, paper, or other educational product describes (a) the use of a device, product, or drug that is not FDA approved or (b) an off-label use of an approved device, product, or drug must also be disclosed. This requirement has been adopted in response to FDA policy and case law involving medical societies, and is not intended to prohibit or inhibit independent presentation or discussion regarding the uses of devices, products, and drugs as described in (a) or (b) above.

For live presentations, all disclosures must be stated orally and on a slide at the beginning of the presentation and will be noted in published material related to the activity. Slides, handouts, and other materials utilized as part of an educational activity cannot contain any advertising, trade names or a product group message. Speakers are required to disclose that they have nothing to disclose if this is the case.

Amended by the STS Executive Committee: April 11, 2012

Unless otherwise noted in this *Abstract Book* or by the speakers, speakers have no relevant commercial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA approved for the purposes they are discussing.

ELECTRONIC CME/CEU EVALUATION

The STS 50th Annual Meeting utilizes an entirely electronic evaluation and CME/Perfusion CEU credit claim process. Both physicians and perfusionists can use this system to claim credit, complete evaluations, and print CME/Perfusion CEU certificates. Certificates of Attendance are also available for other attendees and international physicians not wishing to claim CME credit. Attendees will not be able to evaluate and claim CME/Perfusion CEU credit for ticketed sessions unless they have registered for those sessions.

The overall meeting evaluations and all individual session evaluations can be completed by attendees onsite at CME stations located in the Cypress Ballroom Foyer and the Grand Ballroom Foyer. Certificate printing is available.

Attendees can also access evaluations and CME/Perfusion CEU credit by visiting the online evaluation site through personal computers or handheld devices at www.sts.org/2014evaluation. In order to make this process more convenient for attendees, the meeting evaluations will be available online through Friday, February 7, 2014.

Attendees can log in to the website with the following information:
- **Username:** 6-digit member ID number located at the lower left-hand side of the meeting badge
- **Password:** First initial and last name

PHYSICIAN COMPETENCIES

As an accredited provider of continuing medical education, STS strives to provide the best, most relevant educational experience for those who take part in the Society's educational activities. The Accreditation Council for Continuing Medical Education (ACCME) has stressed the importance of CME program planning and implementation that is focused on quality with the aim of improving health care. In an effort to help clarify how STS programming focuses on the Accreditation Council for Graduate Medical Education (ACGME) / American Board of Medical Specialties (ABMS) competencies, physician competencies are listed prior to STS/AATS Tech-Con 2014 and STS 50th Annual Meeting information. Sessions may touch upon other competencies in addition to those identified below.

Patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.

Medical knowledge about established and evolving biomedical, clinical, and cognate (eg, epidemiological and social-behavioral) sciences and the application of this knowledge to patient care.

Practice-based learning and improvement that involves investigation and evaluation of one's own patient care, appraisal and assimilation of scientific evidence, and improvements in patient care.

Interpersonal and communication skills that result in effective information exchange and teaming with patients, their families, and other health care professionals.

Professionalism, as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.

Systems-based practice, as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system for health care and the ability to effectively call on system resources to provide care that is of optimal value.

Notes

RULES REGARDING ORAL PRESENTATIONS

1. A manuscript for each abstract that is presented orally or as a poster during the STS 50th Annual Meeting must be submitted before or at the time of the meeting to *The Annals of Thoracic Surgery* for publication. Manuscripts must be submitted via *The Annals* online editorial office (www.atseditorialoffice.org). Editorial office staff will be on hand at the meeting to assist you in submitting your paper if you need help. Manuscripts will not be considered for publication if submitted after Wednesday, January 29, 2014, 11:59 PM, Eastern Standard Time. All manuscripts shall become the property of the Society. Publication of manuscripts in *The Annals of Thoracic Surgery* is not assured. If manuscripts are not submitted to *The Annals* prior to or at the time of the STS 50th Annual Meeting, a 2-year period of ineligibility for participation in the STS Annual Meeting will be imposed upon all authors of the manuscript. The same 2-year sanction applies to all abstracts returned to authors for revisions that are not resubmitted within 1 calendar year of the request for revision.
2. Presenters for scientific sessions are provided with time limits for their presentations and must comply with these limits. Please refer to your confirmation notification for your specific time limit.
3. All visuals accompanying scientific oral presentations must be produced in Microsoft Office PowerPoint. Presenters must report to the Speaker Ready Room (Chicago/Denver) at least 24 hours prior to their scheduled presentation time to download their PowerPoint into the presentation system.
4. Reserved seating is available for presenters and invited discussants at the front of the room for the General Sessions. In the interest of time, presenters and discussants are requested to sit in this reserved section.
5. Presenters will remain with discussants on the dais during the oral presentations to respond directly to the discussants' queries.
6. Commercial and regulatory disclosures as defined in the STS Education Disclosure Policy (see page 7) must be disclosed orally to the audience at the beginning of each presentation. This requirement is for moderators, presenters, and invited discussants. The first slide of a presentation must be used to reveal the nature of the disclosure. Disclosure information will also be provided in the text of this *Abstract Book*.

NOTE: The Society of Thoracic Surgeons does not necessarily endorse the opinions expressed by any presenter or discussant.

RULES REGARDING SCIENTIFIC POSTERS

1. A manuscript for each abstract that is presented orally or as a poster during the STS 50th Annual Meeting must be submitted before or at the time of the meeting to *The Annals of Thoracic Surgery* for publication. Manuscripts must be submitted via *The Annals* online editorial office (www.atseditorialoffice.org). Editorial office staff will be on hand at the meeting to assist you in submitting your paper if you need help. Manuscripts will not be considered for publication if submitted after Wednesday, January 29, 2014, 11:59 PM, Eastern Standard Time. All manuscripts shall become the property of the Society. Publication of manuscripts in *The Annals of Thoracic Surgery* is not assured. If manuscripts are not submitted to *The Annals* prior to or at the time of the STS 50th Annual Meeting, a 2-year period of ineligibility for participation in the STS Annual Meeting will be imposed upon all authors of the manuscript. The same 2-year sanction applies to all abstracts returned to authors for revisions that are not resubmitted within 1 calendar year

of the request for revision.

2. Scientific posters have been assigned designated poster boards. Each scientific poster must correspond with the assigned poster board number. Scientific poster numbers begin with "P" followed by the corresponding poster board, eg, P12.

3. Scientific posters must be designed to fit the poster board, which is 4 feet high by 8 feet wide. The poster title and author block must be displayed across the top of the poster. This will allow meeting participants to easily find posters. Poster material should be readable from a distance of at least 6 feet.

4. Commercial and regulatory disclosures as defined in the STS Education Disclosure Policy (see page 7) must be included on the poster in the lower right-hand corner. Posters not containing commercial and regulatory disclosures may be removed from the scientific poster area. If you do not have anything to disclose, please print "Nothing to Disclose" in the lower right-hand corner. This requirement is not intended to imply any impropriety of such relationships or to prejudice any individual presenter, author, or discussant. It is merely to identify such relationships through full disclosure and to allow audience members to form their own judgments regarding the poster presentation.

5. Scientific posters may be set up on Saturday, January 25, 2014, from 8:00 AM to 5:00 PM and Sunday, January 26, 2014, from 8:00 AM to 4:00 PM in the Palms Ballroom Foyer of the Orlando World Center Marriott. Posters must be hung by a poster representative in the Palms Ballroom Foyer during these times. STS staff will move the posters chosen for the Scientific Posters and Wine event (see below) to Canary 1 & 2. You are only responsible for hanging your poster in the Palms Ballroom Foyer by 4:00 PM on Sunday, January 26, 2014. STS will move selected posters to Canary 1 & 2 between 2:00 PM and 4:00 PM on Monday, January 27, 2014. You will be notified via e-mail by 7:00 PM on Sunday, January 26, 2014, if your poster is selected for the Scientific Posters and Wine event.

6. Scientific posters accepted for the STS 50th Annual Meeting must be displayed at the meeting for the entire time assigned and in the assigned location. Authors who do not display their posters will be subjected to a 2-year period of ineligibility for participation in the STS Annual Meeting. This sanction applies to all poster authors.

7. The STS 50th Annual Meeting will feature a Scientific Posters and Wine event, to be held from 5:00 PM to 6:30 PM on Monday, January 27, 2014, in Canary 1 & 2. Moderators for each of the three subspecialties will guide participants through a discussion of the selected posters. If your poster is selected for this event, please arrive at Canary 1 & 2 no later than 4:45 PM on Monday, January 27, 2014, to prepare for this event.

8. All posters will be graded on the evening of Sunday, January 26, 2014. Therefore, in order to be considered as a poster winner, you will need to have your poster set up by 4:00 PM on Sunday, January 26, 2014. Authors of the top graded posters will present their poster during the Scientific Posters and Wine event and will have their presentations graded by selected reviewers. A winner for each category will be announced shortly thereafter.

9. Scientific poster teardown will occur Tuesday evening, January 28, 2014, in the Palms Ballroom Foyer. If your poster was presented at the Scientific Posters and Wine event, your poster will be moved back to the Palms Ballroom Foyer after the event ends. Scientific posters must remain on display until 4:30 PM on Tuesday, January 28, 2014. STS is not responsible for any scientific posters remaining after 10:00 AM on Wednesday, January 29, 2014. STS will not ship posters back to authors.

Commercial Relationships of the Program Planning Members

The Society would like to thank the following STS leaders for planning the educational content of STS/AATS Tech-Con 2014. Unless otherwise noted, the program planning members have no relevant commercial relationships to disclose:

Shanda H. Blackmon, Co-Chair, Workforce on Annual Meeting (Tech-Con Task Force)
COMMERCIAL RELATIONSHIPS Consultant/Advisory Board, MAQUET; Speakers Bureau/Honoraria, Covidien

Jonathan M. Philpott, Co-Chair, Workforce on Annual Meeting (Tech-Con Task Force)
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Robert W. Emery Jr, Workforce on Annual Meeting (Tech-Con Task Force)
COMMERCIAL RELATIONSHIPS Speakers Bureau/Honoraria, St Jude Medical, Inc; Consultant/Advisory Board, Kips Bay Medical, Inc, Medtronic, Inc

Robert C. Hagberg, Workforce on Annual Meeting (Tech-Con Task Force)

K. Robert Shen, Workforce on Annual Meeting (Tech-Con Task Force)

Jack C. J. Sun, Workforce on Annual Meeting (Tech-Con Task Force)

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COMMERCIAL RELATIONSHIPS Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

The Society would like to thank the following STS leaders for planning the educational content of the STS 50th Annual Meeting. Unless otherwise noted, the program planning members have no relevant commercial relationships to disclose:

Kevin D. Accola, Workforce on Health Policy, Reform, and Advocacy
COMMERCIAL RELATIONSHIPS Speakers Bureau/Honoraria, Edwards Lifesciences Corporation; Consultant/Advisory Board, Edwards Lifesciences Corporation; Other, Edwards Lifesciences Corporation, Travel Expenses

Arvind K. Agnihotri, Workforce on Health Policy, Reform, and Advocacy; Workforce on National Databases
COMMERCIAL RELATIONSHIPS Consultant/Advisory Board, Edwards Lifesciences Corporation

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Gabriel S. Aldea, Workforce on National Databases

Diane E. Alejo, Workforce on Associate Membership

Zohair Y. Al-Halees, Workforce on International Relationships

Mark S. Allen, Second Vice President, Board of Directors
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Giorgio M. Aru, Workforce on Patient Safety

Emile A. Bacha, Director-at-Large, Board of Directors; Workforce on Surgical Treatment of Adults With Congenital Heart Disease

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Graciano Castillo-Ortega, Workforce on International Relationships

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FRIDAY, JANUARY 24, 2014

3:00 PM – 6:00 PM *Convention Center Entrance*

Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

SATURDAY, JANUARY 25, 2014

7:00 AM – 6:00 PM *Convention Center Entrance*

Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

12:00 PM – 6:30 PM *Crystal Ballroom Foyer*

STS/AATS Tech-Con 2014 Exhibits

The physician competencies addressed in STS/AATS Tech-Con 2014 are medical knowledge, practice-based learning and improvement, and systems-based practice. These physician competencies will be addressed through individual lectures, debates, panel discussions, and questions and answers from the audience.

1:00 PM – 2:45 PM *Crystal Ballroom H-Q*

Joint Session: Transplantation, Cellular Repopulation, Donor Organ Perfusion, and Extracorporeal Life Support for Rescue

Moderators: *Shanda H. Blackmon, Houston, TX, and Jonathan M. Philpott, Norfolk, VA*

COMMERCIAL RELATIONSHIPS S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau, Covidien; J. M. Philpott: Consultant/Advisory Board, AtriCure, Inc

1:00 PM

Welcome and Introduction

Jonathan M. Philpott, Norfolk, VA

COMMERCIAL RELATIONSHIPS J. M. Philpott: Consultant/Advisory Board, AtriCure, Inc

1:05 PM

Decellularization of Organs: Artificial Organs and Repopulation With Stem Cells

Lung: *Dennis A. Wigle, Rochester, MN*
Heart: *Doris A. Taylor, Minneapolis, MN*

COMMERCIAL RELATIONSHIPS D. A. Taylor: Other, Micromatrix, Medical, Inc, sales royalty through the University of Minnesota

1:25 PM

Ex-Vivo Lung Perfusion

Bartley P. Griffith, Baltimore, MD

REGULATORY DISCLOSURE This presentation will address the XVIVO Perfusion device, which has an FDA status of investigational.

1:35 PM

Ex-Vivo Heart Perfusion Circuits

Abbas Ardehali, Los Angeles, CA

REGULATORY DISCLOSURE This presentation will address the Transmedics Organ Care System, which has an FDA status of investigational.

1:45 PM

New Generation Oxygenators: Novalung vs Quadrox

Stefan Fischer, Ibbenbueren, Germany

1:55 PM

Long-Range ECMO/ECLS: Local, Regional, and International

Matthew D. Bacchetta, New York, NY

COMMERCIAL RELATIONSHIPS M. D. Bacchetta: Consultant/Advisory Board, MAQUET

2:05 PM

Emergency Department ECMO/ECLS: Resuscitative Extracorporeal Life Support

Walter P. Dembitsky, San Diego, CA

COMMERCIAL RELATIONSHIPS W. P. Dembitsky: Speakers Bureau/Honoraria, Thoratec Corporation

2:15 PM

Crossfire

Panelists

2:30 PM

Discussion

2:45 PM – 3:15 PM ***Crystal Ballroom Foyer***

BREAK—Visit STS/AATS Tech-Con 2014 Exhibits

3:15 PM – 5:00 PM ***Crystal Ballroom H-Q***

Adult Cardiac Track I: Next Evolution in Percutaneous Valve Technology for Repair and Replacement

Moderators: *Michael Argenziano, New York, NY, and Vinod H. Thourani, Atlanta, GA*

COMMERCIAL RELATIONSHIPS M. Argenziano: Consultant/Advisory Board, Abbott Vascular, Estech; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

3:15 PM

Introduction

Vinod H. Thourani, Atlanta, GA

COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

3:20 PM

Percutaneous Mitral Valve Replacement

Michael J. Mack, Plano, TX

3:30 PM

Percutaneous Mitral Valve and Tricuspid Valve Repair

Francesco Maisano, Milan, Italy

COMMERCIAL RELATIONSHIPS F. Maisano: Consultant/Advisory Board, Abbott, Medtronic, Inc, St Jude Medical, Inc, Valtech Cardio Ltd; Ownership Interest, 4Tech

3:40 PM

Awake TAVI Implantation

Vinod H. Thourani, Atlanta, GA

COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

3:50 PM

Next Generation TAVR Platforms

Martin Leon, New York, NY

4:05 PM

Left Ventricle Access for Aortic Valve and Mitral Valve Surgery

Thomas Walther, Bad Nauheim, Germany

4:15 PM

Debate: Choice of Valve Therapy for Medium-Risk Patients

Rapid Replacement Valve: *Christoph A. Nienaber, Rostock, Germany*

TAVR: *Michael J. Reardon, Houston, TX*

COMMERCIAL RELATIONSHIPS M. J. Reardon: Consultant/Advisory Board, Medtronic, Inc

4:35 PM

Crossfire
Panelists

4:50 PM

Discussion

3:15 PM – 5:00 PM ***Grand Ballroom 7A***

General Thoracic Track I: General Thoracic Surgery Innovations in 3D

Moderator: *Shanda H. Blackmon, Houston, TX*
COMMERCIAL RELATIONSHIPS S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau, Covidien

3:15 PM

Introduction
Shanda H. Blackmon, Houston, TX
COMMERCIAL RELATIONSHIPS S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau, Covidien

3:20 PM

3D Printers and Creation of Artificial Trachea
Glenn E. Green, Ann Arbor, MI
REGULATORY DISCLOSURE This presentation will address the 3D-printed airway splint device, which is not FDA approved.

3:35 PM

3D Imaging and Bioptic Visualization
Daniel L. Miller, Atlanta, GA
COMMERCIAL RELATIONSHIPS D. L. Miller: Consultant/Advisory Board, Ethicon, Inc

3:50 PM

Paravertebral Blocks and Advanced Drugs for Pain Management
David C. Rice, Houston, TX
COMMERCIAL RELATIONSHIPS D. C. Rice: Consultant/Advisory Board, Olympus America, Inc
REGULATORY DISCLOSURE D. C. Rice: This presentation will address the off-label use of Exparel (liposomal bupivicaine).

4:05 PM

New Developments in Energy Device Technology for Video-Assisted Thoracoscopic Surgery
Linda W. Martin, Bel Air, MD
COMMERCIAL RELATIONSHIPS L. W. Martin: Consultant/Advisory Board, Abbott Vascular, Atheromed, Boston Scientific

4:20 PM

Advances in Chest Wall Reconstruction
Gaetano Rocco, Naples, Italy
COMMERCIAL RELATIONSHIPS G. Rocco: Speakers Bureau/Honoraria, Covidien, Synthes, Takeda Pharmaceuticals; Research Grant, Covidien, Ethicon, Inc

4:35 PM

Predictive Modeling to Diagnose Lung Nodules Through Noninvasive Diagnostics
Eric L. Grogan, Nashville, TN

4:50 PM

Discussion

5:00 PM – 6:30 PM ***Crystal Ballroom Foyer***

STS/AATS Tech-Con 2014 Reception

SUNDAY, JANUARY 26, 2014

7:00 AM – 6:30 PM *Convention Center Entrance*

Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

7:00 AM – 8:00 AM *Crystal Ballroom Foyer*

STS/AATS Tech-Con 2014 Continental Breakfast

7:00 AM – 3:00 PM *Crystal Ballroom Foyer*

STS/AATS Tech-Con 2014 Exhibits

8:00 AM – 9:35 AM *Crystal Ballroom H-Q*

Adult Cardiac Track II: The Rapidly Changing World of Thoracic Aortic Vascular Surgery—Advancements in Branch Endograft Design, Aortic Valve Repair, and the Potential Impact on Current Practice Patterns

Moderators: *Tirone E. David, Toronto, Canada, and Ali Khoynezhad, Los Angeles, CA*

8:00 AM

Introduction
Tirone E. David, Toronto, Canada

8:02 AM

Multilayer Stents
Grayson H. Wheatley, Phoenix, AZ

REGULATORY DISCLOSURE This presentation will address Cardiatis' multilayer flow modulator, which is not FDA approved.

8:12 AM

Upcoming Multibranch Arch Endograft Designs for Thoracic Endovascular Aortic Repair (TEVAR)
Jehangir J. Appoo, Calgary, Canada

COMMERCIAL RELATIONSHIPS J. J. Appoo: Consultant/Advisory Board, W. L. Gore & Associates, Inc

REGULATORY DISCLOSURE This presentation will address Gore, Medtronic, and Cook's branched arch devices currently undergoing FDA study. This presentation will also address the off-label use of endovascular thoracic aortic devices.

8:22 AM

Antegrade Stenting Descending Thoracic Aorta During Type A Dissection
Heinz G. Jakob, Essen, Germany

REGULATORY DISCLOSURE This presentation will address a Jotec GmbH device, which is not FDA approved.

8:32 AM

The Revolution in Bicuspid Aortic Valve Repair: New State-of-the-Art
Joseph E. Bavaria, Philadelphia, PA

COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc

8:42 AM

Aortic Valve Repair Using Aortic Annular Reduction Annuloplasty Rings
J. Scott Rankin, Nashville, TN

COMMERCIAL RELATIONSHIPS J. S. Rankin: Consultant/Advisory Board, BioStable Science & Engineering, Inc; Ownership Interest, BioStable Science & Engineering, Inc

REGULATORY DISCLOSURE This presentation will address the HAART 300 Annuloplasty Ring, which has an FDA status of investigational.

8:52 AM

Debate: TEVAR for Chronic Type B Dissection vs Descending Thoracic Aorta/Thoracic Aortic Aneurysm

Pro: *Nimesh D. Desai, Philadelphia, PA*

REGULATORY DISCLOSURE This presentation will address the off-label use of Gore, Medtronic, Cook, and Bolton TEVAR Grafts for treatment of aortic dissection.

Con: *Thomas G. Gleason, Pittsburgh, PA*

REGULATORY DISCLOSURE This presentation will address the off-label use of Cook's TX2, WL Gore's C-TAG, and Medtronic's Valiant devices for stent grafts for chronic type B aortic dissection.

9:12 AM

Crossfire

Panelists

9:25 AM

Discussion

8:00 AM – 9:35 AM ***Grand Ballroom 7A***

General Thoracic Track II: Lung Navigation, Ablation, Endobronchial Valves, and Personalized Medicine

Moderator: *K. Robert Shen, Rochester, MN*

8:00 AM

Lung Tumor Markers, Contemporary Personalized Medicine, and Reflex Testing

Bruce E. Johnson, Boston, MA

COMMERCIAL RELATIONSHIPS B. E. Johnson: Consultant/Advisory Board, AstraZeneca, Genentech, Inc, Chugai Pharmaceutical Co, Ltd, Transgenomics, Inc, Millennium Pharmaceuticals, Inc, Pfizer Inc, ARIAD Pharmaceuticals, Inc, Novartis Corporation, General Electric Company; Ownership Interest, KEW Group; Other, Dana-Farber Cancer Institute, Post Marketing Royalties for EGFR Mutation Testing

REGULATORY DISCLOSURE This presentation will address the off-label use of GlaxoSmithKline's dabrafenib for BRAF mutant lung cancer. This presentation will also address the off-label use of Pfizer's crizotinib for ROS1 positive lung cancer.

8:15 AM

Electromagnetic Navigation Bronchoscopy: New Technology

Douglas J. Minnich, Birmingham, AL

COMMERCIAL RELATIONSHIPS D. J. Minnich: Consultant/Advisory Board, Varian Medical Systems, Inc; Other, Covidien, Honoraria for physician training

8:30 AM

Energy Lung Ablation Update

Neil A. Christie, Pittsburgh, PA

8:45 AM

Endobronchial Valves—Trial Update

Atul C. Mehta, Cleveland, OH

9:00 AM

Endobronchial Valves to Treat Bronchopleural Fistula

Michael F. Reed, Hershey, PA

COMMERCIAL RELATIONSHIPS M. F. Reed: Consultant/Advisory Board, Spiration, Inc

REGULATORY DISCLOSURE This presentation will address the off-label use of endobronchial valves.

9:15 AM

Digital Drainage Chest Tube Systems

Scott I. Reznik, Temple, TX

9:30 AM

Discussion

9:35 AM – 10:20 AM *Crystal Ballroom Foyer*

BREAK—Visit STS/AATS Tech-Con 2014 Exhibits

10:20 AM – 11:45 AM *Crystal Ballroom H-Q*

Adult Cardiac Track III: Next Generation Devices for Durable Mechanical Circulatory Support

Moderators: *Michael F. McGrath, Norfolk, VA, and Mark S. Slaughter, Louisville, KY*
COMMERCIAL RELATIONSHIPS M. S. Slaughter: Research Grant, Thoratec Corporation

10:20 AM

Introduction
Mark S. Slaughter, Louisville, KY
COMMERCIAL RELATIONSHIPS M. S. Slaughter: Research Grant, Thoratec Corporation
REGULATORY DISCLOSURE This presentation will address Thoratec's HeartMate 3 and HeartMate X, HeartWare's MVAD and tMVAD devices. These devices have FDA statuses of investigational.

10:22 AM

Temporary Right Heart Support Devices: Impella Right Peripheral
Mark B. Anderson, Philadelphia, PA

10:29 AM

Minimally Invasive LVADs: CircuLite
Bartley P. Griffith, Baltimore, MD

10:36 AM

New VADs on the Immediate Horizon: HeartMate III
Michael F. McGrath, Norfolk, VA

10:43 AM

New VADs on the Immediate Horizon: HeartWare M and HeartWare T
Anson Cheung, Vancouver, Canada
COMMERCIAL RELATIONSHIPS A. Cheung: Consultant/Advisory Board, HeartWare Inc
REGULATORY DISCLOSURE This presentation will address the HeartWare M and HeartWare T devices, which are not FDA approved.

10:50 AM

Biventricular Assist Devices for Long-term Durable Support
Martin Strueber, Leipzig, Germany
COMMERCIAL RELATIONSHIPS M. Strueber: Consultant/Advisory Board, HeartWare, Inc
REGULATORY DISCLOSURE M. Strueber: This presentation will address the off-label use of HeartWare's HVAD for left ventricular support as a biventricular device.

11:00 AM

Pediatric SynCardia 50 cc Total Artificial Heart Ventricles for Adults
Jack G. Copeland, Redlands, CA
COMMERCIAL RELATIONSHIPS J. G. Copeland: Ownership Interest, SynCardia Systems, Inc
REGULATORY DISCLOSURE This presentation will address the SynCardia TAH-t 50 ml ventricles, which are not FDA approved.

11:10 AM

CARMAT Bioprosthetic Hydraulic Total Artificial Heart
Mark S. Slaughter, Louisville, KY
COMMERCIAL RELATIONSHIPS M. S. Slaughter: Research Grant, Thoratec Corporation

11:20 AM

Crossfire
Panelists

11:35 AM

Discussion

10:20 AM – 11:45 AM ***Grand Ballroom 7A***

General Thoracic Track III: New Devices for Esophageal Disease—From Diagnosis to Treatment

Moderator: *Raphael Bueno, Boston, MA*

COMMERCIAL RELATIONSHIPS R. Bueno: Consultant/Advisory Board, Exosome Diagnostics, Inc, Myriad Genetics; Research Grant, Castle Biosciences Incorporated., Exosome Diagnostics, Inc, Genentech, Inc, Myriad Genetics, Novartis Corporation, Siemens AG

10:20 AM

Introduction

Raphael Bueno, Boston, MA

COMMERCIAL RELATIONSHIPS R. Bueno: Consultant/Advisory Board, Exosome Diagnostics, Inc, Myriad Genetics; Research Grant, Castle Biosciences Incorporated., Exosome Diagnostics, Inc, Genentech, Inc, Myriad Genetics, Novartis Corporation, Siemens AG

10:25 AM

Innovations in Foregut Surgery (LINX System)

Francis C. Nichols III, Rochester, MN

10:40 AM

Peroral Endoscopic Myotomy

Jeffrey L. Ponsky, Cleveland, OH

10:55 AM

Update on Esophageal Testing Motility Analysis/High-Resolution Manometry/ Impedance-pH

Brian J. Dunkin, Houston, TX

11:10 AM

Mucosal Resection

Steven R. DeMeester, Los Angeles, CA

11:25 AM

Radiofrequency Ablation of the Esophagus

Allan Pickens, Atlanta, GA

COMMERCIAL RELATIONSHIPS A. Pickens: Speakers Bureau/Honoraria, Ethicon, Inc

11:35 AM

Discussion

11:45 AM – 12:00 PM ***Crystal Ballroom Foyer***

BREAK—Visit STS/AATS Tech-Con 2014 Exhibits

12:00 PM – 1:00 PM ***Royal***

Lunch

1:00 PM – 1:15 PM ***Crystal Ballroom Foyer***

BREAK—Visit STS/AATS Tech-Con 2014 Exhibits

1:15 PM – 2:45 PM *Crystal Ballroom H-Q*

Adult Cardiac Track IV: New Frontiers in Hybrid Electrophysiology

Moderators: *Mark La Meir, Maastricht, Netherlands, and Jonathan M. Philpott, Norfolk, VA*
COMMERCIAL RELATIONSHIPS M. La Meir: Consultant/Advisory Board, AtriCure, Inc; J. M. Philpott: Consultant/Advisory Board, AtriCure, Inc

1:15 PM

Introduction
Jonathan M. Philpott, Norfolk, VA
COMMERCIAL RELATIONSHIPS J. M. Philpott: Consultant/Advisory Board, AtriCure, Inc

1:17 PM

Evolving Treatments for Atrial Fibrillation: What Patients Want and Expect
Mellanie T. Hills, Greenwood, TX
COMMERCIAL RELATIONSHIPS M. T. Hills: Ownership Interest, StopAfib.org/American Foundation for Women's Health (501c3 non-profit), and True Hills, Inc

1:25 PM

Developing a True Regional Multidisciplinary Atrial Fibrillation Treatment Destination Center
Steven J. Hoff, Nashville, TN

1:33 PM

Next Generation Hybrid Atrial Fibrillation (Endocardial Cryo With Subxiphoid Pulmonary Vein Isolation)
Mark La Meir, Maastricht, Netherlands
COMMERCIAL RELATIONSHIPS M. La Meir: Consultant/Advisory Board, AtriCure, Inc

1:43 PM

Innovations for Improving Epicard Mapping During Thoracoscopic Ablation
Antoine Driessen, Amsterdam, Netherlands
COMMERCIAL RELATIONSHIPS A. Driessen: Consultant/Advisory Board, AtriCure, Inc; Research Grant, AtriCure, Inc
REGULATORY DISCLOSURE This presentation will address the Atricure Ablation system, which is not FDA approved.

1:53 PM

MRI and Atrial Fibrosis: Improving Patient Selection
Nassir F. Marrouche, Salt Lake City, UT
COMMERCIAL RELATIONSHIPS N. Marrouche: Consultant/Advisory Board, Daiichi Sankyo, eCardio, Estech, Sanofi; Speakers Bureau/Honoraria, Biotronik, Boehringer Ingelheim, Boston Scientific, Seimens; Research Grant, eCardio, Estech; Ownership Interest, CardiacDesignes, Marreck, Utah Medical Solutions

2:03 PM

Hybrid Concomitant Open Mapping and Ablation for Ventricular Tachycardia (VT)
Philip Gentlesk, Norfolk, VA

2:13 PM

CyberKnife for VT
Thomas J. Fogarty, Mountain View, CA

2:23 PM

Crossfire
Panelists

2:35 PM

Discussion

2:45 PM – 3:10 PM *Crystal Ballroom Foyer*

BREAK—Visit STS/AATS Tech-Con 2014 Exhibits

3:10 PM – 4:30 PM *Crystal Ballroom H-Q*

Adult Cardiac Track V: Emerging Service Lines—Left Atrial Appendage Closure, Lead Extraction, and the Role of the Cardiac Surgeon

Moderators: James R. Edgerton, Dallas, TX, and Mark La Meir, Maastricht, Netherlands

COMMERCIAL RELATIONSHIPS J. R. Edgerton: Speakers Bureau/Honoraria, AtriCure, Inc, Medtronic, Inc, St Jude Medical, Inc; M. La Meir: Consultant/Advisory Board, AtriCure, Inc

3:10 PM

Introduction

James R. Edgerton, Dallas, TX

COMMERCIAL RELATIONSHIPS J. R. Edgerton: Speakers Bureau/Honoraria, AtriCure, Inc, Medtronic, Inc, St Jude Medical, Inc

3:12 PM

Surgeons and Lead Extraction: Collaboration and Maintaining Safety

Roger G. Carrillo, Miami, FL

COMMERCIAL RELATIONSHIPS R. G. Carrillo: Consultant/Advisory Board, BIOTRONIK SE & Co KG, Boston Scientific, Medtronic, Inc, Spectranetics, Tyco; Research Grant, SORIN GROUP, St Jude Medical, Inc

3:20 PM

Role of Left Atrial Appendage Closure in Preventing Stroke and the Emerging Service Line of LAA Closure

James L. Cox, Denver, CO

COMMERCIAL RELATIONSHIPS J. L. Cox: Consultant/Advisory Board, CoreMatrix Cardiovascular, Inc, SentreHEART, Inc; Ownership Interest, CoreMatrix Cardiovascular, Inc, SentreHEART, Inc

REGULATORY DISCLOSURE This presentation will address the off-label use of a radiofrequency ablation device approved for the treatment of persistent and long-standing persistent atrial fibrillation, but not for paroxysmal atrial fibrillation.

3:28 PM

Percutaneous Endoprosthesis Occlusive Devices (Watchman and Amplatzer)

TBA

3:36 PM

Percutaneous Endovascular and Epicardial Access Devices: Lariat System

Miguel Valderrabano, Houston, TX

COMMERCIAL RELATIONSHIPS M. Valderrabano: Consultant/Advisory Board, Boston Scientific, SentreHEART, Inc; Research Grant, Medtronic, Inc, St Jude Medical, Inc

REGULATORY DISCLOSURE This presentation will address the Sentreheart Lariat device, which has an FDA status of investigational.

3:44 PM

Thoracoscopic Clip Occlusive Devices

Basel Ramlawi, Houston, TX

COMMERCIAL RELATIONSHIPS B. Ramlawi: Consultant/Advisory Board, AtriCure Inc; Research Grant, Baxter; Other Research Support, Medtronic, Inc; Ownership Interest, REPLICor Inc

REGULATORY DISCLOSURE This presentation will address the off-label use of AtriCure's AtriClip.

3:52 PM

Economic Realities: The Dramatic Cost Differences Between Devices

Jack C. J. Sun, Seattle, WA

4:00 PM

Crossfire

Panelists

4:15 PM

Discussion

6AM

7AM

7:00 AM – 6:00 PM
Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

8AM

8:00 AM – 12:30 PM
STS/SCA: The Mitral Valve—Echo Anatomy for Surgical Decision Making

8:00 AM – 3:00 PM
STS/ACCP: Primer on Advanced and Therapeutic Bronchoscopy—Theory and Hands-on Session

9AM

10AM

11AM

12PM

1PM

1:00 PM – 2:30 PM
Cardiopulmonary Bypass Simulation Course

2PM

3PM

4PM

5PM

6PM

7PM

8PM

9PM

New

50 Anniversary Tribute

7:00 AM – 6:00 PM **Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting**

8:00 AM – 12:30 PM **STS/SCA: The Mitral Valve—Echo Anatomy for Surgical Decision Making**

8:00 AM – 3:00 PM **STS/ACCP: Primer on Advanced and Therapeutic Bronchoscopy—Theory and Hands-on Session**

1:00 PM – 2:30 PM **Cardiopulmonary Bypass Simulation Course**

7:00 AM – 6:00 PM ***Convention Center Entrance***

Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

8:00 AM – 12:30 PM ***Grand Ballroom 7A***

STS/SCA: The Mitral Valve—Echo Anatomy for Surgical Decision Making

In the first part of the course, a cardiac surgeon and an anesthesiologist will dissect a porcine heart to demonstrate the corresponding standard 2D and 3D echocardiographic views.

Later, anesthesiologist/cardiac surgeon teams will present cases that demonstrate the utility of echocardiography for facilitating perioperative surgical decision making.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Recognize the correlation between mitral valve anatomy and standard 2D echo views
- Identify the correlation between mitral valve anatomy, functional geometry, and standard 3D echo views
- Explain the utility of 2D and 3D echocardiography for facilitating perioperative surgical decision making in patients undergoing mitral valve surgery

The physician competencies addressed in this activity are patient care, medical knowledge, and interpersonal and communication skills. These physician competencies will be addressed through a series of collaborative lectures by members of The Society of Thoracic Surgeons and the Society of Cardiovascular Anesthesiologists.

Moderators: *Alina Nicoara, Durham, NC, and Stanton Shernan, Boston, MA*
COMMERCIAL RELATIONSHIPS S. Shernan: Other, Philips, e-echocardiography.com

Session I: Echo Anatomy of the Mitral Valve for the Surgeon

8:00 AM **2D Views With Porcine Heart Dissection**
Stanton Shernan, Boston, MA, and Douglas Shook, Boston, MA
COMMERCIAL RELATIONSHIPS S. Shernan: Other, Philips, e-echocardiography.com

8:45 AM **3D Assessment of the Mitral Valve**
Stanton Shernan, Boston, MA
COMMERCIAL RELATIONSHIPS S. Shernan: Other, Philips, e-echocardiography.com

9:30 AM **Break**

Session II: Intraoperative Decision Making During Mitral Valve Surgery—Case-based Discussion

Faculty: *Vinay Badhwar, Pittsburgh, PA, John G. Byrne, Boston, MA, and James M. Maxwell, Missoula, MT*

10:00 AM **Unexpected Tricuspid Regurgitation During Mitral Valve Surgery: When to Intervene**
Alina Nicoara, Durham, NC

10:35 AM **Myxomatous Valve With Bileaflet Disease**
Georges Desjardins, Salt Lake City, UT

11:10 AM **Systolic Anterior Motion After Mitral Valve Repair**
Douglas Shook, Boston, MA

11:45 AM **Functional Mitral Regurgitation**
Stanton Shernan, Boston, MA
COMMERCIAL RELATIONSHIPS S. Shernan: Other, Philips, e-echocardiography.com

12:20 PM **Discussion**

8:00 AM – 3:00 PM ***Grand Ballroom 8A***

STS/ACCP: Primer on Advanced and Therapeutic Bronchoscopy—Theory and Hands-on Session

This course will introduce participants to the theory and practice of endobronchial ultrasound and interventional bronchoscopy as relevant to the practicing thoracic surgeon. The target is the practicing surgeon who wishes to expand his/her scope of practice and become familiar with the increasing array of technological solutions to lung cancer staging and management of airway obstruction. A combination of lectures, case presentations, and simulation will be used to teach the basics of endobronchial ultrasound (EBUS), endobronchial ultrasound-guided biopsy, and the management of airway obstruction by stenting and several modalities of tumor ablation. Several hands-on workstations will be available for participants to gain exposure and familiarity with EBUS endoscopes, cryoablative technology, rigid bronchoscopes, and airway stent deployment.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Identify indications, yield, and complications of EBUS
- Recognize benefits and limitations of airway ablative modalities
- State the benefits and limitations of various airway stents

The physician competencies addressed in this activity are patient care, medical knowledge, and interpersonal and communication skills. These physician competencies will be addressed through a series of collaborative lectures and hands-on demonstrations led by members of The Society of Thoracic Surgeons and the American College of Chest Physicians.

Moderators: *Momen M. Wahidi, Durham, NC, and Richard I. Whyte, Boston, MA*
COMMERCIAL RELATIONSHIPS M. M. Wahidi: Consultant/Advisory Board, Olympus America, Inc, Pinnacle Technology; Research Grant, Boston Scientific, Olympus America, Inc, PENTAX of America, Inc

8:00 AM **Welcome and Course Overview**
Momen M. Wahidi, Durham, NC, and Richard I. Whyte, Boston, MA
COMMERCIAL RELATIONSHIPS M. M. Wahidi: Consultant/Advisory Board, Olympus America, Inc, Pinnacle Technology; Research Grant, Boston Scientific, Olympus America, Inc, PENTAX of America, Inc

8:10 AM **Fundamentals of EBUS**
Mohit Chawla, New York, NY

8:30 AM **EBUS/Transbronchial Needle Aspiration (TBNA)**
Momen M. Wahidi, Durham, NC
COMMERCIAL RELATIONSHIPS M. M. Wahidi: Consultant/Advisory Board, Olympus America, Inc, Pinnacle Technology; Research Grant, Boston Scientific, Olympus America, Inc, PENTAX of America, Inc

8:50 AM **Therapeutic Endoscopy: Laser, Cryotherapy, Electrocautery, and Argon Plasma Coagulation (APC)**
Moishe Liberman, Montreal, Canada
COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc

9:20 AM **Panel Discussion**

9:40 AM **Break**

10:00 AM **Airway Stents**
Michael S. Mulligan, Seattle, WA

10:20 AM **Radial EBUS**
Lonny B. Yarmus, Baltimore, MD

10:40 AM **Navigational Bronchoscopy**
Richard I. Whyte, Boston, MA

11:00 AM **Rigid Bronchoscopy**
Stephen R. Hazelrigg, Springfield, IL

11:20 AM **Foreign Body Removal**
David Ost, Houston, TX

11:40 AM **Panel Discussion**

12:00 PM **Working Lunch–Case-based Presentations**

Hands-on Breakout Sessions

Grand Ballroom 8B

Faculty: *Mohit Chawla, New York, NY, Moishe Liberman, Montreal, Canada, Robert E. Merritt, Palo Alto, CA, Michael S. Mulligan, Seattle, WA, David Ost, Houston, TX, Momen M. Wahidi, Durham, NC, Richard I. Whyte, Boston, MA, and Lonny B. Yarmus, Baltimore, MD*

COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc; M. M. Wahidi: Consultant/Advisory Board, Olympus America, Inc, Pinnacle Technology; Research Grant, Boston Scientific, Olympus America, Inc, PENTAX of America, Inc

1:00 PM – 3:00 PM **Station 1:** EBUS/TBNA on Airway Models
Station 2: EBUS Simulator
Station 3: Rigid Bronchoscopy and Stents
Station 4: Electrocautery, APC, and Cryotherapy

1:00 PM – 2:30 PM ***Grand Ballroom 7B***

Cardiopulmonary Bypass Simulation Course

Despite the extensive education of a cardiothoracic surgeon, only a small portion of that time is spent studying perfusion. And while there may always be a professional perfusionist in the operating room, it is important for the cardiothoracic surgeon, as team leader in the OR, to understand the role and implications of perfusion related to each procedure.

To gain a behind-the-pump perspective, attendees will work together on a simulator to put a virtual patient on and off bypass. During the class, taught by a nationally recognized cardiothoracic surgeon and a perfusionist, a simulator will allow the attendees to experience common problems as well as uncommon events and learn how the perfusionist, surgeon, and anesthesiologist should interact to effectively solve problems.

This activity is open to residents, medical students, and any other participants who are part of an interprofessional team within the operating room.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Develop a systematic approach to initiating, maintaining, and separating from cardiopulmonary bypass
- Discuss how to diagnose and manage various crises and catastrophes that can occur while on cardiopulmonary bypass

The physician competencies addressed in this activity are medical knowledge, professionalism, and practice-based learning and improvement. These physician competencies will be addressed through several lectures and an interactive simulation.

Course Director: *Thomas E. MacGillivray, Boston, MA*

Notes

6AM
7AM
8AM
9AM
10AM
11AM
12PM
1PM
2PM
3PM
4PM
5PM
6PM
7PM
8PM
9PM

7:00 AM – 6:30 PM
Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

7:50 AM – 12:00 PM
Practice Management Summit

8:00 AM – 12:00 PM
Acquired and Congenital Heart Surgery Symposium: Where the Roads Cross

8:00 AM – 4:30 PM
STS/AATS Cardiothoracic Critical Care Symposium: How to Successfully Establish a CT ICU

1:00 PM – 4:30 PM
Residents Symposium: Finding the Right Job and Transitioning to Practice

1:15 PM – 4:30 PM
Parallel Surgical Symposium: Congenital

1:15 PM – 4:30 PM
Parallel Surgical Symposium: General Thoracic

2:30 PM – 4:30 PM
CT Surgery Interprofessional Education Symposium: TAVR Team Approach and Proven Safety Tools in Cardiac Surgery

2:30 PM – 4:30 PM
International Symposium: Surgical Management of Cardiothoracic Infections

4:00 PM – 6:30 PM
Scientific Posters Open

4:30 PM – 6:30 PM
Opening Reception in STS Exhibit Hall

New

50 Anniversary Tribute

7:00 AM – 6:30 PM	**Registration:** STS/AATS Tech-Con 2014 and STS 50th Annual Meeting
7:50 AM – 12:00 PM	**Practice Management Summit**
8:00 AM – 12:00 PM	**Acquired and Congenital Heart Surgery Symposium:** Where the Roads Cross
8:00 AM – 4:30 PM	**STS/AATS Cardiothoracic Critical Care Symposium:** How to Successfully Establish a CT ICU
1:00 PM – 4:30 PM	**Residents Symposium:** Finding the Right Job and Transitioning to Practice
1:15 PM – 4:30 PM	**Parallel Surgical Symposium:** Congenital **Parallel Surgical Symposium:** General Thoracic
2:30 PM – 4:30 PM	**CT Surgery Interprofessional Education Symposium:** TAVR Team Approach and Proven Safety Tools in Cardiac Surgery **International Symposium:** Surgical Management of Cardiothoracic Infections
4:00 PM – 6:30 PM	**Scientific Posters Open**
4:30 PM – 6:30 PM	**Opening Reception in STS Exhibit Hall**

7:00 AM – 6:30 PM ***Convention Center Entrance***

Registration: STS/AATS Tech-Con 2014 and STS 50th Annual Meeting

7:50 AM – 12:00 PM ***Grand Ballroom 7B***

Practice Management Summit

Concerns over changes in health care have had an impact on providers and hospitals alike. Quality-based initiatives, data reporting, and reimbursement under the Affordable Care Act have become more closely linked than ever before. Concerns about the status quo and incentives of health care alignment have resulted in health systems increasingly engaging cardiothoracic surgeons to aid in program development and quality improvement. This program will guide participants in how to interpret trends in health care that may directly impact cardiothoracic surgical practice.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Explain the philosophical and regulatory changes behind value-based health care reform, the Sustainable Growth Rate formula, and their impact on cardiothoracic surgery
- Describe and evaluate current quality initiatives
- Identify new procedural terminology codes and upcoming changes to the Medicare fee schedule, including new ICD-10 codes
- Appreciate the governance and management implications behind the alignment of cardiovascular services and its impact on cardiothoracic surgery

The physician competencies addressed in this session are professionalism and systems-based practice. These physician competencies will be addressed through a series of individual lectures that are meant to discuss concerns over the changes in health care that have impacted providers and hospitals. The program will have an open discussion forum at the end to encourage questions and participant discussion.

Session I: Health Care Delivery in CT Surgery

Moderators: *Vinay Badhwar, Pittsburgh, PA, and V. Seenu Reddy, Nashville, TN*
COMMERCIAL RELATIONSHIPS V. S. Reddy: Speakers Bureau/Honoraria, AstraZeneca

7:50 AM **Introductory Remarks**
Douglas E. Wood, Seattle, WA, and Vinay Badhwar, Pittsburgh, PA
COMMERCIAL RELATIONSHIPS D. E. Wood: Research Grant, Spiration, Inc; Consultant/Advisory Board, Spiration, Inc

8:00 AM **Reforming the Sustainable Growth Rate: Projecting the Future Impact for Cardiothoracic Surgery**
Jeffrey B. Rich, Norfolk, VA

8:20 AM **ICD-10 and Its Role in Reimbursement in Cardiothoracic Surgery**
Peter K. Smith, Durham, NC

8:40 AM **Where We Are Going Next With National Public Reporting of STS Data and How to Prepare**
Jeffrey P. Jacobs, St Petersburg, FL

9:00 AM **How the Hybrid Operating Room Has Impacted Thoracic Surgery and Where It Will Take Us**
Michael J. Mack, Plano, TX

9:20 AM **Panel Discussion**

9:50 AM **Break**

Session II: Physician Employment

Moderators: *Frank L. Fazzalari, Rochester, MI, and Drew Rector, Rockledge, FL*

10:00 AM **Understanding the Regulatory Hurdles of Physician Employment**
V. Seenu Reddy, Nashville, TN
COMMERCIAL RELATIONSHIPS V. S. Reddy: Speakers Bureau/Honoraria, AstraZeneca

10:20 AM **Are Fair Market Valuations Fair and Representative?**
James D. Reilly, Denver, CO

10:40 AM **The Physician-Owned Heart Hospital in the Era of the Affordable Care Act: Dinosaur or Model**
Goya V. Raikar, Oklahoma City, OK

11:00 AM **Defining the Role of a Cardiothoracic Surgeon in a Multidisciplinary Service Line**
Drew Rector, Rockledge, FL

11:20 AM **Full Disclosure: Understanding the Sunshine Act in the Era of Employment**
John E. Mayer Jr, Boston, MA
COMMERCIAL RELATIONSHIPS J. E. Mayer: Consultant/Advisory Board, Medtronic, Inc; Ownership Interest, Eli Lilly and Company, Johnson & Johnson, Merck & Co, Inc

11:40 AM **Panel Discussion**

8:00 AM – 12:00 PM ***Grand Ballroom 8B***

Acquired and Congenital Heart Surgery Symposium: Where the Roads Cross

Adults with congenital heart disease may be treated by either congenital heart surgeons or adult cardiac surgeons, each of whom have different perspectives. The goal of this symposium is for congenital and adult cardiac surgeons to learn important techniques from each other that they can then apply to their own practices. Experts in both subspecialties will share their strategies for approaching common problems in the treatment of adults with congenital heart disease.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Summarize the advantages and disadvantages of different approaches to tricuspid valve surgery
- Describe current approaches to mitral valve surgery
- Compare and contrast differing surgical approaches to aortic arch surgery

The physician competencies addressed in this session are patient care, medical knowledge, and systems-based practice. These physician competencies will be addressed through a series of individual lectures that will address issues in thoracic surgery that are commonly encountered in daily practice. Panel discussions and questions from the audience will augment these competencies.

Moderators: *Christopher A. Caldarone, Toronto, Canada, Joseph A. Dearani, Rochester, MN, Brian E. Kogon, Atlanta, GA, and Jennifer S. Nelson, Ypsilanti, MI*

8:00 AM **Welcome and Introduction**
Joseph A. Dearani, Rochester, MN, and Brian E. Kogon, Atlanta, GA

8:05 AM **Alternative Approaches to the Pulmonary and Tricuspid Valves**
Brian E. Kogon, Atlanta, GA

8:20 AM **Alternative Approaches to the Mitral and Aortic Valves**
Edward P. Chen, Atlanta, GA

8:35 AM **Discussion**

8:55 AM **Complex Congenital Mitral Surgery**
Pedro J. del Nido, Boston, MA
REGULATORY DISCLOSURE This presentation will address the off-label use of the Medtronic Melody Valve in the mitral position in children.

9:10 AM **Complex Adult Mitral Surgery**
David H. Adams, New York, NY
COMMERCIAL RELATIONSHIPS D. H. Adams: Consultant/Advisory Board, Edwards Lifesciences Corporation, Medtronic, Inc

9:25 AM **Discussion**

9:45 AM **Break**

10:00 AM **Complex Adult Tricuspid Surgery**
Patrick M. McCarthy, Chicago, IL
COMMERCIAL RELATIONSHIPS P. M. McCarthy: Consultant/Advisory Board, Abbott, AtriCure, Inc, Edwards Lifesciences Corporation, MiCardia Corporation; Ownership Interest, Edwards Lifesciences Corporation

10:15 AM **Complex Congenital Tricuspid Surgery**
Joseph A. Dearani, Rochester, MN

10:30 AM **Discussion**

10:50 AM **Adult Aortic Arch Surgery**
Joseph S. Coselli, Houston, TX
COMMERCIAL RELATIONSHIPS J. S. Coselli: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Other, Vascutek Ltd, Royalties Coselli-branched graft for TAAA repair; Research Grant, Medtronic, Inc, W. L. Gore & Associates, Inc; Other, Medtronic, Inc, Research trial committees

11:05 AM **Congenital Aortic Arch Surgery**
Alberto Pochettino, Rochester, MN

11:20 AM **Discussion**

8:00 AM – 4:30 PM ***Grand Ballroom 8A***

STS/AATS Cardiothoracic Critical Care Symposium: How to Successfully Establish a CT ICU

This symposium will focus on how to develop a successful cardiothoracic ICU. Topics include staffing issues, reimbursement, billing, communication, quality assurance, critical care board certification, palliative care, and the payer's point of view. While this symposium will be relevant to those practicing in university settings, special attention will also be given to identifying the critical aspects for development of CT ICUs in non-university-based practices.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe regulations for critical care billing in the 90-day global surgical period
- Discuss the importance of an appropriate compensation structure and quality assurance initiatives
- Compare and contrast different staffing models that include a variety of attending physician training backgrounds, as well as the role for advanced care practitioners
- Formulate effective communications, structured algorithms, and checklists for safe and thorough handoffs

The physician competencies addressed in this session are patient care, medical knowledge, practice-based learning and improvement, professionalism, and systems-based practice. These physician competencies will be addressed through a series of collaborative lectures by members of The Society of Thoracic Surgeons and the American Association for Thoracic Surgery. These lectures are meant to advance knowledge and expertise in the complex field of cardiothoracic critical care. Case scenarios, panel discussions, and questions from the audience will augment these competencies.

Moderators: *Nevin M. Katz, Baltimore, MD, and Michael S. Mulligan, Seattle, WA*

8:00 AM **Welcome and Opening Remarks**
Michael S. Mulligan, Seattle, WA

8:15 AM **Why Develop a High-Intensity Staffing Model: The Payer's Perspective**
TBA

8:45 AM **Critical Care Billing and Coding in the Global Surgical Period**
Julie R. Painter, Denver, CO

9:15 AM **Impact of the Patient Protection and Affordable Care Act**
Jeffrey B. Rich, Norfolk, VA

9:45 AM **Developing an ACP Model for ICU Care**
Joshua P. Squiers, Nashville, TN

10:15 AM **Break**

10:30 AM **Recruiting, Training, and Onboarding Personnel in the CT ICU**
Aaron M. Cheng, Seattle, WA

11:00 AM **Communication and Handoffs in the CT ICU**
Rakesh C. Arora, Winnipeg, Canada

11:30 AM **The Use of Simulation for Education in Critical Care**
Nevin M. Katz, Baltimore, MD, and Michael S. Mulligan, Seattle, WA

12:00 PM **Luncheon Symposium: Resolving Conflict in the CT ICU**
TBA

1:00 PM **Who Should Attend in the CT ICU?**
Glenn J. R. Whitman, Baltimore, MD

1:50 PM **Faculty Development for Cardiothoracic Surgical Intensivists**
TBA

2:30 PM **Discussion**

2:40 PM **Break**

3:00 PM **Essential Elements for Successful Establishment of a CT ICU**
Kevin W. Lobdell, Charlotte, NC

3:30 PM **The Impact of CT ICU Staffing Models on Resident Education**
Edward D. Verrier, Seattle, WA

4:00 PM **Critical Equipment Needs for the CT ICU**
Peter von Homeyer, Seattle, WA

1:00 PM – 4:30 PM ***Grand Ballroom 9-11***

Residents Symposium: Finding the Right Job and Transitioning to Practice

This symposium will provide residents with practical early career information. The first session will include talks related to the job search: how to find the right position, interviewing tips, and negotiating a contract. The second session will include talks related to transitioning into practice: how to bring new technologies to a practice, billing and coding, and early career development. Each session will be followed by small group table discussions led by experienced surgeons and a larger group discussion with the speakers.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Plan a successful job search
- Describe the important elements of negotiating a contract
- Discuss the necessary aspects of bringing new technologies into a practice
- Recognize the legal issues of billing and coding
- Identify the important aspects of early career development

The physician competencies addressed in this session are medical knowledge, professionalism, and interpersonal and communication skills. These physician competencies will be addressed through a series of individual lectures that will discuss practical early career information.

Moderators: *Sidhu P. Gangadharan, Boston, MA, Sandra L. Starnes, Cincinnati, OH, and Ara A. Vaporciyan, Houston, TX*

1:00 PM **Welcome and Introductions**
Sidhu P. Gangadharan, Boston, MA, Sandra L. Starnes, Cincinnati, OH, and Ara A. Vaporciyan, Houston, TX

Session I: Finding a Job

1:05 PM **How to Find a Position**
Danny Chu, Pittsburgh, PA

1:20 PM **Interviewing and Self-Marketing**
Christine L. Lau, Charlottesville, VA

1:35 PM **Contract Negotiations**
Faiz Y. Bhora, New York, NY
COMMERCIAL RELATIONSHIPS F. Y. Bhora: Other Research Support, TEI Biosciences; Other, Merit Medical Endotek, PI

1:50 PM **Discussion**

2:35 PM **Break**

Session II: Transitioning to Practice

2:50 PM **Adding New Technologies and Team Building**
Edward P. Chen, Atlanta, GA

3:05 PM **Billing and Coding**
Francis C. Nichols III, Rochester, MN

3:20 PM **Early Career Development**
Elizabeth A. David, Houston, TX

3:45 PM **Discussion**

1:15 PM – 4:30 PM ***Grand Ballroom 7B***

Parallel Surgical Symposium: Congenital

This course will review pertinent and controversial topics in congenital heart disease. The three main topics will be aortic valve repair, treatment of Ebstein's anomaly, and surgery of the left ventricular outflow tract, including subaortic stenosis, supravalvar aortic stenosis, and therapy for hypoplasia of the aortic arch and coarctation.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Recognize the anatomy of the aortic valve and its supporting structures
- Explain current reparative techniques for the aortic valve
- Recognize the anatomy and pathology of Ebstein's malformation of the tricuspid valve
- Describe the cone technique of tricuspid valve repair
- Discuss the complexities of medical and surgical therapies in neonates with Ebstein's anomaly
- Summarize the surgical options when dealing with subaortic stenosis, supravalvar aortic stenosis, and aortic arch hypoplasia

The physician competencies addressed in this session are patient care, medical knowledge, and systems-based practice. These physician competencies will be addressed through a series of individual lectures that will focus on pertinent and controversial topics in congenital heart disease, pediatric heart surgery, postoperative management, and decision making. Panel discussions and questions from the audience will augment these competencies.

Moderators: *Mark S. Bleiweis, Gainesville, FL, Andrew C. Fiore, St Louis, MO, and Ralph S. Mosca, New York, NY*

1:15 PM **Introductory Remarks**
Ralph S. Mosca, New York, NY

Session I: Aortic and Tricuspid Valve Repair

1:19 PM **Anatomy of the Aortic Valve**
Paul M. Weinberg, Philadelphia, PA

1:31 PM **Aortic Valve Reparative Techniques**
Gebrine El-Khoury, Brussels, Belgium

1:43 PM **Results of Pediatric Aortic Valve Repair**
Yves d'Udekem, Parkville, Australia

1:55 PM **Discussion**

2:05 PM **The Cone Procedure**
Jose P. Da Silva, São Paulo, Brazil

2:17 PM **Tricuspid Valve Repair in Neonatal Ebstein's Malformation**
Christopher J. Knott-Craig, Memphis, TN

2:29 PM **Starnes Procedure for Complex Neonatal Ebstein's Malformation**
Vaughn A. Starnes, Los Angeles, CA

2:41 PM **Individualizing Care for the Patient With Neonatal Ebstein's Malformation**
Glen S. Van Arsdell, Toronto, Canada

2:53 PM **Break**

Session II: Surgery of the Left Ventricular Outflow Tract

3:08 PM **Management of Subaortic Stenosis (Initial and Recurrent)**
TBA

3:20 PM **Supravalvar Aortic Stenosis**
Richard G. Ohye, Ann Arbor, MI

3:32 PM **Hypoplastic Aortic Arch and Coarctation**
Yves d'Udekem, Parkville, Australia

3:44 PM **Cardiopulmonary Bypass Technology Update**
Jorge Molina, Tulsa, OK

3:56 PM **Intraoperative Application of Interventional Cardiac Catheterization Techniques**
Doff McElhinney, New York, NY
COMMERCIAL RELATIONSHIPS D. McElhinney: Consultant/Advisory Board, Medtronic, Inc

4:08 PM **3D Modeling in Congenital Heart Disease**
Shi-Joon Yoo, Toronto, Canada
COMMERCIAL RELATIONSHIPS S. Yoo: Ownership Interest, 3D HOPE Medical; Other, IMIB-CHD, Not-for-profit organization for repository of medical image data for congenital heart diseases

4:20 PM **Discussion**

1:15 PM – 4:30 PM ***Grand Ballroom 7A***

Parallel Surgical Symposium: General Thoracic

This symposium will focus on issues that are pertinent to today's practicing thoracic surgeon and will help attendees address gaps in knowledge on the current approaches to mediastinal tumors, new technology and expanding their thoracic practice, and the management of challenging situations in thoracic surgery.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe the management of nonthymomatous myasthenia gravis, as well as the multidisciplinary role of the thoracic surgeon in the treatment of thymic carcinoma and neurogenic and germ cell tumors
- Outline the necessary resources for expanding one's practice and implementing programs in therapeutic bronchoscopy, esophagoscopy, and robotic surgery
- Recognize the risk factors and identify the best approach for managing various complications during and after pulmonary resection and esophagectomy

The physician competencies addressed in this session are patient care, medical knowledge, and systems-based practice. These physician competencies will be addressed through a series of individual lectures that will address issues in thoracic surgery that are commonly encountered in daily practice. Panel discussions and questions from the audience will augment these competencies.

Moderators: *Moishe Liberman, Montreal, Canada, Jules Lin, Ann Arbor, MI, and Richard I. Whyte, Boston, MA*

COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc

Session I: Modern Treatment of Mediastinal Tumors

1:15 PM **Nonthymomatous Myasthenia Gravis**
Joshua R. Sonett, New York, NY

1:30 PM **Thymic Carcinoma—Role of Neoadjuvant Therapy and Extended Resections**
Frank C. Detterbeck, New Haven, CT
COMMERCIAL RELATIONSHIPS F. C. Detterbeck: Research Grant, Medela

1:45 PM **Neurogenic Tumors**
Reza J. Mehran, Houston, TX

2:00 PM **Panel Discussion**

Session II: Ways to Expand Your Practice and Implement New Programs

2:20 PM **Interventional Thoracic Endoscopy**
Moishe Liberman, Montreal, Canada
COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc

2:35 PM **Robotics**
Robert J. Cerfolio, Birmingham, AL
COMMERCIAL RELATIONSHIPS R. J. Cerfolio: Other, Intuitive Surgical, Inc, Faculty, Proctor, Speaker; Research Grant, Pfizer Inc, Precision Therapeutics, Inc

2:50 PM **Endoscopic Treatments for Benign Esophageal Diseases**
Richard I. Whyte, Boston, MA

3:05 PM **Panel Discussion**

3:25 PM **Break**

Session III: How to Get Out of Trouble in a Tricky Situation

3:40 PM **Conduit Necrosis Following Esophagectomy**
Jules Lin, Ann Arbor, MI

3:55 PM **Prolonged Air Leak After Lobectomy**
John C. Wain, Boston, MA

4:10 PM **Postpneumonectomy Bronchopleural Fistula and/or Empyema**
Claude Deschamps, Rochester, MN

4:25 PM **Panel Discussion**

2:30 PM – 4:30 PM ***Grand Ballroom 8B***

CT Surgery Interprofessional Education Symposium: TAVR Team Approach and Proven Safety Tools in Cardiac Surgery

This symposium will cover two hot topics: the multidisciplinary team approach to transcatheter aortic valve replacement (TAVR) and proven safety tools in cardiac surgery.

Session I will cover the team approach to TAVR. Speakers will discuss patient selection and preoperative workup, transfemoral and transapical approaches, and initial postoperative and long-term patient management.

Session II will focus on the proper use of procedural and surgical time-outs and checklists, which have been shown to reduce patient morbidity and mortality. A team-based approach is required for the success of these proven safety tools. Members of the cardiac surgery operating room will explain how to properly use both time-outs and checklists in the OR.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Summarize the risks and benefits of TAVR versus conventional surgical AVR
- Describe the long-term follow-up and management of TAVR recipients
- Demonstrate the proper utilization of procedural time-outs, surgical/procedure site marking, and surgical/procedure checklists
- Illustrate ways advanced providers can take an active role and be leaders in the proper use of proven safety tools

The physician competencies addressed in this session are patient care, medical knowledge, professionalism, and interpersonal and communication skills. These physician competencies will be addressed through a series of lectures meant to enhance understanding of the evolving roles within the interprofessional team.

Moderators: *Diane E. Alejo, Baltimore, MD, and Kelly C. Gustafson, Morgantown, WV*

Session I: Team Approach to TAVR

2:30 PM **Introduction**
Kelly C. Gustafson, Morgantown, WV

2:33 PM **Patient Selection and Femoral TAVR**
Jeffrey A. Southard, Sacramento, CA
COMMERCIAL RELATIONSHIPS J. A. Southard: Speakers Bureau/Honoraria, Edwards Lifesciences Corporation

2:43 PM **Transapical TAVR**
Joseph N. Young, Sacramento, CA

2:53 PM **Immediate Postop ICU Management**
Edward A. Ranzenbach, Sacramento, CA

3:03 PM **Long-term Follow Up**
Jeffrey A. Southard, Sacramento, CA
COMMERCIAL RELATIONSHIPS J. A. Southard: Speakers Bureau/Honoraria, Edwards Lifesciences Corporation

3:13 PM **Discussion**

Session II: Proven Patient Safety Tools—Checklists and Time-Outs

3:30 PM **Introduction, History, and Regulatory Requirements**
Michael Doll, Danville, PA

3:45 PM **Demonstration of a Time-Out—Use of a Checklist**
Edward L. Woods, Danville, PA

4:00 PM **Use of a Prebypass Checklist**
Cody Trowbridge, Danville, PA

4:15 PM **Discussion**

2:30 PM – 4:30 PM ***Grand Ballroom 4-6***

International Symposium: Surgical Management of Cardiothoracic Infections

This symposium will examine how a variety of cardiothoracic infections are treated surgically in different parts of the world. In particular, the symposium will provide insights into surgical treatment of tricuspid valve endocarditis, mitral valve endocarditis, late-descending mediastinitis, and empyema.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Assess surgical options for treating tricuspid valve endocarditis
- Discuss the importance of timing for treating mitral valve endocarditis
- Recognize optimal approaches for treating late-descending mediastinitis
- Summarize the advantages and disadvantages of employing video-assisted thoracoscopic surgery (VATS) versus open surgery to treat empyema

The physician competencies addressed in this session are patient care, medical knowledge, professionalism, and interpersonal and communication skills. These physician competencies will be addressed through a series of lectures that will focus on how a variety of cardiothoracic infections are treated surgically in different parts of the world.

Moderator: *A. Pieter Kappetein, Rotterdam, Netherlands*

2:30 PM **Welcome and Opening Remarks**
A. Pieter Kappetein, Rotterdam, Netherlands

2:35 PM **Surgical Options for Tricuspid Valve Endocarditis**
Adnan Cobanoglu, Beachwood, OH

2:55 PM **Early vs Late Surgical Treatment of Mitral Valve Endocarditis**
A. Sampath Kumar, Delhi, India

3:15 PM **Surgical Treatment of Late-Descending Mediastinitis**
TBA

3:35 PM **VATS vs Open Surgical Treatment of Empyema**
Carlos A. Olivares-Torres, Tijuana, Mexico

3:55 PM **Postoperative Infections: A Contemporary Reassessment of the Types and Impact**
Keith A. Horvath, Bethesda, MD

4:15 PM **Discussion**

4:00 PM – 6:30 PM *Palms Ballroom Foyer*

Scientific Posters Open

4:30 PM – 6:30 PM *Cypress Ballroom*

Opening Reception in STS Exhibit Hall

Don't miss the special 50th Anniversary celebration!

6AM

6:30 AM – 5:00 PM
Registration: STS 50th Annual Meeting

7AM

7:00 AM – 7:15 AM
Opening Remarks

7:15 AM – 8:15 AM
J. Maxwell Chamberlain Papers

8:15 AM – 9:00 AM
Richard E. Clark Papers

8AM

9:00 AM – 9:30 AM
50th Anniversary Tribute

9AM

9:00 AM – 4:30 PM
Scientific Posters Open

Exhibits Open

9:30 AM – 9:45 AM
Introduction of the President: David A. Fullerton

10AM

9:45 AM – 10:45 AM
Presidential Address: Douglas E. Wood

11AM

11:30 AM – 12:30 PM

- Adult Cardiac Session: Arrhythmia
- Adult Cardiac Session: Heart Failure
- Congenital Session: Adult Congenital
- Basic Science Research: Adult Cardiac
- Critical Care
- General Thoracic Session: New Techniques

12PM

1PM

1:15 PM – 5:15 PM
Joint Council on Thoracic Surgery Education: Implementation of a Surgical Curriculum in Cardiothoracic Surgery

1:30 PM – 3:30 PM

- Adult Cardiac Session: Aortic
- Adult Cardiac Session: Ischemic
- Congenital Session: Pediatric Congenital I
- Considerations in Perioperative Management of Patients With Congestive Heart Failure
- General Thoracic Session: Lung Cancer I
- General Thoracic Session: Lung Transplantation

2PM

3PM

4PM

1:15 PM – 5:15 PM
ACC @ STS

4:15 PM – 5:15 PM
Surgical Motion Picture Matinees: Adult Cardiac, Congenital, and General Thoracic

4:15 PM – 5:15 PM
Late-Breaking Abstract Sessions—Clinical Trials and Quality Improvement

5PM

5:00 PM – 6:30 PM
Scientific Posters and Wine

5:30 PM – 6:30 PM
Business Meeting (STS Members Only)

6PM

7PM

7:00 PM – 10:30 PM
STS Social Event: The Wizarding World of Harry Potter™ at Universal's Islands of Adventure®

8PM

9PM

New 50 Anniversary Tribute

6:30 AM – 5:00 PM	Registration: STS 50th Annual Meeting
7:00 AM – 7:15 AM	Opening Remarks
7:15 AM – 8:15 AM	J. Maxwell Chamberlain Papers
8:15 AM – 9:00 AM	Richard E. Clark Papers
9:00 AM – 4:30 PM	Scientific Posters Open Exhibits Open
9:00 AM – 9:30 AM	50th Anniversary Tribute
9:30 AM – 9:45 AM	Introduction of the President: David A. Fullerton
9:45 AM – 10:45 AM	Presidential Address: Douglas E. Wood
11:30 AM – 12:30 PM	Adult Cardiac Session: Arrhythmia Adult Cardiac Session: Heart Failure Basic Science Research: Adult Cardiac Congenital Session: Adult Congenital Critical Care General Thoracic Session: New Techniques
1:15 PM – 5:15 PM	Joint Council on Thoracic Surgery Education: Implementation of a Surgical Curriculum in Cardiothoracic Surgery ACC @ STS
1:30 PM – 3:30 PM	Adult Cardiac Session: Aortic Adult Cardiac Session: Ischemic Congenital Session: Pediatric Congenital I Considerations in Perioperative Management of Patients With Congestive Heart Failure General Thoracic Session: Lung Cancer I General Thoracic Session: Lung Transplantation
4:15 PM – 5:15 PM	Surgical Motion Picture Matinees: Adult Cardiac, Congenital, and General Thoracic Late-Breaking Abstract Sessions—Clinical Trials and Quality Improvement
5:00 PM – 6:30 PM	Scientific Posters and Wine
5:30 PM – 6:30 PM	Business Meeting (STS Members Only)
7:00 PM – 10:30 PM	STS Social Event: The Wizarding World of Harry Potter™ at Universal's Islands of Adventure®

6:30 AM – 5:00 PM ***Convention Center Entrance***

Registration: STS 50th Annual Meeting

9:00 AM – 4:30 PM ***Palms Ballroom Foyer***

Scientific Posters Open

9:00 AM – 4:30 PM ***Cypress Ballroom***

Exhibits Open

7:00 AM – 10:45 AM ***Crystal Ballroom G-Q***

General Session I

Moderators: *Douglas E. Wood, Seattle, WA, and Keith S. Naunheim, St Louis, MO*

COMMERCIAL RELATIONSHIPS D. E. Wood: Research Grant, Spiration, Inc; Consultant/Advisory Board, Spiration, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care, medical knowledge, and professionalism. These physician competencies will be addressed through a series of individual lectures and focused discussion on key points of presentations.

7:00 AM ***Crystal Ballroom G-Q***

Opening Remarks

7:15 AM ***Crystal Ballroom G-Q***

J. Maxwell Chamberlain Paper for Adult Cardiac Surgery

Safety Implications of Robotic Surgery: Analysis of Recalls and Adverse Event Reports of da Vinci Surgical Systems

*H. Alemzadeh[2], R. K. Iyer[2], *J. Raman[1]*

[1]Rush University Medical Center, Chicago, IL, [2]University of Illinois, Urbana-Champaign

Discussant: *W. Randolph Chitwood Jr, Greenville, NC*

Purpose: We review device-related recalls and safety issues with the da Vinci robot.

Methods: The number, types, and causes of robot malfunctions that led to patient complications and safety hazards were analyzed. Data included recalls and adverse events reported to the US FDA between January 2000 and December 2012, from two public FDA databases.

Results: 4,798 adverse events (involving 4,807 device uses) were reported to the FDA, involving 85 deaths, 414 patient injuries, and 3,402 device malfunctions. We calculated estimated rates of adverse events and injury/death events per year for 2004-2012. The number of safety-critical (injury or death) reports increased from 13.3 per 100,000 procedures in 2004 to 50 per 100,000 in 2012. Comparable accidents in a safety-critical industry, such as aviation, stayed constant over 1992-2011, ranging 0.01-1.81 per 100,000 flight departures. 147 cases (6.5%) were related to cardiothoracic procedures. 74.1% (63/85) of deaths were reported after the procedure and 18% (15/85) during the procedure. In 545 cases (11.3%), a part of the device or burnt/broken pieces of instruments fell into the patient's body, with 12.2% in cardiothoracic surgeries. In 499 cases (10.4%), a system error code was experienced and the robot was transferred to a recoverable or non-recoverable safety state. A high-level control structure of the robot was developed based on the adverse events and used to analyze accidents and characterize safety hazards of system. This study helps identify missing and existing safety controls that were inadequate in mitigating patient injury. Insights on improving the design of future systems were developed.

Conclusions: The da Vinci robot continues to have adverse events and complications, despite increased numbers of procedures. Adoption and use of standard engineering safety mechanisms with this technology may reduce adverse events.

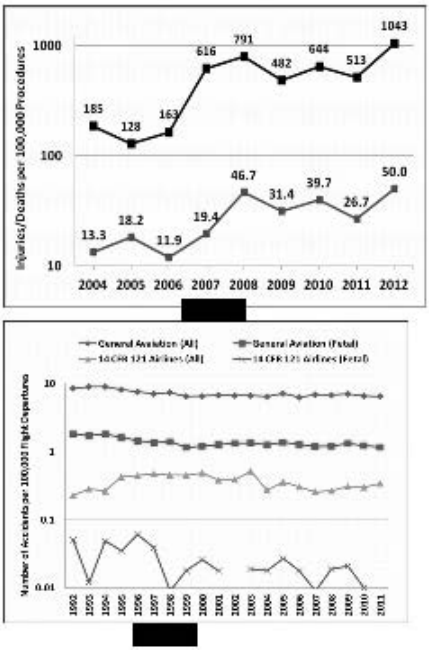


Figure 1 – Comparison of accident rates in robotic surgery and aviation industry:
(a) Total number of adverse events and injury/death events per 100,000 procedures per year
(b) Total number of accidents and fatalities in different aviation classes per 100,000 flight departures per year

7:35 AM ***Crystal Ballroom G-Q***

J. Maxwell Chamberlain Paper for General Thoracic Surgery

A Comparative, Propensity-Matched Analysis of Wedge Resection and Stereotactic Body Radiation Therapy for Early Stage Non-Small Cell Lung Cancer (NSCLC)

J. Port, A. Nasar, P. C. Lee, S. Paul, B. M. Stiles, W. G. Andrews, N. K. Altorki

Weill Cornell Medical College, New York, NY

COMMERCIAL RELATIONSHIPS J. Port: Consultant/Advisory Board, Covidien; Ownership Interest, RF Surgical Systems, Inc

Discussant: *Richard I. Whyte, Boston, MA*

Purpose: Patients who present with early stage NSCLC and are poor candidates for lobar resection may be offered sublobar resection (commonly wedge) or stereotactic body radiation therapy (SBRT). However, comparing the relative effectiveness of these techniques is difficult because of differences in patient selection. We performed a propensity-matched analysis to compare the different treatment modalities.

Methods: A prospectively collected database was reviewed for patients who underwent a wedge resection (W), a wedge + brachytherapy (WB), or SBRT for clinical stage IA NSCLC from 2001 to 2012. Univariate and Cox-regression multivariate analysis were performed for predictors of survival (OS), overall recurrence (local/distant), and locoregional recurrence in propensity-matched groups. Survival was analyzed by the Kaplan-Meier method.

Results: There were 164 patients identified, from which 99 were matched by age, gender, histology, and clinical stage. There were 61 females (62%) and 38 males (38%) with a median age for all three groups of 73. Thirty-eight patients underwent a wedge only (W), 38 patients underwent a wedge with either I-125 (n=6) or CS-131 (n=32) (WB), and 23 had SBRT. Median follow-up was 20 months. Overall recurrence was significantly higher in the SBRT group (35%) compared to W (5%) or WB (16%), p=0.005. The overall 3-year survival rates for the W, WB, and SBRT groups were 62%, 72%, and 75% respectively. Univariate analysis identified male gender, SBRT, and poor pulmonary function tests as significant negative predictors of mortality and recurrence. Multivariate regression analysis identified male gender and SBRT as significant negative predictors for mortality and recurrence (Table 1).

Conclusions: Clinical stage IA NSCLC patients treated by SBRT appear to have a significantly higher overall recurrence rate than those treated by wedge resection. It does not appear that the addition of brachytherapy lowers recurrence or improves overall survival compared to wedge alone.

Univariate and Multivariate Predictors of Mortality and Recurrence

Independents Variables	Univariate Predictors		Multivariate Predictors	
	OR (95% CI)	p value	OR (95% CI)	p value
Age, in years	1.05 (0.98 -1.11)	P=0.171	1.01 (0.94 - 1.09)	P=0.798
Gender				
Female Male	Reference:1.00 4.08 (1.67 -10.00)	P=0.002	5.14 (1.78 -14.86)	P=0.003
Clinic tumor size	0.98 (0.45 -2.11)	P=0.951		
Pathology tumor size, in cm	1.69 (0.83 - 3.46)	P=0.148		
Histology type				
Adenocarcinoma	Reference:1.00			
Squamous,	1.89 (0.59 -6.05)	P=0.283	3.26 (0.81 - 13.04)	P=0.095
Histology grade:				
Well differentiated	Reference:1.00			
Moderate differentiated	1.18 (0.27 - 5.10)	P=0.822		
Poor differentiated	1.96 (0.42 - 9.11)	P=0.393		
Pathology stage				
Stage-IA	Reference:1.00			
Stage-IB	1.45 (0.33 -6.42	P=0.624		
Stage-II/III	0.56 (0.06 -5.11)	P=0.611		
group				
Wedge resection with SEED	Reference:1.00			
Only Wedge resection	1.00 (0.35 - 2.88)	P=0.999	1.23 (0.38 -3.98)	P=0.724
SBRT only	4.19 (1.38 - 12.75)	P=0.012	3.85 (1.07 -13.77)	P=0.038
FVC (in %)	0.98 (0.95 - 1.00)	P=0.068		
FEV1 (in %)	0.97 (0.95 - 0.99)	P=0.007		
DLCO (in %)	0.98 (0.96 -1.01)	P=0.103		
Comorbidities				
No	Reference:1.00			
Yes	1.65 (0.70 -3.90)	P=0.251	1.21 (0.43 -3.38)	P=0.718

Notes

7:55 AM ***Crystal Ballroom G-Q***

J. Maxwell Chamberlain Paper for Congenital Heart Surgery

Vascular Endothelial Growth Factor and Superoxide Dismutase Gene Variants Have an Additive Adverse Effect on Covariate-Adjusted Transplant-Free Survival After Surgery for Isolated Congenital Heart Disease

D. S. Kim[1], J. H. Kim[1], A. A. Burt[1], D. R. Crosslin[1], N. Burnham[2], D. M. McDonald-McGinn[2], E. H. Zackai[2], S. C. Nicolson[2], T. L. Spray[2], I. B. Stanaway[1], D. A. Nickerson[1], M. W. Russell[3], H. Hakonarson[2], G. P. Jarvik[1], J. Gaynor[2]

[1]University of Washington, Seattle, [2]The Children's Hospital of Philadelphia, PA, [3]University of Michigan, Ann Arbor

***Discussant:** John G. Coles, Toronto, Canada*

Purpose: Polymorphisms in oxidative stress and vascular response genes modify postoperative outcomes in infants with congenital heart defects (CHD). We have shown that 2 single nucleotide polymorphisms (SNPs)—Vascular Endothelial Growth Factor A (VEGFA) SNP rs833069 and Superoxide Dismutase 2 (SOD2) SNP rs2758331—are each associated with worse survival after surgery for CHD. We tested the hypothesis that there is an additive, dose-dependent effect of these 2 SNPs on long-term survival.

Methods: This is an analysis of a previously described cohort of non-syndromic CHD patients who underwent cardiac surgery with cardiopulmonary bypass before 6 months of age (n=415). To test for joint effects of the 2 SNPs in VEGFA and SOD2 on transplant-free survival, the genotypes were grouped to form a risk score reflecting the cumulative number of risk alleles (0-4 alleles/patient). Survival curves, adjusting for confounding covariates, were calculated using the Kaplan-Meier method and compared with the log rank test to evaluate the joint effect of the number of risk alleles and covariates.

Results: A higher risk score based on the VEGFA and SOD2 SNP genotypes was associated with worse transplant-free survival (p=3.02x10-4) after confounder adjustment (eg, prematurity and CHD severity). The total burden of risk alleles was additive; individuals with the highest risk score of 4 (n=59 subjects, 14.2% of the cohort) had a total covariate-adjusted HR=15.64 for worse transplant-free survival (see Figure 1).

Conclusions: After cardiac surgery, infants who are homozygous for the high-risk alleles for both the VEGFA and SOD2 SNPs have an approximate 16-fold increased risk of death or heart transplant, independent of other covariates. These data suggest that genetic variants are important modifiers of survival after surgery for CHD. Understanding how genetic variation affects survival may lead to new prevention/treatment strategies.

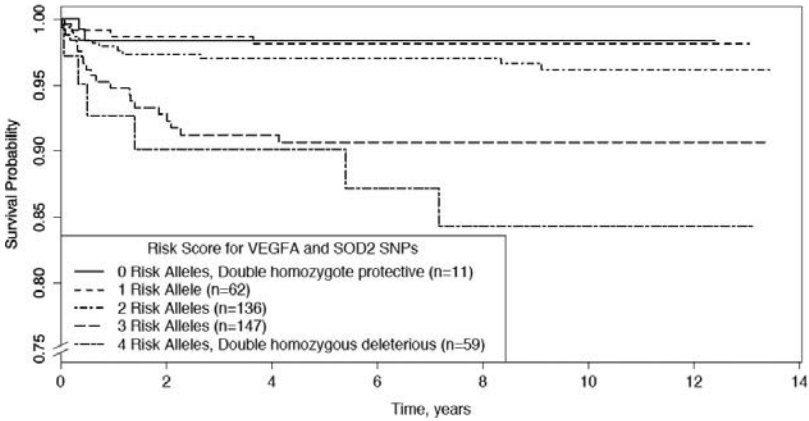


Figure 1. The VEGFA and SOD2 risk score is associated with poorer transplant-free outcomes after surgery for isolated congenital heart disease in neonates

Notes

8:15 AM ***Crystal Ballroom G-Q***

Richard E. Clark Paper for Adult Cardiac Surgery

The Association of Transcatheter Aortic Valve Replacement (TAVR) Availability, Surgical Aortic Valve Replacement Case Volume, and In-Hospital Mortality in the United States: A Report From the STS Adult Cardiac Surgery Database and the STS/ACC TVT Registry™

J. M. Brennan[1], F. H. Edwards[6], J. Carroll[3], F. L. Grover[3], R. Brindis[9], D. M. Shahian[10], E. Tuzcu[8], V. H. Thourani[2], L. G. Svensson[8], S. M. O'Brien[1], E. D. Peterson[1], C. M. Shewan[11], K. Hewitt[12], J. S. Gammie[7], J. Rumsfeld[3], D. R. Holmes[4], M. J. Mack[5]

[1]Duke University Medical Center, Durham, NC, [2]Emory University, Atlanta, GA, [3]University of Colorado, Denver, [4]Mayo Hospital, Rochester, MN, [5]Baylor Health, Dallas, TX, [6]University of Florida, Jacksonville, [7]University of Maryland, Baltimore, [8]Cleveland Clinic, OH, [9]University of California, San Francisco, [10]Massachusetts General Hospital, Boston, [11]The Society of Thoracic Surgeons, Chicago, IL, [12]American College of Cardiology, Washington, DC

COMMERCIAL RELATIONSHIPS J. Carroll: Other Research Support, Edwards Lifesciences Corporation; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc; L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax; E. D. Peterson: Research Grant, Eli Lilly and Company, Janssen Pharmaceutical, Inc; Other Research Support, The Society of Thoracic Surgeons, PI of STS Data Coordinating Center; J. S. Gammie: Research Grant, Edwards Lifesciences Corporation; Ownership Interest, Correx, Inc, Harpoon Medical, Inc; J. Rumsfeld: Other, NCDR, Chief Science Officer

Discussant: *Joseph E. Bavaria, Philadelphia, PA*

COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc

Purpose: Single-center analyses have documented an increase in the volume of surgical aortic valve replacement (SAVR) procedures and improved SAVR outcomes following the initiation of transcatheter AVR (TAVR) programs (the so-called "halo-effect"); however, the association between TAVR availability and subsequent AVR volumes and outcomes in the United States remains unknown.

Methods: Surgical and transcatheter AVR cases from the STS Adult Cardiac Surgery Database (ACSD, 2008-2012) and TAVR cases from the STS/ACC Transcatheter Valve Therapy Registry™ (2012) were combined to evaluate the overall volume of aortic valve interventions (SAVR + TAVR) at participating United States hospital centers. Temporal trends in case volume and in-hospital outcomes were assessed in the overall cohort and among low (STS PROM <4%), intermediate (4%-8%), and high-risk (>8%) cases.

Results: Across the study interval, the total annual volume of AV interventions increased from 34,699 to 43,282, driven predominately by expanded use of SAVR in low- and intermediate-risk cases and the use of TAVR in high-risk cases. With TAVR commercial availability (2012), the volume of high-risk SAVR cases declined slightly; however, the combined volume of AV interventions (SAVR + TAVR) in high-risk cases nearly doubled (from 4,249 cases in 2011 to 8,082 in 2012). In parallel, observed in-hospital mortality for combined aortic valve interventions in high-risk cases declined from 8.9% in 2011 to 7.0% in 2012.

Conclusions: Since TAVR has been commercially available in the United States, low- and intermediate-risk SAVR volumes have continued to increase. While the volume of SAVR has declined slightly in high-risk cases, combined TAVR + SAVR volumes have risen sharply, and overall associated mortality has declined in this cohort.

8:30 AM *Crystal Ballroom G-Q*

Richard E. Clark Paper for General Thoracic Surgery

Wedge Resection Reduces the Incidence of Major Morbidity by Nearly 50% as Compared to Lobectomy: An STS General Thoracic Surgery Database Propensity-Matched Analysis

P.A. Linden[1], S. Sheng[2], P. Saha-Chaudhuri[2], M. Onaitis[2]

[1]University Hospitals Case Medical Center, Cleveland, OH, [2]Duke University, Durham, NC

Discussant: *Hiran C. Fernando, Boston, MA*

COMMERCIAL RELATIONSHIPS H. C. Fernando: Consultant/Advisory Board, CSA Medical, Inc; Other, Galil Medical, Medical Monitor for study

Purpose: Lobectomy is considered the standard for resection of early NSCLC. In an attempt to mitigate the risk of perioperative complications, wedge resection is often used instead of lobectomy. We sought to quantify the degree to which wedge resection may protect against perioperative mortality and major morbidity following lung cancer resection in matched populations.

Methods: The STS National Database was reviewed for stage I-II NSCLC patients undergoing wedge resection and lobectomy between January 1, 2009, and December 31, 2011. During this time period, segmentectomy was grouped together and coded as one group with lobectomy. Propensity scores were estimated using a logistic model using a variety of risk factors. Patients were then matched using a Greedy 5 to 1 digit matching algorithm. After propensity matching, outcomes were analyzed using McNemar's tests.

Results: 3,624 wedge resection and 3,624 lobectomy patients were matched according to propensity analysis. The operative mortality was 1.57% for lobectomy vs 1.08% for wedge resection (p=0.0606). Major morbidity occurred in 8.22% of lobectomy patients vs 4.36% of wedge resection patients (p<.0001). No statistically significant differences were noted in the incidence of deep venous thrombosis, pulmonary embolus, prolonged ventilatory support, myocardial infarction, empyema, or new central neurological event. Significant differences were noted in the incidence of pneumonia, bronchopleural fistula, need for tracheostomy, sepsis, new renal failure, and chylothorax. Differences in the incidence of major complications were also seen in the comparison of VATS wedge vs VATS lobectomy and open wedge vs open lobectomy.

Conclusions: Wedge resection is much safer than lobectomy in these two matched populations. Further study is warranted to determine in which patients wedge resection yields the greatest benefit.

Continues on next page.

Incidence of Mortality and Major Morbidity in Matched Populations of Patients Undergoing Lung Resection for Stage I-II NSCLC

Variable	Wedge Resection (%)	Lobectomy/Segmentectomy (%)	P-value
Outcomes			
Operative Mortality	1.08	1.57	0.0606
Major Morbidity	4.36	8.22	<.0001
Pneumonia	2.26	4.03	<.0001
Bronchopleural fistula	0.19	0.50	0.0278
PE	0.22	0.33	0.3711
Ventilator Support > 48 hrs	0.47	0.72	0.1699
Tracheostomy	0.41	1.24	0.0001
MI	0.28	0.47	0.179
DVT	0.30	0.50	0.1779
Empyema	0.22	0.41	0.1444
Sepsis	0.33	0.88	0.0026
New central neurologic event	0.25	0.41	0.2207
New renal failure	0.58	1.77	<.0001
Chylothorax	0.22	0.52	0.0343

Notes

8:45 AM *Crystal Ballroom G-Q*

Richard E. Clark Paper for Congenital Heart Surgery

Epidemiology and Outcomes of In-Hospital Cardiac Arrest After Pediatric Cardiac Surgery: An Analysis of the STS Congenital Heart Surgery Database

P. Gupta[1], J. P. Jacobs[2], S. K. Pasquali[3], K. D. Hill[4], J. Gaynor[5], S. Sheng[6], S. M. Schexnayder[1], R. A. Berg[5], V. M. Nadkarni[5], M. Imamura[1], M. L. Jacobs[7]

[1]Arkansas Children's Hospital, University of Arkansas for Medical Sciences, Little Rock, [2]Johns Hopkins Children's Heart Surgery, St Petersburg and Tampa, FL, [3]University of Michigan, Ann Arbor, [4]Duke University Medical Center, Durham, NC, [5]The Children's Hospital of Philadelphia, PA, [6]Duke Clinical Research Institute, Durham, NC, [7]The Johns Hopkins University School of Medicine, Baltimore, MD

COMMERCIAL RELATIONSHIPS S. M. Schexnayder: Employment, American Heart Association

Discussant: *Ralph S. Mosca, New York, NY*

Purpose: Multicenter data regarding cardiac arrest in children undergoing heart surgery are limited. We describe epidemiology and outcomes associated with postoperative cardiac arrest after pediatric cardiac surgery in a large multi-institutional cohort.

Methods: Children <18 years undergoing heart surgery (with or without cardiopulmonary bypass) in the STS Congenital Heart Surgery Database (2007-2012) were included. Patient factors, operative characteristics, and outcomes were described overall and for eight commonly performed benchmark operations.

Results: Overall, 70,270 operations (97 centers) were included, and 3% (n=1,843) had one or more postoperative cardiac arrests. By univariate analysis, cardiac arrest rate was higher with younger age, lower weight, and presence of preoperative morbidities. Among eight benchmark operations, the prevalence of cardiac arrest was 3.2% (n=656) and increased with greater case complexity (Table). Cardiac arrest occurred in >5% of patients undergoing three of these eight common operations. Regardless of case complexity, cardiac arrest was associated with significant mortality risk, ranging from 5- to 46-fold increase in mortality across operations relative to patients without arrests (Figure).

Conclusions: Postoperative cardiac arrest occurs in 3% of patients undergoing pediatric heart operations. While prevalence increases with case complexity, cardiac arrest is associated with significant mortality risk regardless of level of complexity. Further study of mechanisms to both prevent cardiac arrest and to reduce subsequent mortality in those with an arrest may help to improve outcomes across centers. Such study could be facilitated by linkage of the STS National Database with the American Heart Association's Get with the Guidelines-Resuscitation Registry.

Continues on next page.

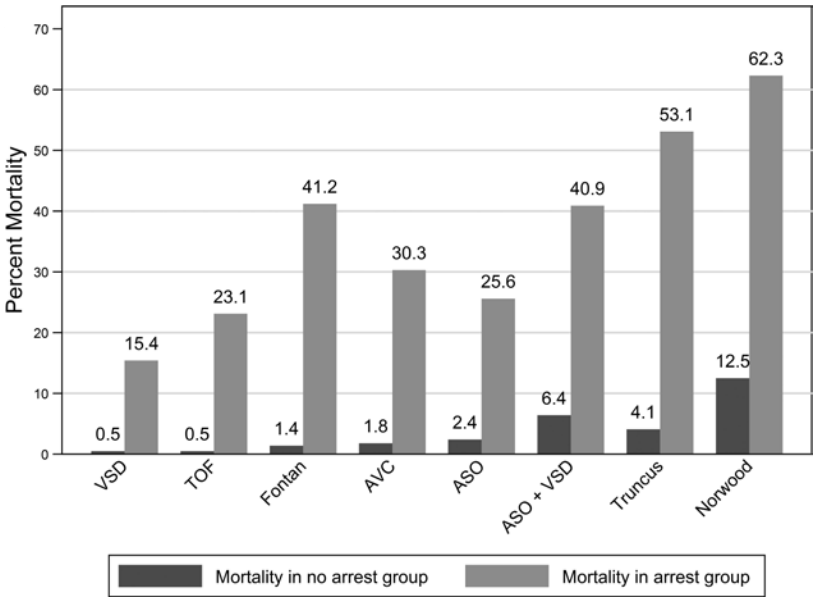
General Session I – Continued

Prevalence of Cardiac Arrest in Patients Undergoing Eight Benchmark Operations

Type of operation	Number of operations	Number of cardiac arrests	Prevalence of cardiac arrests
VSD	6845	52	0.80%
TOF	3732	52	1.40%
Fontan	1923	17	0.90%
AVC	2608	66	2.50%
ASO	1773	43	2.40%
ASO+VSD	656	44	6.70%
Truncus	478	32	6.70%
Norwood	2757	350	12.70%

Abbreviations: VSD: ventricular septal defect repair; TOF: tetralogy of Fallot repair; AVC: repair of complete atrioventricular canal defect; ASO: arterial switch operation

Mortality Associated With Cardiac Arrest in Patients Undergoing Eight Benchmark Operations (p<0.0001 for all comparisons)



Abbreviations: VSD: sentricular septal defect repair; TOF: tetralogy of Fallot repair; AVC: repair of complete atrioventricular canal defect; ASO: arterial switch operation

9:00 AM *Crystal Ballroom G-Q*

50th Anniversary Tribute

Douglas E. Wood, Seattle, WA

COMMERCIAL RELATIONSHIPS D. E. Wood: Research Grant, Spiration, Inc; Consultant/Advisory Board, Spiration, Inc

9:30 AM *Crystal Ballroom G-Q*

Introduction of the President

David A. Fullerton, Aurora, CO

9:45 AM *Crystal Ballroom G-Q*

Presidential Address

Douglas E. Wood, Seattle, WA

COMMERCIAL RELATIONSHIPS D. E. Wood: Research Grant, Spiration, Inc; Consultant/Advisory Board, Spiration, Inc

11:30 AM – 12:30 PM ***Crystal Ballroom G-Q***

Adult Cardiac Session: Arrhythmia

Moderators: *Gorav Ailawadi, Charlottesville, VA, and Vinay Badhwar, Pittsburgh, PA*

COMMERCIAL RELATIONSHIPS G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

Notes

11:30 AM *Crystal Ballroom G-Q*

Mitral Valve Surgery With Atrial Fibrillation Ablation: Early and Mid-term Outcomes of Both Procedures

T. O. Abicht[1], P. M. McCarthy[1], J. Kruse[1], E. C. Mcgee[1], S. C. Malaisrie[1], H. M. Russell[1], R. Lee[2]

[1]Northwestern Memorial Hospital, Chicago, IL, [2]St Louis University Hospital, MO

COMMERCIAL RELATIONSHIPS P. M. McCarthy: Consultant/Advisory Board, Abbott, AtriCure, Inc, Edwards Lifesciences Corporation, MiCardia Corporation; Ownership Interest, Edwards Lifesciences Corporation; E.C. Mcgee: Consultant/Advisory Board, HeartWare Inc; S.C. Malaisrie: Consultant/Advisory Board, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Abiomed, Inc; Research Grant, Medtronic, Inc

Purpose: It has been more than 20 years since the first Maze procedure with mitral valve (MV) operation, but prospectively evaluated outcome reports are scarce and little has been reported about the outcomes of the MV procedure. We investigated atrial fibrillation (AF) ablation and MV repair outcomes.

Methods: 1,540 patients underwent MV surgery (1,065 MV repair, 69%); 954 had no AF history and 586 (38%) had preoperative AF. AF was treated with ablation in 515 (88%; TrAF), while 71 were untreated (UntrAF). Groups were compared with propensity score (PS) matching (except UntrAF due to sample size).

Results: 30-day mortality was 2.5% in TrAF, 2.9% in NoAF, and 7% in UntrAF patients (p=0.11). After PS-matching, TrAF patients had lower perioperative morbidity than NoAF patients (p<0.001). Freedom from AF (FFAF) off antiarrhythmics at last follow-up was 76.8% for TrAF and 89.7% for NoAF (p<0.001). Comparing biatrial lesions (including classic "cut and sew" Maze) to the left atrial (LA) only lesions, there were no differences in FFAF at last follow-up (77.3% vs 73.3%, p=0.54) and predischarge pacemakers (11% vs 6%, p=0.2). Unmatched annualized stroke risk was 0.5%, 1.5%, and 3.2% for NoAF, TrAF, and UntrAF patients respectively (p=0.0056). In the TrAF repair group, MR decreased from 3.4 ± 1.0 preoperative to 0.2 ± 0.5 predischarge (p<0.001) and 0.6 ± 0.8 at last follow-up (p<0.001). Freedom from 3-4+ mitral regurgitation (MR) at last follow-up (1.9 + 1.9 years) was 100%. Freedom from MV reoperation at 1, 3, 5, and 7 years was 100%, 98.6%, 97.6%, and 97.6% in the TrAF MV repair group.

Conclusions: AF ablation was safely added to MV surgery with no adverse impact on morbidity, mortality, or need for pacemaker. Late FFAF was lower than NoAF patients and stroke rate was borderline different. Mitral repair surgery outcomes were good and durable. The LA only lesion set was as effective as more complex lesion sets.

11:45 AM ***Crystal Ballroom G-Q***

Durability of Hybrid Epicardial/Endocardial Ablation for Non-Paroxysmal Atrial Fibrillation Followed With Continuous Monitoring

S. J. Hoff, S. P. Whalen, C. R. Ellis, M. B. Shoemaker, D. Darbar, P. J. Saavedra, S. Ball, R. M. Ahmad, S. Maltais, J. C. Estrada, M. R. Petracek

Vanderbilt Heart Institute, Nashville, TN

COMMERCIAL RELATIONSHIPS M. R. Petracek: Other Research Support, Medtronic, Inc, St Jude Medical, Inc

Purpose: Combining surgical and catheter ablation in the treatment of medically refractory non-paroxysmal atrial fibrillation (AF) may improve efficacy, but results are not well defined. The more rigorously patients can be monitored postprocedure, the more accurately results can be assessed. We describe our experience with a combined epicardial/endocardial ablation procedure in patients followed exclusively with continuous monitoring.

Methods: Bilateral thoracoscopic, bi-atrial epicardial ablation, and left atrial appendage ligation was performed. This was followed immediately by percutaneous endocardial mapping confirming entrance and exit block. Radiofrequency ablation was performed as needed to ensure posterior LA isolation and create lateral mitral and cavotricuspid isthmus lines. Patients were monitored for recurrence of any atrial tachycardia (AT) with an implantable loop recorder (n=31) or permanent dual-chamber pacemaker (n=2). Freedom from AT was defined as no recurrence of AT >30 seconds after a 90-day blanking period. Data were collected retrospectively.

Results: Between October 2010 and December 2012, 33 consecutive patients with non-paroxysmal AF, mean age of 64 years (39-76), 70% male (23/33), underwent hybrid ablation. The average length of stay was 4.8 days (range 3-9). There were no hospital deaths. Mean follow-up was 10 months (1-28). Four patients (12%) had recurrent AT (freedom from recurrent AT = 88%). Three of these patients underwent repeat endocardial mapping and ablation. At last follow-up, 25/33 (76%) were off anti-arrhythmic drugs, and 18/33 (55%) were off anticoagulation.

Conclusions: Hybrid ablation is a safe and durable treatment for non-paroxysmal AF. Continuous monitoring is necessary in these complex patients. Further investigation into the optimal timing of epicardial and endocardial ablation procedures is needed.

12:00 PM *Crystal Ballroom G-Q*

Long-term Outcomes of the Maze Procedure Combined With Mitral Valve Repair: Risk of Thromboembolism Without Anticoagulation Therapy

S. Hwang, J. Kim, J. Lee, C. Chung, S. Choo, S. Jung

Asan Medical Center, Seoul, Republic of Korea

Purpose: Although the strongest benefit of concomitant Maze procedure during mitral valve repair is the obviation of need for anticoagulation therapy, the risk of thromboembolism without anticoagulation therapy has not been evaluated.

Methods: 358 consecutive patients (aged 52.3 ± 13.8 years, 177 females) who underwent the Maze procedure combined with mitral valve repair between 1997 and 2012 were evaluated. Anticoagulation therapy was discontinued after 6 months if synchronous atrial contraction was maintained in the absence of further risk of thromboembolism.

Results: Median follow-up period was 5.4 years (interquartile range, 2.9 to 9.6 years). Late atrial fibrillation (AF) occurred in 61 patients (19.3%). The 5-year freedom from AF off anti-arrhythmic drugs was 82.6 ± 2.3%. In 107 patients (29.9%), warfarin was administered in the late period (>6 months), and of them, 69 patients (19.3%) were maintained with warfarin therapy until the end of follow-up. Patients receiving warfarin therapy were older (P=0.018), had longer AF duration (P=0.036), and had rheumatic valvulopathy more frequently (P=0.010) compared to those not receiving warfarin. Overall, patients were followed up off the warfarin therapy for 1,577 patient-years, during which there were three cases of stroke and 14 late deaths. The linearized rates of stroke and death without warfarin therapy were 0.2% and 0.9% per patient-year, respectively, and these rates were not significantly different from those receiving warfarin therapy (P=0.23 and 0.27, respectively).

Conclusions: With the adoption of appropriate selection criteria for discontinuing anticoagulation therapy, the majority of patients receiving concomitant mitral repair and Maze procedure could be discontinued with warfarin with excellent long-term safety profiles.

12:15 PM ***Crystal Ballroom G-Q***

Is There a Need for a More Specific Anticoagulation Management Protocol for Patients Following the Cox-Maze Procedure for Atrial Fibrillation?

N. Ad, L. Henry, S. D. Holmes

Inova Heart and Vascular Institute, Falls Church, VA

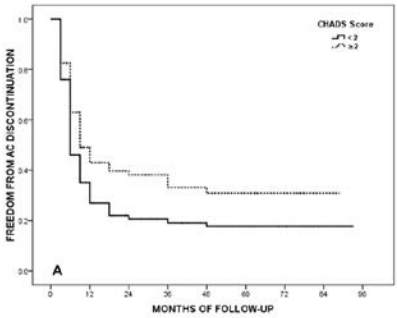
COMMERCIAL RELATIONSHIPS N. Ad: Consultant/Advisory Board, AtriCure, Inc, Estech, Medtronic, Inc

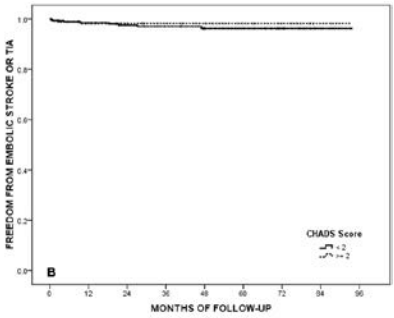
Purpose: Long-term management of anticoagulation (AC) following catheter or surgical ablation (SA) for AF is challenging. The Heart Rhythm Society guidelines have no specific recommendations for AC treatment following SA. The purpose of this study was to determine whether a specific AC protocol is necessary following the Cox-Maze procedure (CM).

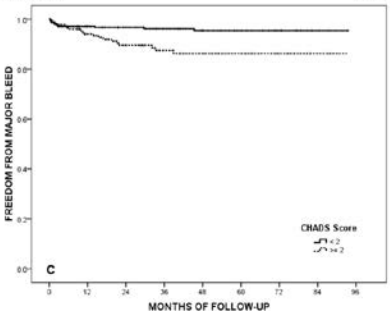
Methods: Patients (pts) who underwent CM and excision/exclusion of left atrial appendage (LAA; n=546) were followed prospectively. All pts were discharged on AC therapy unless contraindicated. Rhythm, bleeding, and embolic stroke/TIA events were verified during follow-up using HRS guidelines.

Results: In mean follow-up of 40.5 ± 27.1 months, embolic stroke/TIA was reported in 11 pts (6.0 cases per 1000 person-years) and 5-year freedom from stroke/TIA was 97%. Major bleeds reported in 32 pts (17.4 cases per 1000 person-years) and 5-year freedom from major bleed was 93%. No association was found for median CHADS2 and incidence of embolic stroke/TIA ($p=0.52$), but higher CHADS2 was associated with major bleeds ($p=0.007$). At 12 months, higher risk for bleeding was found for pts in sinus rhythm in whom AC was not stopped (8% vs 1.7%, $p=0.008$), with no added benefit in reducing embolic stroke/TIA (1% vs 1.7%, $p=1.00$). AC treatment was less likely to be discontinued in pts with CHADS2 ≥2 ($p<0.001$; Fig A) with same rates of stroke/TIA ($p=0.45$; Fig B) and higher rates of major bleeds ($p=0.004$; Fig C). Even after adjusting for AC discontinuation, CHADS2 ≥2 group did not have higher stroke/TIA risk (HR=2.1; $p=0.29$).

Conclusions: This large cohort study indicates that the decision to discontinue anticoagulation treatment following the CM procedure should not be based solely on CHADS2 and rhythm status, but echocardiography findings and patient risk for bleeding should also be considered. Our results point to the need for developing an AC protocol for patients following surgical ablation with appropriate LAA management.


FREEDOM FROM AC DISCONTINUATION
CHADS Score
< 2
≥ 2
A
MONTHS OF FOLLOW-UP


FREEDOM FROM EMBOLIC STROKE OR TIA
CHADS Score
< 2
≥ 2
B
MONTHS OF FOLLOW-UP


FREEDOM FROM MAJOR BLEED
CHADS Score
< 2
≥ 2
C
MONTHS OF FOLLOW-UP

Notes

11:30 AM – 12:30 PM ***Grand Ballroom 7A***

Adult Cardiac Session: Heart Failure

Moderators: *Robert L. Kormos, Pittsburgh, PA, and Jonathan M. Philpott, Norfolk, VA*

COMMERCIAL RELATIONSHIPS J. M. Philpott: Consultant/Advisory Board, AtriCure, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:30 AM ***Grand Ballroom 7A***

Long-term Mechanical Circulatory Support With Highly Pulsed Low Shear Rate Continuous Flow LVAS: Multicenter Japanese Experience With EVAHEART

S. Saito[1], T. Nishinaka[1], Y. Ichihara[1], H. Tsukui[1], K. Yamazaki[1], Y. Saiki[2], T. Nakatani[3], M. Ono[4], K. Syunei[4], Y. Sawa[5], R. Tominaga[6], H. Niinami[7], Y. Matsui[8], T. Kaneko[9], T. Takemura[10], G. Matsumiya[11]

[1]Tokyo Women's Medical University, Japan, [2]Tohoku University, Sendai, Japan, [3]National Cerebral and Cardiovascular Center, Osaka, Japan, [4]Tokyo University, Japan, [5]Osaka University, Japan, [6]Kyusyu University, Fukuoka, Japan, [7]Saitama University International Medical Center, Japan, [8]Hakkaido University, Sapporo, Japan, [9]Gunnma Cardiovascular Center, Japan, [10]Saku Central Hospital, Japan, [11]Chiba University, Japan

COMMERCIAL RELATIONSHIPS K. Yamazaki: Consultant/Advisory Board, Sun Medical Technology Research Corporation; G. Matsumiya: Consultant/Advisory Board, Terumo Medical Corporation; Research Grant, Edwards Lifesciences Corporation, Senko, St Jude Medical, Inc

REGULATORY DISCLOSURE This presentation will address the EVAHEART device, which is not FDA approved.

Purpose: A highly pulsed low shear rate centrifugal pump has theoretical advantages with less blood trauma and more physiological support. The EVAHEART is a centrifugal left ventricular pump providing highly pulsed flow due to its flat H-Q curve and is designed for a lower shear rate (<1500N/m2) with a wide clearance between the housing and impeller. We sought to investigate whether these advantages can be translated into clinical outcomes by assessing the long-term results of EVAHEART LVAS.

Methods: 112 patients with advanced heart failure (INTERMACS profile I-III, eligible for heart transplantation) were implanted with the EVAHEART between 2005 and 2013 in 13 clinical sites. Median age was 43 and 18 of these patients received the device as part of a Japanese multicenter clinical trial. Survival and adverse events data were collected from the Japanese Registry for Mechanical Assisted Circulatory Support (J-MACS).

Results: Mean support duration was 464 days with a cumulative duration of 142.5 patient-years. Seventy-nine patients (71%) remain ongoing, 16 transplanted, and 17 died during support. The Kaplan-Meier survival rate was 94.8% at 6 months, 86.0% at 1 year, and 83.0% at 3 years. Major adverse events in post-approval study included drive line infection in 12 pts, neurological events with ischemic strokes in 12, hemorrhages in nine, TIAs in two, GI bleeding in one, and pump thrombosis and hemolysis in one. One patient required aortic valve surgery for aortic valve insufficiency. There was no right heart failure requiring RVAD nor incidence of pump exchange for mechanical failure.

Conclusions: The EVAHEART can provide safe and reliable long-term circulatory support with an improved survival. The incidence of RV failure, significant AI development, hemolysis, GI bleeding, and mechanical failure is extremely rare. This can be associated with the highly pulsed flow and low shear rate nature during the mechanical circulatory support with EVAHEART.

Notes

11:45 AM ***Grand Ballroom 7A***

Long-term Results in Patients With Aortic Regurgitation Following Continuous-Flow Left Ventricular Assist Device Implantation

N. P. Patil, A. Sabashnikov, P. N. Mohite, D. Garcia Saez, B. Zych, C. T. Bowles, R. Hards, M. E. Hedger, F. De Robertis, A. Moza, T. Bahrami, N. Banner, M. Amrani, A. R. Simon

Royal Brompton & Harefield NHS Foundation Trust, London, United Kingdom

COMMERCIAL RELATIONSHIPS D. Garcia Saez: Consultant/Advisory Board, Transmedics, Inc; A. R. Simon: Consultant/Advisory Board, CircuLite, Inc, HeartWare Inc, Transmedics, Inc, Thoratec Corporation

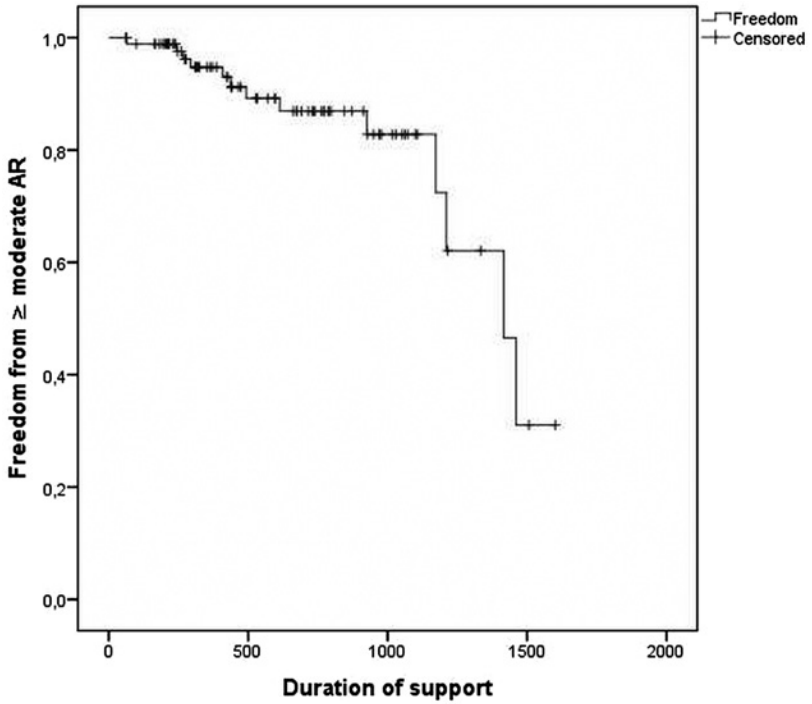
Purpose: Significant aortic regurgitation (AR) after continuous-flow left ventricular assist device (CF-LVAD) placement affects device performance and patient outcomes. This study examined the development of AR and long-term results following implantation of CF-LVADs.

Methods: All patients with no or <mild AR who underwent HeartMate-II (HM-II) (n=58 [62%]) or HeartWare (HVAD) (n=35 [38%]) implantation at our institute from July 2006 to July 2012 were studied. Serial echocardiograms were obtained preoperatively, at 1, 3, 6, 12, and 18 months after surgery, and at further intervals in longer-term supported patients. Kaplan-Meier estimates for freedom from ≥ moderate AR were generated. Logistic regression analysis was used to define independent predictors of AR following CF-LVAD implantation.

Results: Median duration of LVAD support was 527 (289;907) days (range: 60-2,433). 48 patients (51.6%) developed mild AR over a median duration of 126 days, 13 (14%) progressed to moderate AR in 493 days, and 2 (2.1%) to severe AR over 1,231 days. Incidence of ≥ mild AR was 43.1% HM-II vs 65.7% HVAD (p=0.035). Overall freedom from ≥ moderate AR was 94.7 ± 2.6% at 1 year, 86.9 ± 4.5% at 2 years, 82.8 ± 5.9% at 3 years, and 31% ± 16.9 at 4 years (Fig 1). Independent predictors of AR were duration of support (p=0.017, 95% CI 1.000-1.004, OR 1.002) and aortic valve closure (p<0.001, 95% CI 0.097-0.382, OR 0.193).

Conclusions: AR is associated with longer CF-LVAD support duration and aortic valve closure and may be related to the type of CF-LVAD implanted. Incidence of ≥ moderate AR following CF-LVAD implantation increases significantly after 3 years. The clinical implications of this data may warrant consideration of aortic valve replacement at the time of CF-LVAD implantation in selected patients as per the anticipated horizon to destination.

Kaplan-Meier Curve for Freedom From ≥Moderate AR



Notes

12:00 PM ***Grand Ballroom 7A***

Continuous-Flow Left Ventricular Assist Device or Inotropes in Status 1B Patients With and Without Renal Insufficiency: A Multivariate Analysis of Posttransplant Graft Survival

S. Maltais[1], I. Feurer[1], N. Haglund[1], J. P. Dwyer[1], J. M. Stulak[2], R. M. Ahmad[1], T. G. DiSalvo[1], M. Keebler[1], K. H. Schlendorf[1], M. A. Wigger[1]

[1]Vanderbilt Heart and Vascular Institute, Nashville, TN, [2]Mayo Clinic, Rochester, MN

Purpose: Continuous-Flow Left Ventricular Assist Device or Inotropes in Status 1B Patients with and without Renal Insufficiency: A Multivariate Analysis of Post-Transplant Graft Survival

Methods: We analyzed graft survival in adult status 1B recipients undergoing Htx with inotropes or CF-LVAD support. Pre-transplant renal function was measured by estimating glomerular filtration rate (GFR) stratified as <45, 45-59, and ≥60 mL/min/1.73m2. Kaplan-Meier and multivariate Cox regression models evaluated the main effects of GFR strata, CF-LVAD, inotropes, and the GFR by CF-LVAD interaction effect on graft survival.

Results: This study included 4,158 status 1B adults (74% male, 53 ± 12 years) who underwent Htx between January 2003 and February 2012. Of these, 659 had a CF-LVAD (HeartMate II=638, HeartWare=21), while 3,530 were on inotropes. Follow-up time averaged 38 ± 30 (range <1 to 111) months. Univariate Kaplan-Meier analyses demonstrated: a) reduced graft survival (p=0.022) in patients with pre-transplant GFR<45 (log-rank p=0.062 vs GFR45-59, and p=0.007 vs GFR≥60); and b) no effect of CF-LVAD or inotropes on graft survival (p=0.402). The multivariate Cox model (p=0.008) demonstrated, after controlling for the main effects of GFR, CF-LVAD, and inotropes, a significant GFR stratum by CF-LVAD status interaction effect (p=0.040). Status 1B recipients with a CF-LVAD in the lowest GFR stratum (median=37, range 15-44 mL/min/1.73m2) had reduced graft survival compared to all other recipients.

Conclusions: Pre-transplant renal insufficiency (GFR<45 mL/min/1.73m2) is associated with an overall reduction in posttransplant graft survival in status 1B patients undergoing Htx. This risk is significantly increased for the lowest GFR stratum in patients with a CF-LVAD (vs inotropes only). These findings support a thorough evaluation of the probability of renal function improvement prior to the decision to proceed with LVAD implant as a bridge to transplantation.

12:15 PM *Grand Ballroom 7A*

RVAD-ECMO Is Superior to Conventional RVAD Support in the Treatment of Cardiogenic Shock Following Implantable LVAD Placement

J. E. Leidenfrost, S. M. Prasad, A. Itoh, C. P. Lawrance, J. M. Bell, S. C. Silvestry

Washington University School of Medicine, St Louis, MO

COMMERCIAL RELATIONSHIPS S. C. Silvestry: Other Research Support, Abiomed, Inc, Thoratec Corporation; Consultant/Advisory Board, HeartWare Inc, Thoratec Corporation

Purpose: Implantable continuous flow left ventricular assist devices (cfLVAD) are the standard for long-term support for patients with medically refractory LV heart failure. Patients who develop cardiogenic shock from refractory RV failure during LVAD placement are associated with extremely high 30-day mortality. Recent advances in ECMO technology may help augment RV recovery when used in conjunction with a temporary RVAD and lead to improved outcomes.

Methods: We retrospectively reviewed our STS data for all implantable cfLVAD from March 2009 to June 2013. RV failure requiring RVAD support was defined as patients who had severe hemodynamic instability despite maximal vasopressor, pulmonary vascular dilation, and inotropic therapy. RVADs were weaned per our protocol.

Results: 267 cfLVADs were implanted (HM2 236, HVAD 29, Jarvik 2). Continuous flow RVAD insertion for cardiogenic shock was utilized in 27 (10%) patients (CMag 24, RotaFlow 2, Impella 1). Of these patients, 12 (46%) had the addition of inline ECMO. RVAD age was 64.6 ± 6.5 vs 45.6 ± 15.9 in the RVAD-ECMO group (p=0.001). LV EF was 18% in RVAD vs 19% in RVAD-ECMO (p=0.58). Support was weaned in 66% (10/15) of RVAD patients vs 83% (10/12) in the RVAD-ECMO (p=0.42). The time to removal of an RVAD was 17.8 ± 37.8 vs 5 ± 2.79 days in RVAD-ECMO (p=0.1). RVAD-ECMO had a 30 day mortality of 8% vs RVAD at 47% (p=0.04). Survival after discharge was 86%, 63%, and 54% at 3, 6, and 12 months respectively for both groups.

Conclusions: RVAD-ECMO support for refractory acute RV failure after cfLVAD implantation has improved 30-day survival over RVAD alone. Patients who survive to discharge have reasonable 1-year survival. Using recent advances in ECMO technology with RVAD support appears to benefit this complex patient population that historically has had extremely poor outcomes. This novel application of ECMO to right ventricular support needs further study and longer follow-up for broader application.

11:30 AM – 12:30 PM ***Grand Ballroom 1-3***

Basic Science Research: Adult Cardiac

Moderators: *Pavan Atluri, Philadelphia, PA, and Afshin Ehsan, Boston, MA*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:30 AM ***Grand Ballroom 1-3***

Donor Organ Specific Exosome Platform for Monitoring Transplant Organ Rejection in a Mouse Heterotopic Heart Transplant Model

*S. Y. Rostami[1], M. Yu[1], Y. Luo[1], M. A. Acker[1], A. Naji[1], D. D. Taylor[2], *P. Vallabhajosyula[1]*

[1]University of Pennsylvania, Philadelphia, [2]University of Louisville, KY

COMMERCIAL RELATIONSHIPS M. A. Acker: Consultant/Advisory Board, Thoratec Corporation

Purpose: Exosomes are tissue and major histocompatibility complex (MHC) specific microvesicles (30-200 nm) with stable RNA cargo reflecting the conditional state of the tissue releasing them. We hypothesize that transplant organs release donor tissue-specific exosomes into the recipient's blood that can be detected as potential novel biomarkers for monitoring transplant organ rejection/injury.

Methods: In a mouse acute rejection model of full MHC mismatch heterotopic heart transplantation (BALB/c into B6, n=10), plasma exosome pool was isolated from recipient blood using Sepharose gel filtration chromatography, and was assessed at different posttransplant time points for donor heart-specific exosome signal utilizing NanoSight nanoparticle tracking analysis technology with quantum dot labeled anti-donor MHC specific antibodies. Western blot of exosome pool was also performed for confirmation. Syngeneic B6 transplants served as negative control (n=3).

Results: NanoSight tracking confirmed donor-specific exosome signal (anti BALB/c MHC-quantum dot) in the recipient serum with 100% sensitivity and specificity at all time points posttransplant (p=0.003): 4 hours, 2, 5, 9, and 11 days. Histology confirmed progression of donor rejection. Western blot of recipient exosomes confirmed donor MHC protein. In negative controls, BALB/c MHC specific signal was absent by NanoSight, although B6 MHC signal was evident. Western blot showed B6 MHC signal, but not BALB/c MHC.

Conclusions: We are the first to report that a transplanted heart releases stable and detectable donor tissue-specific exosomes into the recipient's circulating blood that can be serially tracked. We propose that characterization of transplant organ-specific exosome signatures from recipient's blood would lay the foundation for development of a novel, serum-based biomarker assay for monitoring organ rejection/injury in heart transplant patients.

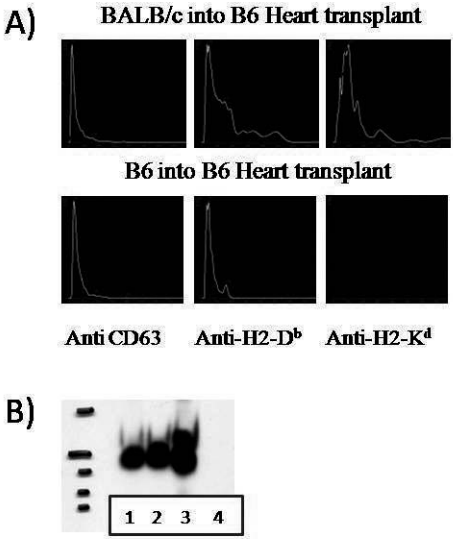


Figure 1. Analysis of circulating plasma exosome pools from recipient animals is shown.
(A) Nanosight analysis on fluorescent mode for BALB/c (donor) and B6 (recipient) specific antibody quantum dot analysis is shown for full mismatch and negative control (syngeneic transplant). Anti-CD63 (canonical exosome marker) signal was detected in both transplant settings. Anti-H2-D^{b} signal (B6 recipient MHC specific signal) was detected in both settings, but anti-H2-K^{d} signal (BALB/c donor MHC) was detected in full mismatch setting only.
(B) Western blot analysis of recipient plasma exosome pool showed BALB/c MHC protein in full mismatch setting (lanes 1 to 3), but not in syngeneic setting (lane 4)

11:45 AM ***Grand Ballroom 1-3***

Altered Oxidative Stress and Nerve Function After Cardiopulmonary Bypass in Patients With Poorly Controlled Type II Diabetes vs Well-Controlled and in Nondiabetics

R. Matyal[1], A. Wang[1], F. Mahmood[1], S. M. Parikh[1], K. R. Khabbaz[1], M. P. Robich[1], F. W. Sellke[2]

[1]Beth Israel Deaconess Medical Center-Harvard Medical School, Boston, MA, [2]Alpert Medical School, Brown University, Providence, RI

COMMERCIAL RELATIONSHIPS F. Mahmood: Consultant/Advisory Board, Medtronic, Inc, Philips; F. W. Sellke: Consultant/Advisory Board, CLS Behring, The Medicines Company, Pfizer Inc

Purpose: Increased oxidative stress is implicated in the etiology of type II diabetic neuropathy, cardiomyopathy, and reduced angiogenesis. Specifically, upregulated oxidative stress in skeletal muscle and sympathetic nerve dysfunction have been associated with unregulated sugar levels. We sought to demonstrate the relationship between the poor regulation of oxidative stress and associated dysfunction in the myocardium of uncontrolled diabetics (UD, HbA1c≥6.6) compared to well-controlled (CD) and non-diabetics (ND) during cardioplegic arrest and cardiopulmonary bypass surgery (CPB).

Methods: Atrial tissue and serum was collected from 47 patients (ND=18, HbA1c=5.8; CD=8, HbA1c=6.2; UD=21, HbA1c=9.6) pre- and post-cardioplegia and CPB surgery for immunoblotting, protein oxidation assays, immunohistochemistry, and microarray analysis.

Results: In the UD group, we observed increased total protein oxidation ($P<0.05$) and decreased antioxidative enzyme MnSOD ($P<0.05$) post-CPB as compared to CD group. Collagen staining revealed increased fibrosis in UD ($P<0.05$) as compared to CD and ND. The UD group showed a decrease post-CPB in neuro- and angiogenic markers NGF ($p<0.05$), ET-1 ($P<0.05$ and $P<0.1$) and PDGF-B ($p<0.05$ and $P<0.08$) as compared to ND and CD groups. Atrial and serum in microarray analysis showed increased oxidative and sympathetic nerve damage, increased fibrosis, and a decrease in angiogenesis in UD ($P<0.03$) compared to ND.

Conclusions: CPB increased oxidative stress in the UD group. This was associated with increased fibrosis, altered markers of nerve function—specifically sympathetic nerve function—and growth as compared to CDs and NDs. These molecular mechanisms could possibly explain reduced angiogenesis in UDs. These observations highlight the importance of tight blood sugar control and potential therapies, such as microRNA treatment or antioxidant supplementation, in this patient population.

Demographics and Results

		ND (n=18)	CD (n=8)	UD (n=21)	P-value (ND vs UD)	P Value (CD vs UD)
Age		68.62	61.38	62.94	0.070	0.607
Female, n (%)		4 (22.22%)	2 (25.00%)	8 (38.10%)	0.271	0.483
HbA1c		5.8	6.2	9.6	0.000	0.000
Pre-op Glucose		109.33	153.25	199.67	0.047	0.180
Post-op Glucose		141.00	132.75	119.33	0.963	0.176
Atrial and Serum Microarray						
Oxidative Stress Markers						
	Parkinson disease (autosomal recessie, early onset) 7 - stress protective*	739.85		487.17	0.006	
	NADPH oxidase 4	5.66	5.39	6.30	0.036	0.018
	Nitric oxide Synthase 1 (neuronal)	18.02	13.08	17.98	0.981	0.040
	cytochrome c oxidase assembly 1-like	5.03	6.27	5.12	0.744	0.047
Fibrosis markers						
	angiotensin II receptor, type 1*	20.91		40.50	0.002	
	angiotensiogen serpin peptidase inhibitor, clade A, member 8*	295.48		598.15	0.002	
	matrix metallopeptidase 19, MMP19	5.70	5.05	6.00	0.325	0.048
	SMAD family member 5 - anti-fibrotic*	10.48		6.90	0.002	
Growth and Angiogenic Factors						
	myocyte enhancer factor 2C*	78.12		27.60	0.002	
	platelet-derived growth factor alpha polypeptide*	156.62		81.36	0.002	
	fibroblast growth factor 12*	28.37		16.09	0.002	
Sympathetic Nerve Function Markers						
	monoamine oxidase A*	579.01		308.32	0.002	
	nerve grwoth factor (beta polypeptide)	36.93	31.64	43.97	0.102	0.022
	endothelin receptor type B	4.68	4.16	4.64	0.903	0.049
	neuropeptide Y receptor Y1 neuropeptide Y receptor Y1	5.30	6.92	5.52	0.567	0.041
Nerve dysfunction markers						
	neural cell adhesion molecule 1*	59.77		91.38	0.002	
	natriuretic peptide precursor B*	800.58		2179.42	0.012	

Abbreviations: ND nondiabetic, CD controlled diabetic, UD uncontrolled diabetics.
** denotes atrial microarray analysis. Atrial microarray was conducted only on UD and ND while serum microarray was conducted on ND, CD, and UD.*

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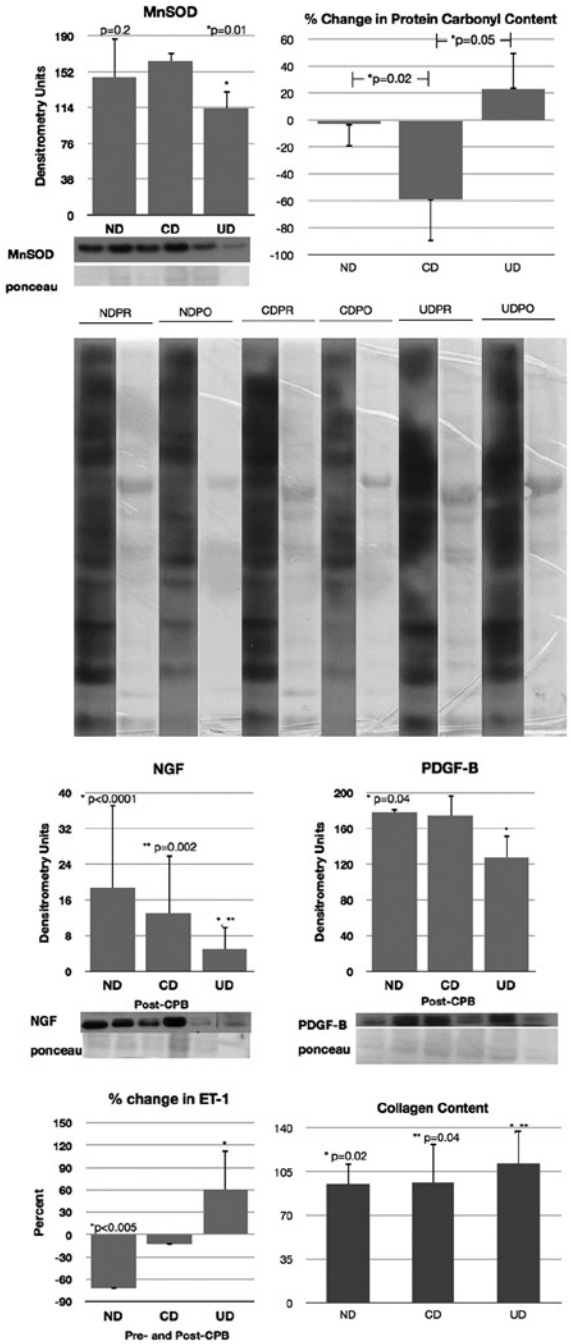
Basic Science Research: Adult Cardiac – Continued



12:00 PM ***Grand Ballroom 1-3***

Successful Heart Transplantation After Machine Perfusion Preservation in a Canine Donation After Cardiac Death (DCD) Model

S. M. Brant, M. Cobert, L. West, M. E. Jessen, M. Peltz

The University of Texas Southwestern Medical Center at Dallas

COMMERCIAL RELATIONSHIPS S. M. Brant: Other Research Support, Organ Transport Systems; M. E. Jessen: Other Research Support, Organ Transport Systems; M. Peltz: Other Research Support, Organ Transport Systems

REGULATORY DISCLOSURE This presentation will address the Organ Transport Systems LifeCradle device, which is not FDA approved.

Purpose: DCD donors are not usually considered for heart transplantation. Machine perfusion appears promising for improving preservation of donor hearts and increasing the donor pool for cardiac transplantation. The purpose of the current study was to evaluate coronary sinus perfusion preservation of DCD donor hearts in a large animal model of cardiac transplantation.

Methods: Eight donor animals were anesthetized and then disconnected from mechanical ventilation. Five minutes after EKG silence, hearts were exposed, cross-clamped, and flushed with one liter of University of Wisconsin Machine Perfusion Solution. Explanted hearts were preserved by machine perfusion through the coronary sinus at 5° C or conventional cold static storage for 4 hours (n=4 per group). Oxygen consumption and lactate accumulation were measured in perfused hearts. Hearts were then reimplanted into recipient animals and reperfused for 6 hours. The preload recruitable stroke work (PRSW) was calculated as a load independent indicator of myocardial function. Cardiac enzyme release was measured.

Results: The agonal phase was similar between perfused and static storage hearts. Perfused hearts continued to extract oxygen throughout the perfusion interval. Lactate levels in perfused hearts were low. All perfused hearts were able to separate from cardiopulmonary bypass (CPB) and remained off CPB for the reperfusion period. Three of 4 static storage hearts initially separated from CPB. Two of 4 static storage hearts required a return to CPB by the end of the reperfusion period. The PRSW was significantly higher in perfused hearts. Troponin-t and creatine kinase (CK) were lower in perfused hearts but only the difference in CK was significant. See Table.

Conclusions: Machine perfusion preservation can recover hearts from DCD donors and may increase the donor pool for cardiac transplantation. Successful transplantation after conventional storage is possible but outcomes are unpredictable.

Group	Agonal Phase (min)	Donor Ischemic Time (min)	PRSW (mm Hg)	CK (IU/L)	Troponin-T(ng/mL)
Static	34±7	305±8	28.5±6	14206±3752	17.1±6
Perfusion	34±6	309±8	66.4±10*	3825±1108*	7.1 ±2†

Data are mean ± standard error of the mean
** – p < .05 vs Static*
† – p = .16 vs Static

12:15 PM ***Grand Ballroom 1-3***

Activation of BKCa Channels With Rottlerin Causes Vasodilation and Improves Cardiac Recovery and Coronary Flow Following Cardioplegic Arrest (CP)

*B. Cordeiro, C. Shinn, F. W. Sellke, *R. T. Clements*

Rhode Island Hospital and Alpert Medical School of Brown University, Providence

COMMERCIAL RELATIONSHIPS F. W. Sellke: Consultant/Advisory Board, CLS Behring, The Medicines Company, Pfizer Inc

Purpose: Activation of BKCa channels is cardioprotective for ischemic injury and enhances vasorelaxation. However, previous studies tested BKCa activation only in the setting of irreversible ischemic injury and necrosis as compared to surgical ischemia resulting in myocardial stunning and vascular perturbations. We tested the effectiveness and specificity of the putative BKCa activator rottlerin on vascular reactivity as well as vascular and myocardial surgical ischemic injury associated with cardioplegic arrest and reperfusion.

Methods: Wt and BKCa KO mice were langendorff perfused and subjected to 2 hours intermittent hypothermic cardioplegia with or without 500 nM rottlerin and 30 minutes reperfusion. Parameters of cardiac function were recorded continuously (LVDP, dP/dt, coronary flow). In addition, aortas were removed, and 3 mm rings mounted in a tissue bath with force transducers. Dose responses to the contractile agonists U46619 and phenylephrine and vasodilation responses to rottlerin and SNP were performed.

Results: Rottlerin as a CP additive greatly improved cardiac functional recovery (LVDP, +/- dP/dt), but not in BKCa KO animals (n=6-8 all groups, $p<.05$ LVDP, +/-dP/dt). In addition, rottlerin greatly improved coronary flow post-CP and this was reduced in BKCa KO mice. In vascular ring studies, rottlerin dose-dependently dilated wild-type vessels, but not in BKCa KO animals (n=6-8, $p<.05$). Importantly, BKCa KO mice displayed a number of significant alterations from wild-type animals. BKCa KO mice had greater contractile responses to U46619 than wt, while response to phenylephrine was similar (n=3-4 in triplicate, $P<.05$). In addition, BKCa KO mice exhibited reduced vasodilation to the NO donor SNP, when compared to wild-type animals ($n>=3$, $P<.05$).

Conclusions: Rottlerin greatly improves cardiac functional recovery following surgical ischemia, as well as enhances coronary flow and promotes vasodilation mediated through BKCa channels.

Notes

11:30 AM – 12:30 PM ***Grand Ballroom 4-6***

Congenital Session: Adult Congenital

Moderators: *Joseph A. Dearani, Rochester, MN, and Edward Hickey, Toronto, Canada*

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The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:30 AM ***Grand Ballroom 4-6***

Contemporary Surgical Approaches and Outcomes in Adults With Kommerell's Diverticulum

*K. M. Kim[1], R. Cambria[2], E. M. Isselbacher[2], J. N. Baker[2], G. M. LaMuraglia[2], J. R. Stone[2], *T. E. MacGillivray[2]*

[1]Hospital of the University of Pennsylvania, Philadelphia, [2]Massachusetts General Hospital, Boston

Purpose: Indication and type of operation in patients with Kommerell's diverticulum (KD) continue to be debated. While patients with symptoms from compression of the aerodigestive tract have long been referred for surgery, the presence of KD itself may be a risk factor for spontaneous dissection.

Methods: A retrospective review of 19 adult patients with KD referred for elective surgery between March 2004 and June 2013 was performed. Mean age at operation was 48 (32-68) years. Fifteen patients were female, 15 were symptomatic, and 13 had a right-sided aortic arch. Sixteen patients with aberrant subclavian artery underwent a two-stage procedure consisting of carotid-subclavian artery transposition or bypass followed by aortic resection, including the origin of the KD, with interposition graft reconstruction via thoracotomy. Eight were done with left-heart bypass and eight with deep hypothermic circulatory arrest. Median interval between stages was 108 (0-453) days. Three patients had KD without aberrant subclavian artery.

Results: There were no deaths or strokes. Complications from carotid-subclavian bypass were: graft occlusion without upper extremity ischemia (n=1); temporary vocal cord paralysis (n=1); paralyzed hemidiaphragm (n=1); mild transient ptosis (n=3); and reintubation (n=1). Complications from aortic resection were: intraoperative type A dissection (n=1); paralyzed hemidiaphragm (n=1); chylothorax (n=1); and transient neurologic dysfunction (n=1). Mean length of stay after Stage I was 2 ± 2 days and after aortic resection 6.4 ± 2.5 days. Pathology was available in 18 patients; of note, 16 specimens showed medial degeneration. Mean follow-up was 35 months.

Conclusions: This is the largest reported single-center experience with the surgical management of KD in adults. KD can be resected safely in the presence of symptoms. The high percentage of KD with medial degeneration suggests that asymptomatic patients with an enlarged KD also may benefit from resection.

11:45 AM *Grand Ballroom 4-6*

The Modified Fontan Operation in Adults With Extracardiac Conduit

M. Ly, C. Sana, R. Kasdi, M. Vergnat, I. Van Aerschot, E. Lebret, R. Roussin, E. Belli
Marie Lannelongue Hospital, Le Plessis Robinson, France

Purpose: Many adults with functional single ventricles are presenting as candidates for Fontan operation. The purpose of this study was to evaluate the course of adult patients undergoing the modified Fontan procedure with an extracardiac conduit.

Methods: Between 2004 and 2013, 30 adult patients underwent a Total CavoPulmonary Connection (TCPC) with extracardiac conduit. Median age at procedure was 24.5 years [IQ Range: 20-33]. Diagnosis included various single ventricles in 16 pts, tricuspid atresia in seven pts, and double outlet right ventricle with complex associated lesions in five pts. 73% of patients had at least one prior palliative procedure; the most common procedures were Blalock-Taussig shunt (18 pts) and pulmonary artery banding (5 pts). Aortic cross-clamping was necessary in 14 pts (46.6%) for intracardiac procedures. Fenestration was required for six cases. Four concomitant intraoperative cryoablation procedures were performed.

Results: There was no hospital mortality. One patient died 6 months after TCPC (3.3%) and another patient (3.3%) had cardiac transplantation 7 months after the Fontan procedure. Both of them were very high-risk patients including impaired single ventricle function. Morbidity included prolonged pleural effusion >10 days in 12 pts and atrial arrhythmias in three pts. Median follow-up was 38 months [IQ Range: 12 - 47]. Five pts were lost to follow-up. Actuarial survival was 95.45% [95% CL: 71.87-99.34] at 1 year and 5 years. NYHA functional class improved from 2.03 ± 0.68 to 1.66 ± 0.85 at last follow-up (p=0.01). Median postoperative oxygen saturation was 82% [IQ Range: 80-95]. No late cardiac arrhythmia was found. Systolic ventricular function deteriorated during follow-up for four pts.

Conclusions: The modified Fontan procedure using extracardiac conduit can be performed with acceptable early and mid-term mortality and morbidity in properly and rigorously selected adult patients with functional single ventricle.

12:00 PM **Grand Ballroom 4-6**

Should Prophylactic Tricuspid Annuloplasty Be Performed in Patients With Tetralogy of Fallot at the Time of Pulmonary Valve Replacement?

J. P. Costello[1], M. Kurkluoglu[1], A. S. John[1], R. Cross[1], R. A. Jonas[1], D. Zurakowski[2], P. Sinha[1]

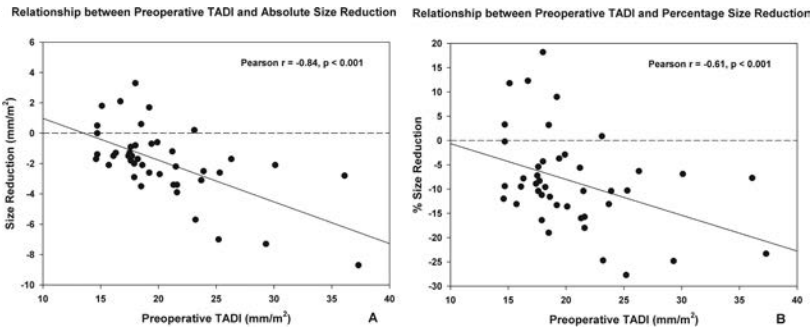
[1]Children's National Medical Center, Washington, DC, [2]Children's Hospital Boston, MA

Purpose: Based on data from adults with functional tricuspid regurgitation (TR), once the tricuspid valve annulus is dilated beyond 4 cm (21 mm/m2), it continues to dilate even after the primary pathology is effectively treated. Unlike functional TR, patients with pulmonary regurgitation (PR) after tetralogy of Fallot (TOF) repair have TR consequent to right ventricle (RV) dilation predominantly from volume overload. We hypothesized that the tricuspid valve annulus is more likely to normalize in these patients after pulmonary valve replacement (PVR).

Methods: All patients who underwent PVR from 2005 until 2012 at a single institution were reviewed. Echocardiographic and MRI data were analyzed pre- and post-PVR with respect to tricuspid valve annulus indexed (TADI) and regurgitation.

Results: Forty-three patients (63% M), mean age at PVR 21 (+10) years, had preoperative data immediately prior to surgery and postoperatively at a median 50 days (5 days - 5.6 years) post-PVR. While there was moderate correlation between TADI by echocardiogram and MRI (Pearson r = 0.65, p < 0.001), Bland-Altman paired analysis indicated poor agreement between the two modalities [95% CI, -7.1 mm/m2 lower to +5.3 mm/m2]. There was poor correlation between TADI and preoperative RV volumes (RVEDV: r = -0.09, p = 0.68; RVESV: r = -0.26, p = 0.22). A higher tricuspid annulus Z score correlated with higher pre (p = 0.005) and postoperative (p = .02) TR grade. Mean TADI was 20.1 (+7.2) mm/m2 pre- and 18.6 (+ 4.2) mm/ m2 post-PVR. Larger absolute and percentage reduction was seen with larger preoperative TADI (p < 0.001, Figure 1A and B).

Conclusions: Significant TADI and Z score reduction is seen after PVR irrespective of preoperative size. Larger reduction is seen with larger valves. Standard criteria for prophylactic annuloplasty from adult function TR population are not applicable and a more conservative approach is warranted.



12:15 PM *Grand Ballroom 4-6*

Unicuspid Aortic Valve and Root Aneurysm: Treatment by Valve Bicuspidization and Root Remodeling

*M. Franciulli, D. Aicher, S. K. Feldner, H. Takahashi, R. Gargiulo, *H. Schafers*

Uniklinikum des Saarlandes, Homburg, Germany

Purpose: Unicuspid aortic valve (UAV) anatomy occurs in young adults requiring surgery of the aortic valve or aorta. UAV is not infrequently associated with aneurysm of the aortic root. To manage both defects, we propose a combination of remodeling of the aortic root combined with bicuspidization of the UAV.

Methods: Between August 2001 and August 2012, 22 patients (20 males, 2 females, mean age 37.5 ± 10.5 years) with aortic regurgitation (AR) due to UAV and aortic root dilatation underwent remodeling of the aortic root and bicuspidization of the UAV. Dilated aortic root tissue was resected, leaving two tongues at 180° orientation for the commissures. A new commissure was created opposite the normal one and cusp tissue was augmented by autologous pericardial patches. Dilatation of the basal ring was corrected by suture annuloplasty in 16 cases. All patients were followed echographically at 3, 6, and 12 months and at yearly intervals.

Results: No early or late death occurred. Intraoperative echocardiography revealed minimal or no AR in all patients and systolic peak gradient was 14 ± 5 mmHg. There was no bleeding, thromboembolic events, or endocarditis during follow-up. Three patients developed relevant recurrent AR and were reoperated between 16 and 32 months postoperatively. The cause of recurrent AR was suture dehiscence. One patient underwent biological valve replacement; two had re-repair. Follow-up ranged from 6 months to 141 months (mean 42 ± 36 months; cumulative 1,003 months). At 5 years, freedom from reoperation and AVR was 78% and 89%, respectively.

Conclusions: In the presence of UAV and aortic root dilatation, the concept of valve bicuspidization and root remodeling can be applied with satisfactory early results. The hemodynamic function of an aortic valve preserved by this concept is good. Using this approach, AVR can be avoided in young patients with AR due to UAV and root aneurysm.

11:30 AM – 12:30 PM ***Grand Ballroom 7B***

Critical Care

Moderators: *Jay G. Shake, Temple, TX, and Glenn J. R. Whitman, Baltimore, MD*

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11:30 AM ***Grand Ballroom 7B***

The Use of Extracorporeal Membrane Oxygenation in Cardiogenic Shock Complication Acute Coronary Syndromes

E. J. Dueweke, S. A. Esper, C. Bermudez, J. K. Bhama, S. Puyana, K. Subramaniam, S. Mulukutla, J. Waters, O. C. Marroquin, C. Toma, C. Smith, S. J. Khandhar

University of Pittsburgh Medical Center, PA

Purpose: Acute coronary syndrome (ACS) complicated by shock is associated with high mortality despite the use of percutaneous support devices. Extracorporeal membrane oxygenation (ECMO) offers complete hemodynamic support, but its use in ACS is not well described.

Methods: We retrospectively analyzed 18 consecutive patients who received femoral veno-arterial ECMO in the cardiac catheterization lab for severe shock due to ACS at our center between 2007 and 2013.

Results: The average age was 59.9 years, 13 of 18 patients were male, and 14 had a ST-segment elevation myocardial infarction, of which 10 had a left main or left anterior descending artery occlusion. Fourteen patients received stents, two were referred for coronary artery bypass grafting, and two received balloon angioplasty. Nine patients underwent ECMO as initial support, while the remainder were upgraded from balloon pump (IABP) before leaving the cath lab. All patients received aspirin, a thienopyridine, and heparin. Five patients received a glycoprotein IIb/IIIa inhibitor. The average length of ECMO was 3.2 ± 2.5 days, length of stay was 23.4 days, four received left ventricular assist devices, and 12 survived to discharge. Causes of death included stroke (2/18), multi-organ failure (2/18), and septic shock (2/18). All patients required a transfusion with an average of 11.2 units of packed red blood cells (PRBC), 1.5 platelet transfusions, and 2.4 units fresh frozen plasma. With IIb/IIIa inhibitor use, average transfusion requirement was 19 units of PRBC vs 8.2 when not used (p=0.003). Four patients required surgical revision for lower extremity ischemia.

Conclusions: Despite the morbidity associated with ECMO, it appears to be a viable strategy in carefully selected patients and offers those with severe cardiogenic shock a chance at survival. Given the lack of benefit in recent clinical trials of IABP in severe cardiogenic shock, future studies are warranted to evaluate clinical outcomes with ECMO in this setting.

11:45 AM *Grand Ballroom 7B*

A Prospective Observational Study of Human Prothrombin Complex in Cardiac Surgery: Efficacy and Safety

N. Nwaejike[1], D. Watson[2], C. Waterhouse[2], E. Brennan[2], A. Tang[2]

[1]University Hospitals of South Manchester, United Kingdom, [2]Blackpool Victoria Hospital, United Kingdom

REGULATORY DISCLOSURE This presentation will address the CSL Behring drug Beriplex®, which is not FDA approved.

Purpose: Cardiac surgery can result in major bleeding due to a consumptive coagulopathy. Beriplex® P/N (Human Prothrombin Complex) contains the human coagulation factors II, VII, IX, and X, and proteins C and S for intravenous administration. Beriplex® P/N is also the only Prothrombin Complex Concentrate containing antithrombin in addition to Heparin. Data were collected prospectively on patients who required Beriplex® P/N to determine its efficacy and safety.

Methods: Consecutive patients from a single center experiencing acute bleeding after cardiac surgery received Beriplex® P/N according to agreed criteria. These patients had been recruited as part of the non-interventional observational study of Beriplex® P/N in prophylaxis and treatment of acute bleeding perioperatively (PROBE-Study - NCT01053169).

Results: 151 patients received Beriplex® P/N (mean dose 8.84 +/- 4.2 I.U/Kg body weight). Mean age 69.74 +/- 12 years; 60% male; mortality 7% (10/151); mean Logistic EuroScore 11.74. 3% (5/151) had new postoperative cerebrovascular incidents, there were no incidences of postoperative MI, and 3% (5/151) had major adverse cardiac or cerebrovascular events (MACCE). Subgroup analysis between patients that had Beriplex® P/N only (121 patients) vs patients that had Beriplex® P/N subsequent to fresh frozen plasma (30 patients) showed no significant differences in mortality or MACCE. Logistic regression on the entire population identified non-elective surgery ($p = 0.01$), mean CPB ($p = 0.05$), and X-Clamp time ($p = 0.05$) as predictors of composite ischemic events. Predictors of cryoprecipitate transfusion in patients who received Beriplex® P/N included patients who had blood transfusions ($p = 0.01$), use of circulatory arrest ($p = 0.01$), mean cardiopulmonary bypass time ($p = 0.01$), and platelet transfusion ($p = 0.05$).

Conclusions: Beriplex® P/N (Human Prothrombin Complex) appears to be safe and efficacious for post-cardiac surgery bleeding when used with an established protocol.

12:00 PM ***Grand Ballroom 7B***

Clinical Impact of Mild Acute Kidney Injury Following Cardiac Surgery

M. Boodhwani, E. Elmistekawy, C. C. Hudson, B. McDonald, M. Ruel, V. Chan, T. G. Mesana

University of Ottawa Heart Institute, Canada

COMMERCIAL RELATIONSHIPS M. Ruel: Research Grant, Medtronic, Inc; Speakers Bureau/Honoraria, Medtronic, Inc

Purpose: Dialysis-dependent renal failure occurs infrequently following cardiac surgery but leads to substantial morbidity and mortality. In contrast, milder degrees of acute kidney injury (AKI), based on small increases in serum creatinine, occur frequently but the independent impact of mild AKI on outcome remains unclear.

Methods: Between January 2010 and December 2012, 4,158 consecutive patients undergoing cardiac surgery composed the study cohort. AKI was defined according to the AKI Network Criteria as stage I, II, or III. A non-parsimonious multivariable logistic regression model including preoperative and intraoperative variables was constructed to determine a propensity score for the development of stage I AKI followed by a greedy matching algorithm to create 1:1 propensity-matched pairs.

Results: Incidence of stage I AKI in the entire cohort was 20%. Stage I AKI patients were more likely to be older, have diabetes, hypertension, preoperative renal dysfunction, and poorer LV function, and require more urgent surgery and longer cardiopulmonary bypass. Following propensity matching, the 806 matched pairs were similar in terms of all of the above characteristics (all $p > 0.5$). Within the matched cohort, AKI patients had higher mortality (2.0% vs 0.5%, $p = 0.006$), higher incidence of neurologic dysfunction (14% vs 8%, $p<0.001$), and longer duration of mechanical ventilation (30 ± 3 vs 16 ± 1 hours, $p<0.001$). Intensive care unit stay (4.2 ± 0.2 vs 2.4 ± 0.1 days, $p<0.001$) and hospital length of stay (16 ± 0.5 vs 13 ± 0.4 days, $p<0.001$) was significantly longer in matched AKI patients.

Conclusions: Patients with even mild degrees of AKI experience increased mortality and morbidity compared to their matched counterparts. Interventions that prevent or mitigate post-cardiac surgery AKI may yield substantial clinical benefit.

12:15 PM *Grand Ballroom 7B*

Planned Cardiac Re-Exploration in the Intensive Care Unit Is a Safe Procedure

D. J. LaPar, J. M. Isbell, D. P. Mulloy, M. Stone, J. A. Kern, G. Ailawadi, I. L. Kron

University of Virginia, Charlottesville

COMMERCIAL RELATIONSHIPS J. A. Kern: Speakers Bureau/Honoraria, Edwards Lifesciences Corporation; G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca

Purpose: Cardiac surgical re-exploration is necessary in approximately 5% of all patients. However, the impact of routine, planned re-exploration performed in the intensive care unit (ICU) remains poorly defined. This study evaluated postoperative outcomes following cardiac re-explorations to determine the safety and efficacy of a planned approach in the ICU.

Methods: All patients undergoing ICU cardiac re-explorations (2000-2011) at a single institution were stratified according to a routine, planned approach to re-exploration for hemorrhage (Planned) vs unplanned (Unplanned) re-exploration. Patient risk and outcomes were compared by univariate and multivariate analyses.

Results: 8,151 total patients underwent cardiac operations, including 267 (3.2%) re-explorations in the ICU (planned=75% and unplanned=25%). Indications for unplanned re-exploration included cardiac arrest (48%) and washout (52%). Among planned re-explorations, 38% had an identifiable surgical bleeding source and 60% were re-explored <12 hours after their primary procedure. Unplanned re-explorations had higher STS predicted mortality (5% vs 3%, $p<0.001$) and incurred higher observed mortality (37% vs 6%, $p<0.001$) and morbidity (Table). Sternal wound infections were rare and similar between groups ($p=0.81$). Furthermore, upon STS mortality risk adjustment, unplanned re-explorations were associated with significantly increased odds of mortality (OR= 26.6 [7.1, 99.7], $p<0.001$) compared to planned re-explorations.

Conclusions: A planned approach to cardiac surgical re-explorations in the intensive care unit setting is safe with acceptable mortality and morbidity and low infection rates. Unplanned re-explorations, however, increase postoperative risk and were associated with high mortality and morbidity. These data argue for protocolized, routine approaches to planned ICU re-exploration to avoid delay in treatment for postoperative hemorrhage.

Observed Relationships Between Postoperative Outcomes and Planned vs Unplanned Intensive Care Unit Re-Explorations Following Cardiac Surgery

Outcome	Planned Re-exploration (n=201)	Unplanned Re-exploration (n=66)	P
Mortality	11 (5.5%)	24 (36.4%)	<0.001
ECMO	2 (1.0%)	12 (18.2%)	<0.001
IABP	22 (10.9%)	28 (42.4%)	<0.001
Perioperative MI	1 (0.5%)	3 (4.5%)	0.02
Deep Sternal Wound Infection	4 (2.0%)	1 (1.5%)	0.81
Renal Failure	26 (12.9%)	23 (34.8%)	<0.001
New onset Hemodialysis	12 (6.0%)	16 (24.2%)	<0.001
Prolonged Ventilation	97 (48.3%)	45 (68.2%)	0.01

ECMO=extracorporeal membranous oxygenation; IABP=intra-aortic balloon pump; MI=myocardial infarction

11:30 AM – 12:30 PM ***Grand Ballroom 8A***

General Thoracic Session: New Techniques

Moderators: *Gaetano Rocco, Naples, Italy, and K. Robert Shen, Rochester, MN*

COMMERCIAL RELATIONSHIPS G. Rocco: Speakers Bureau/Honoraria, Covidien, Synthes, Takeda Pharmaceuticals; Research Grant, Covidien, Ethicon, Inc

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11:30 AM ***Grand Ballroom 8A***

Pulmonary Arterial Branch Sealing Using Energy Devices in an Ex-Vivo Model

M. Liberman, M. Khereba, E. Goudie, J. Kazakov, V. Thiffault, A. Duranceau, E. Lafontaine, P. Ferraro

CHUM Endoscopic Tracheobronchial and Oesophageal Center, University of Montreal, Canada

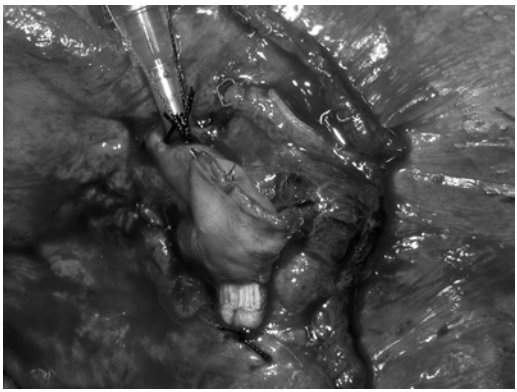
COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc

Purpose: Vascular endo-staplers have a large footprint, are bulky, and can be dangerous when used to staple and divide small pulmonary arterial (PA) branch vessels during VATS lobectomy. We aimed to evaluate and compare the immediate efficacy of available modern energy-sealing devices in an ex-vivo pulmonary artery sealing model.

Methods: Patients undergoing anatomical lung resection or lung transplantation were prospectively recruited. Four commonly utilized energy-sealing devices were evaluated: Harmonic Ace (HA) (Ethicon; Cincinnati, OH), Thunderbeat (TB) (Olympus; Tokyo, Japan), LigaSure (LS) (Covidien; Boulder, CO), and Enseal (EN) (Ethicon; Cincinnati, OH). Following anatomical lung resection, the PA branches were dissected. To simulate normal PA pressure during sealing, a closed circuit of distally ligated PAs was created and the vessel was pressurized to 25 mmHg. Sealing was then performed with one of the sealing devices, the vessel was slowly pressurized, and the bursting pressure (BP) was recorded.

Results: Forty-nine PAs were sealed in 14 patients. The diameter of the sealed PA branches ranged from 1.8 mm to 14.5 mm (mean: 7.4 mm). Eleven patients had normal PA pressure and three had PA hypertension (mean PAP = 37, 46, and 52 mmHg). The mean BP in the HA group was 415.5 mmHg (137.1 mmHg - 1388.4 mmHg), TB group: 875 mmHg (237.1 mmHg - 2871.3 mmHg), LS group: 214.7 mmHg (0 mmHg - 579.6 mmHg), EN group: 133.7 mmHg (0 mmHg - 315.38 mmHg). There were two complete sealing failures in two large PA branches (diameter = 8.3 mm and 6.9 mm) in the EN and LS groups. BPs were higher in smaller PAs in all groups except for the HA group, in which the BPs were higher in larger PAs.

Conclusions: Pulmonary arterial branch energy sealing is effective and can sustain high vessel burst pressures in a simulated ex-vivo environment. Further research is needed to determine the long-term safety of PA energy sealing.



Cannulated and sealed pulmonary artery prior to intravascular pressurization

Notes

11:45 AM **Grand Ballroom 8A**

Equivalent Efficacy of Liposomal Bupivacaine Compared to Paravertebral Catheter in Thoracoscopic Surgery: A New Standard in Postoperative Pain Management?

T. Williams[1], K. Kim[2], J. A. Howington[2]

[1]The University of Chicago, IL, [2]North Shore University Health System, Evanston, IL

COMMERCIAL RELATIONSHIPS J. A. Howington: Consultant/Advisory Board, Ethicon, Inc

REGULATORY DISCLOSURE This presentation will address the off-label use of liposomal bupivacaine as a nerve block in the intercostal space.

Purpose: Postoperative pain control after major surgical procedures is generally suboptimal. Pain control after thoracic surgery is crucial to achieve the best outcomes and avoid postoperative complications. Epidural catheters are highly effective but invasive, with their own side effects. Prior studies demonstrate equivalent pain control between epidural catheters and paravertebral catheters. Liposomal bupivacaine, a novel, long-acting local anesthetic, has shown prolonged pain control and decreased narcotic usage in other surgical disciplines. The aim of this study was to measure the effectiveness of intercostal liposomal bupivacaine in thoracoscopic surgery.

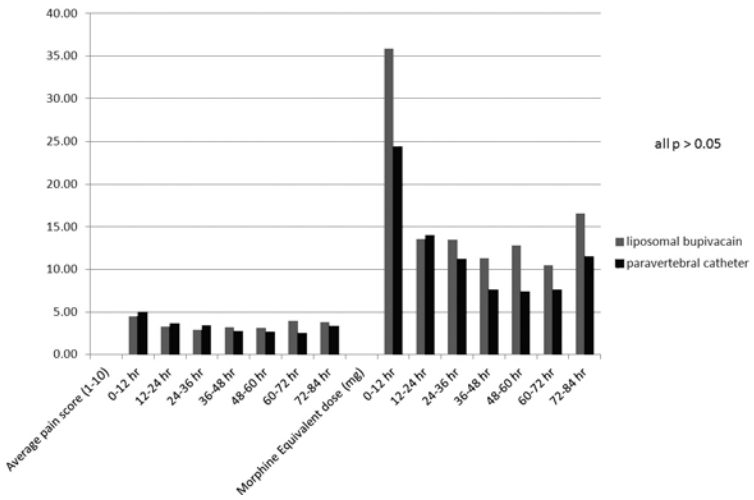
Methods: A retrospective review of 64 consecutive patients undergoing anatomic thoracoscopic lung resection was performed. The last 24 patients treated with intercostal injection of liposomal bupivacaine (ILB) were compared to the 40 previous patients who had paravertebral catheters (PC) placed. Effectiveness of pain control was compared between the two groups.

Results: ILB and PC patient groups were similar demographically. Postoperative pain assessment scores averaged over 12-hour intervals were similar. Total narcotic usage, reported as morphine equivalents, during the first 12 hours was greater in the ILB group, though not statistically significant. Thereafter, narcotic usage was similar between groups (see table and graph). Median length of stay also did not differ between groups (ILB 2.9 days vs PC 3.8 days, p=0.22).

Conclusions: Multilevel intercostal injection of liposomal bupivacaine provides equivalent pain control compared to continuously infused bupivacaine through a paravertebral catheter following thoracoscopic surgery. Prolonged half-life of liposomal bupivacaine may provide pain control even beyond hospitalization. Novel use of liposomal bupivacaine may become the new standard of care for postoperative pain management in thoracic surgery.

Comparison of Length of Stay, Pain Score, and Narcotic Dose by Group

	liposomal bupivacaine		paravertebral catheter		
	mean	standard deviation	mean	standard deviation	p value
Length of stay (days - median)	2.92	2.14	3.77	3.59	0.2171
Average pain score (1-10)					
0-12 hrs	4.51	1.80	4.97	1.98	0.3588
12-24 hrs	3.28	2.10	3.68	2.51	0.5066
24-36 hrs	2.93	2.08	3.45	2.58	0.4053
36-48 hrs	3.19	2.23	2.79	2.77	0.5546
48-60 hrs	3.10	1.98	2.68	2.67	0.5617
60-72 hrs	3.94	2.70	2.55	2.25	0.0793
72-84 hrs	3.78	1.77	3.32	2.48	0.5800
Morphine equivalent dose (mg)					
0-12 hrs	35.85	22.04	24.41	24.72	0.0669
12-24 hrs	13.56	13.11	13.99	37.69	0.9484
24-36 hrs	13.50	15.51	11.21	19.16	0.6223
36-48 hrs	11.33	12.41	7.66	15.68	0.3408
48-60 hrs	12.79	13.46	7.41	12.24	0.1606
60-72 hrs	10.46	12.49	7.65	13.45	0.5123
72-84 hrs	16.59	17.19	11.54	17.76	0.4361



12:00 PM **Grand Ballroom 8A**

Multicenter International Randomized Comparison of Objective and Subjective Outcomes Between Electronic and Traditional Chest Drainage Systems

F. C. Detterbeck[2], C. Pompili[1], K. Papagiannopoulos[4], A. Sihoe[3], K. Vachlas[4], M. W. Maxfield[2], H. C. Lim[3], A. Brunelli[1]

[1]Ospedali Riuniti Ancona, Italy, [2]Yale University, New Haven, CT, [3]The University of Hong Kong, China, [4]Leeds Teaching Hospitals NHS Trust, United Kingdom

COMMERCIAL RELATIONSHIPS F. C. Detterbeck: Research Grant, Medela; K. Papagiannopoulos: Consultant/Advisory Board, Medela; A. Sihoe: Other, Medela, Previous travel support; A. Brunelli: Consultant/Advisory Board, Medela

Purpose: The purpose of this study was to assess the impact of digital vs traditional drainage devices on duration of air leak, chest tube removal, and hospital stay, as well as to explore how different health care environments affect this.

Methods: A randomized trial of digital (DIG) vs traditional (TRAD) devices after lobectomy/segmentectomy was conducted at four international centers (UK, Europe, Asia, USA). Patients were managed with overnight suction followed by gravity drainage. Hospital stay and tube removal was determined by institutional algorithms at each site. Complicated patients requiring an ICU stay or redo surgery were excluded.

Results: Results represent an interim analysis of 250 patients; completion of accrual (400 patients) is anticipated by the end of 2013. The groups (DIG 123 and TRAD 127 patients) were well matched for baseline and surgical characteristics. There were 203 lobectomies/bilobectomies, 47 segmentectomies, and 203 by VATS. Patients randomized to digital systems had a significantly shorter chest tube duration (3.9 vs 4.7 p=0.01) and postoperative length of stay (4.8 vs 5.7, p=0.0002). Subjective endpoints revealed a trend to improved ability to arise from bed (p=0.07), independent mobility (p=0.07), system convenience for patients and personnel (p=0.08), and potentially being comfortable discharged home with the device (p=0.03). A mean difference of 2.8 days from air leak cessation to tube removal was observed, similar in the two groups (p=0.8). Multivariable regression analysis showed that chest tube duration after air leak cessation was associated with the amount of fluid drained within the first 48 hours (p=0.0005) and air leak duration (p=0.04), but not with the type of device or hospital location.

Conclusions: Patients managed with digital drainage systems experienced shorter chest tube duration and hospital stay, as well as higher satisfaction scores compared to those managed with traditional devices. These findings proved consistent across different parts of the world.

12:15 PM *Grand Ballroom 8A*

Single-Incision Video-Assisted Thoracoscopic Major Pulmonary Resection: A Report on 60 Cases

H. Kim, H. Lee, Y. Choi

Korea University Guro Hospital, Seoul

Purpose: We performed video-assisted thoracoscopic (VATS) lobectomy with one incision for the treatment of malignant or benign lung diseases, and we have evaluated the feasibility and safety of this procedure.

Methods: Consecutive patients who underwent major pulmonary resection through VATS using one incision from March 2012 to May 2013 were included in this study. The incision was placed at the 5th intercostal space in the mid-axillary line, approximately 3-5 cm long.

Results: A total of 60 patients (male 39, female 21; mean age 60.2 ± 12.53 years, range 21-83) were included in this study. The preoperative diagnosis was malignant lung disease in 56 patients (93.3%) and benign lung disease in four patients (6.7%). Four patients (6.7%) needed a second port during surgery and conversion to thoracotomy was needed in two patients (3.3%). In 54 cases, which were completed by single-incision VATS, lobectomies were done in 50 patients, segmentectomy in three, and sleeve lobectomy in one. The resected lobes or segments were right upper in 15 patients, right middle in three, right lower in 15, left upper in 10, and left lower in 11. In 50 cases, which were completed by a single-incision VATS lobectomy for primary lung cancer, the mean duration of the operation was 148.2 ± 45.29 minutes, and a total number of dissected lymph nodes per patient were 21.3 ± 10.08 (range, 5-55). The chest tube was removed on postoperative day 4.7 ± 1.8 and there was no occurrence of major perioperative morbidity and mortality.

Conclusions: Single-incision VATS lobectomy is applicable in the selected cases and may obtain similar results with the conventional VATS lobectomy, through there is a certain period of learning curve.

The operator always stood at the right side of the patient. A 4 cm sized incision was placed at the 5th intercostal space. A 5 mm sized thoracoscope, endoscopic instruments, and endostapler were used during the operation.

1:15 PM – 5:15 PM ***Grand Ballroom 12-14***

Joint Council on Thoracic Surgery Education: Implementation of a Surgical Curriculum in Cardiothoracic Surgery

This program will address changes taking place in cardiothoracic surgical education. Following a series of lectures, attendees will participate in one of three workshops, with two focusing on the creation of a traditional cardiothoracic curriculum for 3-year and 2-year programs and the third on building an integrated 6-year curriculum.

Participants will be exposed to new educational resources, current initiatives, learning and content management systems, residents' perspectives on work-hour limitations and implementation of the Thoracic Surgical Curriculum, and documentation of an educational portfolio. Participants can also expect to develop a better understanding of ACGME Milestones, simulation-based instructional techniques, and online curriculum development, all of which can be implemented at their home institutions.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Recognize newer electronic educational tools for cardiothoracic surgical resident education
- Apply the educational foundations of curriculum design
- Demonstrate how trainer and trainee educational portfolios can be developed and used
- Design workshops to help those interested in developing a cardiothoracic curriculum
- Illustrate how ACGME Milestones can be achieved and documented within a surgical curriculum

The physician competencies addressed in this session are professionalism, interpersonal and communication skills, and patient care. These physician competencies will be addressed through a series of lectures followed by in-depth discussion.

Moderators: *Craig J. Baker, Los Angeles, CA, and Ara A. Vaporciyan, Houston, TX*

1:15 PM **Content Management Systems (Personal Brain): How to Find Your Way Around Complex Content**
Craig J. Baker, Los Angeles, CA

1:35 PM **Discussion**

1:45 PM **Learning Management Systems (Moodle): Steps Beyond Information**
Ara A. Vaporciyan, Houston, TX

2:05 PM **Discussion**

2:15 PM **Educational Milestones: How Do They Fit in With Curriculum Development?**
Stephen C. Yang, Baltimore, MD

2:35 PM **Discussion**

2:45 PM **Creation of a Simulation Curriculum: First Steps—Deliberate Practice and Crisis Management**
James I. Fann, Stanford, CA

3:00 PM **Discussion**

3:10 PM **Using the Curriculum From the Resident Perspective: What Are Realistic Time Expectations?**
David D. Odell, Pittsburgh, PA

3:25 PM **Discussion**

3:35 PM **Portfolios and Courses**
Edward D. Verrier, Seattle, WA

3:55 PM **Discussion**

4:05 PM **Break and Transition to Workshops**

4:20 PM **Workshop I:** ***Grand Ballroom 12-14***
Creating a 2-Year Traditional Cardiothoracic Curriculum: 88 Weeks
Edward D. Verrier, Seattle, WA, and Thomas K. Varghese Jr, Seattle, WA

Workshop II: ***Crystal Ballroom A***
Creating a 3-Year Traditional Cardiothoracic Curriculum: 132 Weeks
Ara A. Vaporciyan, Houston, TX, and Stephen C. Yang, Baltimore, MD

Workshop III: ***Crystal Ballroom B***
Creating a 6-Year Integrated Cardiothoracic Curriculum: 264 Weeks
James I. Fann, Stanford, CA, and John S. Ikonomidis, Charleston, SC

1:15 PM – 5:15 PM ***Grand Ballroom 8B***

ACC @ STS

This session will concentrate on a true collaborative "heart team" approach to handling complex issues in the treatment of aortic valvular disease. This unique and innovative session will shed light on the disease process, feature technical videos on the TAVR procedure, discuss outcomes of the STS/ACC TVT Registry™, and highlight original scientific abstracts on TAVR. This session will also present difficult clinical case scenarios with invited commentary and discussion. The overall goal of this course is to update cardiologists, cardiothoracic surgeons, and their respective teams on recent developments in the treatment of aortic disease with an emphasis on procedural techniques, review of the literature, and original science.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Discuss the controversies surrounding the rational dispersion of TAVR technology
- Review and describe the indications and contraindications for TAVR in those with prior cardiac surgery
- Review and describe the indications and contraindications for transfemoral and alternative access TAVR
- Describe the construction and makeup of the multidisciplinary "heart team" and its influence on improving patient outcomes and fostering communication between specialties
- Review and describe optimal management of patients with specific case scenarios who are evaluated for TAVR

The physician competencies addressed in this session are patient care, medical knowledge, and interpersonal and communication skills. These physician competencies will be addressed through a series of collaborative lectures by members of The Society of Thoracic Surgeons and the American College of Cardiology.

Moderators: *Vinod H. Thourani, Atlanta, GA, and E. Murat Tuzcu, Cleveland, OH*
COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

1:15 PM **Introduction**
Vinod H. Thourani, Atlanta, GA, and E. Murat Tuzcu, Cleveland, OH
COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

1:19 PM **Initial Data and IDE Update From the STS/ACC TVT Registry™**
David R. Holmes, Rochester, MN

1:29 PM **Rational Dispersion of TAVR Technology: Are We on the Right Pathway and Can We Afford It?**
Martin Leon, New York, NY

1:39 PM **Discussion**

TAVR in Those With Prior Cardiac Surgery

1:44 PM **Technical Video for TAVR in Prior Bioprosthetic Mitral Valve and Prior Bioprosthetic Aortic Valve**
Mathew R. Williams, New York, NY
REGULATORY DISCLOSURE This presentation will address the off-label use of the Edwards SAPIEN valve in the mitral position and the valve-in-valve.

1:52 PM **Update on Valve-in-Valve TAVR From the STS/ACC TVT Registry™**
Michael J. Mack, Plano, TX

2:02 PM **Discussion**

2:07 PM *Grand Ballroom 8B*

Transcatheter vs Surgical Aortic Valve Replacement in High-Risk Patients With Previous Coronary Artery Bypass Grafting Surgery

K. L. Greason[1], R. M. Suri[1], V. Mathew[1], C. S. Rihal[1], T. McAndrew[2], M. J. Mack[3], J. G. Webb[4], G. Pichard[5], M. R. Williams[6], M. Leon[6], L. G. Svensson[2], V. H. Thourani[7], C. R. Smith[6]

[1]Mayo Medical Center, Rochester, MN, [2]Cleveland Clinic, OH, [3]Baylor Healthcare System, Dallas, TX, [4]St Paul's Hospital, University of British Columbia, Vancouver, Canada, [5]Medstar Washington Hospital Center, Washington, DC, [6]Columbia University Medical Center/New York Presbyterian Hospital, [7]Emory University School of Medicine, Atlanta, GA

COMMERCIAL RELATIONSHIPS R. M. Suri: Research Grant, Edwards Lifesciences Corporation, SORIN GROUP, St Jude Medical, Inc; Other, SORIN GROUP, Principle Investigator Perceval Trial; J. G. Webb: Consultant/Advisory Board, Edwards Lifesciences Corporation; G. Pichard: Consultant/Advisory Board, Edwards Lifesciences Corporation; L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc; C. R. Smith: Nonremunerative Position of Influence, Edwards Lifesciences Corporation

Purpose: Previous coronary artery bypass grafting surgery (CABG) is an important risk factor in elderly patients with aortic valve stenosis undergoing aortic valve replacement. We hypothesized that transcatheter aortic valve replacement (TAVR) would have better outcomes in comparison to standard aortic valve replacement (SAVR) by avoiding bypass graft injury and other issues related to myocardial protection.

Methods: We conducted a post-hoc analysis of 248 patients randomly and prospectively enrolled in the PARTNER 1A study with a history of previous CABG. The median age of the patients was 82 years (range, 78-87) and there were 231 (80%) men. There were 148 patients (51%) in the TAVR group and 140 (49%) in the SAVR group. In the TAVR group, the transfemoral procedure was done in 97 patients (65%) and a transapical procedure in 51 (35%). Preoperative risk factors were similar between groups (Table).

Continues on next page.

Results: Outcomes at 30 days were similar after TAVR and SAVR with respect to death, stroke, and myocardial infarction. At 2 years follow-up, death occurred in 34 patients (25%) in the SAVR group and 53 (36%) in the TAVR group [HR 1.53, 95% CI (0.99, 2.35), p=0.05] and repeat hospitalization in 19 (16%) in the SAVR group and 33 (26%) in the TAVR group [HR 1.75, 95% CI (0.99, 3.07), p=0.05]. There was no difference in stroke prevalence: seven (5%) in the SAVR group and 12 (9%) in the TAVR group (p=0.25). However, moderate or greater aortic valve regurgitation was not present in the SAVR group, but was present in six (9%) in the TAVR group [HR 11.51, 95% CI (0.66, 200.27), p=0.03], and NYHA functional class III/IV was present in 11 (12%) in the SAVR group and 21 (24%) in the TAVR group [HR 1.93, 95% CI (0.99, 3.77), p=0.05].

Conclusions: Transcatheter aortic valve replacement does not result in improved outcomes in comparison to standard aortic valve replacement in high-risk patients with a history of previous coronary artery bypass grafting surgery.

STS-Defined Operative Risk Factors

Continuous variable (Mean ± Std)	TAVR (n=148)	SAVR (n=140)	p value
Age (years)	80 ± 7	82 ± 6	0.08
Serum creatinine (mg/dL)	1.5 ± 1.8	1.7 ± 3.6	0.27
Ejection fraction (%)	50 ± 13	52 ± 11	0.35
STS predicted risk of mortality (%)	11.8 ± 3.3	12.0 ± 3.1	0.51
Categorical variable			
Diabetes	74 (50%)	70 (50%)	1.00
Chronic lung disease	67 (45%)	58 (41%)	0.51
Peripheral vascular disease	75 (51%)	67 (49%)	0.72
Cerebrovascular disease	49 (36%)	40 (29%)	0.28
Number of previous operations			
One	125 (85%)	112 (80%)	0.32
Two	18 (12%)	17 (24%)	0.23
Three	4 (3%)	3 (2%)	1.00

Std=standard deviation of the mean, STS= The Society of Thoracic Surgeons

Alternative Access TAVR

2:22 PM **Technical Video for Transapical and Transaortic TAVR**
Michael J. Reardon, Houston, TX
COMMERCIAL RELATIONSHIPS M. J. Reardon: Consultant/Advisory Board, Medtronic, Inc

2:30 PM **Update on Alternative Access TAVR Outcomes From the STS/ACC TVT Registry™**
Vinod H. Thourani, Atlanta, GA
COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

2:40 PM **Discussion**

2:45 PM ***Grand Ballroom 8B***

Comparison of Non-Transfemoral TAVR Techniques: Transapical, Transaortic, and Transcarotid Approaches in High-Risk and Inoperative Patients With Severe Aortic Stenosis

V. H. Thourani, C. Li, C. Devireddy, S. Lerakis, P. Kilgo, B.G. Leshnower, K. Mavromatis, T. C. Nguyen, M. Kanitkar, P. C. Block, R. A. Guyton, A. L. Maas, J. Merlino, V. Babaliaros

Emory University, Atlanta, GA

COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc; S. Lerakis: Consultant/Advisory Board, Edwards Lifesciences Corporation; B. G. Leshnower: Speakers Bureau/Honoraria, Medtronic, Inc, St Jude Medical, Inc; R. A. Guyton: Consultant/Advisory Board, Medtronic, Inc; V. Babaliaros: Consultant/Advisory Board, Direct Flow Medical, Inc

REGULATORY DISCLOSURE This presentation will address the off-label use of the Edwards SAPIEN valve.

Purpose: Patient characteristics and procedural outcomes from non-transfemoral (TF) TAVR in high-risk or inoperative patients with aortic stenosis (AS) has been incompletely reported. The purpose of this study was to compare our experience and outcomes with non-TF TAVR access techniques including transapical (TA), transaortic (TAo), and transcarotid (TC) TAVR.

Methods: A retrospective review of all patients undergoing TA, TAo, and TC TAVR from 2007 to 2013 at a US academic institution was performed. Preoperative risk factors and postoperative outcomes were evaluated using VARC-2 definitions.

Results: Of 469 TAVR patients performed during that time period at our institution, 139 underwent TA, 35 had TAo, and 11 had TC TAVR. TC patients were younger than TA and TAo (mean ages in years: TC 68.9 ± 23.6, TA 81.3 ± 7.7, and TAo 83.8 ± 8.3, p=0.017). Most TAo patients were female (82.9%), while TA patients were more likely male (62.6%). Slightly more than half of TA (54.7%) and TC (54.6%) patients had prior CABG, while no TAo (0%) patients had prior CABG. There was no preoperative difference in ejection fraction, NYHA class, significant COPD, and STS predicted risk of mortality (PROM) between TA, TAo, and TC, respectively (Table). Average postoperative length of stay was 9-11 days and was similar among groups (p=0.22). Compared to the STS PROM, the O:E ratios were similar for TA (0.55) and TAo (0.50) (Table). There were no deaths in the TC group.

Conclusions: In high-risk and inoperative patients who are not candidates for TF TAVR, careful selection of alternative access options (TA, TAo, and TC) can lead to excellent and comparable postoperative outcomes. Further studies are required to better tailor the most appropriate access algorithm for non-TF TAVR candidates.

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ACC @ STS – Continued

Patient Demographics and Short-Term Outcomes by Access (TA, TAo, and TC)

Clinical/Demographic Characteristics	TA N = 139	TAo N = 35	TC N = 11	p-value
Age, mean ± SD	81.3 ± 7.7	83.8 ± 8.3	68.9 ± 23.6	0.017
Female, n (%)	52 (37.4)	29 (82.9)	6 (54.6)	<0.001
Chronic lung disease, mod/severe, n (%)	42 (30.2)	9 (25.7)	6 (54.5)	0.31
Ejection fraction, mean ± SD	48.4 ± 12.9	50.0 ± 16.1	45.5 ± 17.4	0.29
NYHA class III or IV, n (%)	119 (89.5)	29 (90.6)	10 (90.9)	0.21
Dialysis, n (%)	5 (3.6)	0 (0.0)	0 (0.0)	0.43
Prior CABG, n (%)	76 (54.7)	0 (0.0)	6 (54.6)	<0.001
Valve-in-valve, n (%)	12 (8.6)	0 (0.0)	1 (9.1)	0.20
Myocardial infarction, n (%)	0 (0.0)	0 (0.0)	0 (0.0)	1.00
Stroke, n (%)	3 (2.2)	1 (2.9)	0 (0.0)	0.85
New dialysis, n (%)	5 (3.6)	1 (2.9)	1 (9.1)	0.62
Postoperative LOS (days), mean ± SD	9.1 ± 8.2	10.9 ± 9.2	11.0 ± 9.2	0.22
Operative mortality, n (%)	9 (6.5)	2 (5.7)	2 (5.7)	0.68
STS PROM Score, mean ± SD	0.118 ± 0.057	0.115 ± 0.054	0.171 ± 0.088	0.09
O/E mortality	0.55	0.50	0.00	--

3:00 PM **Break**

Moderators: *Fred H. Edwards, Amelia Island, FL, and John Carroll, Aurora, CO*
COMMERCIAL RELATIONSHIPS J. Carroll: Other Research Support, Edwards Lifesciences Corporation

Demographic Trends in Patients Undergoing Treatment for Aortic Stenosis

3:20 PM **Technical Video for Minimalist Transfemoral TAVR Technique**
Chandan Devireddy, Atlanta, GA

3:28 PM **Who Is Undergoing TAVR in the Early US Clinical Experience? An Update From the STS/ACC TVT Registry™**
John Carroll, Aurora, CO
COMMERCIAL RELATIONSHIPS J. Carroll: Other Research Support, Edwards Lifesciences Corporation

3:38 PM **Discussion**

3:43 PM ***Grand Ballroom 8B***

Treating Patients in the "Grey Zone" With Aortic Valve Disease: A Comparison Among Conventional Surgery, Sutureless Valves, and TAVR

C. Muneretto[1], G. Bisleri[1], A. Moggi[1], L. Di Bacco[1], M. Tespili[2], A. Repossini[1], M. Rambaldini[3]

[1]University of Brescia Medical School, Italy, [2]Ospedale Bolognini, Seriate, Italy, [3]Ospedale Carlo Poma, Mantova, Italy

COMMERCIAL RELATIONSHIPS C. Muneretto: Consultant/Advisory Board, Estech; G. Bisleri: Consultant/Advisory Board, Covidien, Estech, KARL STORZ GmbH & Co KG

Purpose: While the use of TAVR has recently become an attractive strategy in extremely high-risk patients undergoing aortic valve replacement (AVR), the most appropriate treatment option in patients with an intermediate-high (I-H) risk profile among conventional surgery (sAVR), TAVR, or novel options such as sutureless valves has been widely debated.

Methods: 163 consecutive patients with an I-H risk profile were prospectively enrolled and selected to undergo either sAVR (Group 1, G1, n=55), sutureless valves implantation (Group 2, G2, n=53) and TAVR (Group 3, G3, n=55) following a multidisciplinary evaluation including frailty, anatomy, and degree of atherosclerotic disease of the aorta/peripheral vessels. Mean Logistic Euroscore (G1=21.3 ± 12.7 vs G2=16 ± 11.7 vs G3=20.4 ± 12.7, p=0.06) as well as preoperative demographics such as age, gender, and LVEF were similar; of note, COPD was more frequent in TAVI patients (G1= 27.2% vs G2= 15.1% vs G3=47%; p<0.01) The Perceval S sutureless valve was used in Group 2, while TAVR was performed with a Corevalve prosthesis.

Results: Postprocedural PM implantation (G1=1.8% vs G2=2% vs G3=25.5%, p<0.001) and peripheral vascular complications (G1=0% vs G2=0% vs G3=14.5%, p<0.001) occurred more frequently in patients undergoing TAVR, while patients in Group 2 required less transfusions (G1= 47.2% vs G2= 22.6% vs G3=41.8%, p=0.025). Hospital mortality was similar among the groups (G1= 0% vs G2= 0% vs G3=1.8%, p=NS). At 20 months follow-up, overall survival was better in patients undergoing sAVR and stentless valves than those undergoing TAVR (G1=95.5% vs G2=92.9% vs G3=78.5%, p=0.31).

Conclusions: This preliminary study suggests that the use of TAVR in patients with intermediate-high risk profile is associated with a higher rate of perioperative complications and decreased survival at 20 months follow-up when compared to conventional surgery or sutureless valves.

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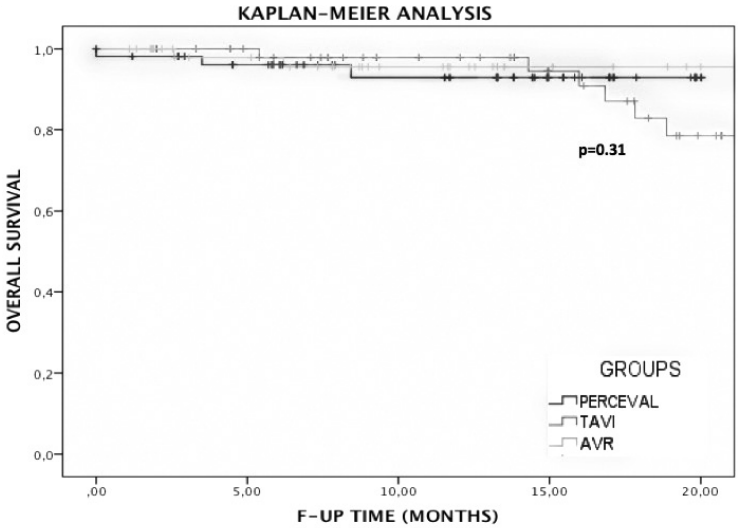
ACC @ STS – Continued



Clinical Case Scenarios: Acute and Remote Paravalvular Leaks

3:58 PM **Case Presentation of Acute and Remote PV Leak Following TAVR**
Joshua D. Rovin, Clearwater, FL

4:03 PM **Preventing PV Leak by Preoperative Imaging and Intraoperative Measures**
E. Murat Tuzcu, Cleveland, OH

4:13 PM **Discussion**

Clinical Case Scenarios: Concomitant Mitral Regurgitation and Low Ejection Fraction With Severe Aortic Stenosis

4:18 PM **Case Presentation of Moderate to Severe MR and Low Ejection Fraction in TA–TAVR**
Hersh Maniar, St Louis, MO

4:23 PM **How to Manage the Difficult TA Patient**
Lars G. Svensson, Cleveland, OH
COMMERCIAL RELATIONSHIPS L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax

4:33 PM **Discussion**

4:38 PM ***Grand Ballroom 8B***

Propensity-Matched Comparison of Open Aortic and Mitral Replacement or Repair vs Transcatheter Aortic Valve Replacement in Patients With Significant Mitral Regurgitation

F. H. McCarthy, N. D. Desai, P. Vallabhajosyula, Z. E. Fox, R. Menon, J. George, S. Anwaruddin, H. C. Herrmann, J. E. Bavaria, W. Y. Szeto

Hospital of the University of Pennsylvania, Philadelphia

COMMERCIAL RELATIONSHIPS S. Anwaruddin: Consultant/Advisory Board, DeMatteo Monness LLC; H. C. Herrmann: Research Grant, Abbott Vascular, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc, W. L. Gore & Associates, Inc; Consultant/Advisory Board, Paieon Inc, Siemens AG, St Jude Medical, Inc; Ownership Interest, Micro Interventional Devices, Inc; J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc; W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc

Purpose: For patients being considered for transcatheter aortic valve replacement (TAVR), significant preoperative mitral regurgitation (MR) and persistent postoperative MR has been associated with worse outcomes. In this group of elderly and often high-risk patients, it remains unknown whether isolated TAVR or combined aortic valve and mitral valve replacement/repair (AVR/MVR) is better. We propensity matched patients to compare AVR/MVR to TAVR in patients presenting with significant MR.

Methods: We evaluated all patients presenting with greater than mild MR undergoing either TAVR or AVR and MVR at a single institution from 2002 to 2012. Patients with preoperative endocarditis were excluded. Out of 306 patients in the AVR/MVR group and 147 patients in the TAVR group, propensity analysis matched 40 pairs of patients. Standard univariate, logistic regression, Cox regression, and propensity matching techniques were used.

Results: There was no difference in the preoperative average age (76 ± 7.4 vs 78 ± 6.9, p=0.68), ejection fraction (53 ± 15 vs 51 ± 17, p=0.68), STS score (9.9 ± 3.1 vs 9.3 ± 3.4, p=0.61), or 30-day mortality (7.5% vs 2.5%, p=0.6) between the matched pairs of open AVR/MVR and TAVR patients. There was an increased number of urgent operations in the open AVR/MVR vs TAVR group (87.5% vs 67%, p =0.01), less NYHA III/IV (75% vs 95%, p=0.003), and less hypertension (70% vs 95%, p=0.03). Among 30-day survivors, long-term survival was significantly better in the AVR/MVR group compared to TAVR. (p=0.04). See Figure 1.

Conclusions: In a propensity-matched analysis of patients presenting with significant MR, open AVR/MVR and TAVR had equivalent perioperative outcomes, but open AVR/MVR had superior long-term survival when compared to TAVR.

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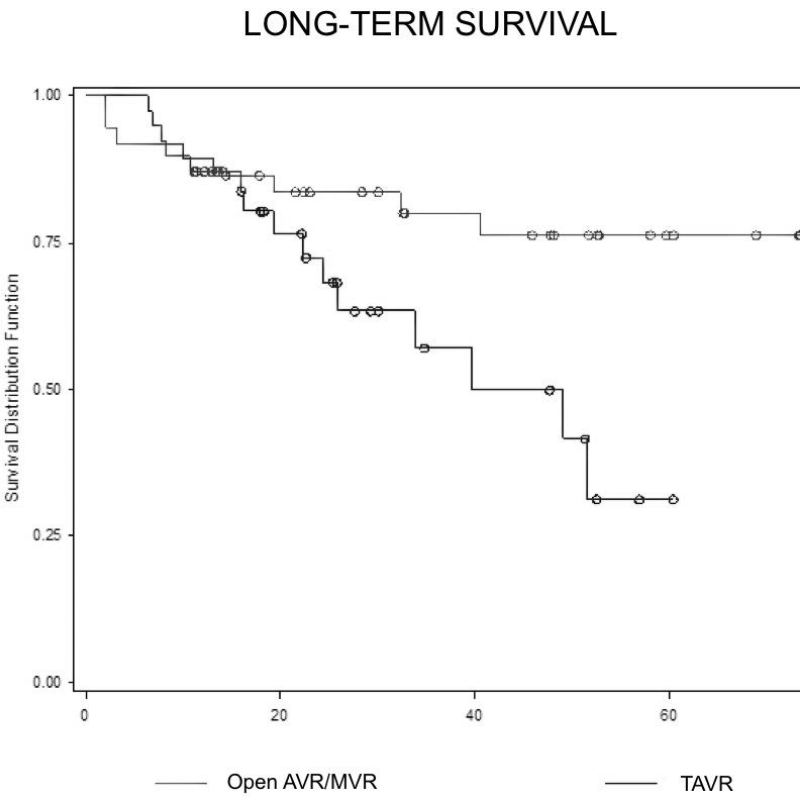
ACC @ STS – Continued



New Research

4:53 PM **Update on Ongoing Research Projects From the STS/ACC TVT Registry™**
Fred H. Edwards, Amelia Island, FL

5:03 PM **Discussion**

5:11 PM **Conclusions**

Notes

1:30 PM – 3:30 PM ***Grand Ballroom 7A***

Adult Cardiac Session: Aortic

Moderators: *Michael P. Fischbein, Stanford, CA, and Wilson Y. Szeto, Philadelphia, PA*

COMMERCIAL RELATIONSHIPS W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

1:30 PM ***Grand Ballroom 7A***

TEVAR for Challenging Aortic Arch Diseases Using Fenestrated Stent Grafts From Super Zone 0

Y. Kurimoto, R. Maruyama, K. Ujihira, N. Nishioka, K. Hasegawa, E. Hatta, A. Yamada, K. Nakanishi

Teine Keijinkai Hospital, Sapporo, Japan

REGULATORY DISCLOSURE This presentation will address the drug Najuta, which is not FDA approved.

Purpose: Conventional TEVAR for aortic arch disease requires a proximal landing zone at least 20 mm long between the left common carotid artery (LCCA) and aortic arch aneurysm. Although use of the debranching technique and chimney technique for distal aortic arch aneurysm has been reported, these techniques cannot avoid surgical management of the carotid artery. Here, we report clinical results of TEVAR using fenestrated stent grafts for aortic arch aneurysms located less than 15 mm from LCCA.

Methods: A semi-custom fenestrated stent graft (SG) designed to fit aortic arch tortuosity and preserve blood flow at least into the brachiocephalic artery (BCA) and LCCA was placed from super zone 0. If necessary, concomitant left subclavian artery (LSA) reconstruction was considered prior to TEVAR.

Results: Since 2007, TEVAR from super zone 0 was performed on 37 patients (mean age 78.2 years) with aortic arch aneurysm. The mean length between LCCA and aortic aneurysm was 11.1 mm (5-15). LSA was preserved for 26 patients (70.3%) through LSA reconstruction (n=19) and graft fenestration (n=7). The technical success rate was 100% without any unintentional BCA or LCCA occlusion. The early mortality rate was 0%. Postoperative strokes and spinal cord ischemia occurred in two (5.4%) and three (8.1%) patients, respectively. Among three patients complicated with postoperative spinal cord ischemia, LSA was preserved in two patients during TEVAR. Although type I endoleaks at discharge were noted in 12 (32.4%) patients, aneurysm enlargement was noted during follow-up in six (16.2%). Four patients (10.8%) underwent secondary interventions consisting of three coil embolization procedures, two reTEVARs, and one open conversion. There were no aorta-related late deaths. Survival and aorta-related event-free rates at 2 years were 86.3% and 88.8%, respectively.

Conclusions: TEVAR using fenestrated SG from super zone 0 can be considered a viable treatment for aortic arch disease.

CT images before and after TEVAR. Aortic arch aneurysm (left) was treated by simple TEVAR using a fenestrated stent graft placed from super zone 0 (right).

Notes

1:45 PM **Grand Ballroom 7A**

Outcomes of TEVAR in Acute Type B Aortic Dissection: Results From the Valiant® US-IDE Study

J. E. Bavaria[1], W. Brinkman[2], G. C. Hughes[3], A. Khoynezhad[4], W. Y. Szeto[1], A. Azizzadeh[5], W. A. Lee[6], R. A. White[7]

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COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc; W. Brinkman: Consultant/Advisory Board, Medtronic, Inc; G. C. Hughes: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Speakers Bureau/Honoraria, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Research Grant, Vascutek Ltd; A. Khoynezhad: Consultant/Advisory Board, Medtronic, Inc; Speakers Bureau/Honoraria, COOK; W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc; A. Azizzadeh: Consultant/Advisory Board, Medtronic, Inc, W. L. Gore & Associates, Inc; R. A. White: Research Grant, Medtronic, Inc, W. L. Gore & Associates, Inc, Endologix, Inc, Volcano Corporation; Speakers Bureau/Honoraria, Medtronic, Inc, W. L. Gore & Associates, Inc, Endologix, Inc, Volcano Corporation

REGULATORY DISCLOSURE This presentation will address the Medtronic Valiant® thoracic stent graft, which has an FDA status of investigational.

Purpose: Acute type B aortic dissection complicated by peripheral ischemia or contained rupture carries a high risk of spontaneous death. In the DISSECTION trial, endovascular techniques were evaluated as an alternative to medical therapy.

Methods: Patients with acute type B aortic dissections diagnosed within 14 days of onset accompanied by malperfusion or contained rupture were eligible for study.

Results: Fifty patients were enrolled between June 2010 and May 2012 at 16 sites in the US and Canada. Mean age was 57 years (18-83). Patients were predominately Caucasian (62%, 31/50) and male (80%, 40/50). Rupture was present in 20% (10/50) and malperfusion in 86% (43/50). Mean time from onset to procedure was 4.7 days (0-23). Successful delivery and deployment and coverage of the primary entry tear were achieved in 100% of patients. Two patients underwent open repair at 5 and 56 days postprocedure following retrograde aortic dissections (4%). Mortality within 30 days was 8% (4/50) and within 12 months was 15% (7/48). Serious adverse events related to the device, procedure, or dissection were reported in 47% (23/49) of patients within 12 months. Four patients underwent secondary procedures to treat type I endoleak (2), continued perfusion of the false lumen, and a thoracic aortic aneurysm. There was no incidence of stent graft collapse or loss of integrity. Through 12 months, when compared to the first available posttreatment imaging, true lumen diameter over the stented region (or endograft segment) remained stable or increased in 93.1% (27/29), false lumen diameter remained stable or decreased in 76% (22/29), and the false lumen was partially or completely thrombosed in 91% (30/33) of patients.

Conclusions: Initial results of the Valiant® Thoracic Stent Graft in the treatment of acute type B aortic dissection are encouraging. Longer-term outcomes are needed to assess the durability of TEVAR in this indication.

2:00 PM *Grand Ballroom 7A*

Warm Antegrade Cerebral Perfusion Does Not Negatively Impact Neurologic Outcomes and Cerebral Oximetry Values During Aortic Arch Surgery

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COMMERCIAL RELATIONSHIPS B. G. Leshnower: Speakers Bureau/Honoraria, Medtronic, Inc, St Jude Medical, Inc; M. E. Halkos: Consultant/Advisory Board, Intuitive Surgical, Inc, Medtronic, Inc; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

Purpose: Moderate hypothermic circulatory arrest (MHCA) + cold selective antegrade cerebral perfusion (SACP) is an effective form of cerebral protection during aortic arch surgery (ARCH). This study examined the safety of MHCA + warm SACP for complex ARCH.

Methods: From January 2010 to May 2013, 229 patients underwent ARCH via right axillary artery cannulation. 138 patients had 16°C SACP (COLD) during MHCA and 91 patients had 28°C SACP (WARM). Outcomes included death, stroke, temporary neurologic dysfunction (TND), and renal failure. Adjustments were made for age, emergency, root, total arch replacement, redo sternotomy, renal failure, diabetes, and COPD using multivariable logistic regression models.

Results: CPB (209 ± 52 vs 195 ± 74, p=0.12) and X-clamp (173 ± 47 vs 162 ± 64, p=0.14) times were similar. MHCA duration was longer in COLD (COLD 34.8 vs WARM 29.4 min, p=0.012), but temperature at MHCA onset (COLD 27.7 ± 2.6° C vs WARM 27.8 ± 1.8° C, p=0.72) was similar. Mortality was 7.4% in COLD and 3.8% in WARM pts (p=0.28). Incidence of stroke (COLD 6.5% vs WARM 2.2%, p=0.14), TND (COLD 2.2% vs WARM 2.2%, p=0.98) and renal failure (COLD 5.2% vs WARM 1.3%, p=0.14) were equivalent. Minimum cerebral oximetry (OX) values during MHCA were similar for the right (COLD 61.2 ± 15.8 vs WARM 59.9 ± 13.9, p=0.57) and left brain (COLD 54.8 ± 15 vs WARM 56.7 ± 11.8, p=0.37). No difference occurred in the decrease of left-sided OX from baseline during MHCA (COLD -13.5 ± 12.8 vs WARM -15.9 ± 12.6, p=0.21), but a smaller decrease of right-sided OX occurred in COLD pts (COLD -5.9 ± 12.9 vs WARM -11.8 ± 12.29, p=0.003). Warm SACP was not a predictor of increased adverse events (Table).

Conclusions: Complex ARCH can be performed with acceptable operative risk using MHCA and warm SACP. Warm SACP did not lead to a higher incidence of stroke and was not a significant predictor of adverse events. SACP at 28°C does not negatively impact outcomes during ARCH conducted under MHCA.

Impact of WARM SACP on Outcomes

	WARM vs. COLD AOR (95% CI)	p-value
Death	0.68 (0.15-3.02)	0.61
Permanent Stroke	0.24 (0.04-1.46)	0.12
TND	1.14 (0.25-5.20)	0.86
Renal Failure	0.29 (0.03-2.78)	0.29

2:15 PM ***Grand Ballroom 7A***

Staged Open and Endovascular Repair of the Distal Aorta in Connective Tissue Disorders

J. Idrees, E. E. Roselli, E. H. Blackstone, J. F. Sabik, L. G. Svensson

Cleveland Clinic, OH

COMMERCIAL RELATIONSHIPS E. E. Roselli: Consultant/Advisory Board, Apica Inc, Edwards Lifesciences Corporation, Medtronic, Inc; Research Grant, Medtronic, Inc; Speakers Bureau/Honoraria, COOK, Vascutek Ltd; Other, Direct Flow Medical, Inc, CEC; J. F. Sabik: Consultant/Advisory Board, Medtronic, Inc, ValveXchange, Inc; Other Research Support, Abbott Vascular, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Medistem, Inc; L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax

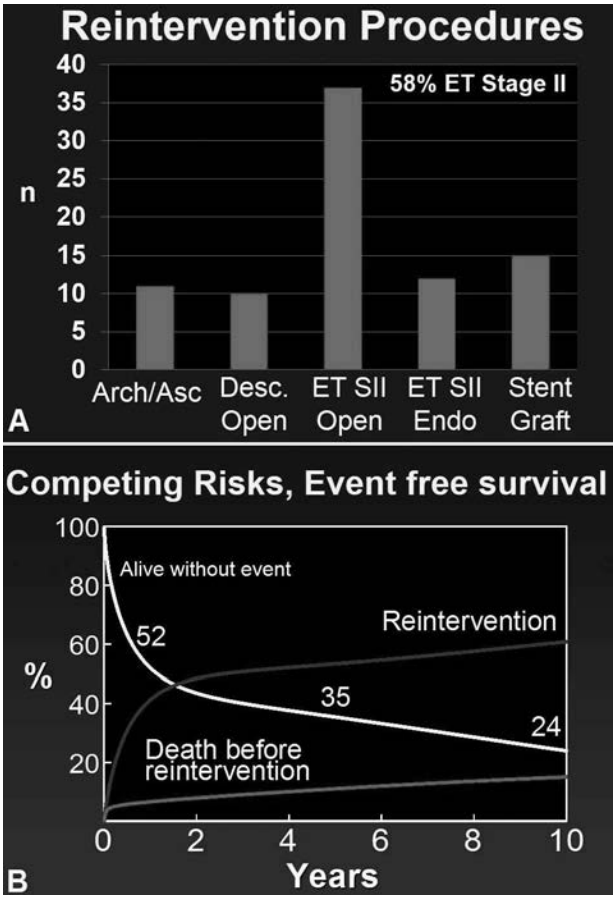
REGULATORY DISCLOSURE This presentation will address the off-label use of stent grafts in chronic dissection.

Purpose: Improvements in care have prolonged survival of patients with connective tissue disorders (CTD), but the distal aorta remains at risk. Little data are available to guide treatment. Our objectives were to characterize patients, describe repair methods, and assess outcomes.

Methods: From 1996 to 2012, 527 patients with CTD underwent cardiovascular operations, and distal aortic repair was performed in 121 (23%; age, 44 ± 15 years) for aneurysm (n=17), dissection (n=8), or both (n=96). Index procedure was defined as the first distal aortic operation in which repair extended beyond the left subclavian artery. CTD diagnoses included Marfan syndrome (n=107), Marfanoid (n=7), Ehlers Danlos (n=4), or Loeys Dietz (n=3). Eighty-seven (72%) had a history of previous ascending repair with a median interval to index operation of 8.4 years. Index procedures included elephant trunk (ET) stage I (n=63), descending aorta repair (n=26), thoracoabdominal aneurysm repair (n=13), total arch replacement (n=13), and stent grafting (n= 6). Median follow-up was 4.4 years.

Results: Operative mortality was 2.5% (3/121). One patient died of sepsis, one of distal rupture, and one of unknown cause following discharge. No paralysis occurred, but three (2.5%) had non-permanent stroke, four (3.3%) required dialysis, 12 (10%) required tracheostomy, and 13 (11%) underwent reoperation for bleeding. During follow-up, 67 patients had 85 additional distal aortic procedures (58 open, 27 endovascular, 49 of which were stage II ET) (Figure). By 10 years, the probability of at least one reintervention was 61%. At 1, 5, and 10 years, estimated survival was 91%, 79%, and 62%, and event-free survival was 52%, 35%, and 24%, respectively.

Conclusions: Most patients with CTD requiring distal operations have aortic dissection and require multiple reinterventions. Staged repair strategies combining open and endovascular approaches are feasible, and benefits outweigh the risks. These patients require lifelong imaging surveillance.



A: Reintervention procedures, B: Competing risks after index distal aortic repair and event-free survival

2:30 PM **Grand Ballroom 7A**

Early Aortic Repair Worsens Concurrent Traumatic Brain Injury

D. G. Harris[1], J. Rabin[2], G. A. Crews[3], J. V. O'Connor[2], T. M. Scalea[2], R. S. Crawford[1]

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Purpose: Thoracic aortic injury (TAI) and traumatic brain injury (TBI) are leading causes of death after blunt trauma. TAI therapy, repair, timing, and anticoagulation may complicate TBI. Optimal management is not defined.

Methods: Adults with TAI and moderate-severe TBI (head abbreviated injury score 3-6) admitted to a Level I trauma center from 2000 to 2012 were reviewed and grouped by early (<24 hours from admission) or delayed repair. Repairs were open with bypass and anticoagulation, or endovascular (TEVAR) with or without anticoagulation. TBI worsening was defined by head CT changes within 48 hours of repair. Outcomes studied were worsening TBI, aortic complications, and overall survival. Analysis was by Fisher exact or independent t tests (significance $p<0.05$).

Results: Seventy-five patients had concurrent TAI and TBI. Twenty-two (29%) were treated non-operatively, 29 (39%) had early aortic repair (17 open, 12 TEVAR), and 24 (32%) had delayed repair (3 open, 21 TEVAR). Initial demographics, measures of TBI severity, and TAI lesions were similar between groups. Worsening TBI and aortic morbidity and mortality were significantly more frequent with early repair. After early repair, rates of worsening TBI were similar for open repair and TEVAR (35% vs 33%, $p=1.00$). As controls for the rate of natural TBI evolution, non-operative patients had similar TBI characteristics but less overall TBI progression (9%, $p<0.05$) compared to the early group. For delayed patients, all had stable head CTs before repair and were anticoagulated without complication, and 75% had repair after 48 hours. Overall survival was the same.

Conclusions: For patients with TAI and TBI, early aortic intervention is associated with worsening TBI regardless of repair modality, as well as increased aortic morbidity and mortality. Patients with clinically and radiographically stable TBIs can undergo delayed repair after 48 hours from admission with full anticoagulation.

Injury Characteristics, Management, and Outcomes

	Early Repair, n=29	Delayed Repair, n=24	P value
Age, years ± SD	39 ± 20	46 ± 22	0.23
Revised Trauma Score ± SD	5.9 ± 1.8	6.4 ± 1.6	0.32
SBP < 90 mmHg, n (%)	4 (14)	3 (13)	1.00
High grade TAI*, n (%)	27 (93)	19 (79)	0.22
GCS ± SD	8.7 ± 5.0	10.1 ± 5.3	0.23
Head AIS ± SD	4.0 ± 0.7	3.8 ± 0.8	0.24
Hemorrhagic TBI, n (%)	16 (55)	18 (75)	0.16
TIme to repair, days ± SD	0.3 ± 0.2	3.6 ± 3.6	0.001
TEVAR, n (%)	12 (41)	21 (88)	0.001
TEVAR without AC, n (%)	6 (50)	0	0.001
Aortic M&M, n (%)	8 (28)	1 (4)	0.03
Worsening TBI, n (%)	10 (34)	0	0.001
Overall survival, n (%)	22 (76)	20 (83)	0.73

*SBP, systolic blood pressure; * pseudoaneurysm or transection; GCS, Glasgow coma scale; AIS, abbreviated injury scale; AC, anticoagulation; M&M, morbidity & mortality*

2:45 PM ***Grand Ballroom 7A***

Outcomes of Aortic Root Replacement After Previous Aortic Root Replacement: The "True" Redo Root

A. S. Jassar[1], N. Desai[1], A. Pochettino[2], P. Vallabhajosyula[1], J. Maniaci[1], R. K. Milewski[1], F. H. McCarthy[1], P. Moeller[1], W. Y. Szeto[1], J. E. Bavaria[1]

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COMMERCIAL RELATIONSHIPS N. Desai: Research Grant, SORIN GROUP; W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc; J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc

Purpose: Reoperative aortic surgery is technically challenging. The objective of this study was to compare outcomes after "true" redo root replacement (previous full root replacement) with de-novo aortic root replacement.

Methods: From 2002 to 2011, 1,099 patients underwent full aortic root replacement. Of these, 723 patients underwent a first time sternotomy (de-novo group) and 100 patients had previously undergone full aortic root replacement (redo group). In the redo group, 59 patients underwent redo operation due to structural valve deterioration (degenerative group) and 41 due to endocarditis (infection group). Patients with prior sternotomy for any operation other than full root replacement were excluded.

Results: The incidence of degenerative failure increased between the first 50 (n=23, 46%) vs the second 50 patients (n=36, 72%, p=0.01%) in the series. Perioperative mortality was 4% (n=26) in the de-novo group and 6% in the redo group (p=0.16). There was no increase in risk of major complications in the degenerative group as compared to the de-novo group. Incidence of heart block, deep sternal infection, prolonged ventilation, reoperation for bleeding, and length of hospital stay was increased, and interval to reoperation was decreased in the presence of infection (see table). Five-year survival (see figure) for de-novo group and redo group was 85.8% and 78.6% (p=0.02) respectively (degenerative=90.1%, infection=67%, p=0.01; p-value for de-novo vs degenerative =0.72).

Conclusions: Indications for reoperative root reconstruction have evolved from infectious to predominantly degenerative processes. Redo root replacement can be performed with low risk of mortality and morbidity. Presence of infection increases risk of complications and worsens survival. However, redo root replacement for degenerative failure can be performed with similar short-term complication risk and mid-term survival as de-novo root replacement.

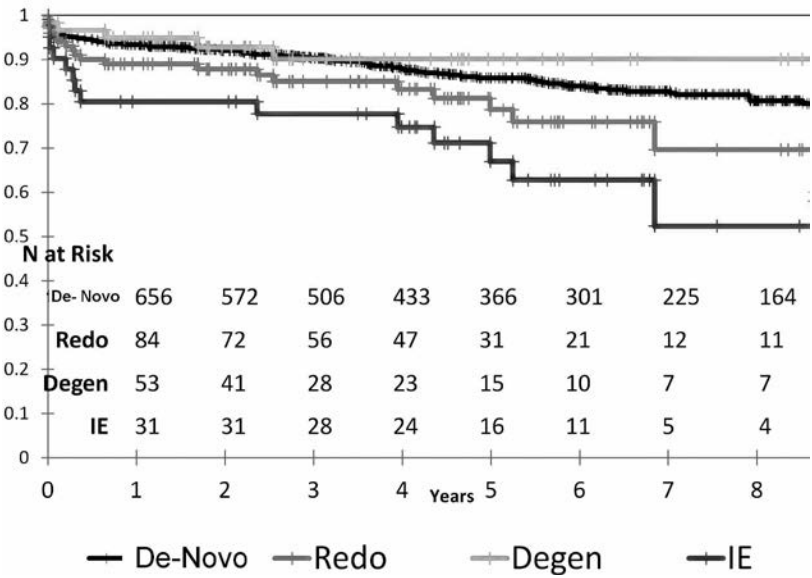
Continues on next page.

Adult Cardiac Session: Aortic – Continued

Perioperative Outcomes

Postoperative Event	De-Novo Root N=723(%)	Redo Root N = 100	Degenerative N = 59(%)	Infection N=41(%)
Time to Redo (yrs	-	7.9 ± 5.5	3.6 ± 3.9 #	11.0 ± 4.3
In- Hosp Mortality	26 (4)	6	2 (3)	4 (10)
Stroke	20 (3)	5	2 (3)	3 (7)
Renal failure requiring dialysis	17 (2)	3	2 (3)	1 (2)
Heart block	53 (7)	15*	8 (14)	7 (17) ¶
Reop for bleed/ tamponade	35 (5)	7	1 (2) #	6 (15) ¶
Deep sternal wound infection	4 (1)	2	0	2 (5) ¶
Prolonged ventilation (>24 hours)	98 (14)	27*	14 (24)	13 (32) ¶
Postoperative length of stay	9.9 ± 9.4 Median = 7	14.4 ± 14 Median = 9.5 *	11.1 ± 7.5 Median = 8 #	19.5 ± 19.4 Median = 13 ¶
	There was no significant difference in any event between the de-novo and degenerative group	*=p<0.05 de-novo vs redo	#=p<0.05 degenerative vs infection	¶= p<0.05 de-novo vs. Infection

Kaplan- Meier Survival



3:00 PM ***Grand Ballroom 7A***

Debate: Bicuspid Aortic Valve Insufficiency With Proximal Aortic Aneurysm—Valve-Sparing Root Replacement (VSRR) vs Bio Root and Bridge to TAVR Valve-in-Valve

VSRR: *D. Craig Miller, Stanford, CA*

Bio Root: *Thomas E. MacGillivray, Boston, MA*

COMMERCIAL RELATIONSHIPS D. Miller: Nonremunerative Position of Influence, Edwards Lifesciences Corporation, PARTNER Executive Committee; Research Grant, Edwards Lifesciences Corporation; Consultant/Advisory Board, Abbott Vascular, Medtronic, Inc

Notes

1:30 PM – 3:30 PM ***Crystal Ballroom G-Q***

Adult Cardiac Session: Ischemic

Moderators: *Marc Ruel, Ottawa, Canada, and Frank W. Sellke, Providence, RI*

COMMERCIAL RELATIONSHIPS M. Ruel: Research Grant, Medtronic, Inc; Speakers Bureau/Honoraria, Medtronic, Inc; F. W. Sellke: Consultant/Advisory Board, CLS Behring, The Medicines Company, Pfizer Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

1:30 PM ***Crystal Ballroom G-Q***

Combined Heart and Liver Transplantation Can Be Safely Performed With Excellent Short- and Long-term Results

P. Atluri, A. C. Gaffey, A. S. Fairman, A. B. Goldstone, J. W. MacArthur, J. E. Cohen, J. T. Gutsche, Y. Shudo, Y. Woo

University of Pennsylvania, Philadelphia

Purpose: Heart transplant has become the gold standard therapy for end-stage heart failure. Short- and long-term outcomes following orthotopic heart transplant have been excellent. Many patients with heart failure manifest hepatic failure as a result of a chronically elevated central venous pressure. Concomitant hepatic failure has been a contraindication to heart transplant in most centers. A few select institutions are currently performing combined heart-liver transplantation to treat dual organ failure. The outcomes following dual organ transplant are largely unknown, with limited data from a few select centers. We undertook this study to analyze our large experience with combined heart-liver transplant and determine the short- and long-term outcomes associated with this procedure.

Methods: We have performed 1,020 heart transplants at our center to date. Of these patients, 26 underwent combined heart and liver transplant (largest single-center experience). We reviewed demographic, perioperative, and short- and long-term outcomes following this combined procedure.

Results: All 26 patients underwent successful dual organ transplant without any episodes of primary graft dysfunction. Average length of ICU stay was 10 ± 5 days and average hospital stay was 25 ± 11 days. Kaplan-Meier analysis demonstrated excellent short- (1 year = 87 ± 7%) and long-term survival (10 year = 80 ± 9%). Interestingly, only three patients (11%) demonstrated any evidence of rejection long term by myocardial biopsy, suggesting that concomitant hepatic transplantation may provide immunologic protection for the cardiac allograft. [TABLE]

Conclusions: We present the largest single-center series of combined heart and liver transplant. This dual organ strategy is highly feasible with excellent long-term survival. Concomitant liver transplant may confer immunologic protection for the cardiac allograft.

Preoperative and Operative Patient Variables

Age (years)	46±13
Female (%)	26.1%
Hypertension (%)	30.1% (8)
Hypercholesterolemia (%)	7.7% (2)
Pulmonary Hypertension (%)	15.4% (4)
Etiology of Heart Failure	
Non-Ischemic	69% (18)
Ischemic	8% (2)
Congenital	23% (6)
MELD Score	16.8±6.8
Pre-Operative Creatinine (mg/dl)	1.7±0.9
Pre-Operative Bilirubin (mg/dl)	1.4±1.0
Pre-Operative INR	1.8±1.0
Cardiac Allograft Ischemic Time (min)	175±50
Cardiopulmonary Bypass Time (min)	186±56
Return to Operating Room for Bleeding	3.8% (1)

Notes

1:45 PM ***Crystal Ballroom G-Q***

The Role of Target Vessel Stenosis in Long-term Patency of Sequential Radial Artery Grafts of Composite I-Graft With an In Situ Internal Thoracic Artery to Circumflex and Right Coronary Artery

*J. Kobayashi, S. Sato, H. Hata, T. Fujita, *Y. Shimahara*

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Purpose: We evaluated the relationship between the patency of sequential radial artery grafts of composite I-graft and the target vessel stenosis.

Methods: Between 2002 and 2012, 1,228 patients underwent total arterial aorta no-touch OPCAB. Among these patients, 335 anastomoses of 107 sequential radial artery grafts of I-graft in 107 patients who received both early graft examination in CAG and late graft examination in CT angiography (4 years after OPCAB) were studied. The I-graft consisted of an in situ internal thoracic artery and the radial artery. All anastomoses were composed of sequential radial artery graft that targeted the circumflex and right coronary artery. Distal end of the I-graft with end-to-side anastomosis was defined as end graft.

Results: There were 25, 46, 33, and 3 I-grafts with 2, 3, 4, and 5 anastomoses, respectively. When the end graft was anastomosed to severe stenotic vessel (>70%), late patency rate of I-graft was over 85%. However, in the case of the end graft with moderate stenotic vessel (≤70%), late patency rate of I-graft was reduced to approximately 60% ($p<0.01$). In the end graft with severe stenotic target of I-graft with four anastomoses, more than one target vessel with moderate stenotic target among three targets except for the end graft made the late patency rate decay to 50%.

Conclusions: In the case of patients who have end graft with severe stenotic vessel, the I-graft of an in situ ITA and radial artery will be reliable. However, in I-graft with 4 sequential anastomoses, even if there is a severe stenotic target of the end graft, the number of moderate stenotic target vessels among other 3 targets should be 1 or less to achieve better late patency.

Notes

2:00 PM ***Crystal Ballroom G-Q***

Off-Pump vs On-Pump Impact on Diabetic Patients' Clinical Outcomes and Costs

A. W. Shroyer[1], B. Hattler[2], T. H. Wagner[3], J. H. Baltz[2], J. F. Collins[4], B. M. Carr[1], G. Almassi[5], J. A. Quin[6], R. B. Hawkins[7], E. Kozora[8], M. Bishawi[1], R. Ebrahimi[9], F. L. Grover[2]

[1]Northport VA Medical Center, NY, [2]Eastern Colorado Health Care System, Denver, [3]VA Palo Alto Health Economics Resource Center, Menlo Park, CA, [4]Cooperative Studies Program Coordinating Center, Veterans Affairs Medical Center, Perry Point, MD, [5]Zablocki Veterans Affairs Medical Center, Milwaukee, WI, [6]VA Boston Healthcare System, West Roxbury, MA, [7]Salem Veterans Affairs Medical Center, VA, [8]National Jewish Health, Denver, CO, [9]Greater Los Angeles VA Medical Center, CA

COMMERCIAL RELATIONSHIPS G. Almassi: Other Research Support, Eli Lilly and Company, Hoffmann-La Roche Inc, Takeda Pharmaceuticals; R. Ebrahimi: Speakers Bureau/Honoraria, Abbott Vascular, Amarin Corp, AstraZeneca, Boehringer Ingelheim GmbH, Daiichi Sankyo Company, Limited., Eli Lilly and Company, Janssen Pharmaceuticals, Inc, sanofi Aventis US LLC

Purpose: Observational studies documented an off-pump advantage over on-pump for high-risk patients, including diabetics. In general, randomized trials have not confirmed this advantage. The VA "Randomization On versus Off Bypass" (ROOBY) trial randomized 2,203 coronary artery bypass grafting patients at 18 sites to an on-pump (n = 1,099) vs off-pump (n = 1,104) procedure with no off-pump advantage identified. A priori, one ROOBY protocol aim was to evaluate treatment impact in diabetic patients as a high-risk patient sub-group.

Methods: Actively treated diabetics (n = 835; on oral or insulin medication) received off-pump (n = 402) or on-pump (n = 433) procedures. Primary ROOBY endpoints were: 1) short-term composite (ie, 30-day operative death or major complications); and 2) 1-year composite (ie, death, acute myocardial infarction, or repeat revascularization). Secondary ROOBY endpoints included 1-year graft patency, 1-year changes from baseline for neurocognitive status and health-related quality of life, and costs up to 1 year post-surgery.

Results: Diabetic patients' risk factors were balanced across treatments. Short-term composite outcomes (8.0% vs 3.9%, p = 0.013) and 30-day operative mortality (2.2% vs 0.5%, p = 0.032) trended worse for off-pump vs. on-pump, but no 1-year composite outcome differences were observed (9.7% vs 6.5%, p = 0.09). Off-pump 1-year graft patency was worse (83.1% vs 88.4%, p < 0.01) than on-pump. No treatment-related differences were found for 1-year costs or 1-year changes from baseline for neurocognitive or health-related quality of life outcomes.

Conclusions: Improved short-term clinical outcomes and costs were found for ROOBY diabetic patients using an on-pump vs off-pump approach. Other than worse 1-year off-pump graft patency rates, no other diabetic patient significant differences in clinical outcomes were observed.

Continues on next page.

Adult Cardiac Session: Ischemic – Continued

Diabetic Patients' Risk Factors, Clinical Outcomes, and Costs

Description	Off-pump	On-pump	p-value
Proportion of Diabetics Treated using Oral and/or Insulin Agents [N = 835/961 (86.9%)]	402/470 (85.5%)	433/491 (88.2%)	0.251
Risk Factors			
Age (mean/SD)	62.928 (8.259)	62.092 (7.791)	0.133
Urgent Status	64/402 (15.9%)	55/433 (12.7%)	0.184
Chronic Obstructive Pulmonary Disease (COPD)	82/402 (20.4%)	87/433 (20.1%)	0.913
Creatinine > 1.5 mg/dl	50/402 (12.4%)	50/433 (11.5%)	0.692
Cerebrovascular Disease (CVD)	42/402 (10.4%)	40/433 (9.2%)	0.557
PeripheralVascular Disease (PVD)	77/402 (19.2%)	83/433 (19.2%)	0.996
Hypertension	379/402 (94.3%)	403/433 (93.1%)	0.475
Single Vessel Disease	16/400 (4.0%)	22/431 (5.1%)	0.559
Clinical Outcomes			
Short-Term Composite (either 30-day operative mortality or major complications)	32/402 (8.0%)	17/433 (3.9%)	0.013
30-Day Operative Mortality	9/401 (2.2%)	2/433 (0.5%)	0.032
1-Year Composite (either death, revascularization, or acute myocardial infarction)	39/402 (9.7%)	28/433 (6.5%)	0.086
Proportion of Grafts Patent at 1-Year	522/628 (83.1%)	731/827 (88.4%)	0.004
Proportion of Patients with 1-Year Cognitive Decline	36/221 (16.3%)	38/265 (14.3%)	0.551
1-Year Composite Z-Score Change for Cognitive Tests	0.130 (+/- 0.319)	0.141 (+/- 0.373)	0.728
Baseline to 1-Year Change in VR-36 Physical Component Summary Score	3.351 (+/- 10.142)	4.778 (+/- 10.926)	0.090
Baseline to 1-Year Change in VR-36 Mental Component Summary Score	2.187 (+/- 11.966)	1.598 (+/- 11.724)	0.532
Baseline to 1-Year Change in SAQ Angina Frequency Score	20.497 (+/- 27.049)	23.924 (+/- 30.005)	0.130
Resource Utilization			
Post-operative Length of Stay (mean/SD)	8.5 (7.0)	8.2 (13.1)	0.650
Total Length of Stay	11.5 (8.9)	10.9 (14.6)	0.419
Surgical Costs	14,771 (7,538)	14,278 (10,734)	0.412
Hospital Discharge Costs	37,706 (24,868)	38,013 (60,339)	0.919
Logged Hospital Discharge Costs	10.4 (0.46)	10.36 (0.50)	0.066
Total 1-Year Cumulative Costs	64,298 (50,946)	62,121 (69,352)	0.581
Logged 1-Year Cumulative Costs	10.89 (0.60)	10.85 (0.54)	0.254

Note: Costs are represented in $, with mean (SD) reported. Neurocognitive and health-related quality of life scores are represented as mean (SD).

2:15 PM *Crystal Ballroom G-Q*

The Optimal Arterial Conduit for Diabetic Patients: A Propensity Analysis of the Radial Artery vs the Right Internal Thoracic Artery

D. M. Hoffman[1], D. J. Lucido[1], K. R. Dimitrova[1], G. R. Dincheva[1], C. M. Geller[1], S. K. Balaram[2], D. G. Swistel[2], W. Ko[1], R. F. Tranbaugh[1]

[1]Beth Israel Medical Center, New York, NY, [2]Saint Luke's Roosevelt Hospital Center, New York, NY

Purpose: Multiple arterial grafts improve long-term survival after coronary bypass grafting (CABG), but for diabetic patients, with concerns about using both left (LITA) and right (RITA) internal thoracic arteries, usage remains low. To identify the optimal arterial conduit to deploy with the LITA for multi-arterial revascularization of diabetic patients, we compared clinical outcomes for radial artery (RA) vs RITA.

Methods: Among 908 consecutive diabetic patients who had primary isolated CABG from January 1,1995, to December 30, 2008, in our centers, in addition to LITA, 501 had RA and 407 RITA graft(s). Data were prospectively collected for the New York State Cardiac Surgery Reporting System, which is mandatory and audited, and long-term survival from the Social Security Death Index. Propensity matching, employing 30 preoperative and operative risk factors, identified 200 matched pairs each from RA and RITA cohorts.

Results: Grafts were constructed on pump in 98.9% and 94% of RITA or RA grafts were used to bypass the circumflex system and 6% to the right coronary system. Kaplan-Meier estimated 1, 5, 10, and 15-year survival rates for matched patients were: 99%, 94%, 80%, and 66% for RA patients and 96%, 89%, 74%, and 60% for RITA patients (p=0.160). Mortality (hospital or 30-day), MI, and stroke were not significantly different between groups. Reoperation for bleeding did not reach significance (p=0.092). However, sternal wound infection (p=0.018) and respiratory failure (p=0.014) markedly favored the RA group.

Conclusions: Long-term survival is similar in selected patients undergoing CABG with LITA and either RA or RITA. RA patients developed significantly fewer respiratory or sternal wound complications. This comparison identifies the radial artery as the preferred conduit to extend the recognized survival benefit of a multiple arterial graft strategy to diabetic patients.

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	RADIAL (%) n=200	RITA (%) n=200	P Value
Mortality	1.0	2.0	0.411
Myocardial Infarction (MI)	1.0	0.5	0.562
Stroke	1.5	3.0	0.312
Re-exploration	1.0	3.5	0.092
Sternal Wound Infection	1.5	6.0	0.018
Respiratory Failure	1.0	3.0	0.014

2:30 PM ***Crystal Ballroom G-Q***

Hybrid Coronary Revascularization (HCR) in 100 Patients With Multivessel Coronary Disease (MVD)

A. Repossini[1], M. Tespili[2], A. Saino[2], L. Di Bacco[1], L. Giroletti[1], F. Rosati[1], C. Muneretto[1]

[1]University of Brescia Medical School, Italy, [2]Azienda Ospedaliera Bolognini, Seriate, Italy

COMMERCIAL RELATIONSHIPS C. Muneretto: Consultant/Advisory Board, Estech

Purpose: Hybrid coronary revascularization, meaning left mammary artery on left anterior descending (MIDCAB) combined with non-LAD PCI stenting, is considered a viable alternative to conventional CABG through sternotomy or to multivessel PCI, in order to perform a functionally complete revascularization.

Methods: From January 2009 to May 2013, 100 consecutive patients underwent hybrid revascularization. Coronary risk was assessed by SYNTAX score, and patients were partitioned in tertiles according to the score categories. Long-term outcomes, major adverse cardiac and cerebrovascular events (MACCE) rate, and repeated target vessels revascularization (TVR) rate were evaluated by Kaplan-Meier curve and log-rank test.

Results: Mean age was 66.3 ± 12.0 years and 83 patients were male. Mean SYNTAX score was 28.22 ± 7. Mean EuroSCORE II was 4.05 ± 1,83. PCI was performed in all patients (n=100), in 75% before MIDCAB and in 25% of cases after surgery (interval 2.2 ± 1.3 months). Intraoperative and hospital mortality was 0%. At follow-up, one cardiac death for acute myocardial infarction occurred. At 3.5 ± 1.3 months follow-up, overall population freedom from MACCEs rate was 82.6% (CI: 79.5% to 85.7%) and the freedom from TVRs rate was 86.1% (CI: 82.9% to 89.3%). Despite the rate of MACCE and TVR being higher in patients with intermediate and high coronary risk than in patients with SYNTAX score ≤ 22, such difference was not statistically significant ($p > 0.05$). Cox regression showed a significant increment of risk for TVR on overall population in patients with diabetes (OR with CI 95%: 2.4 ± 1.1, $p=0.03$) and in patients with non-LAD stented lesions (OR with CI 95%: 4.5 ± 1.7, $p=0.02$).

Conclusions: Hybrid coronary revascularization is a viable option to perform a minimally invasive, functionally complete revascularization in high-risk patients for conventional revascularization, with better results when performed on patients with a SYNTAX score ≤ 22.

2:45 PM *Crystal Ballroom G-Q*

Acute Kidney Injury After On-Pump or Off-Pump CABG–Exploratory Analysis of the GOPCABE Study Population

W. Reents[1], M. Hilker[2], J. Boergermann[3], M. Albert[4], K. Plötze[5], M. Zacher[1], A. Diegeler[1], A. Boening[6]

[1]Cardiovascular Clinic Bad Neustadt, Germany, [2]University Hospital Regensburg, Germany, [3]Heart and Diabetes Center Bad Oeynhausen, Germany, [4]Robert-Bosch Hospital Stuttgart, Germany, [5]Heart Center Dresden, Germany, [6]University Hospital Giessen, Germany

COMMERCIAL RELATIONSHIPS J. Boergermann: Speakers Bureau/Honoraria, Medtronic, Inc; A. Boening: Research Grant, Edwards Lifesciences Corporation, German Society for Thoracic and Cardiovascular Surgery, MAQUET, Merck & Co, Inc

Purpose: Cardiac surgery can be complicated by a decrease or even deterioration of renal function. We hypothesized that off-pump coronary artery bypass grafting (CABG) may better preserve renal function.

Methods: In the German Off-Pump CABG in Elderly Patients (GOPCABE) trial, patients >75 years undergoing elective first-time CABG were randomized to either on- or off-pump CABG. Data on renal function were available from 1,612 patients, constituting 67% of the GOPCABE study population. Before surgery, renal function was graded according to the glomerular filtration rate (GFR). Acute kidney injury (AKI) within the first week after surgery was defined according to the modified RIFLE criteria (AKI 1: increase creatinine x 1.5 from baseline or increase >0.3 mg/dl within 48 hours; AKI 2: increase creatinine x 2 from baseline; AKI 3: increase creatinine x 3 from baseline or creatinine >4 mg/dl or increase >0.5 mg/dl within 48 hours or new-onset renal replacement therapy).

Results: Impaired renal function (GFR <60 ml/min/1,73 m2) was seen in 642 patients (40%) and 19 patients had preexisting end-stage kidney disease. AKI of any severity occurred in approximately half of all patients undergoing CABG, with AKI 1 accounting for the majority of all cases. There was no difference regarding the incidence and severity of AKI in patients undergoing on-pump or off-pump CABG (on-pump vs off-pump: AKI 1: 298 (37%) vs 329 (42%); AKI 2: 38 (5%) vs 43 (5%); AKI 3: 44 (6%) vs 44 (6%); p = 0.174). New renal replacement therapy did not differ between both groups (on-pump: 3.2%; off-pump: 2.7%). Stratification according to preoperative renal function yielded comparable frequencies of AKI for on-pump or off-pump CABG.

Conclusions: Whereas AKI was common in elderly patients undergoing CABG, deterioration of renal function requiring renal replacement therapy was a rare event. Off-pump CABG was not associated with decreased rates or reduced severity of AKI in elderly patients.

Continues on next page.

Adult Cardiac Session: Ischemic – Continued

Acute Kidney Injury After On-Pump and Off-Pump CABG

	on-pump CABG (n=804)	off-pump CABG (n=789)	p value
Preserved renal function	424 (53%)	373 (47%)	
AKI 1: increase creatinine x 1,5 from baseline or increase > 0,3 mg/dl within 48h	298 (37%)	329 (42%)	
AKI 2: increase creatinine x 2 from baseline	38 (5%)	43 (5%)	0,174
AKI 3: increase creatinine x 3 from baseline or creatinine > 4mg/dl or increase > 0,5 mg/dl within 48h or new-onset renal replacement therapy	44 (5%)	44 (6%)	
new-onset renal replacement therapy	26 (3.2%)	21 (2.7%)	
30 day mortality	17 (2.1%)	17 (2.2%)	

3:00 PM *Crystal Ballroom G-Q*

Debate: Are We Off Off-Pump?

Pro: *Robert A. Guyton, Atlanta, GA*

Con: *John D. Puskas, Atlanta, GA*

COMMERCIAL RELATIONSHIPS R. A. Guyton: Consultant/Advisory Board, Medtronic, Inc

Notes

Notes

1:30 PM – 3:30 PM ***Grand Ballroom 4-6***

Congenital Session: Pediatric Congenital I

Moderators: *Ralph S. Mosca, New York, NY, and David M. Overman, Minneapolis, MN*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

1:30 PM ***Grand Ballroom 4-6***

Influence of Surgeon and Center Volume on Early Morbidity and Mortality Following Arterial Switch Operation for Transposition of the Great Arteries: An Analysis of the STS Congenital Heart Surgery Database

T. B. Karamlou[1], M. L. Jacobs[2], S. K. Pasquali[3], X. He[4], K. D. Hill[4], S. M. O'Brien[4], D. M. McMullan[5], J. P. Jacobs[6]

[1]Benioff Children's Hospital, University of San Francisco, CA, [2]Cleveland Clinic, OH, [3]University of Michigan, Ann Arbor, [4]Duke University School of Medicine, Durham, NC, [5]Seattle Children's Hospital, WA, [6]All Children's Hospital and Children's Hospital of Tampa, St Petersburg, FL

Purpose: Previous analysis of The Society of Thoracic Surgeons Congenital Heart Surgery Database (CHSD) suggested a greater impact of center vs surgeon volume on early mortality after Norwood operation. The current study evaluates the association of center and surgeon volume with early outcome following the arterial switch operation (ASO), which poses different challenges to the surgeon and care team.

Methods: Neonates in the CHSD (2005-2012) undergoing ASO for D-transposition of the great arteries with or without ventricular septal defect (VSD) repair were included. Multivariable logistic regression with adjustment for patient factors and VSD closure was used to evaluate the relationship between annual center and surgeon volume and a composite endpoint (in-hospital mortality and/or any of 6 major morbidities).

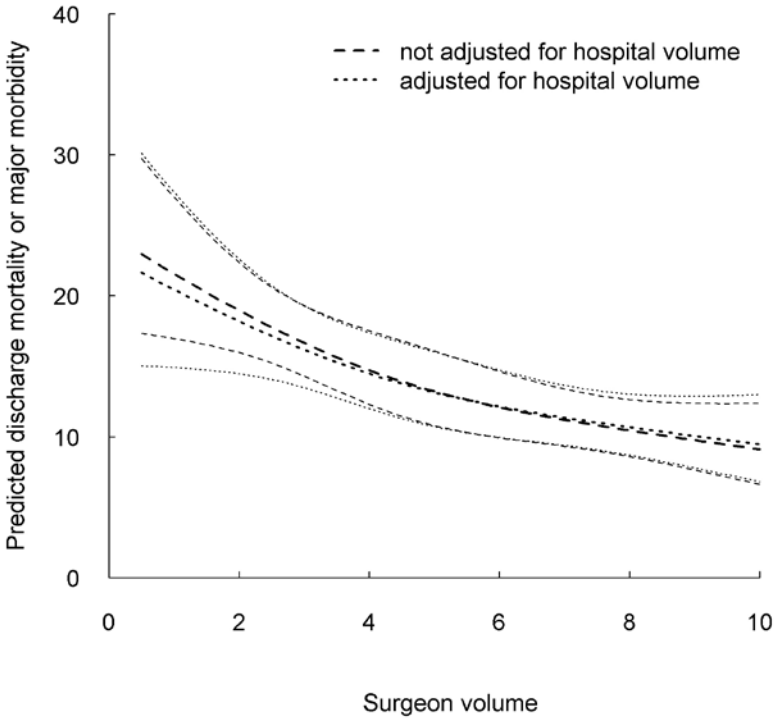
Results: Overall, 2,404 patients (84 centers, 155 surgeons) were included. Annual ASO center volume ranged from 0 to 18 cases. Median annual surgeon volume was 2.3 (IQR 1.2-4.2; max 11). In-hospital mortality was 3.3%, 14.8% had major morbidity, and 15.6% met the composite endpoint. Analyzed individually, both lower center and surgeon volume were associated with the composite endpoint (odds ratios [OR] for centers with 2 vs 10 cases/year 2.08 [95% CI 1.34-3.24]; OR for surgeons with 1 vs 6 cases/year 2.00 [95% CI 1.33-3.24]) (Table). Addition of surgeon volume to the center volume models attenuated the OR by 31%. Addition of center volume to the surgeon volume models attenuated OR by only 7%, indicating that the relationship of surgeon volume and outcome is influenced very little by adjusting for center volume (Figure).

Conclusions: Both center and surgeon volume influence early outcome following ASO; however, surgeon volume appears to be the more important factor. The importance of annual surgeon and center ASO volume should be considered in the context of any initiative to improve outcomes from management of patients with TGA.

Relationship of Surgeon Volume and Center Volume on Early Mortality

Annual Center Volume	Adjusted Odds Ratio (95 % C.I.)	Adjusted Odds Ratio with Surgeon Volume Added to Model	P-value	Relative Attenuation of Odds Ratio
2 cases (vs. 10 cases)	2.08 (1.34-3.24)*	1.44 (0.88- 2.36)	0.15	31%
5 cases (vs. 10 cases)	1.42 (1.15-1.74)*	1.16 (0.91-1.48)	0.22	18%
7 cases (vs. 10 cases)	1.15 (1.05-1.26)*	1.05 (0.94-1.17)	0.43	9%
Annual Surgeon Volume	Adjusted Odds Ratio (95% C.I.)	Adjusted Odds Ratio with Center Volume Added to Model	P-value	Relative Attenuation of Odds Ratio
1 case (vs. 6 cases)	2.00 (1.33-3.01)**	1.86 (1.14-3.03)*	0.01	7%
3 cases (vs. 6 cases)	1.45 (1.22-1.73)**	1.40 (1.12-1.74)*	0.003	4%
5 cases (vs. 6 cases)	1.11 (1.05-1.17)**	1.10 (1.03-1.17)*	0.004	1%

*Legend: **P<0.001; *P<0.01; C.I.: confidence interval*



Predicted rates of a patient with population average risk; thinner lines indicates 95% confidence intervals; both models adjusted for patient risk factors.

1:45 PM ***Grand Ballroom 4-6***

Does the Location of Preoperative Care Affect Outcomes of Cardiac Surgery in Infants? An Analysis From the Pediatric Health Information Systems Database

P. Gupta[1], B. W. Beam[1], T. R. Noel[1], I. Dvorchik[2], H. Yin[2], J. M. Simsic[2], J. D. Tobias[2]

[1]Arkansas Children's Hospital, University of Arkansas for Medical Sciences, Little Rock, [2]Nationwide Children's Hospital, The Ohio State University, Columbus

Purpose: Our purpose was to study the impact of preoperative location on outcomes after pediatric cardiac surgery using a national database.

Methods: Data were obtained from a multicenter administrative national dataset: the Pediatric Health Information System (PHIS). Patients 0-45 days undergoing cardiopulmonary bypass surgery were eligible for inclusion. Study population was divided into two groups, neonatal ICU (NICU) and cardiovascular ICU (CVICU). NICU group received preoperative care in NICU, while CVICU group received preoperative care in either freestanding, dedicated CVICU, or CVICU within a general pediatric ICU (mixed CVICU). The patients included in the study stayed preoperatively in their particular ICU group for at least 4 consecutive days prior to surgery. Postoperatively, all study patients recovered in dedicated CVICU or mixed CVICU. Propensity score matching was performed to 1-1 match patients in the two groups.

Results: 4,483 patients from 39 hospitals qualified for inclusion. By propensity score matching, 1,483 patients matched 1-1 for comparison groups (Table). Preoperative intubation and arterial and central venous catheter usage was higher in NICU vs CVICU. Inotropes and antiarrhythmic drug usage was higher in CVICU vs NICU. At any point during hospital stay, incidence of respiratory insufficiency, renal failure, and sepsis was higher in NICU vs CVICU. Preoperative length of stay (LOS), total LOS, and total length of mechanical ventilation was higher in NICU vs CVICU. There was no difference in mortality or hospital charges between the two groups (Figure).

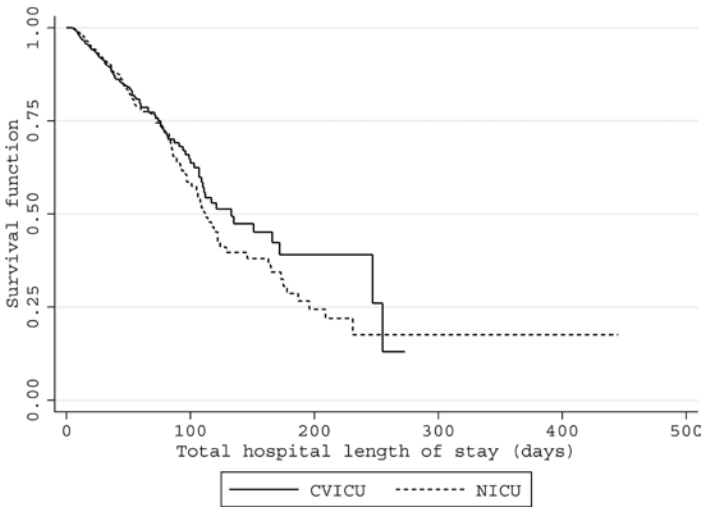
Conclusions: This study demonstrates that preoperative location (NICU vs CVICU) affects outcomes in children undergoing cardiac surgery. Further multicenter randomized controlled trials may help determine optimal preoperative location for neonates undergoing cardiac surgery.

Table. Patient Characteristics and Outcomes for the Study Population

	CVICU N= 1483	NICU N= 1483	P-Value
Baseline characteristics			
Age at procedure (days)	8 (6, 13)	8 (6, 12)	0.15
Birth weight (in grams)	3137 (2760, 3467)	3160 (2800, 3530)	0.14
Gestational age (weeks)	39 (37, 40)	39 (38, 40)	0.40
# CPB cases/center/year	264 (214, 346)	264 (206, 384)	0.85
RACHS score (4-6)	708 (47.7%)	682 (45.9%)	0.33
Any genetic abnormality	199 (13.4%)	170 (11.5%)	0.10
Down's syndrome	22 (1.5%)	17 (1.2%)	0.42
Pre-operative complications			
Endotrachaeal intubation	297 (20.1%)	381 (25.6%)	<0.0001
Chest tube	21 (1.4%)	16 (1.1%)	0.41
Arterial line	183 (12.3%)	377 (25.4%)	<0.0001
Central venous line	594 (40.1%)	795 (53.6%)	<0.0001
Use of nitric oxide	111 (7.5%)	88 (5.9%)	0.09
Cardiopulmonary resuscitation	24 (1.6%)	11 (0.7%)	0.03
Need for inotropes	996 (67.1%)	711 (47.9%)	<0.0001
Use of anti-arrhythmic drugs	480 (32.3%)	316 (21.1%)	<0.0001
Other Outcomes			
Mortality	167 (11.3%)	196 (13.2%)	0.11
Pre-operative length of mechanical ventilation (days)	2 (0,4)	2 (0,4)	0.81
Pre-operative length of hospital stay (days)	6 (5, 9)	7 (5, 10)	<0.0001
Total length of mechanical ventilation (days)	7 (4, 13)	8 (5, 14)	0.004
Total length of hospital stay (days)	22 (15, 35)	26 (18, 41)	<0.0001
Adjusted billed charges	345,443 (241,319; 533,102)	333,763 (222,967; 573,116)	0.13

Continuous variables are summarized by the triplet of quartiles 50th (25th and 75th). Categorical variables are summarized as N (percent). Abbreviations: RACHS: Risk adjustment of congenital heart surgery; ECMO: Extracorporeal membrane oxygenation

Figure. Kaplan-Meier Survival Curve as a Function of Length of Hospital Stay for the Study Patients (p=0.77)



Congenital Session: Pediatric Congenital I – Continued

2:00 PM ***Grand Ballroom 4-6***

Technical Performance Score Is Strongly Associated With Outcomes After Norwood Procedure: Analysis of the Single Ventricle Reconstruction Trial Cohort

M. Nathan[1], L. A. Sleeper[2], R. G. Ohye[3], P. C. Frommelt[4], J. Gaynor[5], C. Pizarro[6], J. S. Tweddell[4], M. Lu[2], S.M. Bradley[7], C. A. Caldarone[8], S. D. Colan[1], C. Dunbar-Masterson[1], P. J. Gruber[9], K. D. Hill[10], J. C. Hirsch-Romano[3], J. P. Jacobs[11], J. R. Kaltman[12], K. R. Kanter[13], D. L. Morales[14], G. D. Pearson[12], S. Ram Kumar[15], I. A. Williams[16], J. W. Newburger[1]

[1]Boston Children's Hospital and Harvard Medical School, MA, [2]New England Research Institutes, Watertown, MA, [3]University of Michigan C. S. Mott Children's Hospital, Ann Arbor, [4]Medical College of Wisconsin, Milwaukee, [5]Children's Hospital of Philadelphia, PA, [6]Alfred I. DuPont Hospital for Children, Wilmington, DE, [7]Medical University of South Carolina, Charleston, [8]Hospital for Sick Children and University of Toronto, Canada, [9]University of Utah School of Medicine, Salt Lake City, [10]Duke University Medical Center, Durham, NC, [11]Johns Hopkins All Children's Heart Institute, Saint Petersburg, FL, [12]National Heart, Lung, and Blood Institute, NIH, Bethesda, MD, [13]Emory University School of Medicine, Atlanta, GA, [14]Cincinnati Children's Hospital Medical Center, OH, [15]Children's Hospital Los Angeles, CA, [16]Morgan Stanley Children's Hospital of New York, Columbia University Medical Center, New York

COMMERCIAL RELATIONSHIPS J. S. Tweddell: Consultant/Advisory Board, CoreMatrix Cardiovascular, Inc

Purpose: This is a product of the Pediatric Heart Network. Technical performance score (TPS) is reported in a single center to predict outcomes after congenital cardiac surgery across procedures and age groups. We sought to determine the association of TPS with outcomes in patients (pts) undergoing Norwood procedure in the Single Ventricle Reconstruction Trial.

Methods: We calculated TPS (Optimal vs Adequate vs Inadequate) based on: 1) echocardiograms (echo) before Norwood discharge, analyzed in a core lab; and 2) unplanned reinterventions (RI) in specific anatomic areas before Norwood discharge (Table). Multivariable regression examined the association of TPS with time to first extubation, death/transplant, unplanned postdischarge RI, and neurodevelopment at 14 months.

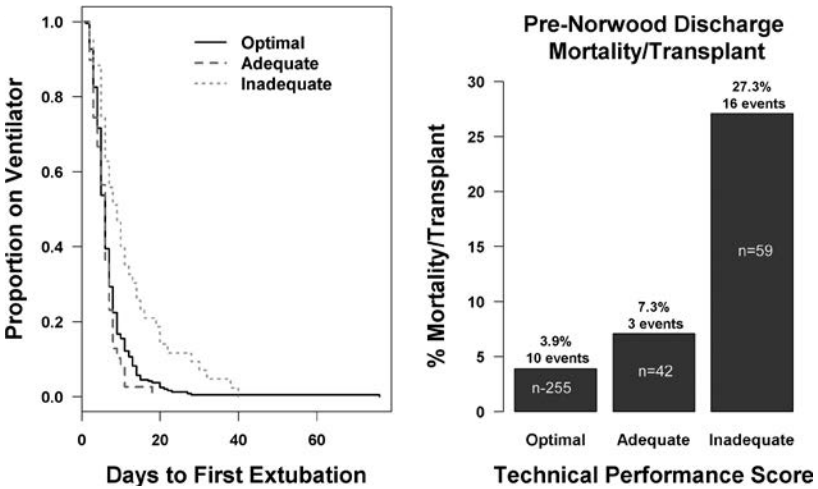
Results: Among 549 pts, 356 (65%) were assigned a TPS based on echo adequate to assess atrial septal restriction/arch obstruction and/or unplanned RI. Of 193 unscorable pts, 137 with inadequate echo/no RI had characteristics similar to scorable pts; in the remaining 56 without echo/ RI (who had ↓ birth wt/gestational age and ↑ % syndromes), 96% died before Norwood discharge. In multivariable regression adjusting for preoperative variables, optimal vs inadequate TPS was an independent predictor of shorter time to first extubation (hazard ratio 0.59, 95% CI 0.41-0.85, p=0.019; Figure), better transplant-free survival before Norwood discharge (odds ratio [OR] 0.11, 95% CI 0.04-0.26, p<0.001; Figure), fewer unplanned RIs before Stage II (OR 0.34, 95% CI 0.16-0.71, p=0.004), and higher Bayley II Psychomotor Development Index score at 14 months (p=0.031). TPS was not associated with transplant-free survival after Norwood discharge, unplanned RIs after Stage II, or Mental Development Index score at 14 months.

Conclusions: TPS is an independent predictor of early and mid-term outcomes after Norwood and may serve as an important tool for quality improvement. Prospective multicenter studies should validate TPS across congenital cardiac procedures.

Modified Technical Performance Score Module for Norwood Procedure

Sub-procedures	Optimal	Adequate	Inadequate
Proximal Arch Reconstruction	NA	NA	Reintervention
Distal Arch Reconstruction	Peak gradient <20mmHg)	Mild narrowing Mild residual peak gradient 20-40 mm Hg	Reintervention or Moderate to severe stenosis, Peak Gradient >40 mm Hg
Coronary Perfusion	NA	NA	Reintervention
Atrial Septectomy	Mean gradient <2 mmHg (Unless intended)	Mean gradient 3-4 mm Hg (Unless intended)	Need for Reintervention or Mean gradient > 4 mm Hg (Unless intended)
Modified BT shunt	Patent	Patent	Reintervention
RV-PA Conduit	Patent	Patent	Reintervention

Final score is optimal if all subprocedure scores are optimal. Final score is adequate if any subprocedure score is adequate, but no subprocedure score is inadequate. Final score is inadequate if any subprocedure score is inadequate. (NA- not assessed in core lab.)



Relationship between Technical Performance Score (TPS) and 1) Time to first extubation, 2) Pre-Norwood Discharge Mortality: Inadequate TPS is associated with longer time to first extubation and higher pre-Norwood discharge mortality when compared to optimal after adjusting for other important preoperative variables.

2:15 PM ***Grand Ballroom 4-6***

Reinforced Sano Conduit Dunked Into the Right Ventricle in Norwood Stage I Reduces Proximal Conduit Obstruction and Preserves Ventricular Function

C. W. Baird, P. Myers, F. A. Pigula, S. Emani

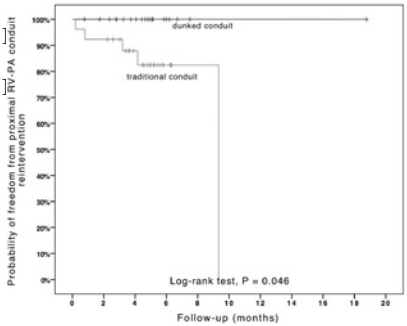
Boston Children's Hospital, MA

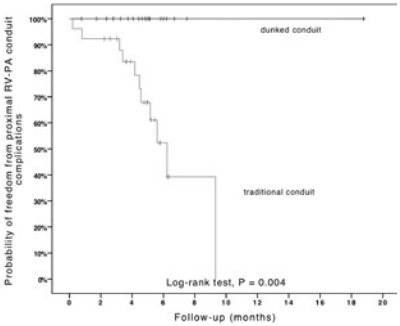
Purpose: Reinterventions are frequent for proximal conduit obstruction after Sano-modified Stage I Norwood palliation of hypoplastic left heart syndrome. We report our initial experience with a modified Sano technique using a ring-reinforced graft inserted into the right ventricle through a limited ventriculotomy.

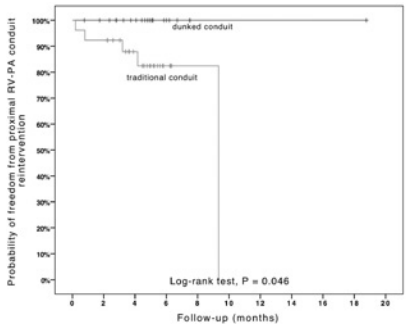
Methods: All patients who underwent Sano-modified Stage I Norwood procedure using a modified "dunked" technique between September 2010 and September 2012 at our institution were reviewed. A historical control group, comprised of patients where a traditional RV-PA conduit anastomosed to the epicardial surface, was used. The primary outcome measures included death, reintervention on the Sano and pulmonary arteries, and ventricular function.

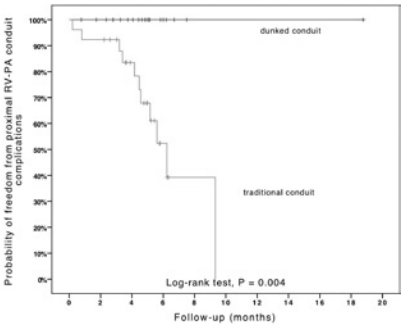
Results: In the study group of 29 patients, none required intervention on the Sano conduit, pulmonary arteries, or aortic arch prior to discharge after Stage I procedure. No interstage intervention was required on the proximal or distal Sano conduit and only one patient required intervention on the mid-portion of the conduit. 84% of patients had mild or less global right ventricular dysfunction. However, 11 of 27 (40.7%) patients in the control group presented with proximal RV-PA conduit complications, including three reinterventions, two reoperations, five with moderate-severe proximal obstruction, and one pseudoaneurysm, compared to none in the study group (0%, P = 0.001). Survival in the study group was 97% at 30 days, 94% at discharge, and 88% at latest follow-up.

Conclusions: The modified ringed and dunked Sano conduit technique provides acceptable results, with a low incidence of interstage reinterventions, significantly less proximal conduit complications compared to the traditional method, and preserved right ventricular function in patients undergoing Stage I palliation.


Probability of freedom from proximal RV-PA conduit reintervention
dunked conduit
traditional conduit
Log-rank test, P = 0.046
Follow-up (months)


Probability of freedom from proximal RV-PA conduit complications
dunked conduit
traditional conduit
Log-rank test, P = 0.004
Follow-up (months)


Probability of freedom from proximal RV-PA conduit reintervention
dunked conduit
traditional conduit
Log-rank test, P = 0.046
Follow-up (months)


Probability of freedom from proximal RV-PA conduit complications
dunked conduit
traditional conduit
Log-rank test, P = 0.004
Follow-up (months)

Notes

2:30 PM ***Grand Ballroom 4-6***

Pulmonary Annulus Growth After the Modified Blalock Taussig Shunt in Tetralogy of Fallot

K. Itatani, K. Miyaji, N. Oka, T. Kitamura, K. Nakashima, Y. Hari, S. Koyama, H. Araki

Kitasato University, Sagamihara, Japan

Purpose: In tetralogy of Fallot, it is well known that postoperative pulmonary regurgitation deteriorates right ventricular function during long-term follow-up. The complete repair without transannular patch should be selected to avoid pulmonary regurgitation. Recently, primary complete repair have been preferred to the staged repair using a Blalock-Taussig shunt (BTS) even in neonates or small infants; however, little has been reported about the influences of BTS on the pulmonary annular growth.

Methods: We examined 40 patients with tetralogy of Fallot or double-outlet right ventricle with pulmonary stenosis. Twenty patients received BTS before complete repair (Group BT), whereas 20 patients underwent primary complete repair (Group PR). Pulmonary annular size was measured by echocardiography before BTS and/or complete repair, and ventricular volume was measured by cardiac catheterization.

Results: There were no significant differences in complete repair age (BT: 7.8 ± 4.2 months, PR: 8.3 ± 11.0 months) between the groups. Pulmonary annulus sizes in Group BT was smaller than those in Group PR (Z score: -5.1 ± 2.5 vs -4.0 ± 2.1); however, after BTS, significant annular growth (Z score -2.8 ± 2.1) was observed ($p = 0.004$), in addition to the significant increase in left ventricular end-diastolic volume ($p = 0.03$). For patients excluding severe pulmonary stenosis (Z score >-7), the pulmonary annular preservation at complete repair was achieved in 66.7% (10/15) of Group BT, compared to 36.8% (7/19) of Group PR ($p = 0.13$).

Conclusions: The BTS increased pulmonary annular size as well as left ventricular volume during 6 months before complete repair, resulting in preservation of pulmonary valve function.

2:45 PM *Grand Ballroom 4-6*

Early Primary Repair of Tetralogy of Fallot Does Not Lead to Increased Resource Utilization or Morbidity

S. M. Peer[1], D. Zurakowski[2], R. A. Jonas[1], P. Sinha[1]

[1]Children's National Medical Center, Washington, DC, [2]Children's Hospital Boston, MA

Purpose: While early primary repair of tetralogy of Fallot (TOF) can be performed with acceptable mortality, younger age at repair is believed to increase resource utilization due to longer recovery times. With overall improvements in outcomes of neonatal and infant cardiac surgery, we hypothesize that age at repair is no longer a predictor of increased postoperative morbidity or resource utilization.

Methods: Retrospective review of all patients undergoing tetralogy of Fallot repair between September 2004 and December 2011 at a single institution was performed. Factors determining indicators of morbidity and resource utilization in the form of ventilation time (VT), intensive care unit length of stay (ICU LOS), and hospital length of stay (LOS) were analyzed using multiple logistic regression.

Results: A total of 164 patients with a median age of 75 days (interquartile range: 47-113) and median weight of 5 kg (3.9-5.8) were included in the study. There was only one operative mortality in the series. Multivariate regression analysis revealed that gestational age <36 weeks, birth weight <2500 g, non-elective surgery, and major extra-cardiac anomalies were significant independent predictors of increased VT and longer ICU and hospital LOS. Prematurity, non-elective surgery, and major extra-cardiac anomalies were found to significantly increase the overall LOS. Younger age at surgery was not associated with increased morbidity or hospital resource utilization [VT, p=0.66; ICU LOS, p=0.99; LOS, p=0.08]. (Table 1)

Conclusions: Prematurity, low birth weight, non-elective indication for surgery, and major extra-cardiac anomalies, and not younger age at repair, predict longer ventilation time, increased ICU, and hospital stay. Early primary repair of TOF can be performed at younger age with similar outcomes without increased resource utilization.

Predictors of Increased Ventilation Time, ICU LOS, and Hospital LOS in Patients After Early Primary Repair of TOF

	Univariate Wilcoxon Rank-Sum test (p-values)			Multivariate Regression Analysis (p-values)		
Variable	Ventilation Time	ICU-LOS	LOS	Ventilation Time	ICU-LOS	LOS
Age as continuous variable	0.40	0.62	0.031	0.63	0.99	0.08
Age < 75 days	0.005	0.005	0.035	0.53	0.67	0.95
Gestational Age < /=36 wks.	<0.001	<0.001	0.009	<0.001*	<0.001*	0.034*
Birth Weight < 2.5 kg	0.014	0.002	0.13	0.018*	0.033*	0.54
Elective vs. Urgent indication	<0.001	<0.001	<0.001	0.032*	<0.001*	0.008*
Major Extracardiac Anomalies	<0.001	<0.001	<0.001	<0.001*	<0.001*	<0.001*
Preoperative Systemic to Pulmonary Artery shunt	0.87	0.86	0.15	-	-	-
Transannular Patch Use	0.042	0.07	0.008	0.29	0.55	0.56

**Statistically significant multivariate predictor.*
ICU-LOS, Cumulative ICU stay in days; LOS, Cumulative hospital length of stay in days; TOF, Tetralogy of Fallot

3:00 PM ***Grand Ballroom 4-6***

Surgical Planning Using In-Silico Anatomical and Functional Characterization of Tetralogy of Fallot With Associated Anomalies

P. G. Menon[1], A. S. Rao[2], P. G. Alba[1]

[1]Sun Yat-sen University-Carnegie Mellon University Joint Institute of Engineering, Pittsburgh, PA, [2]University at Buffalo, The State University of New York

Purpose: The ideal vascular reconstruction strategy for anomalies associated with tetralogy of Fallot (ToF) is often driven by observations made at the operating table. We hypothesize that patient-specific CT-based morphometry followed by in-silico reconstruction of viable surgical options with hemodynamic function assessment using a computational fluid dynamics (CFD) can optimize surgical decisions and help forecast outcomes.

Methods: A CT morphometry-based decision template was first constituted for a model ToF patient with a patent ductus arteriosus (PDA) and atretic proximal left pulmonary artery (LPA), for which a known surgical strategy was adopted (Table 1). Three surgical methods were considered: single pericardial patch (SPP) repair for anomalous LPA and right ventricular outflow tract (RVOT) anatomy, two-patch repair, and SPP repair with a tube at the LPA. Surgical choice for a prospective patient with similar anatomy was designed in-silico as warranted by the template. CFD modeling was adopted to define both baseline pre- and in-silico post-operative PA flow splits and pressure gradients, factoring in patient-specific cardiac output and Qp/Qs.

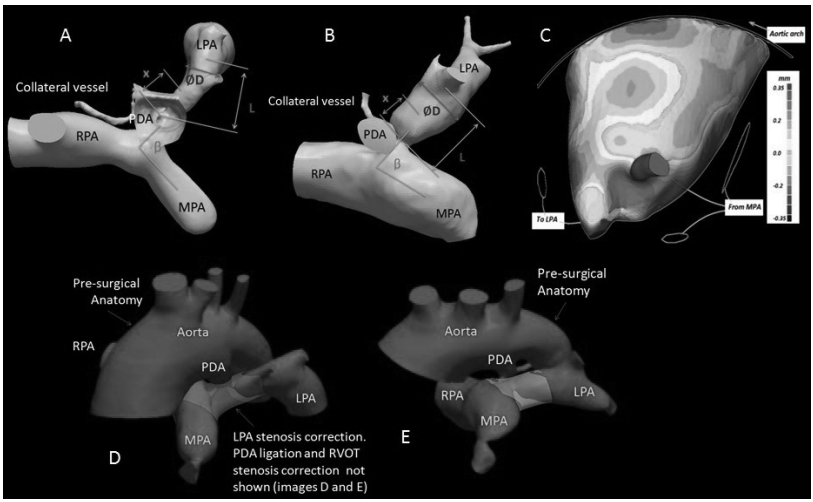
Results: The prospective patient vasculature (Fig 1B) showed close 3D similarity with the template patient (Fig 1A) when individual anatomical elements were analyzed for shape correspondence (Fig 1C). SPP repair was modeled in-silico for both patients, including PDA ligation, creation of an incision along the LPA and MPA, and finally, suturing a rectangular SPP reducing main PA (MPA) to LPA angulation (see Fig 1D, 1E). Analysis of SPP repair revealed significant reduction in MPA-LPA pressure gradient with improved PA flow distribution compared with the baseline pre-surgical anatomy.

Conclusions: In-silico surgery has potential in augmenting morphometry-guided surgical decisions, holds promise in preoperatively determining optimal intervention strategy, and can be incorporated into routine clinical workflow.

Morphometry-based Decision Template Comparing Reference Patient to Prospective Patient

Morphological Parameters	Patient 1 parameters normalized using RPA diameter *	Patient 2 parameters normalized using RPA diameter *	Mean of normalized values	Percent difference between normalized values **
Angle between LPA and MPA (β)	104.45	71.96	88.21 ± 22.97	31.10
Length of the LPA from MPA to the first branch (L)	1.667	1.369	1.52 ± 0.21	17.87
Dimension of LPA prior to branching (D)	0.811	0.892	0.85 ± 0.06	9.98
Distance of point distal to the LPA stenosis where normal LPA diameter is regained (x)	0.775	0.624	0.70 ± 0.11	19.48
Length of stenotic segment (s)	0.272	0.264	0.27 ± 0.01	2.94
Diameter of stenotic segment (d)	0.054	0.0947	0.07 ± 0.03	75.37

** Except angles. Angles are in degrees.*
*** [(|Patient 2 - Patient 1|) ÷ Patient 1]*



3:15 PM *Grand Ballroom 4-6*

Perspectives on the Current Controversies in Tetralogy

Glen S. Van Arsdell, Toronto, Canada

1:30 PM – 3:30 PM ***Grand Ballroom 1-3***

Considerations in Perioperative Management of Patients With Congestive Heart Failure

This session will focus on considerations in perioperative surgical and medical management of patients with congestive heart failure. Specifically, the topics discussed will include assist devices in patients with biventricular failure, managing pulmonary hypertension, perioperative vasoplegia, and hepatorenal syndromes. The panel will consist of cardiac surgeons, cardiac anesthesiologists, and intensivists.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe the approach to biventricular mechanical support in patients with severe congestive heart failure
- Recognize the therapeutic treatment options for perioperative pulmonary hypertension
- Discuss the mechanism, diagnosis, and treatment of perioperative vasoplegia
- Assess the risk benefit ratio for deciding which therapeutic options are most optimal in the treatment of perioperative hepatorenal syndrome

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

Moderators: *John V. Conte, Baltimore, MD, Stanton Shernan, Boston, MA, and Glenn J. R. Whitman, Baltimore, MD*

COMMERCIAL RELATIONSHIPS J. V. Conte: Other Research Support, Medtronic, Inc; S. Shernan: Other, Philips, e-echocardiography.com

1:30 PM **Approaching Mechanical Support of Biventricular Heart Failure**
Scott C. Silvestry, St Louis, MO
COMMERCIAL RELATIONSHIPS S. C. Silvestry: Other Research Support, Abiomed, Inc, Thoratec Corporation; Consultant/Advisory Board, HeartWare Inc, Thoratec Corporation

1:50 PM **Discussion**

2:00 PM **Perioperative Management of Pulmonary Hypertension**
David A. Fullerton, Aurora, CO

2:20 PM **Discussion**

2:30 PM **Vasoplegia: Diagnosis and Therapeutic Options**
Gregory W. Fischer, New York, NY
REGULATORY DISCLOSURE This presentation will address the off-label use of methylene blue in the treatment of vasoplegia.

2:50 PM **Discussion**

3:00 PM **Perioperative Hepatorenal Syndrome**
David A. Silver, Boston, MA

3:20 PM **Discussion**

Notes

1:30 PM – 3:30 PM ***Grand Ballroom 8A***

General Thoracic Session: Lung Cancer I

Moderators: *Douglas J. Minnich, Birmingham, AL, and Thomas K. Varghese Jr, Seattle, WA*

COMMERCIAL RELATIONSHIPS D. J. Minnich: Consultant/Advisory Board, Varian Medical Systems, Inc; Other, Covidien, Honoraria for physician training

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

1:30 PM ***Grand Ballroom 8A***

Comparison of Preoperative High-Dose Radiation vs Less than 60 Gy in the Trimodality Management of Stage III NSCLC

*E. Vallieres, B. E. Louie, A. S. Farivar, R. W. Aye, *S. C. Bharadwaj*

Swedish Cancer Institute, Seattle, WA

COMMERCIAL RELATIONSHIPS E. Vallieres: Speakers Bureau/Honoraria, Genentech, Inc, Synthes; Consultant/Advisory Board, GlaxoSmithKline, Myriad Genetics; B. E. Louie: Speakers Bureau/Honoraria, Intuitive Surgical, Inc, Merit Medical Endotek

Purpose: The management of potentially resectable Stage IIIA NSCLC is controversial. Options include induction chemotherapy (CS) or induction chemoradiation therapy followed by resection (CRTS). Randomized trials comparing CS to CRTS have failed to demonstrate a survival advantage for any strategy despite higher pathological complete responses (pCR) and mediastinal nodal clearance (MNC) with CRTS. Classically, CRTS has used a radiation dose of 45-54 Gy. To improve pCR and MNC, CRTS to a dose of 60 Gy (RT60) has been advocated. To date, no trial has compared the outcomes of induction therapy using different radiation doses. Therefore, we reviewed our experience in Stage IIIA (N2) NSCLC patients treated by CRTS involving two radiation strategies to determine the rates of pCR, MNC, DFS, and OS in groups treated with RT60 or less.

Methods: A review of all Stage IIIA (N2) NSCLC patients treated with CRTS from 2004 to 2011. Demographics, types of treatment and surgery, morbidity, pathological stage, DFS, and OS were compared between patients treated with RT60 vs less.

Results: Seventy-one patients with Stage IIIA NSCLC were treated with CRTS. Ten patients were excluded as surgery was for salvage: more than 8 weeks after CRT, leaving 31 patients treated at RT60, 30 with less. Radiation morbidity was higher at RT60, led by esophagitis (p=0.02). Postop morbidity was similar between the two groups; pCR and MNC rates were not significantly different (pCR= 23% vs 26% [p=0.41]; MNC 57% vs 64% [p=0.51]; RT less and RT60 respectively). DFS and OS were also similar for the two radiation strategies.

Conclusions: In this series of N2 patients treated with CRTS, a higher dose of preoperative radiation trended for better response rates. However, as seen in trials comparing CS alone to CRTS, this did not translate to better survival, suggesting that better systemic therapy and not more radical locoregional treatments are needed to improve the survival of these patients.

1:45 PM *Grand Ballroom 8A*

Pneumonectomy: The Burden of Death Following Discharge and Predictors of Surgical Mortality

*L. Schneider, F. Farrokhyar, C. Schieman, Y. Shargall, J. D'Souza, *C. Finley*

McMaster University, Hamilton, Canada

Purpose: Pneumonectomy (PN) has the highest mortality rate of resections for lung cancer, with limited literature differentiating between predictors of post-PN in-hospital mortality (IHM) and early postdischarge mortality (PDM). This study aims to examine the burden of disease over time and impact of predictive factors such as patient comorbidity, hospital volume, and practitioner volume to identify modifiable differences.

Methods: Data were abstracted from an Ontario population-based linked database from 2005 to 2011. The proportion of mortality and cumulative survival attributable to IHM and PDM at 90 days is reported. Logistic and Cox regression analyses were performed to examine the role of patient, hospital volume, and practitioner volume factors attributable to death.

Results: Of 504 patients who underwent PN, 300 (59.4%) were male and median length of stay was 6 (1-30) days. IHM was 4.4% (2.9-6.5) and PDM was an additional 6.4% (4.6-9.0) within 90 days post-PN discharge. There is increasing proportional mortality in the 60-90 day window (Fig 1). Logistic regression suggests that previous myocardial infarction [odds ratio (OR): 5.4 (1.5-20.0)], congestive heart failure (CHF) [OR: 23.5 (4.0-136.0)], cerebrovascular [OR: 12.5 (1.2-128.0)], and renal disease [OR: 8.8 (1.3-60.5)] were predictive of IHM, while age [Hazard ratio (HR): 1.4 (1.1-1.7)] per year and CHF [HR: 18.0 (4.0-79.0)] were predictive of PDM. All other factors, including year of surgery, were not significant.

Conclusions: PDM represents a distinct and largely unrecognized burden of death in the perioperative period. More than half of post-PN perioperative mortality occurs in the postdischarge setting and the rate was unchanged over the study duration. Patient factors play a major role in both IHM and PDM, while institutional and physician volume do not influence outcome, suggesting the importance of patient selection and need for continued evaluation of this significant mortality in our patients.

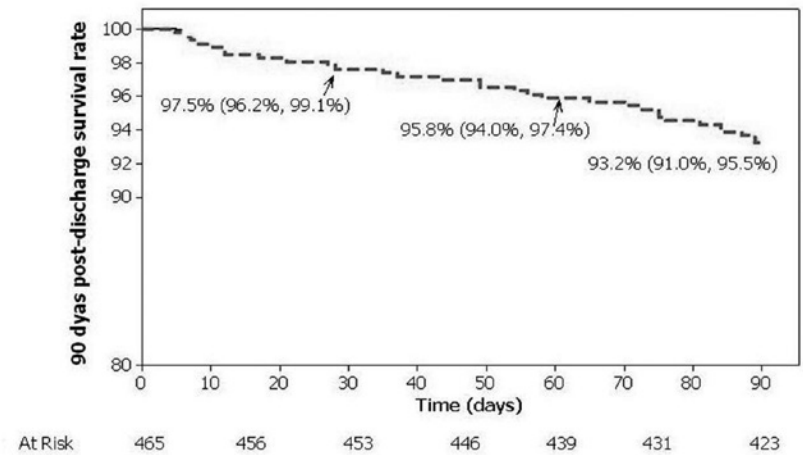


Figure 1: 90 days postdischarge survival rate for pneumonectomy patients

2:00 PM **Grand Ballroom 8A**

Surgery Among 75,000 Clinical Stage III Primary Lung Cancers in the National Cancer Database

A. L. Fonseca, A. L. Van Dyke, A. Moreno, A. W. Kim, F. C. Detterbeck, D. J. Boffa

Yale University School of Medicine, New Haven, CT

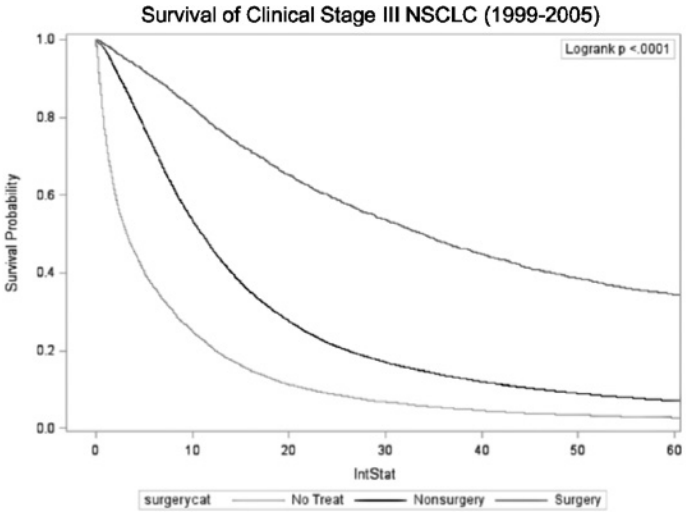
COMMERCIAL RELATIONSHIPS F. C. Detterbeck: Research Grant, Medela

Purpose: The efficacy of pulmonary resection for clinical stage III non-small cell lung cancer (NSCLC) has been challenged, casting uncertainty over the role of surgery in the setting of mediastinal lymph node metastases. We examined clinical stage III NSCLC in a large national database to characterize the use of surgery in this controversial cohort.

Methods: The National Cancer Database (NCDB) by the American Cancer Society and the Commission on Cancer captures up to 70% of newly diagnosed cancers in the United States. The NCDB was queried for patients diagnosed between 1999 and 2009 with NSCLC, clinically staged to have mediastinal lymph node metastases but not systemic metastases (T1-4, N2, M0, cStage III).

Results: 75,352 clinical stage III NSCLC patients with presumed or confirmed mediastinal lymph node metastases were identified. Only 8% of patients underwent surgery, increasing over past 7 years from 7.5% to 9.9% (p=.005). Lobectomy was the most common procedure (74%) followed by pneumonectomy (16%), wedge (8%), and segmentectomy (2%). The 30-day mortality was 3.9% (pneumonectomy = 9.0% and lobectomy = 2.9%). The 5-year survival of surgically managed clinical stage III NSCLC (28%) was higher than nonsurgical treatment (8%) or untreated patients (4%, $p < .0001$) (Figure). Interestingly, among 3,819 tumors resected WITHOUT preoperative therapy, 38% were pathologically downstaged to N0 or N1 by surgical nodal evaluation at resection.

Conclusions: The minority of clinical stage III NSCLC patients by N2 disease are treated surgically. Apparent overstaging of the mediastinum by the clinical staging evaluation is common in patients going directly to surgery. Further study is needed to clarify the true prevalence of overstaging in clinical stage III NSCLC in the United States as erroneous N2 classification may steer potentially curable patients away from surgery.


Survival of Clinical Stage III NSCLC (1999-2005)
Logrank p <.0001
Survival Probability
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
IntStat
surgerycat
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Nonsurgery
Surgery

Notes

2:15 PM ***Grand Ballroom 8A***

A National Study of Adjuvant Chemotherapy After Thoracoscopic vs Open Lobectomy

P. Licht, T. Schytte, E. Jakobsen

Odense University Hospital, Denmark

Purpose: Thoracoscopic (VATS) lobectomy is generally considered less traumatic than thoracotomy with potential advantages in postoperative outcome. Thus, it is believed that patient compliance with adjuvant chemotherapy is superior after VATS but the level of evidence for this assumption is limited to single-institution case-control studies with possible selection bias. We used a complete national lung cancer registry to investigate patient compliance with adjuvant chemotherapy following lobectomy by VATS or thoracotomy.

Methods: For better comparison of surgical approach, we only investigated patients who underwent standard lobectomy for clinical stage-I NSCLC. Patients who had unsuspected nodal upstaging at final pathology examination were analyzed for type and completeness of adjuvant chemotherapy, as well as reasons for not receiving chemotherapy or not completing full treatment. A medical oncologist, who was blinded to the surgical approach, reviewed all oncology charts.

Results: During a 6-year period (2007-2012), lobectomy for clinical stage-I NSCLC was performed in 1,970 patients by VATS (n=991/50.3%) or thoracotomy (n=979/49.7%). Nodal upstaging occurred in 343 patients (17.4%) and 331 were analyzed. Of these, 197 patients (59.5%) received adjuvant chemotherapy and 125 (37.8%) completed full treatment. We found a slight trend but no significant difference in patient compliance with chemotherapy between VATS and thoracotomy (p=0.09). Cox proportional hazard analysis showed that survival was significantly influenced by comorbidity index, final pathology, and patient compliance with chemotherapy (p<0.001), but not by sex, age, or surgical approach.

Conclusions: Complete national data could not confirm the assumption that patient compliance with adjuvant chemotherapy is superior after VATS compared with open lobectomy. Survival was significantly influenced by patient compliance with chemotherapy but not by surgical approach.

2:30 PM *Grand Ballroom 8A*

Induction Chemoradiotherapy (Cisplatin + Vinorelbine + Concurrent Radiotherapy) and Surgical Resection for Non-Small Cell Lung Cancer With Chest Wall Invasion: Initial Results of Central Japan Lung Study Group Trial 0801 (CJLSG 0801)

K. Kawaguchi[1], K. Yokoi[1], H. Niwa[2], Y. Ohde[3], S. Mori[4], S. Okumura[5], H. Saito[6]

[1]Nagoya University Graduate School of Medicine, Japan, [2]Seirei Mikatahara General Hospital, Hamamatsu, Japan, [3]Shizuoka Cancer Center, Japan, [4]Japanese Red Cross Nagoya Daiichi Hospital, Japan, [5]Japanese Foundation for Cancer Research, Cancer Institute Hospital, Tokyo, Japan, [6]Aichi Cancer Center Aichi Hospital, Okazaki, Japan

Purpose: The chest wall is the most common neighboring structure involved by locally advanced lung cancers. However, the treatment strategy for such diseases has not yet been established. This trial tested the feasibility of induction chemoradiotherapy and surgical resection for patients with T3N0-1 non-small cell lung cancer involving the chest wall with the aim of improving survival.

Methods: The clinical criteria of chest wall invasion were defined as follows: the findings of obvious tumor invasion into the soft tissue of the chest wall or ribs on computed tomography (CT), or those of contiguity of the tumor and chest wall with either chest pain or positive findings on bone scintigraphy. The enrolled patients received two cycles of cisplatin and vinorelbine chemotherapy concurrent with 40 Gy of radiation. Surgical resection was performed 3 to 6 weeks after the last day of chemotherapy.

Results: From January 2009 to December 2012, 51 patients (45 males) were entered in this study, including 40 stage IIB and 11 IIIA diseases. Induction therapy was completed as planned in 49 (96.1%) patients, and 25 (51.0%) of the diseases revealed partial response on CT. Forty-eight patients underwent pulmonary resection combined with chest wall, and 44 (91.7%) had a complete resection. There were 12 (25.0%) cases of no viable tumor cells and 31 (64.6%) of minimal residual diseases. Five patients had major postoperative complications, and one patient died of postoperative exacerbation of interstitial pneumonia 6 months after the surgery (the mortality rate was 2.1%).

Conclusions: This combined modality treatment is safe and feasible in a multi-institutional setting and could be effective for patients with T3N0-1 non-small-cell lung cancer involving the chest wall.

2:45 PM **Grand Ballroom 8A**

Synchronous Multiple Non-Small Cell Lung Cancers: Molecular Staging and Survival Outcomes

Y. Zhang[1], H. Hu[1], R. Wang[1], T. Ye[1], L. Shao[1], Y. Pan[1], L. Wang[1], Y. Li[1], L. Shen[1], Y. Yu[2], D. Garfield[3], Y. Sun[1], H. Chen[1]

[1]Fudan University Shanghai Cancer Center, China, [2]School of Public Health, Fudan University, Shanghai, China, [3]ProMed Cancer Centers, Shanghai, China

Purpose: Identification of clonal origins of synchronous, multiple lung cancers (SMLC) are important for both therapeutic and prognostic purposes. This study was aimed at developing a reliable approach to address this issue.

Methods: Resected specimens of SMLC were assessed by the current guidelines, histologic evaluation, and driver mutations of selected genes. Outcomes were verified using Kappa coefficient. Survival was estimated for patients with SMLC and compared to those with single-lesion non-small cell lung cancers (NSCLC) after covariate matching using propensity score methods.

Results: Fifty-two consecutive patients were enrolled in this study. Kappa coefficient showed weak usefulness of current guidelines compared with incorporating mutational analysis. However, histologic evaluation resulted in nearly total consistency with the mutational method (P<0.0001, Kappa=0.85, 95% CI: 0.69~1.00) and clonal origins could be determined in 98.2% of SMLCs by combining the two approaches. New criteria were proposed for the differential diagnosis for SMLC based on these methods. Stratification of SMLC patients by these criteria were significantly difference in terms of relapse-free survival (RFS) (P=0.026). Also, patients with primary SMLC had a prognosis equivalent to those with stage IA single NSCLC (P=0.494), while metastatic SMLC had RFS similar to stage II single-tumor patients (P=0.959).

Conclusions: New criteria based on histologic as well as genetic methods may be a reliable approach for clonal identification of SMLC. Depending on the diagnosis of intrapulmonary metastasis or multiple primaries, SMLC patients could be managed accordingly.

3:00 PM ***Grand Ballroom 8A***

Prospective Trial Evaluating Preoperative Assessment of Chest Wall Invasion in Non-Small Cell Lung Cancer Using Surgeon-Performed Ultrasound

M. Tahiri, M. Khereba, J. Kazakov, V. Thiffault, P. Ferraro, M. Liberman

CHUM Endoscopic Tracheobronchial and Oesophageal Center, University of Montreal, Canada

COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc

Purpose: Chest wall invasion in operable lung cancer upgrades the stage and can affect operative planning. Diagnosing chest wall invasion preoperatively is important in patient consent and choice of operative incision and can be helpful in choosing operative approach. The objectives of this study were to determine the diagnostic accuracy of preoperative, surgeon-performed ultrasound (US) in assessing tumoral chest wall invasion (T3) in non-small cell lung cancer (NSCLC) patients and to compare its accuracy to preoperative computed tomography (CT).

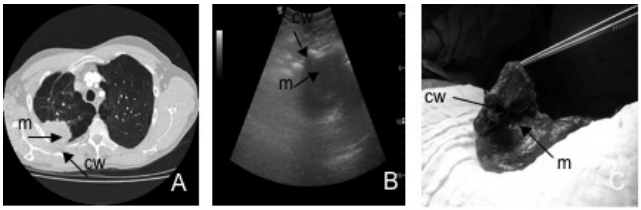
Methods: The study consisted of a prospective clinical trial (clinicaltrials.gov: NCT01206894). Eligible patients included those with NSCLC abutting the parietal pleura or invading the chest wall on preoperative CT scan who were planned for surgical resection. Criteria for chest wall invasion on US included: 1) tumor growth into the chest wall, 2) invasion of the ribs, and 3) impairment of pleural movement with respiration. Ultrasonographic chest wall examination was performed by the thoracic surgical team immediately prior to the surgical intervention. Sensitivity and specificity for CT scan and US in assessing chest wall invasion were calculated using definitive chest wall invasion on final pathologic analysis as the gold standard.

Results: Over a 24-month period, 28 patients were prospectively enrolled. Mean BMI was 25.3 ± 4.5 kg/m2. The average time for surgeon-performed US assessment for chest wall invasion was 5.3 ± 5 min. The sensitivity of US in evaluating chest wall invasion was 88.9% and the specificity was 87.8%. CT scan was associated with a sensitivity of 66.7% and a specificity of 78.6%. The positive and negative predictive values of surgeon-performed US for tumoral chest wall invasion were 80.0% and 94.3%, respectively, compared to 66.7% and 78.6% for CT scan.

Conclusions: Surgeon-performed preoperative chest wall US can reliably diagnose tumoral chest wall invasion in patients with NSCLC.

Continues on next page.

General Thoracic Session: Lung Cancer I – Continued



A. CT scan showing a right upper lobe pulmonary lesion abutting the parietal pleura without CT scan criteria for invasion of the chest wall B. Surgeon-performed US image demonstrating invasion of the chest wall in the same patient C. Surgical pathological gross specimen demonstrating clear T3 chest wall invasion in the same patient. cw: chest wall, m: mass

3:15 PM ***Grand Ballroom 8A***

Starting a Lung Cancer Screening Program

Nasser K. Altorki, New York, NY

Notes

Notes

1:30 PM – 3:30 PM ***Grand Ballroom 7B***

General Thoracic Session: Lung Transplantation

Moderators: *Pasquale Ferraro, Montreal, Canada, and Sudish C. Murthy, Cleveland, OH*

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Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

1:30 PM ***Grand Ballroom 7B***

Contemporary Outcomes of Intraoperative Venoarterial Extracorporeal Membrane Oxygenation vs Cardiopulmonary Bypass in Lung Transplantation

C. Bermudez[1], A. Shiose[1], J. D'cunha[1], N. Shigemura[1], J. K. Bhama[1], T. Richards[1], M. M. Crespo[2], J. M. Pilewski[2]

[1]University of Pittsburgh Medical Center, PA, [2]University of Pittsburgh, PA

Purpose: The intraoperative use of cardiopulmonary bypass (CPB) in lung transplantation (LT) has been associated with increased rates of pulmonary dysfunction and bleeding complications. More recently, extracorporeal membrane oxygenation (ECMO) has emerged as a viable mode of support. We sought to compare early and mid-term outcomes between these two support methods.

Methods: Between July 2007 and April 2013, 271 consecutive patients underwent LT using CPB (n=222) or ECMO (n=49) exclusively. Since March 2012, ECMO became our preferred method of support with only two patients using a combination of support who were excluded from this study. We retrospectively reviewed the outcomes of patients requiring CPB or ECMO during LT.

Results: The CPB and ECMO groups had similar demographic characteristics and type of operation. The ECMO group had higher LAS (73 vs 52, p<0.000001). In the CPB group, more patients required reintubation (35.6% vs 20.4%, p=0.04), temporary tracheostomy (44.6% vs 28.6%, p=0.05), with a trend toward longer total mechanical ventilation time (384 hours vs 250 hours, p=0.06). Patients in the CPB group had higher rate of renal failure requiring dialysis than the ECMO group (22.1% vs 8.2%, p=0.028) and a trend toward longer ICU stay (21.9 days vs 15.1 days, p=0.06). There was no difference in severe PGD requiring postoperative circulatory support between the groups (p=1.00). Red blood cell transfusions during the admission did not differ among groups (p=0.64). There was a trend in lower platelet concentrate transfusion in the ECMO group (4U vs 8U, p=0.08). There was no difference in 30-day and 6-month mortality, 5% and 14.4% vs 4.1% and 14.3% in the CPB and ECMO groups respectively (p=1.00).

Conclusions: The use of ECMO in LT is safe and is associated, in our experience, with decreased rate of pulmonary and renal complications. These data support a contemporary paradigm shift towards ECMO as method of intraoperative support. It is our current standard for LT.

1:45 PM ***Grand Ballroom 7B***

Examining ABO Compatible Donors in Double Lung Transplantation During the Era of Lung Allocation Score

S. Taghavi, S. N. Jayarajan, E. Komaroff, A. Shiose, E. Leotta, K. Hisamoto, N. Patel, F. Cordova, G. Criner, T. Guy, Y. Toyoda

Temple University School of Medicine, Philadelphia, PA

COMMERCIAL RELATIONSHIPS T. Guy: Consultant/Advisory Board, Edwards Lifesciences Corporation

Purpose: ABO compatible donors (ACD) in double lung transplantation (DLT) are thought to result in worse outcomes. However, the use of ACD in the era of lung allocation score (LAS) has yet to be examined in a multi-institutional registry. The aim of this study was to determine if carefully selected ACD could be performed with equivalent outcomes.

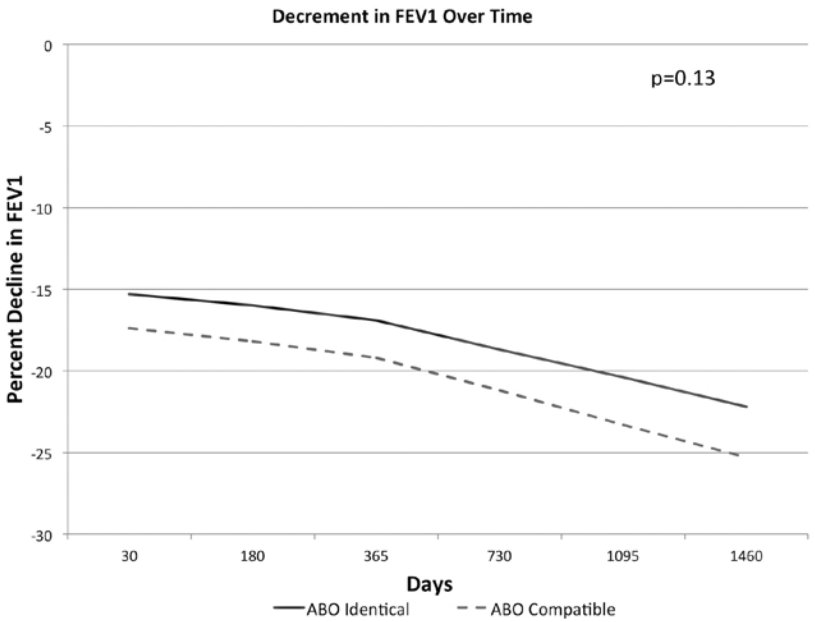
Methods: The United Network for Organ Sharing (UNOS) database was retrospectively reviewed for adult DLT from May 2005 to December 2011. Recipients of ACD were compared to those of ABO identical donors. Risk-adjusted multivariable Cox proportional hazards regression using significant univariate predictors examined short- and long-term mortality. A linear mixed-effects model compared decline in posttransplant FEV1 over time. Freedom from bronchiolitis obliterans syndrome (BOS) was examined by Kaplan-Meier analysis.

Results: Of 6,655 DLT, 493 (7.4%) were with ACD. In multivariate analysis, use of ACD was not associated with mortality at 30 days (HR: 1.16, 95% CI: 0.76-1.79, p=0.49), 1 year (HR: 1.10, 95% CI: 0.86-1.42, p=0.46), and 5 years (HR: 1.06, 95% CI: 0.83-1.34, p=0.65). Variables associated with mortality at 5 years were donor female gender, donor age ≥60, prolonged ischemic time, increasing recipient creatinine, recipient age, race mismatch, and mechanical ventilation or ECMO as a bridge to transplantation (table). Mean length of stay was longer in the ACD group (30.9 vs 25.9 days, p=0.001). Acute rejection episodes on index hospitalization (8.8% vs 8.9%, p=1.00), peak posttransplant FEV1 (82.7% vs 79.7%, p=0.053), and decrement in FEV1 over time were not different (figure). Freedom from BOS was similar (1,475 vs 1,454 days, p=0.17).

Conclusions: In the largest study to evaluate ACD in DLT during the LAS era, use of ACD was not associated with short- or long-term mortality and resulted in equivalent posttransplant lung function. DLT with carefully selected ACD can result in excellent outcomes.

Cox Proportional Hazards Regression Analysis at 5 Years

	Hazard Ratio	95% Confidence Interval	p-Value
ABO Compatible Donor	1.06	0.83-1.34	0.65
Donor Female Gender	1.19	1.03-1.39	0.02
Donor Age 19-39	Reference	Reference	Reference
Donor Age ≤18	0.94	0.77-1.16	0.56
Donor Age 40-49	0.94	0.77-1.13	0.49
Donor Age 50-59	1.14	0.94-1.38	0.18
Donor Age ≥60	1.59	1.16-2.17	0.004
Ischemic Time ≤6 hours	Reference	Reference	Reference
Ischemic Time 6-8 hours	1.04	0.89-1.20	0.65
Ischemic Time 8-10 hours	1.46	1.14-1.88	0.003
Ischemic Time >10 hours	1.77	1.14-2.74	0.01
Recipient Female Gender	0.89	0.77-1.03	0.12
White	Reference	Reference	Reference
Asian	0.81	0.43-1.53	0.52
Black	0.94	0.74-1.19	0.60
Hispanic	1.06	0.80-1.41	0.67
Recipient Creatinine (per mg/dL)	1.11	1.03-1.19	0.01
HLA Total Mismatch ≥4	0.95	0.81-1.11	0.95
Recipient Age (per year)	1.01	1.00-1.01	0.01
Race Mismatch	1.33	1.15-1.53	<0.001
Sex Mismatch	0.96	0.83-1.11	0.55
Re-transplantation	1.10	0.94-1.30	0.23
Class I PRA >10%	1.14	0.97-1.34	0.11
Ventilator Prior to Transplantation	1.77	1.44-2.17	<0.001
ECMO Prior Transplant	2.33	1.61-3.36	<0.001



2:00 PM ***Grand Ballroom 7B***

Differential Survival for Early and Late Lung Re-Transplantation Since Implementation of the Lung Allocation Score

A. A. Osho[1], A. W. Castleberry[2], L. D. Snyder[2], S. Hirji[1], S. Palmer[2], S. S. Lin[2], R. D. Davis[2], M. G. Hartwig[2]

[1]Duke University School of Medicine, Durham, NC, [2]Duke Medical Center, Durham, NC

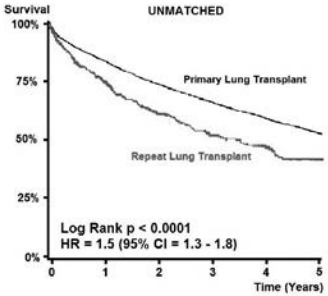
Purpose: An early study in lung transplantation suggested equivalent survival in risk-matched populations receiving primary lung transplant (LTx) vs repeat lung transplant (ReTx). However, this was examined prior to implementation of the Lung Allocation Score (LAS) and without distinguishing between the indications for ReTx. The purpose of this study is to compare survival of perioperative and late ReTx with that of primary LTx.

Methods: We extracted data from 9,646 primary and 419 ReTx cases performed since implementation of the LAS from the United Network for Organ Sharing (UNOS) registry. Propensity scoring was used to match transplant recipients based on the risk of repeat lung transplantation. Kaplan-Meier analyses and Cox Proportional Hazard Ratios were used to compare survival between unmatched and matched LTx and ReTx groups. Separate analyses were performed for patients receiving early (<90 days) and late ReTx (>90 days).

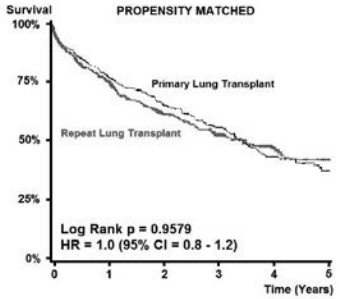
Results: Median age in the LTx group was 58 years (IQR 47, 63) compared with 62 (IQR 53, 65) in the early ReTx group and 47 (IQR 30, 59) in the late ReTx group. Median LAS was 38.9 (IQR 34.3, 47.9), 88.3 (IQR 70.5, 90.4), and 45.8 (IQR 39.2, 59.8) in the LTx, early ReTx, and late ReTx groups respectively. Bilateral transplantation was performed in 66.5% of cases. Comparing all ReTx to LTx demonstrates a survival advantage for LTx that is eliminated with propensity score matching ($p = 0.540$). Considering just late ReTx vs LTx, there are similar survival results ($p = 0.958$) [Figure 1a]. In contrast, early ReTx compared to LTx was associated with a survival disadvantage that persisted despite matching ($p = 0.012$) [Figure 1b].

Conclusions: Repeat transplantation in the LAS era confers equivalent survival when done > 90 days after primary transplant. However, survival in those re-transplanted < 90 days after primary transplant is severely diminished. The utility of early repeat transplant needs to be further examined.

Figure 1a: Survival Analysis Comparing LATE RETRANSPLANT With Primary Lung Transplant

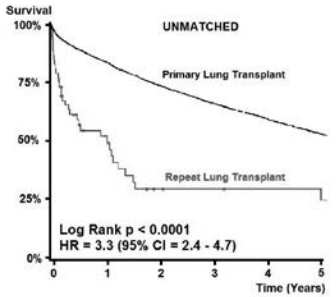


Number at Risk						
Repeat	419	250	158	104	60	32
Primary	9646	6174	4157	2722	1658	818

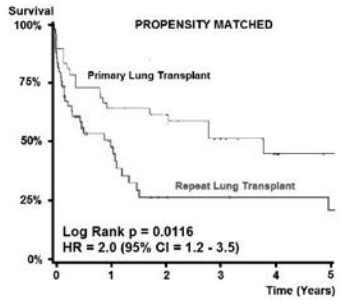


Number at Risk						
Repeat	394	237	151	98	56	30
Primary	394	249	170	108	61	25

Figure 1b: Survival Analysis Comparing EARLY RETRANSPLANT With Primary Lung Transplant



Number at Risk						
Repeat	52	18	7	6	5	4
Primary	9646	6174	4157	2722	1658	818



Number at Risk						
Repeat	50	17	6	5	4	3
Primary	50	27	23	11	4	2

2:15 PM ***Grand Ballroom 7B***

Risk Factors for Lung Re-Transplantation in the United States: Evaluation of a Nationwide Registry Over a Quarter Century

J. A. Hayanga[1], J. Yang[2], J. Aboagye[2], C. A. Berko[2], C. Qiao[3], H. E. Kaiser[2], N. Shigemura[1], J. D'cunha[1]

[1]University of Pittsburgh, PA, [2]The Johns Hopkins Medical Institutions, Baltimore, MD, [3]University of Michigan Medical Center, Ann Arbor

Purpose: Lung transplantation remains the most durable solution for the treatment of end-stage lung disease. The relative paucity of donors heightens the debate and scrutiny surrounding re-transplantation. To date, risk factors for re-transplantation are not well characterized in the literature. We sought to identify those risk factors that may independently serve to predict lung re-transplantation.

Methods: We performed a retrospective evaluation of United Network for Organ Sharing (UNOS) data over 25 years from 1987 to 2012. A total of 24,194 patients who had undergone lung transplantation were identified. A backward stepwise logistic regression was performed on recipient, donor, and transplant related variables to select independent risk factors associated with lung re-transplantation.

Results: Over the 25 years studied, there were 24,194 patients who had undergone lung transplantation, 941 (3.9%) subsequently underwent lung re-transplantation. Factors associated with increased risk of lung re-transplantation included recipient age > 40 years (OR 2.26, p=0.0001), increased Lung Allocation Score (LAS) (OR 0.98, p=0.001), increased percentage decline in Forced Ventilatory Capacity (%FVC) (OR 0.99, p=0.02), and re-admission to the intensive care unit (ICU) (OR 2.27, p=0.02). In addition, increased graft ischemic time (0.91, p=0.02), donor smoking history (OR 1.47, p=0.04), and donor Body Mass Index (BMI) <18.5 (OR 1.68, p=0.04) were each found to be independently associated with lung re-transplantation. The most common indications were primary graft failure and chronic rejection.

Conclusions: We have identified risk factors that are associated with lung re-transplantation. These factors may afford a better prediction of graft failure and the need for re-transplantation. Further, they potentially serve as a better guide for immunosuppression protocols and donor selection in the allocation of a scarce resource for lung transplant centers.

Lung Re-Transplantation Risk Factor Analysis

Risk factors	Adjusted OR (95% CI)	p-value
Recipient related factors	2.33 (1.54-3.53	<0.0001
White	1	-
Black	0.58(0.32-1.03)	0.06
Obstructive lung disease	0.65(0.40-1.06)	0.09
Restrictive lung disease	1.35(0.90-2.05)	0.15
Percentage FVC decline	0.99(0.98-1.00)	0.02
Ventilator support	0.63 (0.33-1.21)	0.17
BMI >30 kg/m2	0.70 (0.46-1.07)	0.1
Admission to ICU	2.27(1.39-3.72)	0.001
Lung allocation score	0.98(0.97-0.99)	0.002
Donor related factors		
Smoking (yes)	1.47(1.02-2.11)	0.04
White	1	-
Black	1.24 (0.92-1.70	0.16
Diabetes	1.51 (0.96-2.37)	0.07
BMI <18.5	1.68 (1.02-2.74)	0.04
Transplant related factors		
Graft ischemic time	0.91 (0.84-0.99)	0.02

Table 1

Notes

2:30 PM **Grand Ballroom 7B**

The Efficacy of Inhaled Nanoparticle Tacrolimus in Preventing Rejection in an Orthotopic Rat Lung Transplant Model

N. A. Das[1], J. D. Simmons[1], A. M. Cline[1], Y. Wang[2], K. P. O'Donnell[2], D. T. DeArmond[1], C. Baisden[1], E. G. Brooks[1], J. H. Calhoon[1], R. O. Williams[2], J. I. Peters[1], S. B. Johnson[1]

[1]The University of Texas Health Science Center at San Antonio, [2]The University of Texas in Austin

COMMERCIAL RELATIONSHIPS E. G. Brooks: Speakers Bureau/Honoraria, Merck & Co, Inc; Consultant/Advisory Board, United Allergy Services; Other Research Support, United Allergy Services; R. O. Williams: Ownership Interest, Enavail

REGULATORY DISCLOSURE This presentation will address the inhalable nanoparticle tacrolimus, which is not FDA approved.

Purpose: Lung transplantation allows for delivery of immunosuppression via inhalation, thereby potentially reducing side effects in remote organs. It is hypothesized that the efficacy of an inhaled form of nanoparticle tacrolimus (nTAC) in preventing rejection in a rodent allogeneic lung transplant model when compared to intramuscularly administered tacrolimus (ie, TAC) will be similar, yet result in lower systemic levels of the drug.

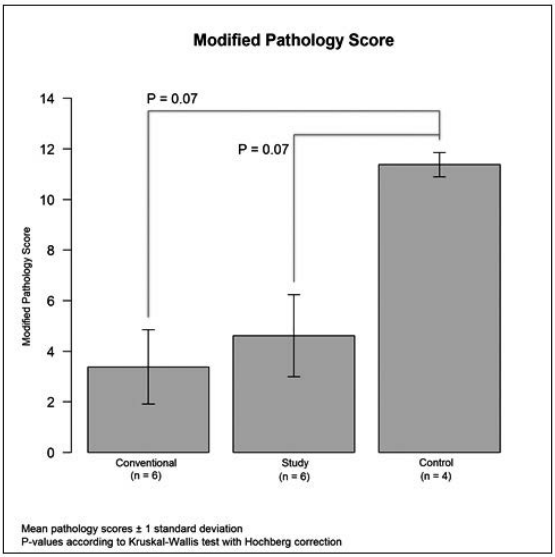
Methods: Sixteen rats underwent allogeneic left orthotopic lung transplantation and were divided into three treatment groups: 1) inhaled nTAC (6.4 mg nTAC / 6.4 mg lactose BID [ie, study group]); 2) intramuscular TAC (1 mg/kg TAC QD [ie, conventional group]); and 3) inhaled lactose only (6.4 mg of lactose BID [ie, control group]). Five days after transplant, the rats were necropsied and underwent histological rejection grading as well as cytokine analysis. Trough levels of tacrolimus were measured in allograft, blood, and kidney.

Results: Both conventional and study group rats displayed lower histologic grades of rejection (mean scores 3.4 ± 0.6 and 4.6 ± 0.9, respectively) when compared to control (mean score 14.4 ± 0.5, $p = 0.07$). However, systemic levels (median) were lower in study vs conventional group (29.2 ng/gm vs 118.6 ng/gm; $p < 0.001$ in kidney, and 1.5 ng/mL vs 4.8 ng/mL; $p = 0.01$ in blood).

Conclusions: Inhaled nanoparticle tacrolimus provided similar efficacy in preventing acute rejection when compared to intramuscularly administered tacrolimus but resulted in lower systemic levels of the drug.

Tacrolimus Drug Levels in pg/mL - Mean (SD)

	Lung Allograft	Blood	Left Kidney	Right Kidney
Conventional (n=6)	5589 (11535.1)	5.4 (3.4)	152.4 (63.5)	121.8 (57.7)
Study (n=6)	245.9 (214.5)	1.4 (0.3)	43.4 (42.8)	29.3 (4.5)
p-value	0.28	0.02	0.01	0.003



Bar graph illustrating total pathology score in the treatment (Conventional or Study) and control group.

2:45 PM **Grand Ballroom 7B**

The Effect of Prior Pneumonectomy or Lobectomy on Subsequent Lung Transplantation

A. M. Ganapathi, A. W. Castleberry, P. Speicher, B. R. Englum, A. A. Osho, S. S. Lin, R. D. Davis, M. G. Hartwig

Duke University, Durham, NC

Purpose: Lung transplantation (LTx) outcomes in patients with prior lobectomy or pneumonectomy are not well defined, due to its rare incidence. Using the United Network for Organ Sharing (UNOS) database, we aimed to determine the impact of prior major lung resection (RESXN) on LTx outcomes.

Methods: Retrospective review of adult LTxs from October 1999 to December 2011 in the UNOS database identified 15,734 LTxs. 104 patients had RESXN, defined as prior pneumonectomy (PN; n=23) or lobectomy (LB; n=81). Propensity match with nonparametric 3:1 nearest-neighbor matching algorithm was used to adjust for patient differences due to non-random treatment selection. After matching, primary (90-day mortality) and secondary outcomes (airway dehiscence, need for dialysis, length of stay > 25 days) were assessed with chi-square test. Subanalysis of PN and LB individually compared to matched non-RESXN patients was also done. Kaplan-Meier approach and Cox proportional hazard models assessed long-term survival.

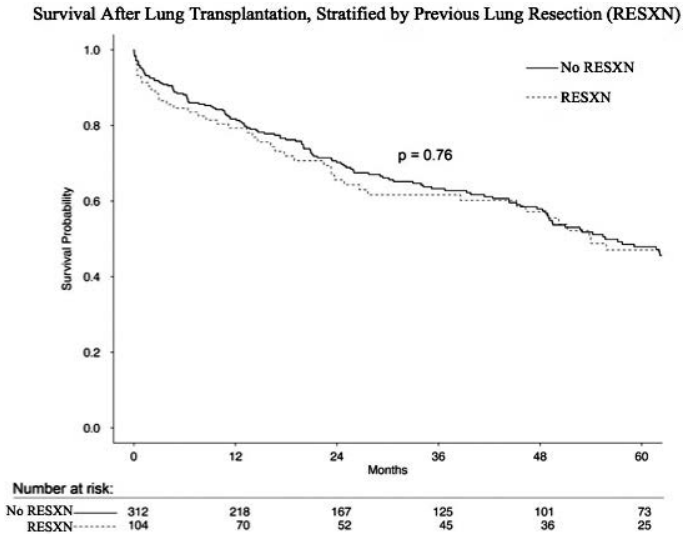
Results: After propensity matching, no significant differences were noted between groups for recipient, donor, or operative characteristics. There were 11 double and 12 single LTx after PN and 52 double and 29 single LTx after LB. Ninety-day mortality was significantly different before matching (13.5% and 8.1% for RESXN and non-RESXN cohorts, respectively; p=0.048). However, comparison after matching of RESXN to non-RESXN groups, as well as sub-analysis of LB to matched non-RESXN, revealed no significant differences in any of the examined outcomes. Subanalysis of PN compared to matched non-RESXN patients revealed a significant increase in need for dialysis (p=0.01; Table). No long-term survival difference was noted (p=0.76; Figure 1).

Conclusions: When propensity matched, RESXN was not significantly associated with decreased early or overall survival. While LTx after RESXN appears to have an acceptable risk profile, careful patient selection is necessary.

Outcomes of RESXN (and Subgroups) and Non-RESXN Patients After 3:1 Propensity Match

Specific Outcome/Complication	No RESXN (n=312)	RESXN (n=104)	p-value
Mortality (90 day)	26 (8.3%)	14 (13.5%)	0.18
Length of stay >25 days	99 (32.4%)	36 (35.6%)	0.63
Airway dehiscence	5 (1.6%)	2 (1.9%)	0.69
Dialysis	26 (8.4%)	14 (13.6%)	0.18
Specific Outcome/Complication	No Pneumonectomy (n=69)	Prior Pneumonectomy (n=23)	p-value
Mortality (90 day)	5 (7.2%)	3 (13.0%)	0.67
Length of stay >25 days	20 (29.0%)	11 (47.8%)	0.16
Airway dehiscence	0 (0%)	1 (4.3%)	0.26
Dialysis	4 (5.9%)	7 (30.4%)	0.01
Specific Outcome/Complication	No Lobectomy (n=243)	Prior Lobectomy (n=81)	p-value
Mortality (90 day)	22 (9.1%)	11 (13.6%)	0.34
Length of stay >25 days	52 (21.8%)	25 (32.1%)	0.10
Airway dehiscence	2 (0.8%)	1 (1.3%)	0.58
Dialysis	18 (7.6%)	7 (8.8%)	0.94

(Values expressed as number and percentage in parentheses)



3:00 PM ***Grand Ballroom 7B***

Expanding the Donor Pool: The Role for Deceased Donors

Michael S. Mulligan, Seattle, WA

3:15 PM ***Grand Ballroom 7B***

Regional Centers for Organ Procurement

G. Alexander Patterson, St Louis, MO

4:15 PM – 5:15 PM *Crystal Ballroom G-Q*

Surgical Motion Picture Matinee: Adult Cardiac

Moderators: *Gorav Ailawadi, Charlottesville, VA, and Alan M. Speir, Falls Church, VA*

COMMERCIAL RELATIONSHIPS G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca; A. M. Speir: Consultant/Advisory Board, Medtronic, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of films followed by discussion and questions from the audience.

4:15 PM *Crystal Ballroom G-Q*

Endoscopic Total Tricuspid Valve Reconstruction With Bioresorbable Extracellular Matrix for Endocarditis: The Cylinder Technique

T. Guy, A. Kashem, A. Shiose, T. Kelley, J. McCarthy, R. J. Kang, S. Pai, Y. Shao, L. R. Kaiser, Y. Toyoda

Temple University School of Medicine, Philadelphia, PA

COMMERCIAL RELATIONSHIPS T. Guy: Consultant/Advisory Board, Edwards Lifesciences Corporation

Purpose: There is no good surgical option for patients with endocarditis of the tricuspid valve (TV) when traditional repair is not feasible. Resection alone can lead to right heart failure. Replacement is associated with a high incidence of recurrent endocarditis and complications of anticoagulation. Complete reconstruction of the tricuspid valve with CorMatrix, a bioresorbable acellular xenograft, offers the possibility of a long-term solution and can be done endoscopically with robotic techniques.

Methods: The illustrative patient presented in this case is a 43-year-old female active intravenous drug user with severe tricuspid valve endocarditis due to staphylococcal infection not responding to medical therapy. There was also a secundum ASD with risk of embolism. A totally endoscopic robotic resection of infected tissue was performed (15 mm working port), leaving almost no native tricuspid valve leaflet and making traditional repair infeasible. A cylinder of CorMatrix extracellular matrix was fashioned and secured to the papillary muscles and the annulus. No annuloplasty band was used.

Results: The operation was smooth and uneventful. Static testing of the reconstructed neovalve demonstrated a competent trileaflet neovalve. Cross-clamp time and bypass times were short. Completion intraoperative transesophageal echocardiogram demonstrated near normal function of the valve, as did a follow-up echocardiogram a month later.

Conclusions: A cylinder reconstruction of the tricuspid valve may provide a good solution for patients with endocarditis in whom traditional repair is not feasible. This technique is simple, reproducible, and avoids the pitfalls of traditional replacement. The video demonstrates the technical details in performing the procedure.

4:25 PM ***Crystal Ballroom G-Q***

Valve-Sparing Aortic Root Replacement in the Presence of Coronary Anomalies

D. Mazzitelli[1], C. Noebauer[1], J. Rankin[2], A. Wagner[1], C. Schreiber[1], R. Lange[1]

[1]Deutsches Herzzentrum München, Germany, [2]Vanderbilt University, Nashville, TN

COMMERCIAL RELATIONSHIPS D. Mazzitelli: Consultant/Advisory Board, BioStable Science & Engineering, Inc; J. Rankin: Consultant/Advisory Board, BioStable Science & Engineering, Inc; Ownership Interest, BioStable Science & Engineering, Inc; R. Lange: Consultant/Advisory Board, Medtronic, Inc, Boston Scientific

REGULATORY DISCLOSURE This presentation will address the HAART 300 Aortic Annuloplasty Ring, which has an FDA status of investigational.

Purpose: Valve-sparing management of aortic root aneurysm with root remodeling or reimplantation can be difficult in the presence of coronary anomalies. In this video, a third surgical option—functional "restoration" of the aortic root complex—is used to repair an aortic root aneurysm in a patient with right coronary artery arising from the left coronary sinus.

Methods: Aortic root "restoration" employs a geometric annuloplasty ring to restore elliptical annular shape and size in patients with root aneurysms and trileaflet aortic insufficiency (AI). The ring mounts the 3 valve commissures on 10° outwardly flaring posts and facilitates required leaflet procedures. The ascending aorta and root are then replaced with a Valsalva graft that is 5-7 mm larger than the aortic annuloplasty ring. Advantages include no need for deep root dissection, performing valve repair first, restoration of physiologic elliptical valve geometry, and the simplicity and flexibility to manage anomalous anatomies.

Results: In the patient shown, a 6 cm aortic root aneurysm was associated with an anomalous right coronary artery, arising from the left coronary sinus close to the top of the left-right commissure. AI grade was 4 preoperatively with right coronary leaflet prolapse. After ring annuloplasty, central plication was used to correct leaflet prolapse and the root was replaced, leaving the right coronary ostium attached to the commissure. AI grade fell to 0-1 postoperatively, while postrepair mean systolic gradient was 4 mmHg. The patient experienced an uncomplicated postoperative course.

Conclusions: Aortic root "restoration" using a geometric annuloplasty ring provides a simple method of aortic valve repair and root replacement in the presence of coronary anomalies. Even with severe leaflet disease, valve sparing can be achieved with physiologic restoration of valve competence. This technique could useful for complex forms of combined aortic valve and root disease.

4:35 PM ***Crystal Ballroom G-Q***

Aortic Valve-Sparing David Operation and Total Aortic Arch Replacement With Frozen Elephant Trunk (FET) in Acute DeBakey Type I Aortic Dissection

M. Shrestha, A. Martens, F. Fleissner, A. Junge, N. Koigeldiyev, E. Beckmann, A. Haverich

Hannover Medical School, Germany

COMMERCIAL RELATIONSHIPS M. Shrestha: Consultant/Advisory Board, Vascutek Ltd

REGULATORY DISCLOSURE This presentation will address the Vascutek Thoraflex Hybrid device, which is not FDA approved.

Purpose: Acute type A aortic dissection (AADA) is a surgical emergency. In patients with aortic root involvement, the Bentall procedure is the gold standard. Valve-sparing operations are alternatives. In patients with dissection of the aortic arch and the descending aorta (DeBakey type I), a total aortic arch replacement with frozen elephant trunk (FET) supposedly has better long-term results. We present a surgical video showing a combined David procedure and total aortic arch replacement with frozen elephant trunk.

Methods: A 62-year-old patient presented with a clinical signs of acute myocardial infarction. However, a coronary angiogram showed an aortic dissection. A CT scan confirmed a diagnosis of acute aortic dissection (DeBakey type I). Intraoperative findings showed complete circular dissection of the aortic root as well as dissection of the aortic arch and the descending aorta. An aortic valve-sparing David procedure, as well as total aortic arch replacement with frozen elephant trunk, was performed.

Results: Cardiopulmonary bypass (CPB), X-clamp, and cardiac arrest times were 338 minutes, 183 minutes, and 56 minutes, respectively. The postoperative echocardiography showed aortic valve insufficiency grade 0. The ventilation time, intensive unit, and hospital stay were 1, 2, and 13 days, respectively.

Conclusions: Combined total aortic arch replacement with an FET and David procedure in an AADA patient does demand high technical skills. As AADA is an absolute emergency with high-risk surgery, whether to perform a valve-sparing operation and or total aortic arch operation should be weighed carefully. Modern grafts with have helped to further simplify the FET implantation. Such a strategy should only be implemented in experienced centers and only if it is absolutely necessary (with intima tear or re-entry in the aortic arch or the descending aorta) in selected young patients.

4:45 PM *Crystal Ballroom G-Q*

Minimally Invasive Papillary Muscle Sling Placement During Mitral Valve Repair in Patients With Functional Mitral Regurgitation

J. Lamelas, O. Santana

Mount Sinai Medical Center, Miami Beach, FL

COMMERCIAL RELATIONSHIPS J. Lamelas: Speakers Bureau/Honoraria, I-Flow, LLC, Medtronic, Inc; Ownership Interest, Miami Instruments

Purpose: We evaluated the safety and feasibility of minimally invasive mitral valve repair with papillary muscle sling placement via a right anterior thoracotomy approach in patients with severe functional mitral regurgitation.

Methods: We retrospectively reviewed all minimally invasive mitral valve repairs with papillary muscle sling placement in patients with severe functional mitral regurgitation performed at our institution between October 2011 and September 2012. The operative times, lengths of stay, postoperative complications, and mortality were analyzed.

Results: We identified a total of 19 consecutive patients with severe functional mitral regurgitation who underwent minimally invasive mitral valve repair with papillary muscle sling placement. There were 12 males (63%), with a mean age of 60 ± 13 years. The mean left ventricular ejection fraction was 23 ± 5.5%, and four (21%) patients had previous coronary artery bypass grafting surgery. The median aortic cross clamp and cardiopulmonary bypass times were 106 (IQR 76-120) and 163 minutes (IQR 119-170), respectively. The median intensive care unit length of stay was 64 hours (IQR 43-75) and the median postoperative length of stay was 7 days (IQR 5-7.5). Postoperatively, two patients developed acute kidney injury. There were no reoperations for bleeding, nor any cerebrovascular accidents. The 30-day mortality was 0. Follow-up echocardiogram, performed at a median of 3 months (IQR 1-7.5), demonstrated none to trivial mitral regurgitation in all patients.

Conclusions: Minimally invasive mitral repair with papillary muscle sling placement for severe functional mitral regurgitation is safe and effective in the short term. Long-term data are needed.

Surgical Motion Picture Matinee: Adult Cardiac – Continued

4:55 PM **Crystal Ballroom G-Q**

Key Features of Synergy® Micro-Pump Implantation Technique in Patients With Severe Heart Failure

A. F. Popov[2], C. Bireta[2], A. Sabashnikov[1], M. Grossmann[1], A. R. Simon[1], F. A. Schöndube[1]

[1]Royal Brompton & Harefield Hospital, London, United Kingdom, [2]University of Goettingen, Germany

COMMERCIAL RELATIONSHIPS A. R. Simon: Consultant/Advisory Board, CircuLite, Inc, Heartware, Inc, Transmedics, Inc, Thoratec Corporation

REGULATORY DISCLOSURE This presentation will address the off-label use of the CircuLite Synergy® Micro-pump.

Purpose: Synergy® Micro-pump is the smallest surgically implantable, long-term left ventricular assist device (LVAD) available at present, which provides a partial hemodynamic support up to 4.25 L/min. In our video, we present the surgical implantation technique of the Synergy® device in a patient with severe dilated cardiomyopathy (DCM).

Methods: A 49-year-old female with familial DCM diagnosed at the age of 23 presented with severely impaired left ventricular (LV) dysfunction (EF 19%, LVEDD 77 mm). Due to progressive hemodynamic deterioration with increasing dyspnea, leg edema, and repetitive cardiac decompensation, the decision was made to implant an LVAD for bridging to transplantation.

Results: Synergy® Micro-pump was implanted via right-sided minithoracotomy with an inflow cannula inserted into the left atrium and an outflow graft connected to the right subclavian artery using a running 5-0 polypropylene suture without cardiopulmonary bypass (CPB). The Micro-pump was placed in a small subcutaneous pocket in the left subclavian region and connected to the inflow cannula and outflow graft. Postoperative course was uncomplicated and a subsequent transthoracic echocardiography revealed significant improvement of LV function (EF 28%). After a short hospital stay of 9 days, heart failure symptoms improved and the patient was discharged home in good clinical condition.

Conclusions: The use of Synergy® Micro-pump in selected patients with end-stage heart failure is feasible and is associated with significantly improved hemodynamics and heart failure symptoms. Its minimally invasive implantation represents a substantial benefit compared to conventional LVADs, particularly in patients bridged to transplantation. The procedure is of short duration, simple, and safe, thus meeting the needs of relief from symptoms for those patients with severely deteriorated cardiac function without alternative therapeutic options.

5:05 PM *Crystal Ballroom G-Q*

A Technique for Comprehensive Epicardial Posterior Left Atrial Wall Ablation for Advanced Atrial Fibrillation

M. C. Robinson, M. Chiravuri, D. Antignani, G. D. Cook

Bridgeport Hospital, CT

COMMERCIAL RELATIONSHIPS M. C. Robinson: Consultant/Advisory Board, nContact Inc; M. Chiravuri: Consultant/Advisory Board, nContact Inc

REGULATORY DISCLOSURE This presentation will address the nContact Numeris Coagulation System, which is not FDA approved.

Purpose: In advanced categories of atrial fibrillation (AF), the substrate of the posterior left atrium is recognized as a concentrated source of mechanisms. Targeting this substrate area by interventions that are effective, safe, and well tolerated has many challenges. We describe an endoscopic abdominal approach, using epicardial radiofrequency (RF) energy, to achieve extensive posterior wall ablation while limiting levels of invasiveness. The technique includes completion endocardial ablation and is part of the Convergent Hybrid procedure.

Methods: Pericardial entry through a single abdominal ablation port and two instrument ports for diaphragm access. Targeted areas of ablation included the entire posterior left atrium in the oblique sinus, and anteriorly and posteriorly on the atrium adjacent to the pulmonary vein confluence. Unipolar RF energy with a suction irrigated device (Numeris® Coagulation System, nContact, Inc) is used. The lesion set involves delivery of multiple parallel adjoining ablation lines spanning the vertical and transverse dimensions of the posterior left atrium. Endocardial ablation with catheters is carried out to complete the lesion set. The video shows the anatomical landmarks and methods of completing the extensive posterior wall epicardial ablation.

Results: Of 42 consecutive patients, 24 had persistent and 18 long-standing persistent AF. Thirty-six were past the blanking period with 89% in sinus rhythm and 69% in sinus rhythm off anti-arrhythmic drugs. Average follow-up was 13 months with monitoring, including two 2-week intervals of continuous rhythm recording. Complications included two tamponades, one visual TIA, and four incisional hernias. There was no mortality. Average length of hospital stay was 2.9 days.

Conclusions: The technique provides a uniquely comprehensive method of posterior left atrial substrate ablation that is well tolerated. It is now the cornerstone of our AF ablation program.

4:15 PM – 5:15 PM ***Grand Ballroom 4-6***

Surgical Motion Picture Matinee: Congenital

Moderators: *Erle H. Austin Jr, Louisville, KY, and Mark S. Bleiweis, Gainesville, FL*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of films followed by discussion and questions from the audience.

4:15 PM ***Grand Ballroom 4-6***

Avoidance of Left Ventricle to Pulmonary Artery Conduit in the Correction of Corrected Transposition Great Vessels, Ventricular Septal Defect, Pulmonary Stenosis, and Dextrocardia Using a Subcoronary Patch

N. F. Sandoval, C. Obando, G. R. Bresciani, J. Camacho, M. Carreno, J. P. Umana

Fundación Cardioinfantil - IC, Bogota, Colombia

Purpose: We report a case of a 3-year-old boy with a diagnosis of situs solitus, corrected transposition of great vessels, pulmonary and subpulmonary stenosis with a gradient of 70 mmHg, left pulmonary artery stenosis, dextrocardia, and ventricular septal defect. Diagnosis was achieved by echocardiogram and cardiac catheterization. We describe a useful technique in this pathology: avoiding conduit between left ventricle to pulmonary artery by mobilizing the right-sided anterior descending coronary artery, allowing a transannular patch.

Methods: Through a median sternotomy using cardiopulmonary bypass on a beating heart, the left anterior descending artery crossing the left outflow track was carefully dissected to allow the subpulmonary resection, and incision throughout the pulmonary annulus. With an arrested heart, an anterior longitudinal pulmonary and transannular incision and subpulmonary resection was performed. The ventricular and atrial septal defect were closed through the right atrium. Left outflow tract enlargement was completed with an autologous pericardial patch underneath the descending coronary artery, extended toward the left pulmonary artery.

Results: The patient had an adequate postoperative period: no AV block was present and he was discharged at the seventh postoperative day. The postoperative echo showed good repair, no residual ventricular septal defect, and a good left ventricular outflow enlargement with a mean gradient of 8.7 mmHg and pick gradient of 18 mmHg.

Conclusions: Patients with this anomaly and dextrocardia represent a technical difficulty to perform an atrial switch, and generally require a conduit between left ventricles to pulmonary artery. Our experience in this type of operation for patient with tetralogy of Fallot with anomaly coronary artery facilitates the use of this modification and represents a good alternative to avoid conduits and future reoperation.

4:27 PM *Grand Ballroom 4-6*

Truncus Arteriosus Communis With Interrupted Aortic Arch Repair: Complete Body Perfusion and Anteposition of the Pulmonary Arteries

P. Murin, V. Hraska

German Paediatric Heart Centre, St Augustin, Germany

Purpose: Neonatal repair of truncus arteriosus communis (TAC) in combination with interrupted aortic arch (IAA) remains a surgical challenge. Aortic arch obstruction and airway compression are the most serious long-term issues.

Methods: A 5-week-old preterm neonate (35th week of gestation) weighing 3 kg underwent primary repair of TAC and aortic arch reconstruction. Complete body perfusion with cannulation of innominate artery and descending aorta, full flow bypass, and mild hypothermia (32°C) were used. Type B IAA was reconstructed with partial end-to-side anastomosis and homograft patch plasty of the arch, thus preserving the growth potential. Anteposition of the pulmonary artery was performed to minimize the risk of compression of the right bronchus. The VSD was closed by patch, and a valveless connection of the right ventricle with the pulmonary trunk was accomplished.

Results: The patient was weaned from ventilator 3 days later. A discrete dyspnea was present due to transient phrenic palsy on the left side. No tracheobronchial obstruction was apparent. Patient was discharged home on 22nd postoperative day with excellent postoperative result without residuals.

Conclusions: Complete body perfusion with mild hypothermia for aortic arch reconstruction is safe and does not compromise the surgery. Anteposition of the pulmonary artery above the aorta facilitates reconstruction of the aortic arch, while minimizing the risk of compression of the airways.

4:39 PM *Grand Ballroom 4-6*

Kommeral Diverticulum Airway Obstruction

Carl L. Backer, Chicago, IL

4:51 PM *Grand Ballroom 4-6*

Autologous End-to-End Arch Repair Technique

Charles D. Fraser, Houston, TX

5:03 PM *Grand Ballroom 4-6*

Techniques Used for Repair of Coarctation From the Front

Yves d'Udekem, Parkville, Australia

4:15 PM – 5:15 PM ***Grand Ballroom 8A***

Surgical Motion Picture Matinee: General Thoracic

Moderators: *Christine L. Lau, Charlottesville, VA, and K. Robert Shen, Rochester, MN*

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Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of films followed by discussion and questions from the audience.

4:15 PM ***Grand Ballroom 8A***

Technical Considerations of Whole Lung Lavage for Pulmonary Alveolar Proteinosis

S. Ajmal, S. Panaro, K. M. Dushay, T. Ng, I. Okereke

Rhode Island Hospital, Providence

Purpose: For pulmonary alveolar proteinosis, the treatment of choice is whole lung lavage. With video media, we describe, in detail, the technique of whole lung lavage.

Methods: The video details the treatment of a 38-year-old male diagnosed with pulmonary alveolar proteinosis. A multidisciplinary team of physicians from thoracic surgery, pulmonary medicine, and anesthesia performed whole lung lavage under general anesthesia. Lung isolation was achieved with a left-sided double lumen endotracheal tube. By gravity, 1 liter of warm saline was instilled followed by gravity drainage. The process was continued until the effluent was clear. Key technical points include: 1) bronchoscopy to precisely position the double lumen tube so that the lavage fluid does not enter the contralateral lung; 2) the use of rapid infuser tubing as its large diameter allows for a water-tight seal between it and the double lumen tube access port; 3) maximize drainage by using vibratory vest, decubitus position with lavage lung up and trendelenburg position; 4) monitor ins and outs to avoid excessive fluid sequestration in the lung; 5) avoid hypothermia by heating the operating room, using a warming blanket, and using warm lavage fluid; 6) continue lavage until the effluent is clear to prevent persistent symptoms and the need to repeat lavage in the short term; and finally, involve multiple specialties in the care of such a complex patient.

Results: The patient underwent stage whole lung lavage, right side first followed by the left side 3 days later, without complication. Each lung required 20 liters of lavage to achieve clear effluent. At 1-year follow-up, his pulmonary function tests have not declined; he is asymptomatic and has returned to work.

Conclusions: Whole lung lavage is an effective and durable treatment for pulmonary alveolar proteinosis. Our video describes the technical details and discusses the key points of this procedure.

4:27 PM *Grand Ballroom 8A*

Transsternal Transpericardial Carinal Resection and Reconstruction for Adenoid Cystic Carcinoma

O. Mercier, E. Fadel, S. Mussot, D. Fabre, P. G. Dartevelle

Marie Lannelongue Hospital, Le Plessis Robinson, France

Purpose: To describe the anterior approach to carinal resection and reconstruction for cancer resection.

Methods: Even though right thoracotomy is the preferred approach for right-sided carinal resections, exposure of tumors invading both bronchi or the left main bronchus remain challenging. The movie describes a tracheal bifurcation and esophageal muscularis mucosae resections at the level of the carina for an adenoid cystic carcinoma with subsequent reconstruction using a transsternal transpericardial approach.

Results: The carina and main bronchi were exposed through a median sternotomy. The anterior pericardium was divided vertically and circumferential mobilization of the ascending aorta and aortic arch was performed, allowing an adequate exposure of the left main bronchus. Then, excellent exposure of the mediastinal trachea and carina can be displayed by retracting the SVC and the right main pulmonary artery. Transection of the distal trachea and both main bronchus offered a good exposure for oesophagus repair without damaging the left recurrent nerve. Esophageal muscularis was sutured and carinal reconstruction was performed using an end-to-end anastomosis between the trachea and the left main bronchus and an end-to-side anastomosis between the right side of the trachea and the right main bronchus. Anastomoses were covered with surrounding tissue and the anterior pericardium closed.

Conclusions: Transsternal transpericardial approach provides good and safe exposure to the carina and the esophagus, allowing one stage resection and reconstruction for tumors invading the tracheal bifurcation or the origin of the left main bronchus.

Surgical Motion Picture Matinee: General Thoracic – Continued

4:39 PM ***Grand Ballroom 8A***

Right-Sided Robotic Thymectomy

R. J. Cerfolio, D. J. Minnich, A. S. Bryant

University of Alabama at Birmingham

COMMERCIAL RELATIONSHIPS R. J. Cerfolio: Other, Intuitive Surgical, Inc, Faculty, Proctor, Speaker; Research Grant, Pfizer Inc, Precision Therapeutics, Inc; D. J. Minnich: Other, Covidien, Honoraria for physician training; Consultant/Advisory Board, Varian Medical Systems, Inc

Purpose: To illustrate the surgical technique for a right-sided thymectomy in a patient with myasthenia gravis.

Methods: This is a robotic right-sided thymectomy.

Results: This is a young patient with myasthenia gravis and a 1-cm thymoma. The use of the nonrobotic arm to provide traction on the specimen is demonstrated, as well as the fact that the left phrenic nerve is visible from the right chest and the innominate vein can be handled with clips or bipolars.

Conclusions: Robotic thymectomy affords an outstanding view of the mediastinum and can be done from either the right or left chest. We continue to prefer the right.

Notes

4:51 PM *Grand Ballroom 8A*

Sternal Replacement Using a Novel Customized Titanium Prosthesis After Sternectomy

D. Fabre, M. Paradela, E. Fadel, S. Mussot, O. Mercier, P. G. Dartevelle

Marie Lannelongue Hospital, Le Plessis Robinson, France

Purpose: The postoperative course following sternectomy for cancer carries significant morbidity due to paradoxical breathing, pulmonary infections, and infectious complications. The purpose of this video is to report the surgical reconstruction technique after sternectomy using a novel material.

Methods: Preoperatively, this titanium material is customized based on 3D computed tomography. In order to exactly customize the material, the surgeon should gauge the extension of the resection. This novel prosthesis is in one piece including a central part and bars with all titanium rib clips. Rib clips are fixed bilaterally and angled.

Results: We report in this video a two-step surgical procedure. After sternectomy, sternal replacement is performed. We used this novel customized titanium prosthesis fixed on the resected ribs. Soft tissue coverage of the sternal defect was performed using the pectoralis major (PM) muscles with skin advancement.

Conclusions: After sternectomy for cancer, reconstruction with a preoperatively customized titanium bridge system has low morbidity and permits a rapid return to baseline pulmonary mechanics.

Notes

5:03 PM ***Grand Ballroom 8A***

Sleeve Right Upper Lobectomy Combined Resection of the Carina Followed by Double Barrel Type Reconstruction for Recurrent Mucoepidermoid Carcinoma of the Bronchus

K. Suzuki, S. Oh, Y. Tsushima, K. Takamochi

Juntendo, Tokyo, Japan

Purpose: Bronchoplastic procedure is one of established techniques for complete resection of lung cancer. On the other hand, some types of bronchoplastic techniques are rarely adopted.

Methods: Present illness: 35-year-old woman. Tumor was found at the carina with bronchoscopy, which was performed because of her dyspnea. Histological diagnosis was mucoepidermoid carcinoma of the bronchus. For this tumor, wedge resection of the carina was performed in 2007 at previous hospital. Surgical margin was positive for cancer cells. Tumor regrew twice and was treated with endobronchial laser. Finally in 2012, the tumor regrew at the carina and we were consulted for the treatment. Preoperative diagnosis: Mucoepidermoid carcinoma was found at the carina, and majority of the tumor was located at the right tracheobronchial angle. No distant metastasis.

Results: Operation: One lung ventilation was established using left bronchocath. Posterolateral incision was made and severe pleural adhesion was found. Hilar stractures, the superior vena cava, bronchus, pulmonary artery, and vein were also frozen. Following individualization of hilar structures, extension of the tumor was evaluated and confirmed the complete resection was possible. Left main bronchus was cut and confirmed to be free of tumor cells. Right intermedius bronchus was cut and proximal trachea was cut. Difference in proximal and distal caliber was so large that we decided to perform reconstruction of double barrel type, which meant reconstruction was made between right and left bronchi as well as trachea and bronchi. 3-0 Prolene was used for suturing between trachea and bronchus, and 3-0 PDS was used for reconstructing a new carina. 3-0 PDS was used because those sutures were made intraluminally. Sealing test revealed no air leakage.

Conclusions: Pathological examination confirmed complete resection. Postoperative course was uneventful and no chin-stitch was made.

4:15 PM – 5:15 PM ***Grand Ballroom 7A***

Late-Breaking Abstract Session: Adult Cardiac

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures that focus on the latest clinical trials and quality improvement projects.

4:15 PM – 5:15 PM ***Grand Ballroom 7B***

Late-Breaking Abstract Session: General Thoracic

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures that focus on the latest clinical trials and quality improvement projects.

4:15 PM – 5:15 PM ***Grand Ballroom 1-3***

Late-Breaking Abstract Session: Quality Improvement

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures that focus on the latest clinical trials and quality improvement projects.

To view the late-breaking abstracts presented at the STS 50th Annual Meeting, please see the booklet in your meeting briefcase or visit www.sts.org/annualmeeting.

5:00 PM – 6:30 PM ***Canary 1 & 2***

Scientific Posters and Wine

5:30 PM – 6:30 PM ***Grand Ballroom 7A***

Business Meeting (STS Members Only)

7:00 PM – 10:30 PM

STS Social Event: The Wizarding World of Harry Potter™ at Universal's Islands of Adventure®

Get ready for one of the most incredible parties The Society of Thoracic Surgeons has ever thrown. The Wizarding World of Harry Potter™ at Universal's Islands of Adventure® theme park has been reserved just for you! All night long, you'll have unlimited access to some of the most amazing theme park rides and attractions in Orlando. It's an entire evening of thrills and excitement—and it's all yours!

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6AM

6:30 AM – 4:30 PM
Registration: STS 50th Annual Meeting

7AM

7:00 AM – 8:00 AM
Early Riser Sessions

7:00 AM – 8:00 AM
Early Riser Health Policy Forum: Physicians Payment Sunshine Act Implementation—What CT Surgeons Need to Know

8AM

8:15 AM – 10:15 AM

Adult Cardiac Session: General I	Adult Cardiac Session: Mitral Valve	Congenital Session: Pediatric Congenital II	General Thoracic Session: Esophageal	General Thoracic Session: Lung Cancer II	Patient Safety Symposium: Safely Adopting New Technology in Cardiothoracic Surgery	STS/EACTS: Repair of Type A Aortic Dissection

9AM

9:00 AM – 4:30 PM
Scientific Posters Open

Exhibits Open

10AM

11AM

11:00 AM – 12:30 PM

Adult Cardiac Session: Aortic Valve	Adult Cardiac Session: General II	Basic Science Research: General Thoracic	Cardiothoracic Surgical Education	Clinical Trials: Reflections on Old and Plans for New	Congenital Session: Pediatric Congenital III	General Thoracic Session: Mediastinal/ Pulmonary	SVS @ STS

12PM

12:30 PM – 1:30 PM
Ethics Debate: Another Surgeon's Error: Must You Tell the Patient?

12:30 PM – 1:30 PM
Residents Luncheon

1PM

1:30 PM – 2:30 PM
C. Walton Lillehei Lecture: Shaf Keshavjee

2PM

3PM

3:15 PM – 3:30 PM 50th Anniversary Tribute

3:30 PM – 3:45 PM Award Presentations

3:45 PM – 4:30 PM
Hot Topics in Cardiothoracic Surgery

4PM

4:30 PM – 5:30 PM
Thomas B. Ferguson Lecture: Bassem Youssef

5PM

6PM

7PM

8PM

9PM

New 50 Anniversary Tribute

6:30 AM – 4:30 PM	Registration: STS 50th Annual Meeting
7:00 AM – 8:00 AM	Early Riser Sessions
	Early Riser Health Policy Forum: Physicians Payment Sunshine Act Implementation—What CT Surgeons Need to Know
8:15 AM – 10:15 AM	Adult Cardiac Session: General I
	Adult Cardiac Session: Mitral Valve
	Congenital Session: Pediatric Congenital II
	General Thoracic Session: Esophageal
	General Thoracic Session: Lung Cancer II
	Patient Safety Symposium: Safely Adopting New Technology in Cardiothoracic Surgery
	STS/EACTS: Repair of Type A Aortic Dissection
9:00 AM – 4:30 PM	Scientific Posters Open
	Exhibits Open
11:00 AM – 12:30 PM	Adult Cardiac Session: Aortic Valve
	Adult Cardiac Session: General II
	Basic Science Research: General Thoracic
	Cardiothoracic Surgical Education
	Clinical Trials: Reflections on Old and Plans for New
	Congenital Session: Pediatric Congenital III
	General Thoracic Session: Mediastinal/Pulmonary
	SVS @ STS
12:30 PM – 1:30 PM	Ethics Debate: Another Surgeon's Error—Must You Tell the Patient?
	Residents Luncheon
1:30 PM – 2:30 PM	C. Walton Lillehei Lecture: Shaf Keshavjee
3:15 PM – 3:30 PM	50th Anniversary Tribute
3:30 PM – 3:45 PM	Award Presentations
3:45 PM – 4:30 PM	Hot Topics in Cardiothoracic Surgery
4:30 PM – 5:30 PM	Thomas B. Ferguson Lecture: Bassem Youssef

6:30 AM – 4:30 PM *Convention Center Entrance*

Registration: STS 50th Annual Meeting

9:00 AM – 4:30 PM *Palms Ballroom Foyer*

Scientific Posters Open

9:00 AM – 4:30 PM *Cypress Ballroom*

Exhibits Open

7:00 AM – 8:00 AM *Various locations; see below*

Early Riser Sessions

The physician competencies addressed in these sessions are patient care, medical knowledge, practice-based learning and improvement, professionalism, and systems-based practice. These physician competencies will be addressed through conversational lectures on the specific topic of the course.

Early Riser Session 1 *Sawgrass*

STS National Database: Adult Cardiac Surgery

Richard L. Prager, Ann Arbor, MI

This session will focus on the Adult Cardiac Surgery Database, discussing ways of optimizing data collection and using data to improve quality. This session will also review the new elements for the upcoming version to be implemented on July 1, 2014.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Discuss the Adult Cardiac Surgery Database content
- Explain the rationale for surgeon involvement in data collection
- Describe ways to use data for quality initiatives

Early Riser Session 2 *St Thomas*

STS National Database: General Thoracic Surgery

Cameron D. Wright, Boston, MA

This session will focus on new initiatives involving the General Thoracic Surgery Database, including quality metrics in general thoracic surgery, development of a composite quality measure for lung resections, and moving toward publicly reporting outcomes.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Discuss quality metrics in general thoracic surgery
- Describe composite quality measures
- Recognize the rationale for public reporting

Early Riser Session 3 *Crystal Ballroom B*

STS National Database: Congenital Heart Surgery

Jeffrey P. Jacobs, St Petersburg, FL, and Marshall L. Jacobs, Baltimore, MD

This session will review the current state of the Congenital Heart Surgery Database, as well as the upgrade and upcoming report revisions.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Recognize the current issues involving the Congenital Heart Surgery Database
- Discuss changes in the next version of the Congenital Heart Surgery Database
- Describe feedback report revisions

Early Riser Session 4 *Grand Cayman*

Women in Thoracic Surgery: Global Surgical Volunteerism

Emily A. Farkas, Pittsburgh, PA, Kathleen N. Fenton, Boston, MA, Virginia R. Litle, Boston, MA, and Valerie A. Williams, Cincinnati, OH

The poorest third of the world population has access to less than 5% of global surgical care. As global partnerships between academic general surgery programs and hospitals in developing countries increase, so do opportunities for cardiothoracic surgeons to volunteer their clinical experience or teach. Three surgeons who have had diverse involvement in all three cardiothoracic subspecialties will provide their perspective on short- and long-term experiences in developing countries.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Delineate what short-term surgical volunteer opportunities exist for cardiothoracic surgeons
- Understand the global need for cardiothoracic surgeons in developing countries
- Identify how to select a volunteer opportunity

Early Riser Session 5 *Aruba*

Evolution of the Treatment of Thoracic Trauma in the Military—From Korea to Afghanistan

Sidney Levitsky, Boston, MA, and Thomas D. Starkey, Fort Polk, LA

This session will feature presentations from STS members involved in major military conflicts involving US Armed Forces in Korea, Vietnam, and Iraq/Afghanistan. Attendees will gain an understanding of how military medicine has changed as warfare has evolved from direct combat to terrorism activities.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Discuss the traumatic injury patterns among soldiers
- Describe the medical facilities in-theater and how they were organized
- Explain the evacuation capabilities
- Discuss medical advances for civilian surgeons that came about as a result of military experiences

Early Riser Sessions – Continued

Early Riser Session 6 ***Vinoy***

Innovations in Cardiac Surgery

Lawrence H. Cohn, Boston, MA, William E. Cohn, Houston, TX, Robert W. Emery Jr, Minneapolis, MN, Thomas J. Fogarty, Mountain View, CA, Michael J. Mack, Plano, TX, and Vinod H. Thourani, Atlanta, GA

COMMERCIAL RELATIONSHIPS R. W. Emery: Speakers Bureau/Honoraria, St Jude Medical, Inc; Consultant/Advisory Board, Kips Bay Medical, Inc, Medtronic, Inc; W. E. Cohn: Ownership Interest, AlphaDev, LLC, SentreHEART, Inc, TVA Medical, Inc, Viacor Inc; Other, Teleflex Incorporated, Royalties; Consultant/Advisory Board, 14 Pews, Xconomomy; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

In this session, well-known innovators in cardiothoracic surgery will discuss the whys and hows of innovations in the field.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe how to partner with an academic institution
- Explain what a surgeon's time is worth
- Recognize the pitfalls of publishing clinical trials sponsored by industry

Early Riser Session 7 ***Bahamas***

Reinventing Your Career: Pathways Outside the Operating Room

Benjamin D. Kozower, Charlottesville, VA, Mark J. Krasna, Neptune, NJ, Richard I. Whyte, Boston, MA, and Stephen C. Yang, Baltimore, MD

After years in practice and reflection, many cardiothoracic surgeons develop alternative skill sets and interests outside the operating room. These include obtaining advanced degrees, going into business administration, advancement through the medical school hierarchy, and leaving surgery altogether. This session will briefly showcase several surgeons who have reinvented themselves, discuss the process of their transitions, and provide a potential mentoring network for those considering a new career focus.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Define potential career pathways in business, public health, and education
- Outline strategies for leadership roles outside the operating room
- Reflect on self-improvement and options for self-education in areas that revolve around our surgical specialty

Early Riser Session 8 ***Crystal Ballroom A***

Lessons Learned From the Pediatric Heart Network

Richard G. Ohye, Ann Arbor, MI, Steven M. Schwartz, Toronto, Canada, and Glen S. Van Arsdell, Toronto, Canada

The NHLBI-funded Single Ventricle Reconstruction (SVR) trial is a multi-institutional surgical trial undertaken by the Pediatric Heart Network to compare two techniques for the Norwood procedure for single right ventricle patients. It is the first and only large, multicenter, randomized surgical trial ever performed in congenital heart surgery. This Early Riser Session will provide an overview of the project and describe the lessons learned from running the trial.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe the framework and outcomes of the SVR trial, focusing on late and secondary outcomes
- Discuss the role of evidence-based medicine in clinical practice, including how evidence derived from a single cohort may change over time
- Explain the lessons learned in running a multicenter surgical randomized controlled trial

Early Riser Session 9 ***Key West***

How I Do It: Expert Esophagectomy

Manjit S. Bains, New York, NY, Shanda H. Blackmon, Houston, TX, Seth D. Force, Atlanta, GA, Wayne L. Hofstetter, Houston, TX, James D. Luketich, Pittsburgh, PA, and Joshua R. Sonett, New York, NY

COMMERCIAL RELATIONSHIPS W. L. Hofstetter: Consultant/Advisory Board, Ethicon, Inc; J. D. Luketich: Research Grant, Accuray Incorporated, Precision Therapeutics, Inc, Torax Medical, Inc; Other, Covidien, Honoraria for lectures, Stryker, Honoraria for lectures, Accuray, Honoraria for lectures; Ownership Interest, Johnson & Johnson

Experts in esophagectomy will review selected video clips and compare esophagectomy techniques, step-by-step.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Identify different methods of performing esophagectomy
- Identify pros and cons of the different approaches
- List alternative ways that portions of esophagectomy can be done
- Debate whether minimally invasive, pyloroplasty, or stapled anastomosis is better

Early Riser Sessions – Continued

Early Riser Session 10 ***Key Biscayne***

Ask the Expert: Masters of Thoracic Surgery—Pulmonary Resections

Robert J. Cerfolio, Birmingham, AL, Todd L. Demmey, Buffalo, NY, Erino A. Rendina, Rome, Italy, and K. Robert Shen, Rochester, MN

COMMERCIAL RELATIONSHIPS R. J. Cerfolio: Other, Intuitive Surgical, Inc, Faculty, Proctor, Speaker; Research Grant, Pfizer Inc, Precision Therapeutics, Inc

This session will provide participants with the opportunity to discuss technical aspects of complex and difficult pulmonary resections with an expert faculty panel. The focus will be a detailed discussion of technical details and techniques in performing sleeve lobectomy, prevention and management of intraoperative complications during VATS lobectomy, and pulmonary resection requiring pulmonary artery resection.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Identify key technical aspects in performing pulmonary resections requiring airway sleeve resection
- Discuss methods to prevent and manage intraoperative complications during VATS lobectomy
- Describe the options for partial or circumferential sleeve resection of the pulmonary artery

Early Riser Session 11 ***Grand Ballroom 12-14***

Ask the Experts: Controversies in Mitral Valve and Atrial Fibrillation Surgery

Niv Ad, Falls Church, VA, and Vinay Badhwar, Pittsburgh, PA

COMMERCIAL RELATIONSHIPS N. Ad: Consultant/Advisory Board, AtriCure, Inc, Estech, Medtronic, Inc

Several current controversies in mitral valve repair include handling complex bileaflet disease, minimally invasive and robotic approaches, ischemic restrictive disease, and rheumatic pathology. Atrial fibrillation controversies extend to case selection associated with cardiac concomitant complications, lone atrial fibrillation, and lesion sets. The objective of this session is to review these controversies and debate them with attendee input.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Identify techniques and lesion sets used for surgical ablation of atrial fibrillation
- Identify techniques for minimally invasive and robotic mitral surgery
- Review pathology-directed strategies in complex degenerative and restrictive mitral valve disease

Early Riser Session 12 *Marco Island*

Controversies in the Management of Thoracic Aortic Disease

Joseph E. Bavaria, Philadelphia, PA, John A. Elefteriades, New Haven, CT, Anthony L. Estrera, Houston, TX, and John S. Ikonomidis, Charleston, SC

COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc; J. A. Elefteriades: Consultant/Advisory Board, CoolSpine LLC, Datascope, Medtronic, Inc; Research Grant, Medtronic, Inc, National Marfan Association; Other, AORTA Journal, Commercial Interest/Editor

This session will explore current topics of interest and controversy in the surgical management of thoracic aortic disease, centering on management of aortic arch disease and type A aortic dissection.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Explain optimal cerebral protection strategies for aortic arch replacement
- Discuss treatment options for aortic arch disease
- Identify controversies in type A aortic dissection repair and management under different clinical circumstances

Early Riser Session 13 *Key Largo*

Billing and Coding in the Cardiothoracic ICU

Jay G. Shake, Temple, TX

This course will provide attendees with the framework to appropriately code and bill for critical care and subsequent care in the cardiothoracic intensive care unit.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Explain current coding systems
- Review critical care coding
- Outline the appropriate documentation for coding
- Explain coding for physicians in training and nonphysician providers
- Identify noncritical care codes
- Identify ECMO and VAD notes

Early Riser Session 14 ***Puerto Rico***

American Board of Thoracic Surgery (ABTS) Maintenance of Certification (MOC) Update

Bryan F. Meyers, St Louis, MO, and Richard J. Shemin, Los Angeles, CA

COMMERCIAL RELATIONSHIPS B. F. Meyers: Speakers Bureau/Honoraria, Ethicon, Inc, Varian Medical Systems, Inc; Consultant/Advisory Board, Varian Medical Systems, Inc; R. J. Shemin: Consultant/Advisory Board, Edwards Lifesciences Corporation

This session will review the recently changed requirements for ABTS Diplomates to remain compliant with required MOC activities. It will review MOC goals in general, discuss the trend of change in specific MOC practices and requirements in surgery and cardiothoracic surgery, and offer a primer in the responsibilities for thoracic surgeons.

While all thoracic surgeons might find this session of interest, those who are in or approaching the fifth or 10th year of their ABTS cycle will find it particularly valuable. Practical solutions will be offered to allow effective ways for Diplomates to meet the requirements without excessive trouble.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Discuss the current requirements for the ABTS MOC program
- Explain how these requirements might differ from previous expectations by the ABTS and the American Board of Medical Specialties
- Identify multiple resources to help meet the expectations of the Board
- Demonstrate the ability to meet the requirements in the time remaining for the 5- and 10-year cycle within the ABTS MOC program

7:00 AM – 8:00 AM ***Grand Ballroom 4-6***

Early Riser Health Policy Forum: Physicians Payment Sunshine Act Implementation—What CT Surgeons Need to Know

The Physician Payments Sunshine Act requires that drug and device manufacturers report certain payments and items of value given to physicians and teaching hospitals. Manufacturers will submit the reports to the Centers for Medicare & Medicaid Services on an annual basis. In addition, manufacturers must report particular ownership interests held by physicians and their immediate family members. Information contained in the reports will be available on a public, searchable website. Physicians have the right to review their individual reports for accuracy and challenge those reports if necessary.

This session will identify key provisions of Sunshine Act regulations that impact physicians, including financial interactions and ownership interests that are subject to reporting. The session will also discuss available resources to ensure reportable financial interactions between a cardiothoracic surgeon and industry are accurately and fairly reported.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Identify the key provisions of Sunshine Act regulations, including financial interactions and ownership interests that are subject to reporting
- Discuss how key provisions in Sunshine Act regulations directly impact cardiothoracic surgeons
- Describe how the Sunshine Act will affect interactions between physicians and industry
- Identify available resources for ensuring that reportable financial interactions between a cardiothoracic surgeon and industry, as well as ownership interests, are accurately and fairly reported

The physician competencies addressed in this session are patient care and systems-based practice. These competencies will be addressed through a lecture that is followed by discussion.

Moderator: *T. Bruce Ferguson Jr, Greenville, NC*

Speaker: *Johanna M. Kreisel, Washington, DC*

COMMERCIAL RELATIONSHIPS T. B. Ferguson: Research Grant, Novadaq Technologies Inc; Other Research Support, LifeCell Corporation

8:15 AM – 10:15 AM ***Crystal Ballroom G-Q***

Adult Cardiac Session: General I

Moderators: *Niv Ad, Falls Church, VA, and Danny Chu, Pittsburgh, PA*

COMMERCIAL RELATIONSHIPS N. Ad: Consultant/Advisory Board, AtriCure, Inc, Estech, Medtronic, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

8:15 AM ***Crystal Ballroom G-Q***

Contemporary Outcomes of Surgery for Tricuspid Valve Infective Endocarditis

M. Y. Dawood, M. Ghoreishi, N. W. Foster, R. Villanueva, R. Salenger, B. P. Griffith, J. S. Gammie

University of Maryland School of Medicine, Baltimore

COMMERCIAL RELATIONSHIPS J. S. Gammie: Research Grant, Edwards Lifesciences Corporation; Ownership Interest, Correx, Inc, Harpoon Medical, Inc

Purpose: Surgical indications for tricuspid valve infective endocarditis (TVIE) are not clearly established. Patients are traditionally treated with antibiotics alone, leaving most centers without substantial operative TVIE experience. We reviewed our operative experience at a single urban center.

Methods: From 2002 to 2012, we performed 62 operations for TVIE. Indications included refractory symptomatic severe TR, large vegetations, failure of antibiotic therapy, and multivalve IE. Patient characteristics and surgical outcomes were examined.

Results: In this cohort, the mean age was 38, and 40% were male (Table). A history of recent intravenous drug abuse was present in 86%. Indications for operation included large vegetations (55%), severe TR (52%), failure of antibiotic therapy (6.5%), and multivalve IE (39%). The mean interval from admission to operation was 9 (range 1-28) days. Isolated TV operation was performed in 61%, with the remainder having concomitant mitral (n=14), aortic (n=9), or pulmonary (n=1) valve procedures. TV repair was performed in 52% of patients. Overall in-hospital mortality was 5%, 2.6% for isolated TV operations, and 0% for isolated native TVIE. The presence of pulmonary septic emboli was not a risk factor for prolonged ventilation (p=0.4), reintubation (p=0.09), or increased length of stay (p=0.54). Permanent pacemakers were inserted in 3.1% of the repair group and 16.7% of the replacement group (p=0.06). There was equivalent 5-year survival for the repair (66%) and replacement groups (69%), p=0.82.

Conclusions: This experience represents the largest single-institution series of operations for TVIE. In contrast to historical reports of high mortality, these results suggest that TVIE operations can be performed with low morbidity and excellent survival. These data support reconsidering the threshold for operation in TVIE. Further studies are needed to compare short- and long-term outcomes of medical and surgical therapy.

Patient Characteristics		
Prosthetic TVIE	7	11.3%
Reoperative Sternotomy	10	16.1%
Vegetation Size > 1 cm	34	54.8%
Pulmonary Septic Emboli	41	66.1%
Active TVIE	46	74.2%
Microbiology		
Staphylococcus sp.	41	66.1%
MRSA	26	41.9%
MSSA	12	19.4%
S. epidermidis	3	4.8%
Streptococcus sp.	6	9.7%
Enterococcus sp.	4	6.5%
Other	7	11.3%
Culture negative	4	6.5%
Operative Characteristics		
Repair: Annuloplasty Only	9	14.5%
Repair: Reconstruction with Annuloplasty	12	19.4%
Repair: Reconstruction without Annuloplasty	11	17.7%
Replacement: Stentless Porcine Bioprosthesis	7	11.3%
Replacement: Stented Bioprosthesis - Porcine	15	24.2%
Replacement: Stented Bioprosthesis - Bovine	8	12.9%
Morbidity		
Reoperation for Bleeding	3	4.8%
Deep Sternal Wound Infection	0	0%
Postoperative CVA	0	0%
Prolonged Ventilation (>24 hrs)	20	32.3%
Postoperative Hemodialysis Dependency	4	6.5%

8:30 AM ***Crystal Ballroom G-Q***

Outcomes of Open Repair for Chronic Descending Thoracic Aortic Dissection

A. Jan, A. L. Estrera, S. Shalhub, C. C. Miller, M. Castro-Medina, A. Azizzadeh, K. M. Charlton-Ouw, H. J. Safi

The University of Texas Medical School at Houston, Memorial Hermann Heart and Vascular Institute

COMMERCIAL RELATIONSHIPS A. Azizzadeh: Consultant/Advisory Board, Medtronic, Inc; Consultant/Advisory Board, W. L. Gore & Associates, Inc

Purpose: The aim was to analyze early and late outcomes after open repair of descending thoracic aortic aneurysms with chronic aortic dissection.

Methods: Between 1991 and 2011, a total of 519 open repairs of the descending thoracic aorta were performed. From this, 211 (41%) repairs involved chronic dissection. Mean age was 60 years, with 74% (155/211) men. Previous ascending repair was performed in 40% (85/211) and the second stage elephant trunk was performed in 11% (21/211). The adjunct of distal aortic perfusion with cerebral spinal fluid drainage was used in 89% (188/211) of cases and circulatory arrest with bypass in 1% (3/211).

Results: 30-day mortality was 8.5% (18/211). Immediate neurologic deficit (IND) was 0.9% (2/211), all occurring in the extent C resection. Delayed neurologic deficit (DND) was 1.4% (3/211), one occurring in each extent. Since 66% (2/3) of DND recovered function, permanent neurologic deficit occurred in 1.4% (3/211). Stroke occurred in 2.4% (5/211) and acute renal dysfunction in 14% (30/211). The only risk factor for 30-day mortality was preoperative renal dysfunction (glomerular filtration rate) <75 mL/min, OR=4.2, p<0.006. Use of adjunct was protective against 30-day mortality, OR=0.26, p<0.02. Late survival by Kaplan-Meier is depicted on Figure 1. Survival of age and sex matched US cohort is also represented after 1 year.

Conclusions: Open repairs of chronic descending thoracic dissections can be performed with acceptable morbidity and mortality. Neurologic deficit remains low with use of adjuncts, and early mortality is directly related to the preoperative renal status. Survival after 1 year approaches the normal age and sex matched population. These results allow comparison when thoracic endovascular aortic repair (TEVAR) is performed for chronic aortic dissection.

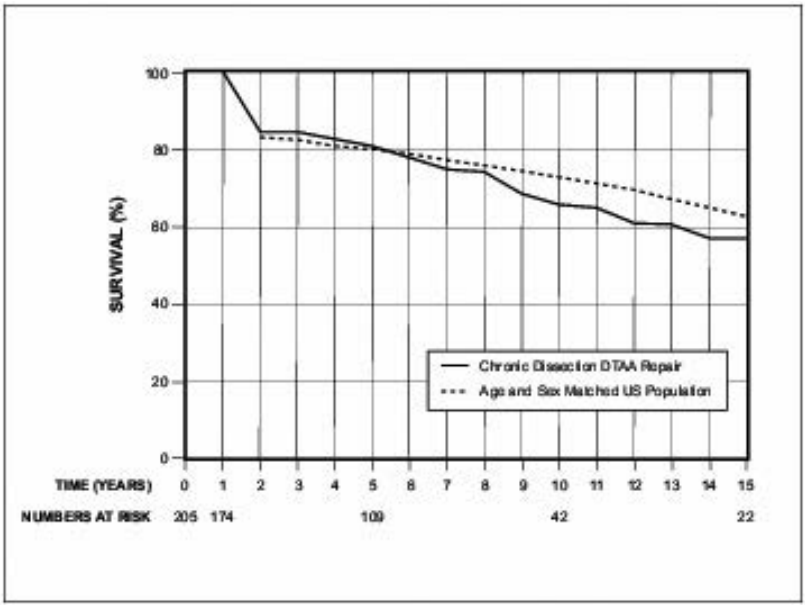


Figure 1: Kaplan-Meier Survival of Open Repair for Descending Thoracic Aortic Dissection (age and sex-matched survival of normal US population is superimposed after 1 year, dashed line)

8:45 AM ***Crystal Ballroom G-Q***

Sutureless Aortic Valve Replacement: A Canadian Multicenter Study

A. Mazine, I. Bouhout, M. Carrier, D. Bouchard

Montreal Heart Institute, Canada

Purpose: Sutureless aortic valve replacement (AVR) has recently been introduced as an alternative to standard AVR in elderly, high-risk surgical patients. Very few North American studies have reported results with this new form of therapy. The purpose of this study is to report the early Canadian experience with sutureless AVR.

Methods: A Canadian multicenter study included 156 patients who underwent sutureless AVR between June 2011 and May 2013. Small (21 mm), medium (23 mm), large (25 mm), and extra-large (27 mm) prostheses were used in 33 (21%), 47 (30%), 70 (45%), and six (4%) patients, respectively.

Results: Mean age was 79 ± 5 years (range: 64 to 94) and 82 (53%) patients were female. Concomitant procedures included CABG in 64 (41%) patients, mitral surgery in 10 (6%) patients, and septal myectomy in seven (5%) patients. A total of 117 cases (75%) were performed using a full sternotomy, 23 (15%) using a minithoracotomy and 16 (10%) using a partial sternotomy. Fourteen cases (9%) were redo procedures. For isolated AVR, mean aortic cross-clamp time was 41 ± 12 minutes. In-hospital mortality occurred in seven (4%) of patients. No postoperative valve migration was reported. Thirteen patients (8%) suffered from postoperative AV block requiring pacemaker implantation. Six patients (4%) suffered from stroke. Echocardiographic evaluation demonstrated well-seated valves with no significant valvular or paravalvular aortic insufficiency and a mean aortic gradient of 14 ± 6 mmHg.

Conclusions: This study is the largest North American series of sutureless AVR published to date. Our experience demonstrates that this technique is safe, reproducible, and results in short operative times. Clinical outcomes are promising, with a low rate of perioperative complications considering the baseline characteristics of this population. Echocardiographic results are also encouraging, with no valve migration/dislodgement, low gradients, and no valvular or paravalvular aortic insufficiency.

9:00 AM *Crystal Ballroom G-Q*

Cardiac Autotransplantation for Malignant and Complex Left-Sided Cardiac Tumors: A 15-Year Experience

L. E. Rodriguez[1], B. Ramlawi[1], S. H. Blackmon[1], A. A. Vaporciyan[2], R. Bunge[1], O. M. Shapira[3], M. J. Reardon[1]

[1]Methodist DeBakey Heart & Vascular Center, Houston, TX, [2]MD Anderson Cancer Center, Houston, TX, [3]Haddasah Medical Center, Jerusalem, Israel

COMMERCIAL RELATIONSHIPS B. Ramlawi: Consultant/Advisory Board, AtriCure, Inc; Other Research Support, Medtronic, Inc; Ownership Interest, REPLICor Inc; Research Grant, Baxter; S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau/Honoraria, Covidien; M. J. Reardon: Consultant/Advisory Board, Medtronic, Inc

Purpose: Local recurrence due to inadequate resection is a challenge when treating complex left heart tumors. Previous reports have demonstrated improved survivability with cardiac autotransplantation (ex-vivo resection, reconstruction, and reimplantation). In some cases, concomitant pneumonectomy (PNX) is required when tumor extends to the lungs, which is associated with poorer outcomes. In this study, we present our updated series of patients managed with cardiac autotransplantation (ATx) and report outcomes with and without concomitant PNX.

Methods: Since April 1998, a total of 34 consecutive patients with malignant or complex left atrial or ventricular intracavitary cardiac tumors underwent resection via cardiac ATx. Demographics, tumor histology, perioperative data, and outcomes were analyzed.

Results: Mean age at the time of surgery was 42 ± 15 years, and males represented 56% (19/34) of the cases. Overall, 74% (25/34) were histologically graded as a sarcoma (or subtype). A previous standard resection was done in all left atrial sarcomas with the belief they were myxomas (92%, 23/25), and one patient had a repeat ATx. Concomitant PNX was required in 21% (7/34) of the patients. There were no operative deaths in the group that had ATx alone. There were four deaths (4/7, 57%) in the combined ATx and PNX group. Overall, survival at 30 days, 6 months, and 1 year was 83.3%, 63.3%, and 60.9%, respectively. Subgroup analysis of concomitant PNX vs no PNX yielded a significant improvement in survival. At 30 days, survival was 57.1% vs 91.3% (p=0.026). At 6 months, survival was 28.6% vs 87% (p=0.001). Excluding PNX patients, the median survival was 378 days (range 18 to 3,047 days).

Conclusions: Cardiac ATx is associated with improved outcomes in the treatment of malignant and complex left heart tumors. It is a feasible and safe technique when done as a standalone procedure in experienced centers. Addition of a PNX carries a mortality of 57% and should be avoided.

9:15 AM ***Crystal Ballroom G-Q***

Initial Experience With the Organ Care System Heart in Extended Criteria Donors and High-Risk Recipients

D. Garcia Saez, B. Zych, F. De Robertis, O. Maunz, L. A. Mc Brearty, P. N. Mohite, A. Sabashnikov, N. P. Patil, C. T. Bowles, R. Hards, M. Amrani, T. Bahrami, N. Banner, A. R. Simon

Royal Brompton and Harefield NHS Trust, United Kingdom

COMMERCIAL RELATIONSHIPS D. Garcia Saez: Consultant/Advisory Board, Transmedics, Inc; O. Maunz: Consultant/Advisory Board, TransMedics, Inc; A. R. Simon: Consultant/Advisory Board, CircuLite, Inc, HeartWare Inc, Thoratec Corporation, Transmedics, Inc

REGULATORY DISCLOSURES This presentation will address the Transmedics Heart Organ Care System, which has an FDA status of investigational.

Purpose: The severe shortage of available donor organs has resulted in increasing attempts to utilize marginal organs for transplantation. While these attempts may increase organ availability, they result in higher risk organ-recipient combinations. The individual risk-benefit ratio is further affected by the increasing complexity of today's recipients (eg, ventricular assist devices [VAD], severe pulmonary hypertension [PHT], age, or previous surgery). The Organ Care System (OCS) allows for preservation and transport of a continuously perfused heart in a near physiological environment at 34°C-37°C in a beating state. This allows for extended out-of-body times, avoids the detrimental effect of cold ischemic storage, and provides additional assessment. We describe our experience with the OCS in a consecutive series of patients transplanted at our institution.

Methods: Data were collected prospectively for all patients transplanted with the OCS (n=9) between February 22, 2013, and June 9, 2013. Donor and recipient data and postoperative results were analyzed.

Results: All patients were weaned off bypass at the first attempt and none required mechanical support. No graft developed right heart failure. Time on inotropic support was 80 ± 60 hours, duration of mechanical ventilation 51 ± 37 hours, and ICU stay 153 ± 110 hours. At follow-up 55 ± 41 days (5-112), graft function was preserved in all cases; left ventricular ejection fraction was 69 ± 4%. All patients were alive at the time of abstract submission.

Conclusions: The OCS allows expanding the donor pool by either utilizing organs previously not considered for transplantation (eg, marginal organ, long transport time) or transplanting higher risk graft-recipient combinations (previous operations, VADs, PHT). In these patients, the observed mortality and morbidity was more favorable than expected, given the combined risk profile of donor-recipient. If these results are reproducible, OCS preservation may become the standard of care in these types of situations.

Indications for OCS and Timings

N	Indication OCS	CIT	OCS-PT	OBT
1	Prolonged transport time + Recipient (PHT)	103	244	347
2	Donor (Prolonged cardiac arrest) + Recipient (VAD, 5 previous sternotomies)	99	337	436
3	Prolonged transport time	105	420	525
4	Donor (CVRF-unknown CAD) + Recipient (PHT)	98	324	422
5	Recipient VAD	94	178	272
6	Donor (cardiac arrest, elevated Troponin T-substance abuse) + Recipient VAD	105	298	403
7	Donor (CVRF-unknown CAD) + Recipient (PHT)	88	192	280
8	Donor (Left ventricle hypertrophy) + Recipient VAD	94	156	250
9	Prolonged transport time	92	274	366
	Mean ± SD	98±6	269±85	355±99

CIT (Cold ischemic time), OCS-PT (OCS Perfusion time), OBT (Out of body time), CVRF (Cardiovascular risk factors), CAD (Coronary artery disease)

9:30 AM ***Crystal Ballroom G-Q***

Utilization of the HeartWare Continuous-Flow Ventricular Assist Device Decreases Blood Product Utilization in Patients Awaiting Heart Transplantation

*M. E. Davis, N. Haglund, R. M. Ahmad, T. G. DiSalvo, M. Keebler, D. J. Lenihan, K. H. Schlendorf, M. A. Wigger, *S. Maltais*

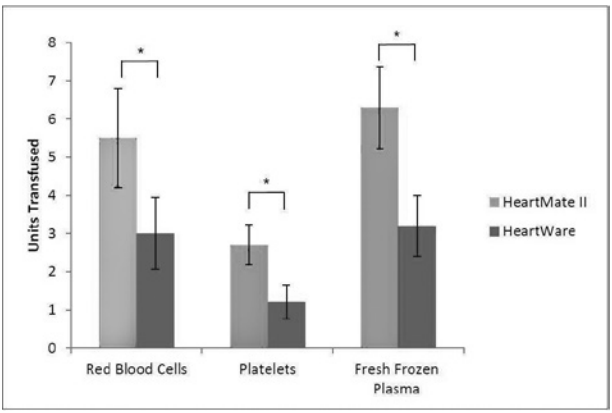
Vanderbilt Heart and Vascular Institute, Nashville, TN

Purpose: The HeartWare (HW) ventricular assist device (VAD) is an approved device to bridge patients to transplantation. The ADVANCE trial compared outcomes between the HeartMate II (HMII) and the HW, but did not report detailed outcomes related to blood product utilization after implant.

Methods: Retrospective evaluation was performed of blood product utilization in 65 patients bridged with a continuous-flow VAD, HMII (n=37) and HW (n=28), between January 2009 and June 2013 at Vanderbilt University Medical Center. Perioperative and index hospitalization data obtained from the Vanderbilt Heart and Vascular Institute Main Heart Registry were compared between device groups.

Results: Preoperative characteristics (age, LVEF, % reoperation, % ischemic etiology) and risk stratification (INTERMACS category, Leitz-Miller score, Kormos score) were comparable between groups (all $p>0.05$). HW recipients had a significant reduction in blood product utilization. All perioperative product transfusions (red blood cells [pRBC], platelets, fresh frozen plasma) were significantly (all $p<0.05$) decreased after HW implant (Figure 1). The number of non-perioperative to discharge pRBC transfusions was also lower in HW (1.6 ± 2.6 vs 3.0 ± 4.2, p=0.05). HW patients had a significant decrease in time on mechanical ventilation (1.8 ± 1.6 days vs 4.9 ± 7.3, p=0.01). Despite these differences, ICU length of stay (HMII: 9.0 ± 10.0 days vs HW: 6.4 ± 4.7 days, p=0.09), and in-hospital (30-day) mortality (HMII: 14% [n=5] vs HW: 11% [n=3], p=0.37) was comparable between groups.

Conclusions: Compared to HMII, the intrapericardial-positioned continuous-flow HW was associated with a reduction in perioperative blood product utilization and non-perioperative to discharge RBCs transfusions. These findings have critical implications and should be considered when choosing between these two devices, as transfusion-related sensitization after implant can limit donor compatibility.



9:45 AM *Crystal Ballroom G-Q*

Aortic Valve Reconstruction Using Autologous Pericardium for Aortic Stenosis Patients

S. Ozaki, I. Kawase, H. Yamashita, Y. Nozawa, M. Takatoo, S. Hagiwara, N. Kiyohara

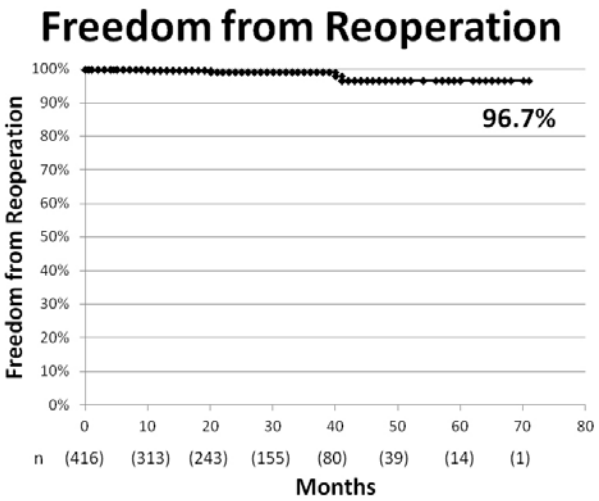
Toho University Medical Center Ohashi Hospital, Tokyo, Japan

Purpose: To determine the feasibility of original aortic valve reconstruction for patients on aortic stenosis, consecutive 416 cases were reviewed. The mid-term results are reported here.

Methods: Aortic valve reconstruction for aortic stenosis was performed on 416 patients from April 2007 through April 2013. All 416 patients were retrospectively reviewed. 114 patients showed bicuspid aortic valves and 16 showed unicuspid valves. There were 182 males and 234 females. Mean age was 71.2 ± 12.0 years. Preoperative echocardiography revealed peak pressure gradient averaged 79.0 ± 33.6 mmHg. Surgical annular diameter was 20.1 ± 2.8 mm. Procedure is based on the independent tricuspid replacement by autologous pericardium. First, the distance between commissure is measured with original sizing apparatus. Pericardial cusp is then trimmed using original template and sutured to annulus.

Results: There was no conversion to the prosthetic valve replacement. There were 8 in-hospital mortalities by non-cardiac cause. Postoperative echocardiography revealed peak pressure gradient averaged 21.2 ± 10.7 mmHg 1 week after surgeries and 14.3 ± 5.0 mmHg 5.5 years after surgeries. Four patients needed reoperation because of infective endocarditis. The other 412 patients showed less than mild aortic regurgitation. No thromboembolic event was recorded. The mean follow-up period was 25.2 ± 17.5 months. Freedom from reoperation was 96.7% with 73 months follow-up.

Conclusions: Mid-term results are excellent. Original aortic valve reconstruction was feasible to the patients with aortic stenosis. Long-term data will be disclosed in the future.



10:00 AM ***Crystal Ballroom G-Q***

Procedure-Specific Cardiac Surgeon Volume Associated With Patient Outcome Following Valve Surgery

S. Ch'ng[1], A. D. Cochrane[1], R. Wolfe[2], C. L. Smith[2], C. Reid[2], J. A. Smith[1]

[1]Monash Medical Centre, Clayton, Australia, [2]Monash University, Melbourne, Australia

Purpose: Trends towards subspecialization within surgery to improve patient outcomes are well documented and largely supported by evidence. Yet there are little data examining whether the same benefit exists within adult cardiac surgery. To answer if subspecialization within adult cardiac surgery is supported based on improved patient outcomes, we assessed the relationship between procedure-specific and total-cardiac surgeon volume and mortality and morbidity in cardiac valve and coronary artery bypass grafting (CABG) surgery.

Methods: Data from the Australian and New Zealand Society of Cardiac and Thoracic Surgeons (ANZSCTS) registry, including 43,000 patients, 23 hospitals, and 122 surgeon-hospital combinations from 2001 to 2010, were reviewed. 20,619 patients with isolated CABG surgery and 11,536 patients with valve procedures were included. Surgeon volume was defined as the number of operations a surgeon performs at a hospital in a year. Hierarchical logistic regression using generalized estimating equations was performed. Outcome measures included operative mortality and morbidity (deep sternal wound infection, new stroke, and new renal failure).

Results: Crude operative mortality (and complication rates) were 1.7% (4.9%) and 4% (11%) for isolated CABG and valve populations, respectively. Greater procedure-specific surgeon volume was associated with reduced mortality and complication rates in valve surgery but not isolated CABG. There was a 33% decrease in mortality odds for every additional 50 valve procedures performed [OR 0.67, p=0.003]. Conversely, greater total-cardiac surgical volumes did not result in improved outcomes for both isolated CABG and valve populations.

Conclusions: Our finding of an association between increased valve-specific surgeon volume and improved valve surgery outcomes, and absence of an association between these outcomes and total-cardiac surgeon volume, supports the case for subspecialization of surgeons specifically regarding valve surgery.

Relationship Between Hospital-Specific Surgeon Volume and Outcomes in Isolated CABG Surgery and Valve Surgery (Per 50 Patients)

	Outcome	Surgeon volume	OR	95% C.I.	P
Isolated CABG	30-day mortality	Total cardiac	0.915	0.831-1.127	0.7
		CABG-specific	0.999	0.998-1.005	0.3
	Complications	Total cardiac	0.915	0.828-1.010	0.08
		CABG-specific	0.999	0.998-1.001	0.2
Valve	30-day mortality	Total cardiac	0.95	0.94-1.04	0.5
		Valve-specific	0.67	0.52-0.88	0.003
	Complications	Total cardiac	0.96	0.89-1.03	0.3
		Valve-specific	0.68	0.55-0.86	0.001

OR: odds ratio; 95% C.I.: 95% confidence interval; CABG: coronary artery bypass grafting

Notes

8:15 AM – 10:15 AM ***Grand Ballroom 7A***

Adult Cardiac Session: Mitral Valve

Moderators: *Vinay Badhwar, Pittsburgh, PA, and Patrick M. McCarthy, Chicago, IL*

COMMERCIAL RELATIONSHIPS P. M. McCarthy: Consultant/Advisory Board, Abbott, AtriCure, Inc, Edwards Lifesciences Corporation, MiCardia Corporation; Ownership Interest, Edwards Lifesciences Corporation

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

8:15 AM ***Grand Ballroom 7A***

Expanding Experience With Minimally Invasive Mitral Repair for Barlow Disease – 4-Year Clinical Results of a Randomized Study vs Median Sternotomy

G. Nasso[1], V. Romano[1], K. Fattouch[2], V. Pezzimenti[1], M. Brigiani[1], R. Bonifazi[1], G. Visicchio[1], F. Bartolomucci[3], G. Speziale[1]

[1]GVM Care & Research, Bari, Italy, [2]University Hospital, Palermo, Italy, [3]L. Bonomo Hospital, Andria, Italy

Purpose: In previous studies, access to the mitral valve towards either right minithoracotomy or median sternotomy has been reported to have limited influence over the reliability of valve repair for complex lesion (Barlow valve). We herein report the 4-year follow-up of a randomized study comparing alternative surgical accesses for mitral repair.

Methods: In a randomized study of mitral repair for Barlow disease (bileaflet prolapse) via the minimally invasive access (MI group) vs median sternotomy (MS group), we achieved an average 4.1 ± 1 year follow-up. Artificial chordal implantation was used for both leaflets. Follow-up consisted of echocardiography, physical exam, and quality-of-life assessment (SF-36 questionnaire) at 6-month intervals.

Results: Groups included 105 (MI) and 104 (MS) patients. Operative time was significantly longer in the MI group (p=0.03), but there was no meaningful difference in cardiopulmonary bypass time (p=0.4). Mitral repair was successfully performed in 104 and 105 cases (MS and MI groups, respectively, 99% both). Mechanical ventilation time, intensive care unit stay, and hospital stay were shorter in the MI group (p=0.002, p=0.009, and p=0.004, respectively). At follow-up, 10 patients in the MS group (9.6%) and nine in the MI group (8.6%) displayed residual mild mitral regurgitation, while moderate/severe regurgitation and heart failure occurred in four patients in each group (3.8% both). The rate of mitral reoperation was 3.8% in the MI group and 2.9% in the MS group (p=0.6). The overall mortality was 2.9% in both groups.

Conclusions: At the mid-term follow-up, the results of mitral repair for Barlow disease are independent of the surgical approach used to repair the valve (minithoracotomy vs full sternotomy).

8:30 AM *Grand Ballroom 7A*

Port Access Mitral Valve Surgery Can Be Safely Performed With Minimal Vascular Complications Utilizing Either Endoaortic Balloon or Chitwood Clamp

P. Atluri, A. B. Goldstone, J. T. Fox, W. Y. Szeto, W. Hargrove

University of Pennsylvania, Philadelphia

COMMERCIAL RELATIONSHIPS W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc

Purpose: Port access (right mini-thoracotomy) mitral valve surgery is increasingly being performed. Standard techniques include endoaortic balloon and Chitwood clamp aortic occlusion. The endoaortic balloon has the advantage of minimal incision size and ease of conduct of redo-operation. There have been concerns raised regarding potential increased risk of vascular complications (embolization, dissection, stroke, lower extremity ischemia) associated with the endoaortic balloon. We undertook this study to evaluate the vascular risk associated with both techniques.

Methods: All patients undergoing port access operations from 1998 to 2012 were analyzed. A total of 1,095 patients were identified. Patients undergoing aortic occlusion with the Chitwood clamp (n=189) were compared to patients undergoing occlusion with the endoaortic balloon (n=875). Patients who underwent fibrillatory arrest were excluded.

Results: A very low percentage of port access operations were complicated by aortic dissection (1.03%, n=11). There was no difference in the rate of dissection between patients undergoing aortic occlusion with an endoaortic balloon (n=9, 1.03%) or Chitwood clamp (n=2, 1.06%). Similarly, there was no difference in the rate of type A dissection between aortic occlusion strategies (endoaortic balloon = 0.57%, n=5 vs Chitwood = 1.06%, n=2; p=0.28). Type B dissections complicated 0.46% of endoaortic balloon operations (n=4). When stratified by learning curve, there was a significant improvement in the rate of dissection with experience (first 100 = 3%, n=3; last 500 = 0.6%, n=3; p=0.05). There were no peripheral vascular complications with either strategy. No difference in the incidence of stroke was identified between endoaortic balloon and Chitwood clamp (2.2% vs 2.1%, p=1.0).

Conclusions: Minimally invasive mitral valve surgery can be safely performed with minimal vascular complications incorporating either endoaortic balloon or Chitwood clamp aortic occlusion.

8:45 AM ***Grand Ballroom 7A***

Long-term Outcomes of Mitral Valve Repair for Isolated Commissural Prolapse: A 20-Year Experience

A. Shimizu, M. Tabata, T. Fukui, H. Kasegawa, S. Takanashi

Sakakibara Heart Institute, Tokyo, Japan

Purpose: Mitral valve repair has been shown to be effective and durable for anterior leaflet, posterior leaflet, and bileaflet prolapse. Commissural prolapse has been categorized into the groups of posterior leaflet prolapse or bileaflet prolapse that generally have demonstrated excellent early and long-term outcomes. However, outcomes of mitral valve repair for isolated commissural prolapse remains poorly defined.

Methods: Between 1992 and 2010, 1,112 adult patients underwent mitral valve repair for degenerative mitral regurgitation at our institution. Among those, we reviewed 122 patients with isolated commissural prolapse. We analyzed operative outcomes, long-term survival rate, freedom rate from reoperation, and freedom rate from recurrent moderate or severe mitral regurgitation.

Results: The median age was 59 years, 83 patients (68.0%) were men, 16 patients (13.1%) had infective endocarditis, 43 patients (35.2%) had atrial fibrillation, 27 patients (22.1%) had anterolateral commissural prolapse, 91 (74.6%) had posteromedial commissural prolapse, and four (3.3%) had bilateral commissural prolapse. We performed leaflet resection in 111 (91.0%), (concomitant sliding plasty in 43), leaflet plication in one (0.8%), artificial chordal replacement in 94 (77.0%), and ring annuloplasty in 121 patients (99.2%). Residual mild or greater mitral regurgitation was confirmed in 7 patients (5.7%) on predischarge echocardiography. Fifteen-year survival and freedom from mitral reoperation were 87.6% and 93.0%, respectively. Freedom from recurrent moderate or severe mitral regurgitation at 15 years was 87.4%.

Conclusions: Mitral valve repair for isolated commissural prolapse demonstrated excellent early and late outcomes.

	N	%
Leaflet resection	111	91.0
with sliding plasty	43	35.2
Leaflet plication	1	0.8
Artificial chordal replacement	94	77.0
with leaflet resection	83	68.0
without leaflet resection	11	9.0
Prosthetic ring annuloplasty	121	99.2

9:00 AM ***Grand Ballroom 7A***

Contemporary Mid-term Outcomes of an Innovative Lifting Mitral Annuloplasty Technique in Adult Patients With Mitral Regurgitation

M. Song, J. Park, J. Shin, H. K. Chee, J. Kim, H. Yang

Konkuk University Medical Hospital, Seoul, Republic of Korea

Purpose: This study is aimed to assess the mid-term results of an innovative lifting mitral annuloplasty (LMA) technique, which was applied for mitral regurgitation (MR) in adult patients.

Methods: LMA is a new mitral annuloplasty method that lifts up the downward displaced left ventricular (LV) wall by placing a specially designed fabric annuloplasty strip on the left atrial wall along the posterior mitral annulus. We analyzed the outcomes of 341 consecutive patients (173 females and 168 males) who underwent LMA for MR between October 2007 and December 2012. The mean age was 51 ± 15 years. New chordae formation (n=33) and posterior and/or anterior leaflet extensions (PLE/ALE, n=23/2), which can improve the coaptation surface of mitral valve leaflets, were added. Concomitant surgeries, such as Maze (n=104, 30.5%), tricuspid annuloplasty (n=50, 14.6%), or CABG (n=24, 7.0%), were performed as well if indicated.

Results: Preoperatively, severe LV dysfunction (EF <35%) was observed in 14 patients (4.1%). There were three in-hospital deaths (0.9%). During the follow-up period (38 ± 17 months), 12 patients died (three cardiac [0.9%], nine non-cardiac [2.6%]) and six patients (1.8%) required valve-related reoperations. Overall 5-year survival was 96.0 ± 1.1% and 5-year freedom from valve-related reoperation was 98.1 ± 0.8%. Postoperative mitral regurgitation based on the latest echocardiograms was absent or mild in 331 patients (97%), moderate in nine (2.6%), and severe in one (0.3%). The mean LV end-systolic and diastolic dimension was decreased from 37.5 ± 8.3 to 32.9 ± 7.4 mm and from 57.3 ± 8.1 to 49.2 ± 6.6 mm ($p<0.001$), respectively.

Conclusions: In patients with mitral regurgitation, the LMA technique showed satisfactory early and mid-term results with a low reoperation risk.

9:15 AM **Grand Ballroom 7A**

Multicenter Evaluation of High-Risk Mitral Valve Operations: Implications for Selection of Conventional Surgery vs Novel Transcatheter Valve Therapies

D. J. LaPar[1], J. M. Isbell[1], I. K. Crosby[1], J. A. Kern[1], E. Fonner[3], A. M. Speir[2], I. L. Kron[1], G. Ailawadi[1]

[1]University of Virginia, Charlottesville, [2]Inova Heart and Vascular Institute, Falls Church, VA, [3]Virginia Cardiac Surgery Quality Initiative, Charlottesville

COMMERCIAL RELATIONSHIPS J. A. Kern: Speakers Bureau/Honoraria, Edwards Lifesciences Corporation; A. M. Speir: Consultant/Advisory Board, Medtronic, Inc; G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca

Purpose: The REALISM trial for MitraClip includes several inclusion criteria to suggest a patient would be high risk for conventional mitral valve surgery. The purpose of this study was to evaluate contemporary surgical outcomes for high-risk patients who meet these defined criteria to serve as a benchmark from which to evaluate appropriateness in treatment allocation between surgery and MitraClip for high-risk mitral disease.

Methods: Patient records from the STS National Database were evaluated for patients undergoing isolated mitral valve surgery over a 12-year study period over 17 different hospitals. Patients were stratified into high-risk (HR) vs non-high-risk (non-HR) cohorts based upon clinical criteria similar to those utilized in the REALISM trial (Table). Mixed effects multivariable regression modeling was used to evaluate study endpoints across hospitals.

Results: Of 2,440 isolated mitral operations, 698 (29%) were HR per REALISM criteria. Median STS PROM for HR patients was 6.6% compared to 1.6% for non-HR patients (P<0.001). HR patients more commonly underwent MV replacement as well as urgent (30% vs 19%, P<0.001) and emergent (3.2% vs 1%, P<0.001) operations. As expected, HR patients incurred higher morbidity and operative mortality (7% vs 1.6%) with longer ICU (48 vs 41 hours) and hospital stays (7 vs 6 days, all P<0.001). Among criteria utilized to select HR patients (Table), STS PROM ≥12% and high-risk STS criteria were the only criteria associated with operative mortality.

Conclusions: These data suggest that certain REALISM criteria, including reoperation with patent grafts and functional MR with EF <40, may not represent patients at high risk of death with surgery. In addition to conventional STS criteria, risk assessment by surgeons is essential to direct appropriate treatment allocation for high-risk mitral disease.

Adjusted Relationships Between REALISM High-Risk Patient Selection Criteria and Mortality

Outcome	Odds Ratio	95% Confidence Interval	P
PROM ≥12%	5.80	3.21, 10.48	<0.001
Three or more STS high risk factors	1.54	1.04, 2.28	0.01
Functional MR with EF < 40	2.52	0.92, 6.97	0.07
Age > 75 with EF<40	0.30	0.03, 2.53	0.27
Reoperation with patent grafts	1.32	0.66, 2.62	0.44
Two or more prior chest surgeries	0.17	0.02, 1.34	0.09

9:30 AM *Grand Ballroom 7A*

Perioperative Mortality Following Mitral Valve Surgery May Be Overestimated by Contemporary Risk Models

V. Chan, A. Ahrari, M. Boodhwani, M. Ruel, E. Elmistekawy, T. G. Mesana

University of Ottawa Heart Institute, Canada

COMMERCIAL RELATIONSHIPS M. Ruel: Research Grant, Medtronic, Inc; Speakers Bureau/Honoraria, Medtronic, Inc

Purpose: Percutaneous therapies to manage mitral regurgitation are emerging as an alternative to conventional surgery, especially for patients with a high estimated perioperative risk. However, contemporary risk models may not accurately reflect outcomes from dedicated mitral valve centers. The purpose of this study was to describe perioperative mortality following mitral valve surgery in a contemporary Canadian cohort.

Methods: Between 2001 and 2011, 1,155 patients underwent mitral valve surgery at a dedicated mitral valve clinic. Of these, 852 underwent mitral valve repair and 303 mitral valve replacement. Concomitant coronary artery bypass grafting (CABG) was performed in 198 (17%), aortic valve repair/replacement in 108 (9%), tricuspid valve repair in 199 (17%), and Maze procedure in 259 (22%). The Society of Thoracic Surgeons risk score and Euroscore II were used to estimate perioperative mortality risk.

Results: Actual perioperative mortality was 0.9%. Perioperative mortality was 0.4% for patients who underwent mitral valve repair, 0.7% after mitral valve repair plus CABG, 2.0% after mitral valve replacement, and 2.0% mitral valve replacement plus CABG. Estimated STS risk score was higher for each of the above listed subgroups supported by the STS calculator (all $p<0.001$). Overall, 401 patients underwent at least one concomitant procedure at the time of mitral valve repair or replacement. The estimated mortality from the Euroscore II was greater for isolated and combined procedures (both $p<0.001$).

Conclusions: Although current risk models aid in risk stratifying patients, the contemporary perioperative mortality at a dedicated mitral valve center is significantly lower than expected. The use of alternate therapies must therefore take into consideration differences in perioperative risk based on the treating center.

9:45 AM *Grand Ballroom 7A*

Debate: Will Mitral Surgeons Be Clipped by COAPT?

Pro: *Steven F. Bolling, Ann Arbor, MI*
Con: *Michael J. Mack, Plano, TX*

8:15 AM – 10:15 AM ***Grand Ballroom 4-6***

Congenital Session: Pediatric Congenital II

Moderators: *Carl L. Backer, Chicago, IL, and Andrew C. Fiore, St Louis, MO*

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The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

8:15 AM ***Grand Ballroom 4-6***

Staged Strategy for Biventricular Repair in Borderline Complex Biventricular Repair Candidates With Ventricular Septal Defect

Y. Nakamura, M. Aoki, I. Hagino, H. Koshiyama, S. Akiyama, T. Fujiwara

Chiba Children's Hospital, Japan

Purpose: Although borderline biventricular repair (BVR) candidates unsuitable for primary BVR are often subjected to single ventricle repair (SVR), some of them reach BVR by appropriate staged strategy. We evaluated our staged strategy for BVR in borderline BVR candidates with ventricular septal defect (VSD).

Methods: Between 1991 and 2012, 42 borderline BVR candidates with VSD were identified in whom a decision on whether BVR or SVR should be pursued could not be made in the neonatal period. All patients were referred to us within 1 month after birth, and they had been followed toward BVR until it was judged impossible. The table shows reasons for staged strategy. Outcomes, time course toward definitive repair (DR: BVR, SVR, or 1+1/2 ventricle repair), and hemodynamics were reviewed.

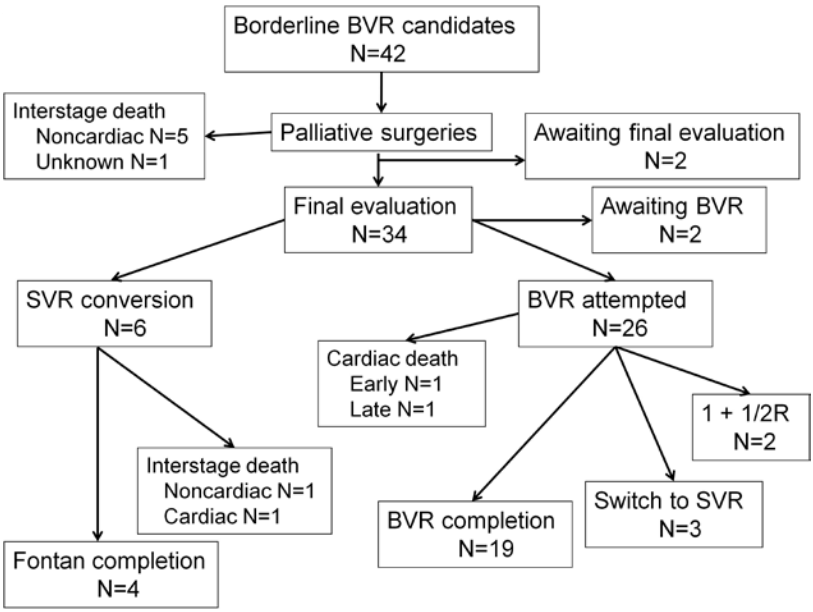
Results: A total of 57 palliative surgeries were performed before BVR or bidirectional Glenn (BDG), namely, procedures to control pulmonary blood flow in 40, to improve mixing in five, to promote left ventricle (LV) growth in five, and to address aortic arch hypoplasia in nine patients. LV growth was achieved in four patients. Outcomes are shown in the image. There were three cardiac deaths: two hospital deaths after attempted BVR, and one late death after BDG, the only dropout from pathway toward DR. DR was performed at age 35 ± 21 months, and the median follow-up after DR was 84 months, with all in New York Heart Association class 1. Cardiac cath before BVR or BDG performed at age 30 ± 25 months revealed well-preserved pulmonary vasculature with pulmonary artery pressure of 16 ± 7 mmHg, except three patients unsuitable for SVR.

Conclusions: Our BVR strategy required longer time course and more complex palliation compared with a simple SVR strategy. However, dropout from indication for DR was rare and a substantial number of patients reached BVR, suggesting that timing of intervention and evaluation was appropriate. Pulmonary blood flow control and LV growth promotion remain major problems for BVR completion.

Reasons for Staged Biventricular Repair Strategy

Reasons	Number of patients
Large apical muscular, multiple VSDs, or Swiss-cheeze VSD	13
Mildly hypoplastic LV (40-70%N) ± MV stenosis	8
Mildly hypoplastic RV (40-60%N) ± TV overriding	6
DORV, Noncommitted VSD with TV chordal insertion to subaortic area	8
Atrioventricular valve straddling	6
Crossed atrioventricular connection	1
Total	42

VSD = ventricular septal defect; LV = left ventricle; MV = mitral valve; RV = right ventricle; TV = tricuspid valve; DORV = double outlet right ventricle.



Clinical outcomes toward biventricular repair

8:30 AM ***Grand Ballroom 4-6***

Profile of Current Surgical Techniques for Repair of Anomalous Aortic Origin of a Coronary Artery: A Report From the Congenital Heart Surgeons' Society AAOCA Registry

J. A. Poynter[1], T. B. Karamlou[2], H. L. Walters[3], W. M. Decampli[4], I. Bondarenko[3], E. H. Austin[5], J. Gaynor[6], C. M. Mery[7], E. H. Blackstone[8], G. Ziemer[9], J. Pearl[10], J. P. Jacobs[11], C. Mavroudis[12]

[1]The Hospital for Sick Children, Toronto, Canada, [2]University of California, San Francisco, [3]Children's Hospital of Michigan, Detroit, [4]Arnold Palmer Hospital for Children, Orlando, FL, [5]Kosair Children's Hospital, University of Louisville, KY, [6]The Children's Hospital of Philadelphia, PA, [7]Texas Children's Hospital, Houston, [8] Cleveland Clinic, OH, [9]Comer Children's Hospital/ The University of Chicago, IL, [10]Phoenix Children's Hospital, AZ, [11]Johns Hopkins All Children's Hospital, St Petersburg, FL, [12]Florida Hospital for Children, Orlando

Purpose: Anomalous aortic origin of a coronary artery (AAOCA) from outside the correct sinus of Valsalva encompasses a wide morphological spectrum. We sought to construct a profile of coronary morphology and surgical techniques associated with contemporary repair of this anomaly.

Methods: Patients <30 years old (n=113) with isolated AAOCA who underwent surgical repair at 29 member institutions from 1998 to 2012 were identified from a registry of 220 patients with AAOCA. Operative findings and techniques of index repairs were abstracted from patient records.

Results: Median age at operation was 12.6 years. Anomalous origin of the left coronary artery was found in 33 patients (27%) and anomalous origin of the right coronary was found in 79 (69%). In one patient, a single origin giving rise to both coronary arteries was located above the commissure between the left and right sinuses. 101 vessels (89%) were interarterial and intramural (IA+IM), 10 (9%) were interarterial but not intramural (IA-IM), and two (2%) were not intramural or interarterial. Eighty-five ostia (75%) were stenotic and/or slit-like. 100 operations (88%) included unroofing of an intramural vessel, usually with intimal tacking after incision (n=47) or excision of the tunica media (n=25). Less common were coronary artery reimplantation (n=11; 5 for IA-IM), pulmonary artery (PA) translocation (n=9; 5 for IA-IM, 4 for IA+IM), simple ostioplasty (without unroofing; n=3), coronary artery bypass grafting (n=2), ostial window (n=1), and aortocoronary anastomosis without unroofing (n=1; for IA+IM). In 37 cases (33%), an aortic valve commissure was taken down; 33 (89%) were resuspended.

Conclusions: Repair of AAOCA is individualized to each patient's unique morphology. Unroofing alone is the most common procedure for intramural vessels. PA translocation or coronary artery reimplantation may be chosen for IA-IM vessels. Other procedures may be appropriate in selected cases to address unusual variants of AAOCA.

8:45 AM ***Grand Ballroom 4-6***

Refining Risk Adjustment for Pediatric and Congenital Heart Surgery—The Importance of Patient-Specific Preoperative Factors: An Analysis of the STS Congenital Heart Surgery Database

J. P. Jacobs[1], S. M. O'Brien[2], S. K. Pasquali[3], S. Kim[2], D. M. Shahian[4], M. L. Jacobs[5]

[1]Johns Hopkins All Children's Heart Institute, St Petersburg, FL, [2]Duke Clinical Research Institute, Duke University Medical Center, Durham, NC, [3]University of Michigan C. S. Mott Children's Hospital, Ann Arbor, [4]Massachusetts General Hospital, Harvard Medical School, Boston, [5]Johns Hopkins University School of Medicine, Baltimore, MD

Purpose: The most common forms of risk adjustment for pediatric and congenital heart surgery used today are based mainly on the estimated risk of mortality of the primary procedure of the operation. The purpose of this analysis was to assess the importance of including patient-specific preoperative factors in pediatric and congenital cardiac surgical risk models.

Methods: All index cardiac operations in the STS Congenital Heart Surgery Database (CHSD) during 2010-2012 were eligible for inclusion. Patients <2.5 kg undergoing PDA closure were excluded. Centers with >10% missing data and patients with missing data for discharge mortality or other key variables, including preoperative factors, were excluded. Discharge mortality was determined for patients with or without preoperative factors in CHSD. Preoperative factors were included in the analysis if their age-group-specific prevalence was >2% or if the number of associated deaths was >19. The death rates of patients with each preoperative factor and patients without each preoperative factor were compared using Fisher's exact test.

Results: 25,476 operations were included (overall discharge mortality=3.7%, n=943). The table shows the prevalence of common preoperative factors and their associated discharge mortality. The associations of discharge mortality with the following preoperative factors were all highly significant (P<0.0001) for neonates, infants, and children: mechanical circulatory support, renal dysfunction, shock, and mechanical ventilation.

Conclusions: Current CHSD risk adjustment is based on estimated risk of mortality of the primary procedure of the operation, as well as age, weight, and prematurity. The inclusion of additional patient-specific preoperative factors in risk models for pediatric and congenital cardiac surgery could lead to increased precision in predicting risk of operative mortality and comparison of observed to expected outcomes.

Continues on next page.

The Prevalence of Common Preoperative Factors and Their Associated Discharge Mortality

	NEONATES (N=5630)	INFANTS (N=9500)	CHILDREN (N=8742)	ADULTS (N=1604)
Overall mortality rate	9.88%	2.91%	0.92%	1.93%
Potential Preoperative Risk Factor	N of Deaths / N with Factor = Mortality Rate % (P-value)	N of Deaths / N with Factor = Mortality Rate % (P-value)	N of Deaths / N with Factor = Mortality Rate % (P-value)	N of Deaths / N with Factor = Mortality Rate % (P-value)
Preoperative/Preprocedural mechanical circulatory support (IABP, VAD, ECMO, or CPS)	20/37 = 54.1% (P<.0001)	12/49 = 24.5% (P<.0001)	13/48 = 27.1% (P<.0001)	0/4 = 0.0% (P=0.9999)
Shock, Persistent at time of surgery	42/125 = 33.6% (P<0.0001)	9/47 = 19.2% (P<0.0001)	9/29 = 31.0% (P<0.0001)	1/4 = 25.0% (P=0.0752)
Renal dysfunction	31/119 = 26.1 (P<0.0001)%	17/79 = 21.5% (P<0.0001)	5/63 = 11.3% (P<0.0001)	2/26 = 7.7% (P=0.0882)
Mechanical ventilation to treat cardiorespiratory failure	271/1792 = 15.1% (P<0.0001)	83/723 = 11.5% (P<0.0001)	21/146 = 14.4% (P<0.0001)	3/13 = 25.0% (P=0.0013)
Gastrostomy present	3/18 = 16.7% (P=0.4132)	41/654 = 6.3% (P<0.0001)	13/164 = 3.6% (P<0.0001)	0/5 = 0.0% (P=0.9999)
Shock, Resolved at time of surgery	63/121 = 15.0% (P=0.0006)	10/179 = 5.6% (P=0.0407)	8/59 = 13.6% (P<0.0001)	1/7 = 14.3% (P=0.1279)
Coagulation disorder, Hypocoagulable state secondary to medication	5/11 = 45.5% (P=0.0026)	/44 = 11.4% (P=0.0086)	2/40 = 4.0% (P=0.0764)	1/36 = 2.8% (P=0.5086)
Hypothyroidism	6/23 = 26.1% (P=0.0211)	9/190 = 4.7% (P=0.1258)	4/113 = 3.5% (P=0.0197)	2/66 = 3.0% (P=0.3674)
Preoperative neurological deficit	10/47 = 21.3% (P=0.022)	12/155 = 7.7% (P=0.0018)	8/246 = 3.2% (P=0.0018)	4/47 = 8.5% (P=0.0114)
Preoperative complete AV block	10/50 = 20.0% (P=0.0276)	2/27 = 4.3% (P=0.3984)	5/161 = 3.1% (P=0.0158)	0/57 = 0.0% (P=0.6247)
Stroke, CVA, or Intracranial hemorrhage > Grade 2 during lifetime	7/41 = 17.1% (P=0.1179)	10/100 = 10.0% (P=0.0006)	4/102 = 3.9% (P=0.014)	2/34 = 4.4% (P=0.2152)
Seizure during lifetime	7/51 = 13.7% (P=0.3426)	9/187 = 4.8% (P=0.1204)	10/291 = 3.4% (P=0.0003)	3/48 = 6.3% (P=0.0629)
Other preoperative factors	99/716 = 13.8% (P=0.0003)	80/1427 = 5.6% (P<0.0001)	29/1029 = 2.8% (P<0.0001)	10/302 = 3.3% (P=0.0631)

9:00 AM ***Grand Ballroom 4-6***

Model Predicting Need for Mechanical Support in Children Waiting for Heart Transplant

R. R. Davies, S. Haldeman, M. A. McCulloch, C. Pizarro

Nemours Cardiac Center, Wilmington, DE

Purpose: Due to availability of new devices, the use of ventricular assist devices (VADs) in children has been increasing. Optimal timing of device implantation in this population remains uncertain. The purpose of the study was to identify patient characteristics at listing which would be predictive of mortality or mechanical support within 60 days of listing.

Methods: We performed a retrospective review of all primary pediatric (<18 years) status 1A/1B listings for heart transplant in the US 1995-2012 based on the UNOS/SRTR dataset. Patients on mechanical circulatory support (ECMO or VAD) at listing were excluded, leaving 4,899 patients. Primary outcome was 60-day survival on the waitlist without VAD or ECMO. Candidates transplanted (n=943) prior to 60 day were censored. Mutivariable logistic regression analysis was performed to determine predictors of death or need for a VAD within 60 days on the waitlist. Model discrimination was assessed by using area under the receive operating curve (AUC).

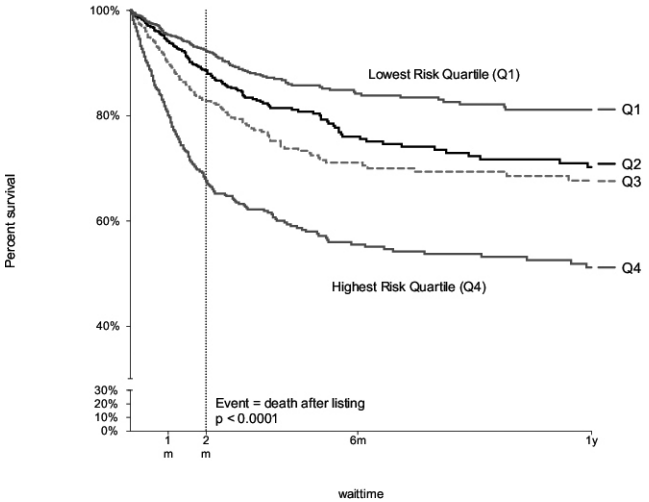
Results: Patient characteristics included in the risk score are shown in Table. The AUC for the model was 0.698. When divided into quartiles based on risk score (Q1 = lowest predicted risk, Q4 = highest predicted risk), the risk of death or need for VAD/ECMO within 30 days was 4.2%, 5.1%, 8.5%, and 16.2% (p<.0001); risks at 60 days were 13.2%, 23.1%, 34.3%, and 50.4% (p<.0001). Overall survival on the waitlist was lowest in patients with the highest risk score (Figure, p <.0001)

Conclusions: Among patients listed without VAD or ECMO, patient characteristics at listing are highly predictive of early mortality or need for mechanical support. Use of this risk score may be helpful in guiding decisions to proceed with VAD implantation as a bridge to transplant and in improving early waitlist survival.

Continues on next page.

Congenital Session: Pediatric Congenital II – Continued

Variable	Parameter Estimate	Odds Ratio	95%CI	p value
Age: 6 to 12 yrs	0.607208	1.84	1.35-2.49	<.0001
Age: 13 to 18 years	0.677478	1.97	1.48-2.62	<.0001
Age: 2 to 5 years	0.453155	1.57	1.22-2.03	0.0005
Mechanical ventilation	0.970739	2.64	2.12-3.29	<.0001
Inotropes	0.284507	1.33	1.07-1.65	0.01
Status 1A	0.440939	1.55	1.22-1.99	0.0004
Creatinine clearance <40cc/min	0.326175	1.39	1.05-1.83	0.02
Etiology: restrictive cardiomyopathy	-0.450918	0.64	0.36-1.12	0.1
ABO type: B	0.375156	1.46	1.10-1.92	0.0008



9:15 AM ***Grand Ballroom 4-6***

The Impact of Extracorporeal Membrane Oxygen Combined With Continuous Renal Replacement Therapy in Children

N. Ota, K. Sakamoto

Mt Fuji Shizuoka Children's Hospital, Japan

Purpose: Extracorporeal membrane oxygenation (ECMO) has emerged as an effective mechanical support for children with respiratory and cardiac failure, and continuous renal replacement therapy (CRRT) has become the preferred dialysis option in the pediatric intensive care unit. CRRT has been introduced at our institution for all patients who needed ECMO support. The aim of our study was to investigate the use of CRRT in children with ECMO support.

Methods: We retrospectively reviewed medical records of 85 pediatric patients (Univentricle heart: 57.6% [49/85: HLHS: 21, Asplenia: 16, others: 12], Biventricle heart: 42.4% [36/85]) who received ECMO between January 1998 and September 2012. Forty-three patients out of 85 were treated with ECMO-CRRT combined approach (CRRT group, 2006-2012). The comparison group comprised consecutive 42 historical control patients who had conventional ECMO support (conventional group) from 1998 to 2006. Demographics, diagnosis, operative variables, ECMO indication, and duration of survivors and non-survivors were compared. The all-dialysis systems were connected with ECMO circuits directly.

Results: Two groups (ECMO-CRRT vs Conventional) were matched for age, weight at ECMO, and cardiac morphologies. The maximum blood lactate levels (CRRT vs Conventional) (mmol/deL) at 0, 12, 24, and 48 hours during the ECMO support were 2.9 ± 3.3 vs 3.2 ± 2.1, p = 0.056), (2.1 ± 1.9 vs 3.9 ± 3.8, p=0.056) and (2.4 ± 1.4 vs 3.9 ± 3.8, p=0.04), respectively. Thirty-four patients (79%) were successfully weaned from ECMO-CRRT group, compared with 23 patients (54.7%) (P=0.021) in the conventional group, and 28 (65.1%) were discharged in the ECMO-CRRT group compared with 16 (38.1%) (0.028) in the conventional group.

Conclusions: The ECMO combined with CRRT approach improved our management of neonatal and pediatric ECMO.

9:30 AM ***Grand Ballroom 4-6***

What Is the Best Surgical Option for Symptomatic Neonates With Ebstein's Anomaly and Pulmonary Atresia?

C. Knott-Craig, T. S. Kumar, M. Figueroa, V. M. Joshi

Le Bonheur Children's Hospital, Memphis, TN

Purpose: Symptomatic neonates with Ebstein's anomaly (EA) have high mortality irrespective of the surgical management strategy. We have previously advocated a two-ventricular repair for all neonates with EA and reported an 80% early survival with this approach. Within this cohort, neonates with associated pulmonary atresia (PA) have the highest mortality. We undertook this analysis to determine, in our experience, whether there was a difference in outcome between one-ventricle and two-ventricle repairs in this subset of neonates with EA/PA.

Methods: We reviewed our results with surgical repair of 30 severely symptomatic neonates with EA between 1994 and 2013. Eighteen neonates (60%, 18/30) had associated PA. Patients' weights ranged from 1.9 Kg to 3.4 Kg. All patients without PA had a two-ventricle repair. Fourteen neonates (14/18) with EA/PA had a two-ventricle repair, and four had a one-ventricle palliation (two Starnes' palliation, two shunts). Five patients with EA/PA had a right ventricle-pulmonary artery (RV-PA) valved conduit as part of their two-ventricle repair.

Results: Early mortality was 30% (9/30). For those without pulmonary atresia, mortality was 8.3% (1/12). For neonates with EA/PA, mortality was 44% (8/18). For neonates with EA/PA having a two-ventricle repair, mortality was 50% (7/14). For neonates with EA/PA having a two-ventricle repair utilizing a RV-PA valved conduit, the mortality was 20% (1/5). For those having a one-ventricle repair, the mortality was 25% (1/4) (P=NS).

Conclusions: Surgical management of symptomatic neonates with EA remains challenging. For neonates with EA/PA, one-ventricle palliation is associated with lower early mortality compared to two-ventricle repair. This outcome advantage is negated by the inclusion of a RV/PA valved conduit as part of the two-ventricle repair.

9:45 AM ***Grand Ballroom 4-6***

Functional Single Ventricle With Unbalanced Atrioventricular Septal Defect and Trisomy 21: Outcomes at Completion Fontan and Comparison With Hypoplastic Left Heart Syndrome Survivors

A. C. Polimenakos[1], S. Subramanian[2], C. F. Elzein[2], M. N. Ilbawi[2]

[1]J Weis Children's Hospital-Geisinger Clinic, Danville, PA, [2]Advocate Hope Children's Hospital, Oak Lawn, IL

Discussant: *Kirk R. Kanter, Atlanta, GA*

Purpose: There are limited data regarding the management of children with Trisomy 21 syndrome (T21S) and functional single ventricle (FSV). A study to evaluate T21S in patients with FSV compared to hypoplastic left heart syndrome (HLHS) survivors at completion Fontan (CF) was undertaken.

Methods: From September 1999 to August 2009, 139 patients with FSV underwent CF. Sixty-five had unbalanced atrioventricular septal defect (uAVSD). Thirteen were associated with T21S (Group A). Five (of 13) had heterotaxy syndrome (HS). Mean age at CF was 27.6 ± 12.1 months. In comparison, 52 HLHS survivors (Group B) underwent CF. Mean age at CF was 25.8 ± 7.1 months (p >0.05). Extracardiac conduit CF was used in all cases. Analysis was conducted.

Results: In Group A, initial procedure was pulmonary-artery banding (PAB) in nine patients, aortopulmonary shunt only (APS) in two, and Damus-Kay-Stansel/Norwood (DKS/NO) operation in two. Median follow-up was 69 months (IQR 25-75 21-99). There was one death after DKS/NO and one interstage after Glenn. At last follow-up, eight (of 11) survivors successfully underwent CF, two awaiting CF. One was unsuitable for CF. There was one late death after CF. Heterotaxy syndrome did not affect outcome (p 0.3). In Group B, there was one late death after CF. Median follow-up was 74 months (IQR 25-75 32-104). Between groups, there was no statistical difference in pre-CF McGoon ratio, hospital length of stay, pleural drainage duration, ventilatory support time, arrhythmia, nodal dysfunction, protein-losing-enteropathy, and thromboembolic events. Fenestration was more often (7 of 8) required in Group A (p<0.05)

Conclusions: CF in unAVSD/FSV with T21S survivors can be associated with satisfactory intermediate results. T21S and HS did not affect outcome at last follow-up. Compared to HLHS survivors, fenestration was more often required in FSV with T21S but without impact on perioperative quality variables, morbidity, and mid-term survival.

10:00 AM ***Grand Ballroom 4-6***

The Volume of Blood Transfused Predicts Outcomes Following Congenital Cardiac Surgery

A. T. Legg[1], M. M. Zubair[1], S. Saharan[1], R. J. Legg[2], S. Langley[1]

[1]Oregon Health and Science University, Portland, [2]Northern Michigan University, Marquette

Purpose: To determine whether the volume of blood transfused is associated with morbidity and mortality in patients undergoing congenital cardiac surgery.

Methods: 594 consecutive patients undergoing congenital heart surgery were analyzed. Demographic, preoperative, operative, and postoperative variables were evaluated. Blood use was grouped into 6 categories based on the amount received (no transfusion, <15 mL/kg, 15-30 mL/kg, 30-45 mL/kg, 45-60 mL/kg, and >60 mL/kg) in the OR, during the initial 48 hours of PICU stay, and in total. Univariate and multivariate analysis was used to determine whether volume of blood transfused was associated with hospital length of stay (LOS), ICU LOS, mechanical ventilation, and mortality.

Results: Patients receiving up to 30 mL/kg of blood in the OR did not have a significant increase in LOS. There was a significant increase in the LOS for patients who received more than 30 mL/kg (6.2 vs 9.4 days; P <0.01) and a further increase for those who received more than 60 mL/kg (20.2 days; P<0.001). Multivariate analysis demonstrated an independent association between blood usage in the OR and hospital length of stay, ICU LOS, and length of mechanical ventilation (P <0.001). Patients receiving more than 15 mL/kg blood in the ICU had a significant increase in the LOS (6.5 vs 12.5 days; P<0.001). The RACHS-1 score, age, preop hematocrit, and presence of a single ventricle were also associated with the hospital LOS, ICU LOS, and mechanical ventilation.

Conclusions: Like many institutions, our decision to transfuse is often based on clinical judgment rather than a specific algorithm. Our study has defined the volume of blood transfused in the OR and ICU that is associated with increased morbidity. We will integrate these volumes into a new blood transfusion algorithm with the goal of reducing blood transfusions and morbidity.

Notes

8:15 AM – 10:15 AM ***Grand Ballroom 7B***

General Thoracic Session: Esophageal

Moderators: *Shanda H. Blackmon, Houston, TX, and David T. Cooke, Sacramento, CA*

COMMERCIAL RELATIONSHIPS S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau/Honoraria, Covidien

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

8:15 AM ***Grand Ballroom 7B***

Short-term Outcomes Using the Magnetic Sphincter Augmentation Device (LINX) vs Nissen Fundoplication for Medically Resistant GERD

B. E. Louie, A. S. Farivar, D. E. Shultz, E. Vallieres, R. W. Aye

Swedish Cancer Institute, Seattle, WA

COMMERCIAL RELATIONSHIPS B. E. Louie: Speakers Bureau/Honoraria, Intuitive Surgical, Inc, Merit Medical Endotek; E. Vallieres: Speakers Bureau/Honoraria, Genentech, Inc, Synthes; Consultant/Advisory Board, GlaxoSmithKline, Myriad Genetics

Purpose: The majority of patients with GERD are treated with PPIs. However, over 40% will experience incomplete relief with PPIs and suffer a reduced quality of life. Despite the limitations of PPIs, only 1% will undergo laparoscopic Nissen fundoplication (LNF) because of concerns over the invasiveness and side effects. The FDA approved implantation of a magnetic sphincter (LINX) to augment the native reflux barrier in 2012 based on single series data. We sought to compare our initial experience with LINX with LNF to provide early comparative data.

Methods: We performed a retrospective case-control study of consecutive patients undergoing either LINX or LNF who had refractory GERD, hiatal hernias <3 cm, and normal manometry. Demographic, operative, clinical, and quality of life data were collected preop, 6 weeks postop, and 6 months postop. Postop pH and manometry were performed at 6 months.

Results: A total of 56 patients underwent antireflux surgery (20 LINX:36 LNF). The groups were similar in age, gender, duration of GERD, and hernia size. There were no mortalities or morbidities. There were no erosions in the LINX group, but one patient required dilation for dysphagia. At 6-month follow-up, preoperative symptoms were abolished in both groups. Compared to baseline, both LINX and LNF demonstrated improvement in 6-month DeMeester scores, percent time pH <4 LES pressure, and relaxation pressure (Table 1). At each interval, QoLRAD improved from (5, 6, 7 vs 4, 6, 7) and GERD-HRQL improved (19, 12, 1 vs 22, 12, 3). Dysphagia worsened at 6 weeks and returned to baseline at 6 months for both groups.

Conclusions: Implantation of a magnetic sphincter augmentation device (LINX) results in symptomatic and objective control of medically resistant GERD and leads to improved quality of life. On short-term follow-up, these results are similar to those achieved by Nissen fundoplication in similar patients. LINX may be an alternative to LNF.

	Pre Op		Post Op	
	LINX	LNF	LINX	LNF
DeMeester Score	41.5	46.7	14.9	8.3
% time pH < 4	7 .2	12.9	5.2	2.4
LES pressure (mmHg)	23	20	27	26
LES Relaxation (mm Hg)	9	7	15	7

8:30 AM **Grand Ballroom 7B**

Evidence of Neoadjuvant Treatment Response in Pathologically Negative Lymph Nodes Is Associated With Worse Survival for Early Stage Adenocarcinoma Patients Undergoing Esophagectomy

D. Nieman, W. Cao, M. D. Lunt, M. J. Lada, M. S. Han, P. Timratana, C. Peyre, C. E. Jones, T. J. Watson, J. Peters

University of Rochester, NY

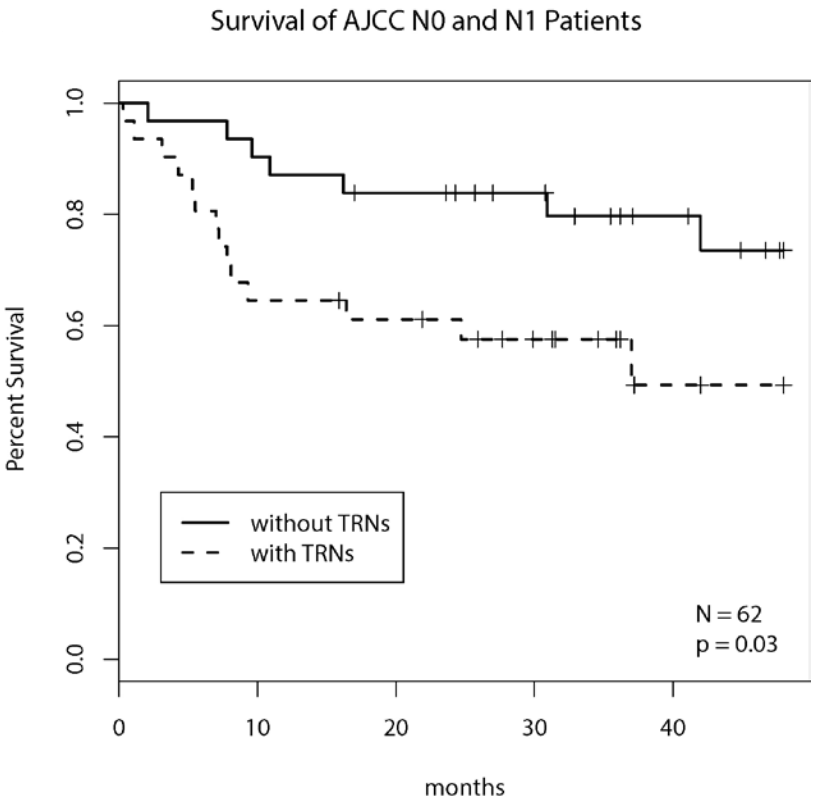
COMMERCIAL RELATIONSHIPS J. Peters: Research Grant, C2 Therapeutics, Torax Medical, Inc; Consultant/Advisory Board, Torax Medical, Inc

Purpose: The current AJCC pathological staging for esophageal adenocarcinoma (EAC) is derived from the experience of patients undergoing esophagectomy alone and has unclear relevance in patients having received neoadjuvant therapy. Lymph nodes with evidence of neoadjuvant treatment effect without residual cancer cells may mark the prior spread of tumor. These nodes are occasionally noted, but not conventionally counted in pathology reports.

Methods: All patients who underwent esophagectomy after completing neoadjuvant therapy for EAC at our institution between 2006 and 2012 were reviewed. Pathology slides were re-examined for locoregional treatment response nodes (TRNs) lacking viable cancer cells, but with evidence of acellular mucin, necrosis, central fibrosis, or calcifications suggesting prior tumor involvement. Kaplan-Meier (KM) survival functions were estimated. Cox proportional hazards regression models were used to compare staging models.

Results: Ninety patients underwent esophagectomy after neoadjuvant therapy for EAC (82/90 male, mean age 61.8 ± 8.9 years). KM median survival was 55.6 months and 5-year survival was 35% (CI 19-62%). All patients received cisplatin and 5-flourouracil. Fifty patients received radiation therapy. 38/90 patients (18/39 N0, 13/23 N1, 4/16 N2, 3/12 N3) had a total of 100 TRNs. For 62 N0-N1 patients, presence of TRNs was associated with significantly worse survival (Graph; p = 0.03). Adjusting for patient age and AJCC stage, the detection of TRNs portended a significantly increased risk of mortality at 5 years (HR 2.7; CI 1.1-6.9; p=0.037). When modeling stage adjusted survival, counting TRNs as positive offered a better model fit (p=0.0055) than neglecting them (p=0.011).

Conclusions: TRNs provide valuable prognostic information, particularly for early stage cancers. The current practice of ignoring them likely results in consistent pathological understaging; it is likely more appropriate to count them as positive.


Survival of AJCC N0 and N1 Patients
Percent Survival
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
months
without TRNs
with TRNs
N = 62
p = 0.03

Notes

8:45 AM **Grand Ballroom 7B**

Outcome With Colon Interposition 10 to 38 Years After Esophagectomy

C. L. Greene, S. R. Demeester, S. G. Worrell, D. S. Oh, J. A. Hagen, T. R. Demeester

Keck School of Medicine of the University of Southern California, Los Angeles

Purpose: The colon is useful for esophageal reconstruction but the long-term frequency of regurgitation, aspiration, and graft redundancy are not well established. Our objective was to assess alimentary satisfaction and quality of life 10 or more years after colon interposition.

Methods: A chart review was performed to identify patients who underwent colon interposition before April 2003. Reflux symptoms and alimentary satisfaction were assessed by telephone interview and Gastrointestinal Quality of Life (GIQL) and SF-36 questionnaires. Results from the most recent EGD were obtained.

Results: We identified 79 surviving patients and follow-up was obtained from 61 patients. The indication for esophagectomy was cancer in 44 and benign disease in 17 patients. The esophagectomy was vagal sparing in 49%, en-bloc in 38%, and transhiatal in 7% of patients. In 84% of patients, the colon interposition was placed in the posterior mediastinum. Median follow-up was 13 years (range 10-38 years). The majority of patients (77%) had a normal weight and were free of significant gastrointestinal symptoms (Table). The median GIQL Score was 3 out of 4 and results from the SF-36 survey were above the published means in all categories. Follow-up EGD in 28 patients at a median of 6 years showed no Barrett's in the residual esophagus. Two patients have been hospitalized for aspiration. Five patients had a reoperation for colon redundancy.

Conclusions: Nutritional status, alimentary satisfaction, and quality of life were excellent 10 to 38 years after colon interposition. Hospitalization for aspiration was rare and few patients needed revision for redundancy. These results should encourage use of a colon interposition in patients expected to survive long-term after esophagectomy.

Symptoms	Never	Rare/Occasional	Daily/Weekly
Dysphagia	54 (89%)	2 (3%)	5 (8%)
Regurgitation	51 (84%)	5 (8%)	5 (8%)
Heartburn	51 (84%)	3 (5%)	7 (11%)
Dumping Symptoms	49 (80%)	4 (7%)	8 (13%)
Sweating with Meals	52 (85%)	5 (8%)	4 (7%)
Diarrhea (> 3 times per day)	43 (71%)	10 (16%)	8 (13%)
Early Satiety	37 (61%)	0	24 (39%)
Breathing Difficulties	47 (77%)	0	14 (23%)

9:00 AM *Grand Ballroom 7B*

Understanding Mortality as a Quality Indicator Following Esophagectomy

D. M. Walters, T. McMurry, J. M. Isbell, G. J. Stukenborg, B. D. Kozower

University of Virginia, Charlottesville

Purpose: Postoperative mortality is an important outcome measure following esophagectomy and the Centers for Medicare & Medicaid Services currently uses 30-day mortality as a quality indicator for this operation. However, 30-day mortality may underestimate a patient's true postoperative mortality risk, as sequelae of an operation often continue beyond the 30-day time frame. The purpose of this study was to evaluate different definitions of postoperative mortality using a large registry of patients undergoing esophagectomy for cancer.

Methods: Data were extracted from the linked SEER-Medicare registry for patients with esophageal cancer who underwent resection between 2005 and 2010. Mortality rates were compared using four different definitions of postoperative mortality: 30-day mortality, in-hospital mortality, perioperative mortality (in-hospital or 30-day), and 90-day mortality. Hierarchical logistic regression models evaluated the association between patient and tumor characteristics with survival at 30 and 90 days.

Results: We identified 1,209 patients (mean age 69 years) from 313 hospitals. The various postoperative mortality rates are shown in Table 1. The observed 90-day mortality (15.8%) was nearly twice that of 30-day mortality (8.9%) in this patient population ($p<0.001$). The most important predictors of postoperative mortality were age, CHF, HTN, DM, and disease stage ($p<0.05$).

Conclusions: There are clinically meaningful differences between postoperative mortality definitions following esophagectomy. Thirty-day mortality significantly underestimates a patient's true mortality risk as this number nearly doubles, approaching 16%, at 90 days in this elderly, Medicare population. Accordingly, 90-day rather than 30-day mortality should be used as a quality measure following esophagectomy and The Society of Thoracic Surgeons should consider reporting this measure in its General Thoracic Surgery Database.

Comparison of Mortality Definitions Following Esophagectomy

Mortality Definition	N (%)
In-hospital	107 (8.9%)
30-Day	119 (9.8%)
Perioperative	137 (11.3%)
90-Day	191 (15.8%)

$p<0.001$

9:15 AM ***Grand Ballroom 7B***

Thoracoscopic Esophagectomy in Prone vs Decubitus Position: Ergonomic Evaluation From a Randomized and Controlled Study

Y. Shen, H. Wang, M. Feng, L. Tan, J. Li, Q. Wang

Zhongshan Hospital of Fudan University, Shanghai, China

Purpose: Previously, both prone and decubitus position were applied during thoracoscopic esophagectomy. However, which position was ergonomically superior remained uncertain. In this study, we aimed to compare the surgeon's workload between the two positions in a randomized and controlled trial (NCT01194895).

Methods: From October 2012 to June 2013, 67 consecutive patients who underwent three-stage minimally invasive esophagectomy were randomly assigned to decubitus position (DP) or prone position (PP) during the thoracic stage. All operations were performed by the same senior surgeon. Objectively, the surgeon's eye blink rate would be recorded pre- and postthoracoscopic esophagectomy. Subjectively, wear-off effects of the relevant musculoskeletal system (MSS) elements were evaluated with rating scales ranging from 1-10 (1=uninfluenced; 10=maximum fatigue). Clinical characteristics, including patient demographics and operative features, were collected and compared between the two groups by means of statistical analysis.

Results: There were 35 patients in PP group and 32 patients in DP group. The two groups were comparable in patient demographics. In terms of operative features, DP group was longer in the thoracic duration than PP group (87 ± 24 min vs 68 ± 22 min, p=0.000), and the volume of blood loss was higher (89 ± 18 ml vs 67 ± 16 ml, p=0.000). After thoracoscopic esophagectomy, the surgeon's eye blink rate decreased more significantly in DP group (3.0 ± 1.4 blink/min vs 1.2 ± 0.9 blink/min p=0.001), and the MSS scale score was higher in DP (3.13 ± 2.82 vs 6.29 ± 1.54, p=0.003). No conversion to open thoracotomy was recorded in either group.

Conclusions: Thoracoscopic esophagectomy in prone position provided less workload and better ergonomic results compared with decubitus position. Further study based on larger volume of population is required to confirm these findings.

9:30 AM *Grand Ballroom 7B*

Redo Laparoscopic Repair for Failed Antireflux Procedures

G. Makdisi, F. C. Nichols, S. D. Cassivi, D. A. Wigle, K. Shen, M. S. Allen, C. Deschamps

Mayo Clinic, Rochester, MN

COMMERCIAL RELATIONSHIPS S. D. Cassivi: Other, Patent Owner, Inventor of Brachytherapy Delivery Device; M. S. Allen: Ownership Interest, Medtronic, Inc

Purpose: Since minimally invasive procedures have become common, more reoperations for failed antireflux procedures (ARP) are performed laparoscopically.

Methods: Medical records of all patients who underwent reoperation without esophageal resection following previous ARP between January 2000 and October 2012 were reviewed.

Results: 495 patients had reoperation. Laparoscopic approach was initiated in 83 (17.0%); eight (10%) converted to open repair. Seventy-five patients were included. Median age was 58 years (range, 20-88 years). Median BMI was 28.7 (range, 14-39). Initial operation was laparoscopic ARP in 65 (87%). Median interval between operations was 42 months. All patients were symptomatic. Pain was present in 66 (88%) patients, pyrosis in 55 (73%), dysphagia in 48 (64%). Esophageal dilatation was performed in nine (12%). Weight loss was observed in eight (11%) patients (median of 7.6 kg). Endoscopic findings included esophagitis in 38 (51%) and Barrett's esophagus in 11 (15%). Intraoperative findings included recurrent hiatal hernia in 37 (49%), incompetent fundoplication in 14 (19%), tight fundoplication in eight (11%), and tight crura in two (3%). Nissen fundoplication was performed in 57 (76%) patients. Wedge gastroplasty was utilized in 37 (49%). Thirteen (15%) patients had complications. Median hospitalization was 3.3 days. Median follow-up was 25 months. Improvement was observed in 70 (93%) in early postoperative follow-up and in 59 (78%) in long-term follow-up. Intermittent pain was the most common complaint in 11 (15%), followed by dysphagia in eight (11%). During follow-up, Barrett's esophagus developed in four patients (5%).

Conclusions: Laparoscopic reoperation for failed antireflux surgery is safe and effective in selected patients. Hiatal hernia and slipped wrap are the most common indications for reoperation, which might reflect inadequate crural repair or failure to identify a foreshortened esophagus at the time of the primary repair.

9:45 AM *Grand Ballroom 7B*

Regionalizing Esophageal Surgery: Lessons Learned

Sudhir Sundaresan, Ottawa, Canada

10:00 AM *Grand Ballroom 7B*

Centralization of High-Risk Cancer Services: What Are the Current Differences in Esophagectomy Services in the United States and the United Kingdom?

Donald E. Low, Seattle, WA

8:15 AM – 10:15 AM ***Grand Ballroom 8A***

General Thoracic Session: Lung Cancer II

Moderators: *Yolonda L. Colson, Boston, MA, and Anthony W. Kim, New Haven, CT*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

8:15 AM ***Grand Ballroom 8A***

Incidence of Second Primary Lung Cancers in Smokers vs Non-Smokers After Curative Resection of Stage I Lung Adenocarcinoma

R. T. Ripley, R. R. McMillan, C. S. Sima, S. M. Hasan, V. W. Rusch, N. P. Rizk, J. Huang

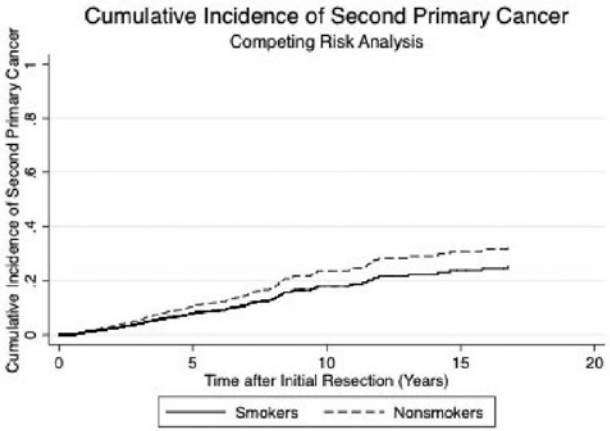
Memorial Sloan-Kettering Cancer Center, New York, NY

Purpose: Smokers are at higher risk for developing non-small cell lung cancer (NSCLC) than non-smokers, but the relative risk of each group for developing second primary lung cancers (SPLC) is unclear. Determining the risk of SPLC in smokers vs non-smokers after treatment of an initial cancer may help guide recommendations for long-term surveillance.

Methods: Patients who had undergone resection of stage I adenocarcinoma were identified from a prospectively maintained institutional lung cancer database. Patients with other histologies, synchronous lesions, or who underwent neoadjuvant or adjuvant therapy were excluded.

Results: From 1995 to 2012, 2,151 patients underwent resection for stage I adenocarcinoma. Of these, 308 (14%) were never-smokers, and 1,843 (86%) were current or former smokers. During this time period, 30 (9.7%) never-smokers and 145 (7.9%) smokers developed SPLC. SPLC were detected through surveillance CT scans in the majority of cases (161, 92%). Based on competing-risk analysis, there was no significant difference in the cumulative incidence rates (CIR) of SPLC between non-smokers and smokers (p=0.126), with a CIR at 10 years of 23.5% for never-smokers and 18.0% for smokers. Prolonged survival was observed after treatment of the SPLC with a median survival of 7.5 years from the time of its treatment.

Conclusions: Although smokers are at greater risk for NSCLC than non-smokers, the risk for developing second primary cancers after resection of stage I lung cancer in non-smokers is comparable to that of smokers. The majority of these second primary cancers are detectable at a curable stage. Postoperative surveillance on an ongoing basis should be recommended for all patients regardless of smoking status.


Cumulative Incidence of Second Primary Cancer
Competing Risk Analysis
Cumulative Incidence of Second Primary Cancer
0
.2
.4
.6
.8
1
0
5
10
15
20
Time after Initial Resection (Years)
Smokers
Nonsmokers

Notes

8:30 AM **Grand Ballroom 8A**

Lung Resection Improves Quality of Life for Patients With Symptomatic Bronchiectasis

*C. C. Vallilo, *R. M. Terra, A. W. Mariani, A. L. Albuquerque, M. M. Suesada, P. M. Pêgo-Fernandes*

University of São Paulo Medical School, Brazil

COMMERCIAL RELATIONSHIPS R. M. Terra: Consultant/Advisory Board, Johnson & Johnson

Purpose: The outcomes of the surgical treatment of bronchiectasis is a matter of debate, but quality of life (QOL), one of the most relevant results, is neglected in the majority of the studies. Our objective was to evaluate the impact of lung resection on the QOL of patients with symptomatic bronchiectasis.

Methods: Prospective cohort study, including patients with symptomatic (cough, bleeding, sputum production) bronchiectasis of tuberculous and non-tuberculous origin. All patients underwent anatomical lung resection. QOL, lung function, and cardiopulmonary function were assessed before and 9 months after surgery through SF36 instrument, espirometry, and cardiopulmonary exercise test, respectively. Paired T-Test was used to compare before and 9-month results and multivariable linear regression was used to find predictors for QOL improvement; $p<0.05$ was considered significant.

Results: Thirty-seven patients completed the protocol, 19M/18F, with a mean age of 40.97 ± 11.80 years. Out of these, 56.75% had a history of tuberculosis and the median number of compromised segments was five. They underwent the following procedures: pneumonectomy (13.51%), upper lobectomy (45.94%), middle lobectomy (24.32%), and lower lobectomy (32.43%). Postoperative complications were: empyema (1), cardiac arrhythmia (1), and pulmonary embolism (1). QOL results are depicted in Table 1. All QOL domains improved 9 months after surgery and such improvement did not correlate with lung or cardiopulmonary function variations in the same period. Multivariable regression models to predict QOL improvement showed that baseline results (Physical, p=0.001; General Health, p=0.001; Emotional, p=0.001), Tiffenau index (Physical, p=0.002), and Charlson index (Physical, p= 0.014; Emotional, p= 0.005) inversely correlated with QOL improvement.

Conclusions: The surgical treatment improves QOL of patients with symptomatic bronchiectasis.

Results of Quality-of-Life (SF-36), Lung Function, and Cardiopulmonary Tests Pre- and 9 Months Postoperatively

	Preoperative	Post 9months	p
Domains			
Functional	61.22 ± 30.85	82.70 ± 23.79	0.002
Physical	41.22 ± 40.49	82.70 ± 23.79	0.0001
General	47.08 ± 24.07	67.73 ± 25.64	0.0001
Vitality	59.86 ± 21.71	70.14 ± 20.36	0.016
Social	68.24 ± 68.40	83.11 ± 83.68	0.001
Emotional	46.83 ± 47.21	75.67 ± 76.85	0.015
Mental	63.78 ± 64.22	71 97 ± 72.64	0.048
Pain	58.8 ± 55.2	72.3 ± 71.64	0.014
FEV1	2.27 ± 0.12	2.06 ± 0.12	0.0001
peakVO2	21.42 ± 1.05	19.68 ± 0.83	0.0145

8:45 AM ***Grand Ballroom 8A***

Thoracoscopic or Open Surgery for Pulmonary Metastasectomy: An Observer-Blinded Study

J. Eckardt, P. Licht

Odense University Hospital, Denmark

Purpose: In patients with limited pulmonary metastatic disease, thoracotomy is the gold standard for metastasectomy because non-imaged nodules may be missed when bimanual palpation is restricted during thoracoscopy (VATS). Yet, against all recommendations, VATS is now used routinely for metastasectomy with therapeutic intent in 40% of thoracic surgeons surveyed—most likely because VATS technology has improved and is now used routinely in many centers for more advanced resections. The evidence base for surgical approach in metastasectomy is limited to case-series and registries, which prompted us to conduct a prospective observer-blinded study with high-definition (HD) VATS.

Methods: All patients with limited pulmonary metastatic disease on chest CT considered for surgical resection were scheduled for EBUS to exclude metastatic lymph nodes before surgery. HD-VATS and digital palpation was performed by one surgical team followed by immediate thoracotomy with bimanual palpation and resection by a different surgical team. CT evaluations and surgical results were blinded and the primary endpoint was number of lesions detected.

Results: During a 2-year period, 72 patients were included. 112 elements suspicious of metastatic disease were visible on CT. Ninety-nine of these were palpable during VATS (88%) and all were identified at thoracotomy. In addition, 50 new and unexpected lesions were identified during thoracotomy: 20 were metastases (40%), 29 were benign (58%) lesions, and one (2%) was a primary lung cancer.

Conclusions: Even in a high-volume center with HD-VATS, non-imaged and therefore unexpected nodules were frequent during subsequent observer-blinded thoracotomy. 40% of these were malignant and would have been missed if VATS was used exclusively for metastasectomy. Whether or not this has any impact on survival is unknown and also depends on subsequent clinical decisions if new metastases appear during follow-up.

9:00 AM **Grand Ballroom 8A**

VATS Lobectomy Has Better Perioperative Outcomes than Open Lobectomy: Ancillary Analysis of CALGB 140202 (Alliance)

C. Nwogu[1], J. D'cunha[2], H. Pang[3], L. Gu[3], X. Wang[3], W. G. Richards[4], L. Veit[5], T. L. Demmy[1], D. J. Sugarbaker[4], L. J. Kohman[5], S. J. Swanson[4]

[1]Roswell Park Cancer Institute, State University of New York at Buffalo, [2]University of Pittsburgh Medical Center, PA, [3]Alliance Statistics and Data Center, Duke University Medical Center, Durham, NC, [4]Brigham and Women's Hospital, Harvard Medical School, Boston, MA, [5]The State University of New York Upstate Medical Center, Syracuse

COMMERCIAL RELATIONSHIPS S. J. Swanson: Consultant/Advisory Board, Covidien, Ethicon, Inc

Purpose: The short-term superiority of video-assisted thoracoscopic surgery (VATS) lobectomy compared to open lobectomy for early stage lung cancer has been suggested by single institution studies. Lack of equipoise limits the feasibility of a randomized study to confirm this. This analysis was performed to investigate the hypothesis that VATS lobectomy results in shorter hospital length of stay and fewer perioperative complications compared to open lobectomy in Stages I and II non-small cell lung cancer in a multi-institutional setting.

Methods: 519 patients (282 VATS and 237 Open) whose tumors had been collected as part of CALGB 140202 (The Lung Cancer Tissue Bank) were identified to be eligible. Propensity scoring, using age, race, gender, performance status, histology type, pathologic stage, and tumor size as independent variables, was used to create a 1:1 matched group of 175 pairs of patients. McNemar's test for binary and Wilcoxon signed-rank test for continuous variables were used to assess any differences in length of hospital stay, perioperative complications, and discharge dispositions between the groups. An exploratory comparison of failure-free and overall survival between the two operative approaches was done using the log-rank test. All p-values <0.05 were considered significant.

Results: As shown in Table 1, the matched data on length of hospital stay, perioperative complications, and discharge dispositions significantly favored the VATS group. There was no statistically significant difference in failure-free and overall survival between the two operative approaches with a median follow-up of 60 months.

Conclusions: This multi-institutional study supports the assertion that thoracoscopic lobectomy results in shorter hospital length of stay, fewer perioperative complications, and greater likelihood of independent home discharge compared to open lobectomy for early stage lung cancer.

Table 1. Endpoints – Matched Data

	Open (N=175)	VATS (N=175)	Total (N=350)	p value
Length of Hospital Stay Mean (SD) Median	8.0 (6.0) 6.0	5.4 (4.7) 4.0	6.7 (5.5) 5.0	<0.0001
Any Surgical Procedure Complication Yes No	44 (25.1%) 131 (74.9%)	26 (14.9%) 149 (85.1%)	70 (20.0%) 280 (80.0%)	< 0.0001
Discharge Disposition Home Others	158 (90.3%) 17 (9.7%)	164 (93.7%) 11 (6.3%)	322 (92.0%) 28 (8.0%)	< 0.0001

9:15 AM ***Grand Ballroom 8A***

Disease-Free Survival After Pulmonary Metastasectomy for Colorectal Carcinoma Is Affected by the Primary Tumor Location

J. Cho, M. Hamaji, S. D. Cassivi, F. C. Nichols, M. S. Allen, D. A. Wigle, C. Deschamps

Mayo Clinic, Rochester, MN

COMMERCIAL RELATIONSHIPS S. D. Cassivi: Other, Patent Owner, Inventor of Brachytherapy Delivery Device; M. S. Allen: Ownership Interest, Medtronic, Inc

Purpose: Rectal cancer has a higher risk of developing lung metastasis compared to colon cancer. It is unclear whether this increased incidence portends a worse prognosis after pulmonary metastasectomy.

Methods: Patients who underwent surgical resection of colorectal metastases in the lung were analyzed for survival and patterns of recurrence depending on the location of the primary colorectal cancer. Multivariate regression analysis was performed to identify clinical variables predictive of survival following pulmonary metastasectomy.

Results: Between 1985 and 2012, 698 patients underwent resection of colorectal metastatic lung tumors. Complete information was available in 626. These patients were divided into groups based on whether the primary tumor was colon or rectal in origin. Median follow-up was 45.5 months (range, 0-287 months). There were no statistical differences between the two groups in terms of number of tumors, tumor size, or lymph node involvement. There was no difference in overall survival (p= 0.545). Five-year disease-free survival for colon cancer patients was 67.2% compared to 60.1% for rectal cancer (p=.004). The most common site of recurrence after pulmonary metastasectomy was the liver in colon cancer and the lung in rectal cancer. Multivariate Cox proportional hazards analysis indicated that rectal cancer (hazard ratio [HR], 1.39; 95% confidence interval [CI], 1.07 to 1.83; p=0.015) and multiple nodules (greater than three) (HR, 1.41; 95% CI, 1.04 to 1.89; p= 0.027) were independent adverse risk factors affecting disease-free survival after pulmonary metastasectomy.

Conclusions: Disease-free survival and site of recurrence after pulmonary metastasectomy for colorectal carcinoma is dependent on the site of the primary tumor. Lung metastases from rectal cancer have a worse prognosis than colon cancer and recur most often in the lung compared to the liver for colon cancer. This could influence treatment and follow-up strategies.

9:30 AM ***Grand Ballroom 8A***

Cost-Effectiveness of Initial Diagnostic Strategies for Solitary Pulmonary Nodules Presenting to Thoracic Surgeons

*W. T. Davis[1], E. A. Green[1], O. Rickman[1], S. A. Deppen[1], M. C. Aldrich[1], S. Fletcher[1], J. B. Putnam[1], *E. L. Grogan[2]*

[1]Vanderbilt University Medical Center, Nashville, TN, [2]Veterans Hospital, Nashville, TN

Purpose: Patients often present to thoracic surgeons for diagnosis of solitary pulmonary nodules (SPN). Navigation bronchoscopy (NB), CT-FNA, FDG-PET, and VATS are potential initial diagnostic options. We sought to determine the most cost-effective initial diagnostic strategy for a 1.5-2 cm SPN.

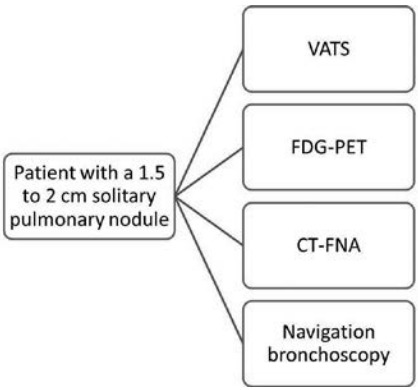
Methods: A decision analysis model from the societal perspective was developed to assess the costs and consequences of NB, CT-FNA, FDG-PET, and VATS as the initial diagnostic strategy for the workup of a patient with a 1.5-2 cm SPN with either a 50% or 65% probability of cancer. If either NB or CT-FNA was non-diagnostic in the base case with a 65% probability of cancer, then 85% of patients were assumed to undergo VATS and 15% underwent continued surveillance. 2011 US Medicare reimbursement rates were used for costs. Quality adjusted life years (QALYs) were estimated using the survival based on pathologic staging and utilities derived from the literature.

Results: At a 65% probability of cancer, tissue acquisition strategies of NB and CT-FNA are the most cost-effective (Table 1). CT-FNA and NB strategies had nontherapeutic VATS resection rates of less than 14%, compared to 35% for VATS alone, despite an aggressive strategy to operate on patients with nondiagnostic aspirations. At a 50% pretest probability for malignancy, NB, CT-FNA, and FDG-PET had similar cost-effectiveness, and VATS was costly with a high rate of nontherapeutic wedge resections. NB, CT-FNA, and VATS were more cost-effective than FDG-PET when FDG-PET specificity was less than 58% in sensitivity analyses.

Conclusions: The NB and CT-FNA diagnostic strategies are more cost-effective than either VATS or FDG-PET strategies in high-risk lesions resulting in fewer nontherapeutic operations, even if VATS is done after nondiagnostic biopsies. FDG-PET scan for diagnosis of lung cancer may not be cost-effective in regions of the country where FDG-PET specificity is low due to infectious lung diseases.

Cost-Effectiveness of Diagnostic Strategies

65% probability of malignancy	VATS	PET	CT-FNA	ENB
Cost ($)	12,665	11,134	11,555	11,429
QALYs	14.15	14.10	14.17	14.17
Nontherapeutic VATS resection rate	35%	10.6%	13.2%	11.7%
50% probability of malignancy	VATS	PET	CT-FNA	ENB
Cost ($)	12,466	9,722	9,497	9,511
QALYs	15.54	15.51	15.51	15.49
Nontherapeutic VATS resection rate	50%	15.1%	11.4%	10.8%



Notes

9:45 AM **Grand Ballroom 8A**

Stage-Specific Differences in Patterns of Recurrence and Their Mode of Detection in Early Stage vs Locally Advanced Non-Small Cell Lung Cancer

F. Lou[1], V. W. Rusch[2], J. Huang[2]

[1]The State University of New York Downstate Medical Center, [2]Memorial Sloan-Kettering Cancer Center, New York, NY

Purpose: The benefits of screening for non-small cell lung cancer (NSCLC) have been established for high-risk individuals, and recent guidelines have advocated continued surveillance after curative therapy. Yet the optimal post-treatment surveillance strategy remains unclear. We compared patterns of recurrence and modes of detection in patients with early stage vs locally advanced NSCLC.

Methods: Consecutive patients who had undergone resection for stage I-IIIA NSCLC were identified from a prospectively maintained institutional NSCLC database. All patients received interval chest CT scans every 6-12 months post-treatment.

Results: From 2004 to 2009, 1,640 patients were identified; 181 of 346 patients with stage IIIA NSCLC (52%) and 257 of 1,294 patients with stage I-II NSCLC (20%) developed recurrences. Asymptomatic recurrences were detected by surveillance CT scans in 157 stage I-II patients (61%) but in only 89 stage III patients (49%) (p=0.04). However, symptoms led to detection of recurrences more often in stage III patients (73 [40%]) than in stage I-II patients (81 [32%]). Distant metastases made up a greater proportion of recurrences in stage III patients (153 [85%] vs 112 [44%] for stage I-II; p=0.008), whereas locoregional-only recurrences were more frequent in stage I-II patients (67 [26%] vs 28 [15%] for stage III). Although the risk of recurrence in stage IIIA patients was highest in the first 2 years, it remained substantial into year 4 (Figure).

Conclusions: Patients with stage IIIA NSCLC less often had recurrences detected on surveillance scans and more often presented with symptoms between scans, compared with patients with early stage disease. Stage IIIA patients had a markedly higher risk of recurrence and a higher propensity for distant relapse, and this risk was not limited to the first 2 years. Strategies for surveillance may need to account for stage-specific differences.

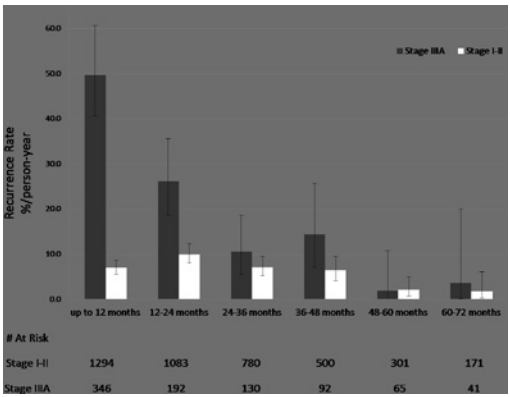


Figure. Comparison of recurrence rates after surgical resection for NSCLC

10:00 AM *Grand Ballroom 8A*

The Outcome Measure 30-Day Mortality Underestimates Risk of Early Mortality After Major Resections for Thoracic Malignancies

R. R. McMillan, C. S. Sima, F. Lou, J. Dycoco, N. P. Rizk, V. W. Rusch, J. Huang

Memorial Sloan-Kettering Cancer Center, New York, NY

Purpose: Thirty-day mortality is a commonly reported outcome measure in national databases such as the STS National Database and the National Surgical Quality Improvement Program. These measures are often cited when presenting risks to patients in informed consent discussions. Given the nature of these operations, and the fact that these patients are often older and carry comorbidities, we hypothesized that 30-day mortality underrepresents the true perioperative risk faced by patients undergoing resections for thoracic malignancies. As the Medicare global period encompasses 90 days postoperatively, we compared mortality rates at 90 vs 30 days across several operations for different thoracic malignancies.

Methods: Review of institutional prospectively collected lung and esophageal cancer and mesothelioma databases of consecutive patients undergoing resections.

Results: From 1999 to 2012, 7,665 surgical resections were performed for lung cancer (6,115), esophageal cancer (1,257), or mesothelioma (293). Among the different cancers and across various operations, on average, the additional mortality incurred in the time period from day 31 to day 90 (1.52%, CI 1.26-1.82; n=115) was similar to the mortality occurring by day 30 (1.24%, CI 1.00-1.51; n=95), resulting in an overall 90-day mortality (2.74%, CI 2.39-3.13, n=210) that was more than double that of the 30-day mortality.

Conclusions: Mortality at 90 days is significantly higher than that observed at 30 days across multiple different thoracic cancer operations. Ninety-day mortality should be used as the primary measure for mortality in national databases and when presenting surgical risk to patients.

Perioperative Mortality Among Thoracic Resections

	30-Day Mortality	31-90-Day Mortality	Total 90-Day Mortality
Sublobar (1,580)	0.70%, CI 0.35-1.24%	0.70%, CI 0.35-1.25%	1.39%, CI 0.87-2.10%
Lobectomy (N=4,222)	0.85%, CI 0.6-1.18%	1.15%, CI 0.85-1.52%	1.99%, CI 1.59-2.46%
Pneumonectomy (N=313)	2.56%, CI 1.11-4.97%	1.97%, CI 0.73-4.23%	4.47%, CI 2.47-7.39%
Esophagectomy (N=1,257)	2.70%, CI 1.88-3.76%	2.78%, CI 1.93-3.86%	5.41%, CI 4.23-6.80%
Extrapleural Pneumonectomy (N=154)	3.24%, CI 1.06-7.41%	8.72%, CI 4.73-14.46%	11.69%, CI 7.08-17.84%
Pleurectomy/Decortication (N=139)	0.72%, CI 0.02-3.94%	2.17%, CI 0.45-6.22%	2.88%, CI 0.79-7.20%

8:15 AM – 10:15 AM ***Grand Ballroom 1-3***

Patient Safety Symposium: Safely Adopting New Technology in Cardiothoracic Surgery

Cardiothoracic surgeons constantly face the challenge of how to safely incorporate new technologies into their practice. Certain technologies, such as robotic surgery and transcatheter aortic valve replacement (TAVR), mandate the acquisition of advanced skills and also carry the potential for significant morbidity. Using these two examples, this symposium will explore the following questions:

1. How is the training and credentialing process defined for new technology?
2. To what degree should industry or government agencies be responsible for credentialing and ensuring patient safety?
3. Should the early adoption of new technology be restricted to "centers of excellence"?

Learning Objectives

Upon completion of this activity, participants should be able to:

- Outline the steps required for a center to perform TAVR
- Understand the role of government agencies in regulating the adoption of new surgical technology
- Recognize the complexities of the credentialing process for new technology and the roles that national societies and hospitals play in this process
- Describe the steps that an individual surgeon can take to maximize patient safety while adopting new technology

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of lectures and an interactive panel discussion.

Moderators: *Raja M. Flores, New York, NY, and Richard I. Whyte, Boston, MA*

Session I: Regulation and Credentialing of New Procedures

8:15 AM **Introductory Remarks**
Michael S. Kent, Boston, MA

8:20 AM **Regulation of New Technology: Perspective of Hospital Administration**
Richard I. Whyte, Boston, MA

8:30 AM **What Is the Role of National Societies in Credentialing Surgeons?**
John S. Ikonomidis, Charleston, SC

8:40 AM **Should Industry Be Responsible for Training Surgeons?**
Thomas A. Vassiliades, Mounds View, MN
COMMERCIAL RELATIONSHIPS T. A. Vassiliades: Employment, Medtronic, Inc

8:50 AM **Panel Discussion**

Session II: How to Safely Adopt New Technology—The Surgeon's Perspective

9:05 AM **Learning Robotic Cardiac Surgery**
Joe William R. Bolton, Fresno, CA

9:20 AM **Challenges of VATS Lobectomy**
Raja M. Flores, New York, NY

9:35 AM **Innovation and Congenital Cardiac Surgery**
Christopher A. Caldarone, Toronto, Canada

9:50 AM **Panel Discussion**

8:15 AM – 10:15 AM ***Grand Ballroom 8B***

STS/EACTS: Repair of Type A Aortic Dissection

This new session is the result of a collaborative effort between STS and EACTS to produce stimulating content on important issues in thoracic aortic surgery. This year's session will concentrate on dilemmas faced by all cardiac surgeons who repair acute type A aortic dissections.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Explain the rationale for robust classic proximal aortic reconstruction in acute type A dissection
- Evaluate when to proceed with more extensive treatment options in acute type A dissection
- Identify when to choose an aortic root replacement (Bentall) during the treatment of acute type A dissection

The physician competencies addressed in this session are patient care, medical knowledge, and interpersonal and communication skills. These physician competencies will be addressed through a series of collaborative lectures by members of The Society of Thoracic Surgeons and the European Association for Cardio-Thoracic Surgery.

Moderators: *Joseph E. Bavaria, Philadelphia, PA, and Martin Czerny, Zurich, Switzerland*
COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc

8:15 AM ***Grand Ballroom 8B***

Introduction

Joseph E. Bavaria, Philadelphia, PA, and Martin Czerny, Zurich, Switzerland
COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc

8:20 AM *Grand Ballroom 8B*

Aortic Root Surgery Improves Long-term Survival After Acute Type A Aortic Dissection

I. Hysi[1], O. Fabre[2], F. Juthier[1], O. Fouquet[3], N. Rousse[1], A. Prat[1], A. Vincentelli[1]

[1]Centre Hospitalier Universitaire de Lille, France, [2]Centre Hospitalier de Lens, France, [3]Centre Hospitalier Universitaire d'Angers, France

Purpose: Whether aortic root surgery improves late survival in acute type A aortic dissection compared to supracommissural replacement of the ascending aorta has to be demonstrated.

Methods: Between 1990 and 2010, 224 patients underwent emergency surgical operations for acute type A dissection. Supracommissural replacement of the ascending aorta (SCR, group I) or aortic root surgery (ARS, group II) were performed. We have followed the long-term outcome of those two groups of patients.

Results: 144 patients were operated on with SCR and 82 with ARS (including 77 Bentall procedures and 5 Tirone David operations). Aortic cross-clamp was longer in group II (150 vs 103 min, p<0.05). Overall 90-day mortality was lower in group II (27.7% vs 34.7%, p 0.027). Mean follow-up was 9.1 years. Ten-year survival was higher in group II (85.7% vs 65.9%, p 0.03). Ten-year freedom from proximal reintervention was significantly lower in group II (93.4% vs 82.9%, p 0.02). In a multivariate analysis, aortic root surgery was a protective factor from reoperation (OR: 0.26, 95% CI [0.12-0.70], p=0.005).

Conclusions: Our study suggests that complete aortic root replacement in type A dissection has improved short- and long-term survival and has decreased the rate of late reoperation. In our experience, aggressive management of the proximal aorta has improved the long-term outcome of the patients with acute type A dissection compare to a supracommissural ascending aorta replacement.

8:35 AM ***Grand Ballroom 8B***

Ascending Hemi-Arch Replacement With Valve Re-Suspension Is the Preferred Approach in Classic Type A Dissection

G. Michael Deeb, Ann Arbor, MI

8:55 AM ***Grand Ballroom 8B***

Long-term Results of Neo-Media Sinus Valsalva Reconstruction in 525 Patients With Type A Aortic Dissection

B. Rylski, R. K. Milewski, J. E. Bavaria, G. Moser, P. Moeller, W. Y. Szeto, P. Vallabhajosyula, A. Pochettino, N. D. Desai

Hospital of the University of Pennsylvania, Philadelphia

COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc; W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc

Purpose: Preservation of non-aneurysmal aortic root whenever it is technically possibly in aortic dissection type A (ADA) is controversial. The aim of this investigation was to present long-term results of sinus Valsalva repair in ADA.

Methods: From 1993 to 2012, 525 (46% males, median age 63 ± 14 years) of 697 patients operated on for ADA at one center underwent aortic valve resuspension, reinforcement of the residual sinus of Valsalva with a Teflon felt "neo-media," and sinotubular junction normalization. Median follow-up was 3.4 ± 4.0 years (2,056 patient-years).

Results: In-hospital mortality was 11% (57/525). Survival was 93 ± 1%, 54 ± 3%, and 24 ± 3% at 1, 5, and 10 years, respectively. Freedom from proximal aortic reoperation was 99 ± 0%, 97 ± 1%, and 92 ± 3% at 1, 5, and 10 years, respectively. Fifteen patients required proximal reoperation: three for severe aortic regurgitation, seven for pseudaneurysm, and five for both aortic regurgitation and pseudaneurysm. In-hospital and 1-year mortality after reoperation were 20% (3/15) and 27% (4/15), respectively. Logistic regression analysis revealed that cardiac tamponade (OR 2.98, 95% CI 1.01-4.13, P=0.022), moderate or severe aortic regurgitation (OR 2.04, 95% CI 1.01-4.13, P=0.046), cerebral malperfusion (OR 5.13, 95% CI 2.05-12.9, P<0.001), and cardiopulmonary bypass time (OR 1.01, 95% CI 1.01-1.02, P=0.001) were independent predictors for in-hospital mortality after the primary surgery.

Conclusions: Aortic root preservation in ADA patients warrants very low in-hospital mortality. The results are durable; however, the proximal reoperation remains significant morbid procedure.

9:10 AM ***Grand Ballroom 8B***

Hybrid Two-Stage Repair of Type A Acute Aortic Dissection With Lupiae Technique: Mid-term Results

G. Esposito, S. Bichi, P. Pellegrino, M. Redaelli, D. Patrini, C. Poloni, P. Gerometta, G. Valerio, G. Cappabianca

Humanitas Gavazzeni, Lecce, Italy

COMMERCIAL RELATIONSHIPS P. Gerometta: Consultant/Advisory Board, Baxter

Purpose: The long-term prognosis after type A acute aortic dissection (AAD) surgery remains disappointing as patency of the descending aorta false lumen is little affected by the surgical outcome of the "conventional" primary proximal repair. We present the mid-term results of a hybrid, two-stage technique (Lupiae Technique) aimed to reduce the risk of late expansion of the residual false lumen.

Methods: From December 2005 to December 2012, 67 patients with AAD were treated with an ascending aorta and proximal arch replacement associated with a rerouting of the epiaortic vessels (EAV). The left subclavian artery (LSA) was involved in the rerouting in 27/67 patients (40.3%). The EAV rerouting creates a long and stable Dacron landing zone "zero" suitable for further subsequent endovascular intervention, if necessary. Postoperatively, 35 of the surviving 61 patients with a patent or partially thrombosed false lumen >22 mm or a descending aorta >46 mm and 3/61 with signs of visceral malperfusion underwent the implant endovascular stent grafts into the descending aorta.

Results: Six patients (8.95%) died after the first procedure. One patient died after the endovascular stage. No patients experienced stroke or paraplegia. The 7-year follow-up survival was 98%. The obliteration of false lumen was obtained in 93.9% of patients with preserved perfusion of the visceral vessels from the true lumen in all of them.

Conclusions: In patients with acute type A AAD, the rerouting of EAV associated to ascending aorta and proximal aortic arch replacement, using a multibranched Dacron graft prosthesis, can be safely performed. This technique creates a long and stable landing zone "zero" that can be easily used for the deployment of endovascular stent grafts in case of distal false lumen expansion.

9:25 AM ***Grand Ballroom 8B***

Mid-term Results of David V Valve-Sparing Aortic Root Replacement in Acute Type A Aortic Dissection

B. G. Leshnower, L. McPherson, E. P. Chen

Emory University School of Medicine, Atlanta, GA

COMMERCIAL RELATIONSHIPS B. G. Leshnower: Speakers Bureau/Honoraria, Medtronic, Inc, St Jude Medical, Inc

Purpose: The David V valve-sparing aortic root replacement (David V) is an established therapy for root pathology and has been shown to provide excellent long-term valve function and low rates of valve-related complications in the elective setting. The safety and long-term durability of the David V in the emergent setting of acute type A aortic dissection (Type A) is presently unclear. In this study, the mid-term results of performing a David V in the setting of a Type A were analyzed.

Methods: In a single US academic medical center, 195 patients underwent a David V from 2005 to 2013. Outcomes were analyzed in 42 consecutive patients undergoing a David V in the setting of Type A. Patients were followed prospectively and had annual postoperative echocardiograms. The average period of follow-up was 29 months and ranged from 1-72 months. Follow-up was 79% complete.

Results: There were two operative deaths (4.8%). Two additional patients died in the follow-up period of non-cardiac causes for an overall patient survival of 90%. Hypothermic circulatory arrest was used in 93% of patients for arch reconstruction, with six patients undergoing total arch replacement. The average age of the type A patients was 45 years. Cusp repair procedures were performed in six cases. 52% of patients had ≥3+ aortic insufficiency (AI) on the baseline TEE. Seven patients left the operating room with trace AI (17%) and the remainder of the patients had no AI (83%) after surgery. No patient in the follow-up period developed subsequent endocarditis or required aortic valve replacement. At mid-term follow-up, freedom from >2+ AI was 98%, and freedom from aortic valve replacement was 100%.

Conclusions: The David V can be safely and effectively performed with acceptable operative risk in young patients presenting with acute type A and root pathology requiring root replacement. At mid-term follow-up, valve function is durable and the incidence of valve-related complications is low.

9:40 AM *Grand Ballroom 8B*

Unilateral vs Bilateral Cerebral Perfusion in Patients With Acute Type A Aortic Dissection: A Valuable, Simple Solution to a Complex Problem

O. A. Preventza[1], K. H. Simpson[2], D. A. Cooley[1], L. D. Cornwell[2], F. G. Bakaeen[2], S. Omer[2], K. I. de la Cruz[1], J. S. Coselli[1]

[1]Texas Heart Institute at St Luke's Episcopal Hospital, Baylor College of Medicine, Houston, [2]Michael E. DeBakey Veterans Affairs Medical Center, Houston, TX

COMMERCIAL RELATIONSHIPS O. A. Preventza: Other, W. L. Gore & Associates, Inc, Travel Sponsorship; F. G. Bakaeen: Other, Speaker at CME event organized by Voxmedia and Medscape and sponsored by AstraZeneca; Research Grant, VA Cooperative Studies Program; Other Research Support, The Michael E. DeBakey VA Medical Center Cardiovascular Center of Excellence; J. S. Coselli: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Other, Medtronic Inc, Research trial committees, Vascutek Ltd, Royalties Coselli-branched graft for TAAA repair; Research Grant, Medtronic, Inc, W. L. Gore & Associates, Inc

Purpose: Antegrade cerebral perfusion (ACP) has become standard in the treatment of complex aortic pathology and has included both unilateral (u-ACP) and bilateral (b-ACP) techniques. Focusing on proximal acute aortic dissection, we investigated the clinical effect of u-ACP vs b-ACP.

Methods: From January 2005 to May 2013, 157 consecutive patients presented with acute type A aortic dissection. Antegrade cerebral perfusion was used in 153 patients (97.4%). Eighty-nine patients received u-ACP (58.2%) and 63 patients received b-ACP (41.2%). No retrograde cerebral perfusion was used. The target systemic hypothermia temperature during ACP was 22-24°C. Mean ACP time, cardiopulmonary bypass (CPB) time, and cardiac ischemia time were 34.77 ± 20.03, 131.31 ± 62.77, and 94.83 ± 39.69 minutes, respectively.

Results: P-values from logistic regression models indicated that in both groups, CPB time and cardiac ischemia time predicted hospital mortality (p=0.0033 and p=0.035) but ACP time did not (p=0.071). None of these times was associated with stroke. The operative mortality was 13.5% for u-ACP patients (n=12) and 12.7% (n=8) for b-ACP patients (p=0.89). Of the surviving patients (87 u-ACP and 62 b-ACP), 13 u-ACP (14.9%) and eight b-ACP (12.9%) patients had a postoperative stroke (p=0.72). Temporary neurologic dysfunction (TND) was present in 10 u-ACP (11.5%) and five b-ACP (8.1%) patients (p=0.51). Postoperative renal failure occurred in 10 u-ACP (11.5%) and 10 b-ACP patients (16.1%) (p=0.41).

Conclusions: This is one of the largest single-center studies of the efficacy of u-ACP and b-ACP in patients with type A aortic dissection. We found similar operative mortality, stroke, TND, and renal failure rates in the two groups. In this intrinsically complex disease, survival is the most important outcome. u-ACP may provide the cardiac surgeon with valuable technical simplicity during a challenging surgical procedure.

9:55 AM *Grand Ballroom 8B*

Acute Type A Dissection Should Be Treated With a More Extensive Aortic Solution at the Initial Procedure

Martin Grabenwoger, Vienna, Austria

11:00 AM – 12:30 PM ***Grand Ballroom 7A***

Adult Cardiac Session: Aortic Valve

Moderators: *Thomas E. MacGillivray, Boston, MA, and Alan M. Speir, Falls Church, VA*

COMMERCIAL RELATIONSHIPS A. M. Speir: Consultant/Advisory Board, Medtronic, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:00 AM ***Grand Ballroom 7A***

Minimally Invasive Aortic Valve Replacement With Perceval S Sutureless Valve Through Right Anterior Minithoracotomy Is Superior to Transcatheter Aortic Valve Implantation in High-Risk Patients: A Propensity-Matched Analysis

M. Glauber, A. Miceli, M. Murzi, D. Gilmanov, M. Ferrarini, P. Farneti, M. Solinas, A. G. Cerillo, E. Quaini

Fondazione Toscana G. Monasterio, Massa, Italy

REGULATORY DISCLOSURE This presentation will address the Sorin Perceval S sutureless valve, which has an FDA status of investigational.

Purpose: The aim of this study was to compare early outcomes and mid-term survival of patients undergoing minimally invasive aortic valve replacement through right anterior minithoracotomy (RT) with Perceval S sutureless valve vs patients undergoing transcatheter aortic valve implantation (TAVI) for severe aortic stenosis.

Methods: From October 2008 to March 2013, 269 patients with severe aortic stenosis underwent either RT with Perceval S sutureless valves (n=159 patients, 66.2%) or TAVI (n=91, 33.8%: 44 transapical and 47 transfemoral). Of these, 37 patients undergoing RT with Perceval S valve were matched to a TAVI group by propensity score.

Results: Baseline characteristics were similar in both groups (mean age 79 ± 6 years) and the median EuroSCORE was 14% (range 9-20). In-hospital mortality was 8.1% (n=3) in the TAVI group and 0% in the RT group (p=0.25). Incidence of stroke was 5.4% (n=2) vs 0% in the TAVI and RT group. In the TAVI group, 16.2% (n=6) had moderate and 56.8% (n=21) had mild paravalular leakage, whereas 5.4% (n=2) had mild paravalvular leakage in the RT group (p<0.001). At a median follow-up of 10 (range 4-17) months, survival was better in patients undergoing RT compared to those undergoing TAVI (92 ± 6% vs 62 ± 9%, p= 0.059).

Conclusions: Minimally invasive aortic valve replacement with Perceval S sutureless valves through RT is associated with better early outcomes and mid-term survival compared to TAVI.

11:15 AM *Grand Ballroom 7A*

Better Outcome and Health Care Cost Reduction by Using Sutureless Valves: A Propensity-Matched Score Analysis

F. Pollari[1], G. Santarpino[1], A. M. Dell'Aquila[2], L. Gazdag[1], M. Alnahas[1], F. Vogt[1], S. Pfeiffer[1], T. J. Fischlein[1]

[1]Klinikum Nürnberg, Germany, [2]Universitätsklinikum Münster, Germany

COMMERCIAL RELATIONSHIPS S. Pfeiffer: Other, SORIN GROUP, Proctor; T. J. Fischlein: Consultant/Advisory Board, SORIN GROUP

Purpose: Sutureless aortic valve prostheses have the potential of shortening surgical time. However, whether shorter operative times may also result in improved patient outcomes and the impact on the hospital costs remain to be established.

Methods: From 2010, 547 patients underwent aortic valve replacement (AVR) with a bioprosthesis; of these, 112 patients received a sutureless bioprosthesis. Based on a propensity-score analysis, two groups (Sutureless and Sutured) with 82 matched-pairs were created, with comparable preoperative characteristics. Hospital outcome, follow-up, and related resources consumption of the health care system were recorded and compared.

Results: There were three hospital deaths in Sutured and two in Sutureless (p=0.65). Aortic cross-clamp, cardiopulmonary bypass, and operation time were 20%, 23%, and 16% shorter in Sutureless (each one p<0.001). Sutureless required less frequent blood transfusion (1.2 ± 1.3 vs 2.5 ± 3.7 units, p=0.005) with a similar incidence of re-exploration (2 vs 5, p=0.221). Moreover, Sutureless had a shorter intensive care unit stay (2.0 ± 1.72 vs 2.8 ± 1.3 days, p<0.001), hospital stay (11.4 ± 3.9 vs 17.3 ± 13.7 days, p<0.001), and intubation time (9.5 ± 4.6 vs 16.6 ± 6.4 hours, p<0.001) and a lower incidence of postoperative atrial fibrillation, pleura effusions, and respiratory insufficiency (p 0.015, 0.024, and 0.016, respectively). Pacemaker implantation and incidence of neurological events was not different (p>0.05). Despite not taking into account the shorter time in the operation room, the use of Sutureless valve prostheses could result—including the follow-up—in a reduction in resources consumption of about 51.9%.

Conclusions: Combining the advantage of shorter procedural times with a consequent better outcome and a correlated health care cost reduction, sutureless AVR may be the first-line treatment for patients undergoing AVR with a bioprosthesis.

11:30 AM **Grand Ballroom 7A**

Impact of Surgical Approach for Aortic Replacement on Outcomes and Cost: A Multi-Institution Analysis of "Real World" Data

E. Rodriguez[4], S. C. Malaisrie[2], J. R. Mehall[3], A. Salemi[6], G. Ailawadi[5], W. H. Ryan[9], M. Moore[8], C. Gunnarsson[7], E. A. Grossi[1]

[1]NYU Langone Medical Center, New York, NY, [2]Northwestern Memorial Hospital, Chicago, IL, [3]Penrose-St Francis Health Services, Colorado Springs, CO, [4]Saint Thomas Heart, Nashville, TN, [5]University of Virginia, Charlottesville, [6]New York Presbyterian-Weill Cornell Medical Center, NY, [7]S[2] Statistical Solutions, Inc, Cincinnati, OH, [8]Edwards Lifesciences, Inc, Irvine, CA, [9]The Heart Hospital Baylor Plano, TX

COMMERCIAL RELATIONSHIPS E. Rodriguez: Consultant/Advisory Board, Edwards Lifesciences Corporation; S. C. Malaisrie: Consultant/Advisory Board, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Abiomed, Inc; Research Grant, Medtronic, Inc; J. R. Mehall: Consultant/Advisory Board, Edwards LifeSciences Corporation; Other Research Support, AtriCure, Inc; A. Salemi: Consultant/Advisory Board, Edwards Lifesciences Corporation; Other, Edwards Lifesciences Corporation, Proctor; G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca; W. H. Ryan: Speakers Bureau/Honoraria, Edwards Lifesciences Corporation; Consultant/Advisory Board, Medtronic, Inc; M. Moore: Employment, Edwards Lifesciences Corporation; C. Gunnarsson: Consultant/Advisory Board, Funding Entity; E. A. Grossi: Consultant/Advisory Board, Edwards Lifesciences Corporation, Medtronic, Inc

Purpose: While national champions of right anterior minithoracotomy (RAT) for isolated aortic valve replacement (isoAVR) have presented their outcomes, no large multi-institutional analyses exist. To this point, a group of experienced minimally invasive cardiac surgeons analyzed a cross-section of US hospital records. The purpose of this report is to analyze "real world" outcomes of RAT as compared to sternotomy approaches.

Methods: The Premier database was queried from 2007 to 2011 for clinical and cost data for patients undergoing isoAVR. This de-identified database contains complete billing, hospital cost, and coding data from >600 US facilities with information from >25 million inpatient discharges. A set of expert rules were developed to identify patients with RAT approach and those with any sternal incision (aStern). Propensity matching created groups adjusted for baseline patient differences. Impact of surgical approach on outcomes and costs were modeled using regression analysis and where indicated after adjusting for hospital size and geographical differences.

Results: AVR was performed in 27,051 patients. Expert rule analysis positively identified isoAVR by RAT (n=1,572) and by aStern (n=3,962). Propensity matching created two balanced groups of 921 patients each. Outcomes and cost are presented in Table. RAT was more likely performed in southern hospitals (63% vs 36%; p<0.01), teaching hospitals (66% vs 58%; p<0.01), and larger hospitals (47% vs 30%; p<0.01). After adjusting for hospital differences, RAT was associated with lower total cost than aStern ($38,768 vs $42,655; p<0.01).

Conclusions: Informative outcomes analyses can be performed from hospital administrative collective databases. This conservative real world analysis (grouping full and partial sternotomies together) demonstrates mostly comparable outcomes and less total cost and board cost with RAT for AVR.

Adverse Events, Length of Stay, and Hospital Costs

	aStern (N=921) n (%)	RMT (N=92) n (%)	P value
In-hospital deaths	17 (1.9)	25 (2.7)	0.21
Neurologic Complications	27 (2.9)	24 (2.6)	0.67
All pulmonary Complications	312 (33.9)	283 (30.7)	0.15
Non-infectious	251 (27.3)	51 (5.5)	0.33
Total Infectious Complications	90 (9.8)	75 (8.1)	0.22
Sepsis and other	40 (4.3)	32 (3.5)	0.34
Wound Complications	55 (6.0)	49 (5.3)	0.55
Length of stay (mean days)	8.8	8.7	0.90
Room&Board (incl ICU) (mean)	$11,283.56	$9890.77	<0.01
Hospital Costs (LS Means)	$42,655.97	$38,768.85	<0.01

Notes

11:45 AM ***Grand Ballroom 7A***

Factors Influencing Structural Valve Deterioration of Aortic Prostheses: Implications for Valve Choice and Medical Management

N. Vakil, E. G. Soltesz, J. Rajeswaran, J. F. Sabik, L. G. Svensson, B. W. Lytle, E. H. Blackstone, D. R. Johnston

Cleveland Clinic, OH

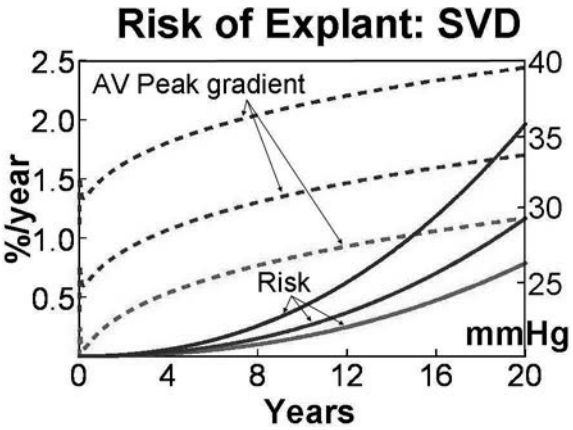
COMMERCIAL RELATIONSHIPS E. G. Soltesz: Speakers Bureau/Honoraria, St Jude Medical, Inc; Consultant/Advisory Board, Estech, Transmedics, Inc; J. F. Sabik: Consultant/Advisory Board, Medtronic, Inc, ValveXchange, Inc; Other Research Support, Abbott Vascular, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Medistem, Inc; L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax; D. R. Johnston: Consultant/Advisory Board, Baxter; Speakers Bureau/Honoraria, St Jude Medical, Inc

Purpose: Increased life expectancy and desire of patients to avoid lifelong anticoagulation creates the need to understand better bioprosthethic aortic valve (AV) failure. The purpose of this study was to determine patient, operative, and echocardiographic factors associated with AV explantation for structural valve deterioration (SVD) in a single-center, very long-term series of Carpentier-Edwards (CE) PERIMOUNT AVs.

Methods: From June 1982 to January 2011, 12,569 patients underwent AV replacement (AVR) with the Edwards LifeSciences CE PERIMOUNT stented pericardial prosthesis, models 2700 PM (n=310) or 2700 (n=12,259). Mean age was 71 ± 11 years (range 18-98). 93% had native AV disease, 48% concomitant coronary artery bypass grafting, and 26% additional valve surgery. 81,706 patient-years of data were available for analysis. Demographics, intraoperative variables, and 23,957 echocardiograms were used to identify factors associated with valve explantation for SVD and to assess longitudinal changes in transprosthesic gradients, using time-varying covariate analyses.

Results: 354 explants were observed, 41% related to endocarditis and 44% to SVD. Actuarial estimates of explantation for SVD at 10 and 20 years were 2% and 15%, respectively. Younger age ($p < 0.0001$) and higher total cholesterol ($p=0.002$) were associated with increased risk of explantation for SVD. Smaller AV size alone was not associated with higher risk of explant for SVD; however, higher postoperative peak and mean AV gradients were ($p < 0.0001$; Figure).

Conclusions: This large, very long-term study of PERIMOUNT aortic valves has identified two novel findings: the association of elevated serum cholesterol and higher AV gradients with increased SVD. Therefore, aggressive serum lipid-lowering therapy and surgical strategies aimed at decreasing AV gradients, such as aortic root enlargement and use of more efficient prostheses, may reduce SVD.



Unadjusted curves depicting the relationships between temporal trends of postop peak AV gradients and instantaneous risk of explants due to SVD. Solid lines depict risk of explants. Dash-dash lines depict three patient-specific corresponding profiles of estimated postop peak AV gradients in the 15th, 50th, and 85th percentiles.

12:00 PM ***Grand Ballroom 7A***

Best Option for Intermediate-Risk Patients

Traditional AVR: *Joseph F. Sabik III, Cleveland, OH*

Sutureless: *Michael A. Borger, Leipzig, Germany*

TAVR: *Michael J. Reardon, Houston, TX*

COMMERCIAL RELATIONSHIPS J. F. Sabik: Consultant/Advisory Board, Medtronic, Inc, ValveXchange, Inc; Other Research Support, Abbott Vascular, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Medistem, Inc; M. A. Borger: Speakers Bureau/Honoraria, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc; M. J. Reardon: Consultant/Advisory Board, Medtronic, Inc

REGULATORY DISCLOSURE M. J. Reardon: This presentation will address Medtronic's CoreValve, which has an FDA status of investigational.

11:00 AM – 12:30 PM ***Crystal Ballroom G-Q***

Adult Cardiac Session: General II

Moderators: *Joshua N. Baker, Boston, MA, and Edward P. Chen, Atlanta, GA*

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Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:00 AM ***Crystal Ballroom G-Q***

Transapical Aortic Valve Implantation: Predictors of Paravalvular Leakage and Impact on Survival in 679 Patients

A. Unbehaun, M. Pasic, T. N. Drews, S. Dreysse, A. Mladenow, R. Hetzer, S. Buz

Deutsches Herzzentrum Berlin, Germany

COMMERCIAL RELATIONSHIPS A. Unbehaun: Other, Edwards Lifesciences Corporation, Proctor; M. Pasic: Other, Edwards Lifesciences Corporation, Proctor

Purpose: In line with our institutional strategy and the "surgical way of thinking," we do not accept paravalvular leakage after transcatheter aortic valve implantation (TAVI). Apart from very limited initial experience, predictors of leakage in large cohorts are still lacking. The intention of this study was to define strategies on how to anticipate and how to avoid postprocedural regurgitation.

Methods: Since 2008, 679 patients have undergone transapical TAVI at our institution. The study group consisted of 409 female (60%) and 207 male (40%) patients. Based on the EuroScore II model, the estimated risk for surgery was 16 ± 16% (1-95%), and 5% of patients (37/679) were in cardiogenic shock.

Results: To minimize leakage after initial valve deployment, re-dilation was performed in 50/679 patients (7%) and a second valve was implanted in 16/679 (2%). The postprocedural grade of regurgitation was absent or trace in 542/679 patients (80%), mild in 131/679 (19%), and moderate in 6/679 (<1%); there was no severe postprocedural regurgitation. Patients with more than trace postprocedural regurgitation presented with smaller body mass indices ($p=0.006$) and received a larger prosthesis ($p=0.005$), with more oversizing in terms of annular area ($p<0.001$) as derived from multislice computed tomography. In patients with mild regurgitation, survival up to 5 years was identical to patients without leakage or trace regurgitation jets ($p=0.530$).

Conclusions: In transapical TAVI, the risk of relevant paravalvular leakage may be eliminated completely. There is no negative impact on survival in patients with irrelevant, lesser grades of regurgitation.

11:15 AM *Crystal Ballroom G-Q*

Aortic Valve Morphology Determines the Clinical Presentation and Surgical Approach to Type A Aortic Dissection

B. Rylski, N. D. Desai, J. E. Bavaria, G. Moser, P. Moeller, P. Vallabhajosyula, A. Pochettino, R. K. Milewski

Hospital of the University of Pennsylvania, Philadelphia

COMMERCIAL RELATIONSHIPS J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc

Purpose: Data on aortic dissection type A (ADA) in bicuspid aortic valve (BAV) syndrome patients is limited. This investigation evaluates clinical presentation, surgical management, and outcomes in ADA patients stratified according to aortic morphology.

Methods: Between March 1993 and May 2013, 697 patients (48% males, median age 61 ± 14.8 years) underwent surgery for ADA at one center. Fifty-three (8%) had BAV. BAV and tricuspid aortic valve (TAV) patients were compared. Median follow-up was 3.5 ± 4.7 years (3,166 patient-years).

Results: BAV patients were younger than those with TAV (54 ± 14.0 vs 62 ± 14.7 years, P<0.001), had higher occurrence of previous cardiac surgery (19% vs 11%, P=0.093), higher chronic dissection incidence (25% vs 8%, P<0.001), and greater aortic diameter after acute dissection onset (5.5 ± 1.0 cm vs 4.9 ± 1.0 cm, P=0.001). BAV patients more frequently required aortic root replacement (83% vs 15%, P<0.001), necessitating longer cardiopulmonary bypass and cross-clamp times (255 ± 76 vs 214 ± 62 minutes, P<0.001; 207 ± 51 vs 143 ± 50 minutes, P<0.001, respectively). Total arch replacement was performed in two BAV and 30 TAV patients (4% vs 5%, P=0.973). All others underwent hemi-arch replacement. In-hospital mortality was lower in BAV patients, however, not statistically significantly (9% vs 13%, P=0.630). Twenty-two (3%) TAV and zero BAV patients underwent proximal reoperation (P=0.338) at median follow-up of 3.2 ± 3.1 years. There was no significant difference in overall survival after adjustment for age and gender in BAV and TAV patients (60% vs 63%, P=0.194).

Conclusions: Clinical presentation and surgical approach to ADA are influenced by aortic valve morphology. BAV patients dissect at a younger age and at greater ascending aortic diameter. Extensive aortic root repair in BAV patients is not associated with higher in-hospital mortality and prevents the need for later proximal redo-surgery.

11:30 AM ***Crystal Ballroom G-Q***

Mortality Risk While Waiting for Aortic Valve Surgery

S. C. Malaisrie, E. McDonald, J. Kruse, Z. Li, A. Andrei, P. M. McCarthy

Northwestern University, Chicago, IL

COMMERCIAL RELATIONSHIPS S. C. Malaisrie: Consultant/Advisory Board, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Abiomed, Inc; Research Grant, Medtronic, Inc; P. M. McCarthy: Consultant/Advisory Board, Abbott, AtriCure, Inc, Edwards Lifesciences Corporation, MiCardia Corporation; Ownership Interest, Edwards Lifesciences Corporation

Purpose: Patients with severe aortic stenosis (AS) have a high mortality without surgical intervention. The impact of waiting time for aortic valve surgery (AVS), either aortic valve replacement or transcatheter aortic valve implantation, has not been reported.

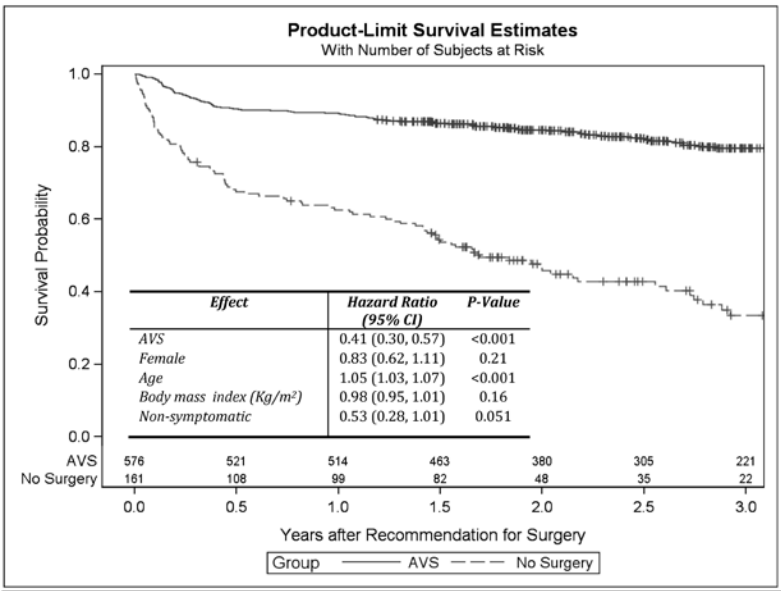
Methods: We queried echo data for diagnosis of severe AS from January 2008 to December 2011 to identify 876 patients. AVS was recommended for 737 patients (84%); 44 (5%) were advised not to have surgery, and in 95 (11%) patients, a recommendation was not available. Of those advised to undergo surgery, 567 (77%) did and 161 (23%) did not have surgery. We assessed the effect of surgery on overall survival (OS), measured from surgery recommendation date, using a Cox regression model with time-until-surgery as time-dependent covariate.

Results: The mean age of the cohort was 75.1 ± 12.2 years and 324 (44%) were female. OS from the surgery recommendation date is displayed in Figure 1. After adjusting for age, gender, body mass index (BMI), and presence of symptoms, OS was significantly higher in the AVS group (hazard ratio (HR) = 0.41, 95% CI = (0.30, 0.57), p<0.001). For patients undergoing AVS, the median (quartile 1, quartile 3) waiting time until surgery was 3.1 (1.6, 5.9) weeks. OS at these time points was 91% (96%, 84%) in the no surgery group. STS-defined AVS 30-day and operative mortality (measured from surgery date) were 4% and 5%, respectively. Among AVS patients, the waiting time from surgery recommendation date was not associated with the OS, after adjusting for age, gender, and BMI (HR=1.00, 95% CI=[0.99, 1.01], p=0.19).

Conclusions: Short-term mortality (<6 weeks) from surgery recommendation date was significant, more than operative mortality after AVS itself. Although waiting time was not associated with poor operative outcomes in the AVS group, many patients may die while waiting for AVS. Patients and physicians should proceed with AVS for severe AS on a semi-urgent, not elective, basis.

Figure1. Estimated Overall Survival Since Surgery Recommendation Date:

AVS vs. No Surgery Group



OS since surgery recommendation date	*30-day*	*6-Month*	*1 Year*	*2 Year*	*3 Year*
AVS	99.1%	90.5%	89.2%	84.6%	79.5%
No Surgery	88.8%	67.6%	62.6%	45.8%	33.5%

11:45 AM ***Crystal Ballroom G-Q***

Prosthesis Choice and Outcomes for Active Aortic Valve Infective Endocarditis: Analysis of the STS Adult Cardiac Surgery Database

E. B. Savage[1], P. Saha-Chaudhuri[2], C. R. Asher[1], J. Brennan[2], J. S. Gammie[3]

[1]Cleveland Clinic Florida, Weston, [2]Duke University, Durham, NC, [3]University of Maryland Medical Center, Baltimore

COMMERCIAL RELATIONSHIPS J. S. Gammie: Research Grant, Edwards Lifesciences Corporation; Ownership Interest, Correx, Inc, Harpoon Medical, Inc

Purpose: Trends in valve use for patients with active infective endocarditis (AIE) is unreported. We sought to evaluate rates of prosthesis usage and mortality in patients undergoing aortic valve replacement (AVR) with AIE.

Methods: The STS National Database was used to identify patients aged ≥18 with AIE who underwent AVR at participating institutions between January 1, 2005, and June 30, 2011. All patients with AIE reported as undergoing an aortic valve procedure were included. Demographics, operative procedures, postoperative outcomes and trends were analyzed.

Results: AVR was performed in 382,747 patients, of whom 19,879 (5.2%) had infective endocarditis; 11,560 (58%) were identified as having AIE and formed the study group. 3,131 (27%) had prior valve surgery (redo); 8,421 (73%) had no prior valve surgery (primary). The table shows the distribution of replacement, root replacement with valve conduit, and other types of surgery for each group and the usage of homograft (H), mechanical (M), and bioprosthetic (B) valves. Associated actual operative mortality rates are presented. During the study period, for primary patients, use of B increased from 57% to 67%, M decreased from 30% to 24%, and H from 9% to 6% ($p<0.001$). For redo patients, use of B increased from 38% to 52%, M decreased from 20% to 17%, and H from 38% to 28% ($p<0.001$). Homografts were used mostly in the redo group (32%) vs primary (7%).

Conclusions: B were increasingly utilized relative to M and H for AIE patients. H were used in a minority of patients, though much more commonly for endocarditis patients who had prior valve surgery. Mortality is high for primary (9.8%) and about doubled (21.1%) for redo surgery. Mortality varied significantly among prosthesis groups but may be related to the severity of infection. These data provide unique insight into the patterns of prosthesis selection for aortic valve surgery for AIE and may provide a guide for future patient assessment.

	Procedure Distribution %		Operative Mortality %	
	Redo	Primary	Redo	Primary
Valve Replacement only	58.7	88.5	19.0	9.2
Root Replacement	29.9	7.2	23.1	14.4
Other	11.4	4.3	27.0	14.5
	Prosthesis Usage %		Operative Mortality %	
	Redo	Primary	Redo	Primary
Homograft	32.2	7.0	23.3	14.8
Mechanical	18.0	25.5	17.9	7.0
Stented Bioprosthetic	46.6	64.1	21.4	10.2
Other	3.2	3.5	24.4	13.3

12:00 PM *Crystal Ballroom G-Q*

Outcomes Following Transfer to a Tertiary Cardiothoracic Surgery Center for Cardiopulmonary Failure Following Cardiac Surgery

N. R. Teman, D. S. Demos, B. N. Reames, F. D. Pagani, J. W. Haft

University of Michigan Health System, Ann Arbor

COMMERCIAL RELATIONSHIPS F. D. Pagani: Other, HeartWare, Inc, National Co-PI ENDURANCE Trial

Purpose: Cardiopulmonary failure is potentially best managed at specialized centers with available resources for multiple treatment modalities including cardiac support devices and transplantation. The objective of this study was to examine the outcomes and predictors of mortality in patients that previously underwent cardiac surgery at referring institutions and were transferred to a tertiary center for cardiopulmonary failure.

Methods: We identified 104 patients with cardiopulmonary failure and recent cardiac surgery that were transferred from an outside hospital to the cardiovascular ICU at our institution from 2004 to 2012.

Results: Common reasons for admission prior to transfer were acute MI (60%), coronary artery disease requiring elective CABG (11%), and mitral valve disease (6%). Eighty-one patients were on temporary mechanical support (VAD, ECMO, or IABP) at transfer (78%). Previous operations included CABG alone (20%), CABG and valve (8%), CABG and temporary support device (13%), and temporary support device alone (6%). Sixty-one patients (59%) underwent an intervention upon transfer. Interventions included temporary support removal (29%), ECMO cannulation (13%), and VAD placement (10%). Six patients underwent heart transplantation either during the same hospitalization or during subsequent visits. Survival to hospital discharge was 54% (56/104). Risk factors for in-hospital mortality and long-term mortality are shown in Table 1. Kaplan-Meier analysis revealed 5-year survival of 39% in all patients and 72% in patients who survived to hospital discharge.

Conclusions: Critically ill patients in cardiopulmonary failure following cardiac surgery can safely be transferred to tertiary care centers with acceptable short- and long-term mortality. Developing a robust program of tertiary referral is beneficial to the referring hospital, tertiary center, and patient. We recommend embracing and cultivating these relationships as a critical component of any heart failure center.

Factor	OR (95% CI)	p value
In-hospital Mortality:		
Increasing initial creatinine	3.63 (1.94-6.70)	<0.001
Increasing initial lactate	1.25 (1.09-1.45)	0.002
Long-term Mortality:		
Increasing initial creatinine	1.56 (1.27-1.92)	<0.001
Increasing initial lactate	1.13 (1.08-1.19)	<0.001

12:15 PM ***Crystal Ballroom G-Q***

Acute Liver Failure in Patients With Terminal Heart Failure Undergoing Mechanical Bridging: The Predictive Value of the MELD Score

E. Ruttmann, J. Hoefer, J. Kilo, C. Velik-Salchner, M. Edlinger, I. H. Lorenz, P. Mair, H. Ulmer

Innsbruck Medical University, Austria

Purpose: Acute liver failure (ALF) is a lethal condition in heart failure (HF) patients and optimum timing of mechanical bridging is essential. The aim of this study was to analyze the diagnostic value of the model-for-end-stage-liver disease (MELD) score to predict ALF in patients requiring mechanical support.

Methods: A consecutive series of 164 HF patients with NYHA IV / ACC/AHA stage D received mechanical bridging, either ECMO and/or ventricular assist device (VAD) implantation. Patients with postpump failure were excluded. Of all patients, 71 (43.3%) received veno-arterial ECMO support, 42 patients (25.6%) ECMO and consecutive VAD implantation, and 51 patients (31.1%) received primary VAD implantation. The MELD score was calculated at the timepoint of device implantation. Development of ALF after implementation of mechanical bridging was defined by the King's College criteria. ROC-analysis was performed to assess the optimal cutoff point for the MELD score in order to predict the diagnosis of ALF.

Results: A total of 45 patients (27.4%) developed ALF during mechanical bridging. Mortality in these patients was excessively high, amounting to 88.4% (40 patients). Mean MELD score was significantly higher in patients developing ALF compared to patients with stable liver function (12.2 ± 4.0 vs 24.4 ± 6.6; $p<0.001$). ROC analysis revealed a MELD-score higher than 17 as optimal for predicting the diagnosis of ALF (area under the curve 0.95; 95% CI 0.92-0.99, $p<0.001$). The corresponding sensitivity was 88.9% (95% CI 0.76-0.96), the specificity 93.3% (95% CI 0.87-0.97), and the positive predictive value 83.3% (95% CI 0.70-0.93).

Conclusions: The MELD score is an effective and reliable diagnostic clinical tool to predict ALF in patients with advanced HF. Its application may help decide the optimal timing of mechanical bridging to prevent the life-threatening complication of ALF.

Notes

11:00 AM – 12:30 PM ***Grand Ballroom 1-3***

Basic Science Research: General Thoracic

Moderators: *Chuong D. Hoang, Stanford, CA, and TBA*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:00 AM ***Grand Ballroom 1-3***

TLR-3 Mediated Preconditioning Protects Lung From Ischemia/Reperfusion Injury

P. Phelan, M. Zhao, M. Doak, M. S. Mulligan

University of Washington Medical Center, Seattle

Purpose: We have demonstrated that lipopolysaccharide (LPS) pretreatment protects against lung ischemia-reperfusion injury (LIRI) through down regulation of MyD88-dependent TLR-4 signaling and augmentation of MyD88-independent (TRAM-dependent) signaling. Polyinosinic-polycytidylic acid [Poly (I:C)] is a unique activator of TLR-3-mediated TRIF-signaling. We hypothesized that poly (I:C) is protective against LIRI via a TLR-3-dependent, TLR-4-independent mechanism.

Methods: Adult Long-Evans rats were given intratracheal poly (I:C) at a dose of 0.04mg/kg body weight or vehicle 24 hours before they were subjected to 90 minutes of left lung ischemia and 4 hours of reperfusion. Lungs were then assessed for changes in vascular permeability, bronchoalveolar lavage (BAL) leukocyte counts, and tissue TNF-α, IL-1β, IL-10 mRNA levels (RT-PCR), and IRAK-M expression by Western Blot.

Results: Poly (I:C) pre-treated rats demonstrated 65% (0.311 ± 0.0079 to 0.109 ± 0.0057) reductions in IRI induced lung vascular permeability and a marked decrease in BAL total leukocytes compared to vehicle pre-treated positive controls. These protective effects were associated with a 2.6 fold (5.073 ± 0.382 to 13.173 ± 0.665) increase in IL-10 mRNA production but no change in tissue TNF-α or IL-1β mRNA levels (MyD88-driven). IRAK-M protein expression was elevated in poly (I:C) pre-treated animal.

Conclusions: Poly (I:C) pre-treatment protects against lung IRI. This is the first evidence of a role for TLR-3 in non-ischemic preconditioning. The identification of poly (I:C) as an exclusive TLR-3/TRIF agonist suggests significant translational potential for lung donor pretreatment. Additionally, our results also suggest that the mechanisms of poly (I:C) in protecting lungs from IRI are not only by activation of MyD88-independent signaling but also by inhibiting of MyD88-dependent signaling via IRAK-M.

11:15 AM *Grand Ballroom 1-3*

Human iPS-Derived Lung Progenitors Display the Capacity to Repopulate Decellularized Lung Slices and Whole Organ Scaffolds

S. E. Gilpin[1], G. Gonzalez[1], X. Ren[1], J. Guyette[1], J. P. Vacanti[2], D. J. Mathisen[2], H. C. Ott[2]

[1]Massachusetts General Hospital/Harvard Medical School, Boston, [2]Massachusetts General Hospital, Boston

Purpose: Whole lung scaffolds created by detergent perfusion via the native vasculature can generate a matrix suitable for recellularization with selected cell types. To accomplish functional regeneration, this study assessed the potential of human iPS-derived lung progenitors for recellularization.

Methods: Whole rat and human lungs were decellularized by constant pressure perfusion with SDS solution. For recellularization, lungs were retained intact or slices cut from frozen tissue. Human BJ-RiPS cells were differentiated to (1) definitive endoderm, (2) anteriorized, and (3) ventralized toward an Nkx2.1-expressing population following a previously published protocol. Lineage potential was assessed by qRT-PCR and IF staining.

Results: Cells were differentiated in vitro to anterior foregut endoderm by Activin-A, followed by brief TGF-beta inhibition, and confirmed by FOXA2, SOX17, and SOX2 expression. Subsequent induction of Nkx2.1-expressing lung progenitors was assessed following FGF2 and BMP4 treatment and glycogen synthase kinase inhibition. To test their functional potential to repopulate lung scaffolds, anteriorized endoderm cells were seeded onto human lung matrix slices and cultured for 4 days with FGF2/BMP4/GSK3i. Cell viability was confirmed and attachment and elongation to the matrix was observed. Nkx2.1-expressing cells were identified with ~10% efficiency. Next, anteriorized endoderm was seeded to the airways of whole rat lungs and cultured for 4 days with perfusion of FGF/BMP4/GSK3i media. Histology revealed patchy cell retention and 18S mRNA quantification confirmed equivalent cell distribution throughout the tissue. Conserved expression of SOX17 and FOXA2 was observed and an Nkx2.1-positive population was identified within the recellularized lungs.

Conclusions: Decellularized rat and human lung scaffolds can support the culture of human iPS-derived lung progenitors and induce an Nkx2.1-positive cell phenotype by targeted differentiation.

11:30 AM **Grand Ballroom 1-3**

PIK3CA Mutations Frequently Coexist With EGFR/KRAS Mutations in Non-Small Cell Lung Cancer and Might Suggest a Poor Prognostic Subgroup in EGFR/KRAS Wildtype Patients

L. Wang, H. Hu, Y. Pan, Y. Sun, H. Chen

Shanghai Medical College, Fudan University Shanghai Cancer Center, China

Purpose: The PIK3CA gene encoding a catalytic subunit of the phosphatidylinositol-3-kinase (PI3K) is mutated and/or amplified in various neoplasms, including lung cancer. Here, we investigated PIK3CA gene alterations, the expression of core components of PI3K pathway, and evaluated their clinical importance in non-small cell lung cancer (NSCLC).

Methods: Oncogenic mutations/rearrangements in PIK3CA, EGFR, KRAS, HER2, BRAF, AKT1, and ALK genes were detected in resected tumors from 1,117 patients with NSCLC. PIK3CA gene copy number was examined by fluorescent in situ hybridization and the expression of PI3K p110 subunit alpha (PI3K p110α), p-Akt, mTOR, PTEN was determined by immunohistochemistry in PIK3CA mutant cases and 108 patients without PIK3CA mutation.

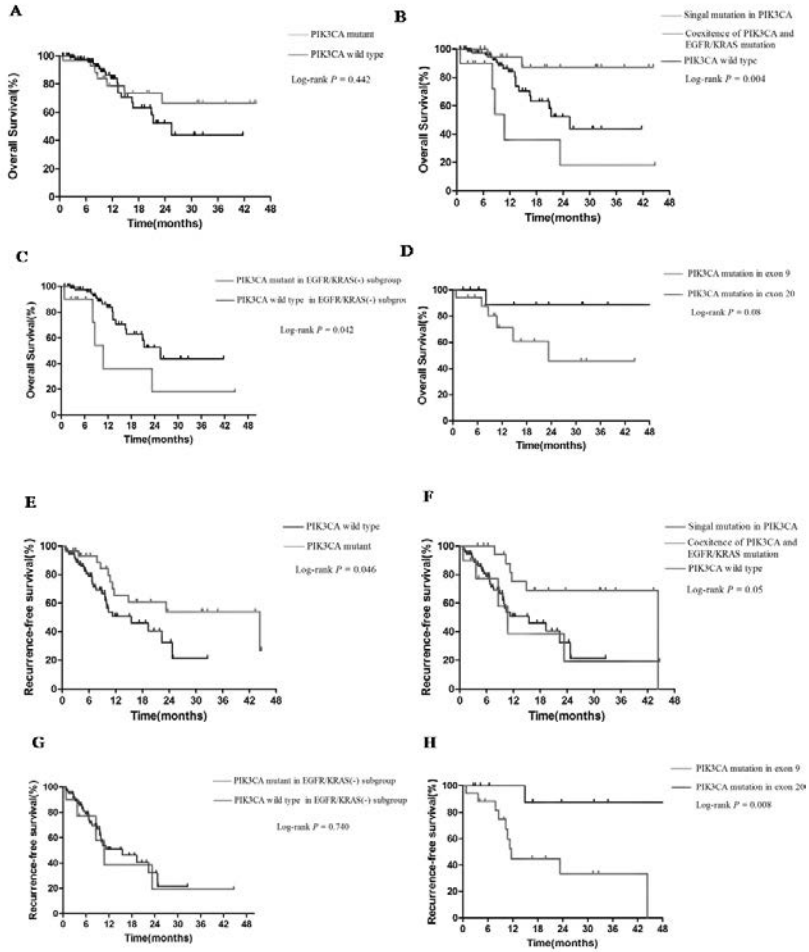
Results: PIK3CA mutation was found in 3.9% of squamous cell carcinoma and 2.7% of adenocarcinoma. Among 34 PIK3CA mutant cases, 17 tumors harbored concurrent EGFR mutations and four had KRAS mutations. PIK3CA mutation was significantly associated with high expression of PI3K p110α (p<0.001), p-Akt (p=0.024), and mTOR (p=0.001), but not correlated with PIK3CA amplification (p=0.463). Patients with single PIK3CA mutation had shorter overall survival than those with PIK3CA-EGFR/KRAS co-mutation or wildtype PIK3CA (p=0.004). A significantly worse survival was also found in patients with PIK3CA mutations than those without PIK3CA mutations in the EGFR/KRAS wildtype subgroup (p=0.042).

Conclusions: PIK3CA mutations frequently coexisted with EGFR/KRAS mutations. The poor prognosis of patients with single PIK3CA mutation in NSCLC and the prognostic value of PIK3CA mutation in EGFR/KRAS wildtype subgroup might suggest the distinct mutation status of PIK3CA gene should be determined for individual therapeutic strategies in NSCLC.

Correlation Among PIK3CA Mutation, Amplification, and Expression of PI3K p110 , p-Akt, m TOR, and PTEN

Expression		PIK3CA mutation Positive(%)	Positive(%) PIK3CA mutation Negative(%)	P
PI3K p110α	(+)	27(79.4)	42(38.9)	< 0.001
	(-)	7(20.6)	66(61.1)	
PTEN loss	(+)	8(23.5)	30(27.8)	0.626
	(-)	26(76.5)	78(72.2)	
p-Akt	(+)	18(52.9)	34(31.5)	0.024
	(-)	16(47.1)	74(68.5)	
mTOR	(+)	25(73.5)	44(40.7)	0.001
	(-)	9(26.5)	64(59.3)	
PIK3CA amplification	(+)	5(14.7)	22(20.4)	0.463
	(-)	29(85.3)	86(79.6)	

Fig 3



A, Overall survival curves for patients with or without PIK3CA mutation; B, Overall survival curves for patients with single PIK3CA mutation, coexistence of PIK3CA, and other gene mutation, and those in PIK3CA wild type group; C, Overall survival curves for patients with or without PIK3CA mutation in EGFR/KRAS wildtype; D, Overall survival curves for patients with PIK3CA mutation in exon 9 or exon 20; E, Recurrence-free survival curves for patients with or without PIK3CA mutation; F, Recurrence-free survival curves for patients with single PIK3CA mutation, coexistence of PIK3CA, and other gene mutation, and those in PIK3CA wild type group; G, Recurrence-free survival curves for patients with or without PIK3CA mutation in EGFR/KRAS wildtype; H, Recurrence-free survival curves for patients with PIK3CA mutation in exon 9 or exon 20.

11:45 AM ***Grand Ballroom 1-3***

Small Molecule Activators of Protein Phosphatase 2A (PP2A) Inhibit Malignant Pleural Mesothelioma (MPM) Cell Growth

J. Y. Lim[1], R. M. Flores[1], K. McClinch[1], A. J. Kaufman[1], D. Kastrinsky[1], M. Ohlmeyer[1], G. Narla[2], S. Y. Ramanathan[1]

[1]The Mount Sinai Hospital, New York, NY, [2]Case Western Reserve University, Cleveland, OH

COMMERCIAL RELATIONSHIPS D. Kastrinsky: Ownership Interest, Mount Sinai School of Medicine, Filed patents for protection of composition of matter ; M. Ohlmeyer: Other, Mount Sinai School of Medicine, Inventor of IP (patents) on compounds; Consultant/Advisory Board, BioMotive; G. Narla: Consultant/Advisory Board, BioMotiv

REGULATORY DISCLOSURE This presentation will address BioMotiv's TRC-794 and TRC-766, which are not FDA approved. This presentation will also address the off-label use of clomipramine as an antineoplastic agent.

Purpose: MPM is a rare, aggressive disease with no effective chemotherapeutic regimen. To exploit the anticancer activity exhibited by the tricyclic neuroleptic drugs, they were reverse-engineered to generate a series of novel compounds that maintain the anti-proliferative effects of the parent drugs, but are devoid of the central nervous system pharmacology. The new derivatives were shown to exert their effects by modulation of signaling pathways, including AKT and ERK, by a mechanism involving activation of a tumor suppressor, PP2A. As AKT and MAPK signaling are dysregulated in mesothelioma, we examined the effect of these compounds on MPM cells.

Methods: MPM cells (H2052, H2452) were cultured in RPMI. Clomipramine (CIP) and the novel derivatives TRC-794 (active)/TRC-766 (inactive) were resuspended in DMSO. Cell proliferation and colony formation were measured using the MTT assay and crystal violet staining respectively. Cell cycle was measured using propidium iodide staining and FACS analysis. Expression levels of cell proliferation and apoptosis-linked proteins were determined by western blot analyses using pAKT, AKT, pERK, ERK, Cyclin D1, p21, and PARP antibodies. Apoptosis studies used Annexin APC and ZVAD.

Results: CIP and TRC-794, but not the inactive tricyclic analog TRC-766, suppressed growth of MPM cells in a dose-dependent manner with TRC-794 being more potent than CIP. These findings were recapitulated by cell cycle analysis showing an increase in sub-G1 populations, G1 arrest, decreases in Cyclin D1 levels; inhibition of AKT and ERK phosphorylation; induction of apoptosis through caspase activity showing PARP cleavage and its partial rescue (in H2052) when treated with ZVAD.

Conclusions: Our data show that these novel compounds suppress MPM cell growth by inhibition of the ERK/AKT pathways inducing apoptosis and G1 arrest. Further investigation is required to explore the potential use of these compounds in MPM.

12:00 PM ***Grand Ballroom 1-3***

Angiogenesis Biomarkers Differ Significantly Across the Spectrum of Lung Cancer Progression

S. Daly, D. Rinewalt, R. Pithadia, G. C. Lobato, S. Basu, E. Hong, G. W. Chmielewski, M. J. Liptay, J. A. Borgia

Rush University Medical Center, Chicago, IL

Purpose: Dysregulation of angiogenesis has been shown to be intimately associated with tumorigenesis and metastatic progression in multiple carcinomas. The objective of this study was to establish trends in circulating angiogenesis biomarker levels across a various stages of lung cancer progression. We hypothesize differences in angiogenesis biomarker levels will associate strongly with lung cancer progression and may have clinical value.

Methods: Patients enrolled in the study were grouped as follows: stage I NSCLC with no recurrence (n=57), stage I NSCLC with recurrence (n=21), node positive disease (n=58), and stage IV (n=58). Seventeen angiogenesis biomarkers were assayed on the Luminex platform, including: EGF, Angiopoietin-2, G-CSF, BMP-9, Endoglin, Endothelin-1, Leptin, FGF-1, FGF-2, Follistatin, IL-8, HGF, HB-EGF, PLGF, VEGF-A, VEGF-C, and VEGF-D. Biomarkers levels were analyzed using a Mann-Whitney U test and significance was defined by a p-value ≤ 0.05.

Results: We found nine biomarkers to be strongly associated with progression to metastatic disease: Endoglin, BMP-9, G-CSF, FGF-1, IL-8, PLGF, VEGF-C, VEGF-D, and FGF-2 ($p<0.01$). In addition, we found six biomarkers to be associated with lung cancer recurrence in stage I patients: Endoglin, G-CSF, FGF-1, FGF-2, VEGF-C, and VEGF-D ($p<0.05$).

Conclusions: We discovered 10 angiogenesis biomarkers to be significantly associated with lung cancer progression. These angiogenesis biomarkers may provide ideal targets for the establishment of a validated model for predicting lung cancer progression. Such a model would have a profound effect on the treatment of lung cancer.

12:15 PM ***Grand Ballroom 1-3***

Establishing a Novel Protocol for Lung Bioscaffold Cryopreservation Using a Porcine Model

C. Hemphill, A. S. Ferng, A. Louis, N. Qu, T. Son, S. Reid, K. J. Penick, J. E. Kobes, Z. Khalpey

University of Arizona, Tucson

Purpose: Establishing a lung bioscaffold cryopreservation protocol is vital to increasing the availability of transplantable lungs, which does not meet patient demand. Decellularized lungs can be reseeded with recipient stem cells, thereby eliminating the possibility of immunorejection. To create a biofarm of lung bioscaffolds for transplantation, we devised a cryopreservation method for lung bioscaffolds using a porcine model.

Methods: Decellularized lung bioscaffolds were cryopreserved using three techniques. Standard control (n=5) lung bioscaffolds were frozen (-80˚C) with cryoprotectant (DMEM+DMSO). The super cooling (n=5) approach included cooling (-20˚C) prior to deep-freezing (-80˚C) in cryoprotectant. The interval cooling (n=5) method exposed bioscaffolds to cooler temperatures (4˚C, -20˚C) prior to freezing (-80˚C) with cryoprotectant. Samples were stained (Masson's trichrome, H&E) for histological analysis and MRI scans were taken. Mechanical assessment verified lung compliance.

Results: Decellularized lung bioscaffold architecture and ECM integrity was not altered by cryopreservation. Control lung architecture was as expected with visualization of cell nuclei and collagen fibrils. Freshly decellularized lung tissue showed no basophilic staining representative of cellular nuclear material, whereas lung architecture and collagen staining appeared normal. Super cooled and interval cooled bioscaffolds also displayed intact architecture with eosinophilic collagen staining. Cryopreserved bioscaffolds showed viable lung compliance. MRI scans of cryopreserved bioscaffolds showed maintenance of architecture.

Conclusions: ECM components were maintained during decellularized lung bioscaffold cryopreservation. Super cooling is an effective, clinically applicable option for cryopreserving bioscaffolds. Establishing optimal cryopreservation parameters will expand the availability of more human lungs for transplantation.

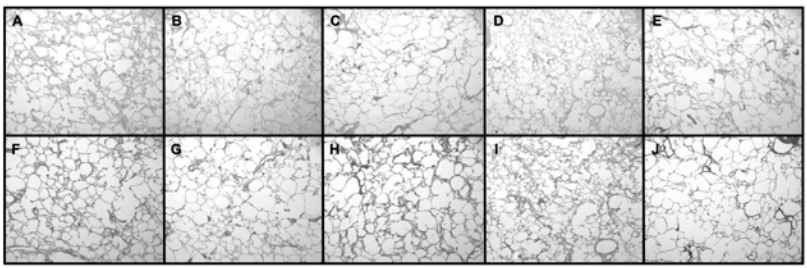


Figure 1. Lung tissue before, after, and after decellularization/cryopreservation.
Row 1 (A-E): Hemotoxylin and eosin stain of native lung, freshly decellularized lung, control lung, decellularized interval cooled lung, and decellularized super cooled lung.
Row 2 (F-J): Masson's trichrome stain of native lung, freshly decellularized lung, control lung, decellularized interval cooled lung, and decellularized super cooled lung.

Notes

11:00 AM – 12:30 PM ***Grand Ballroom 8B***

Cardiothoracic Surgical Education

Moderators: *Andrea J. Carpenter, San Antonio, TX, and Sidhu P. Gangadharan, Boston, MA*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:00 AM ***Grand Ballroom 8B***

Novel Use of Online Learning to Supplement Thoracic Surgical Training: Promising Results of a Moodle-Based Multi-institutional Pilot Study

M. B. Antonoff[1], E. D. Verrier[2], S. C. Yang[3], J. Lin[4], D. T. DeArmond[5], M. S. Allen[6], T. K. Varghese[2], D. Sengewald[7], A. A. Vaporciyan[8]

[1]Washington University, St Louis, MO, [2]University of Washington, Seattle, [3]Johns Hopkins Medical Institutions, Baltimore, MD, [4]University of Michigan, Ann Arbor, [5]The University of Texas Health Science Center, San Antonio, [6]Mayo Clinic, Rochester, MN, [7]Joint Council on Thoracic Surgery Education, Chicago, IL, [8]The University of Texas MD Anderson Cancer Center, Houston

COMMERCIAL RELATIONSHIPS M. S. Allen: Ownership Interest, Medtronic, Inc

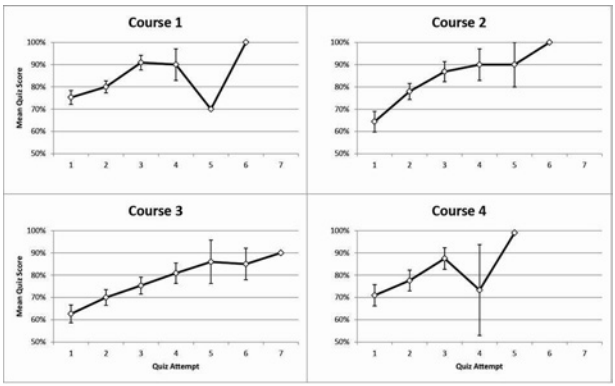
Purpose: Cardiothoracic surgical education faces multiple challenges. Barriers include reduced duty hours and diminishing prioritization of teaching, in the setting of rapidly advancing knowledge, skills, and case complexity. The failure rate on the ABTS exam remains suboptimal. New training formats are being evaluated. Online education with self-paced courses may offer a solution. We hypothesize that Internet-based courses can be developed, implemented, and allow learning of basic topics in cardiothoracic surgery.

Methods: A needs assessment was conducted using recent ABTS exam results. Using a Moodle platform, four online self-study courses were developed by four content experts. As a pilot cohort, students from four US thoracic surgery training programs participated, accessing courses at their own pace. Each course included general readings, detailed readings, multimedia content, an open forum, and a question-bank supported quiz (≥90% required to pass, multiple attempts allowed). Utilization and exam data were tracked electronically. T-tests were used to compare first vs final-year traditional track trainees. Post-course surveys collected data on trainee attitudes.

Results: Nineteen students completed four courses on tracheal disease. Mean time spent per course and quiz attempts to pass were 1 hour 21 minutes and 2.86. Mean scores improved with successive attempts (Graph). Senior trainees showed a trend toward less time spent per course and fewer quiz attempts. Post-course surveys demonstrated uniform agreement that the content and quizzes were beneficial to learning and the courses were easy to navigate.

Conclusions: Moodle courses can be developed and integrated within our training programs. This pilot demonstrates evidence of active learning as shown through the embedded assessments. Internet-based courses may serve as a means of supplementing modern thoracic surgical training. Further development and evaluation are warranted.

Progression of Quiz Scores



Notes

11:15 AM ***Grand Ballroom 8B***

"Top Gun" Competition: Deliberate Practice May Offer Most Improvement to Trainees With Lower Baseline Skills

D. H. Enter[1], R. Lee[2], J. I. Fann[3], G. L. Hicks[4], E. D. Verrier[5], R. Mark[6], X. Lou[1], N. A. Mokadam[5]

[1]Northwestern University, Chicago, IL, [2]Saint Louis University, MO, [3]Stanford University, CA, [4]University of Rochester, NY, [5]University of Washington, Seattle, [6]Joint Council on Thoracic Surgery Education, Chicago, IL

COMMERCIAL RELATIONSHIPS N. A. Mokadam: Consultant/Advisory Board, Thoratec Corporation, SynCardia Systems, Inc; Speakers Bureau/Honoraria, CoreMatrix Cardiovascular, Inc; Other, Thoratec Corporation, Study PI, HeartWare, Inc, Study PI, SynCardia Systems, Inc, Study PI

Purpose: Simulation skills training is in its infancy in cardiothoracic (CT) surgery. This study sought to determine if a "Top Gun" competition would encourage simulator use and improve technical skills among first-year CT residents.

Methods: A coronary anastomosis simulation module with instructional video was sent to 96 first-year CT residents in traditional programs who were then invited to participate in a "Top Gun" competition. Residents uploaded a video recording of their baseline anastomosis using the simulator. After 6 weeks of practice under faculty supervision, each trainee uploaded a final video. All submissions were rated by three blinded CT surgeons. Twelve components were scored on a 5-point Likert scale (1=poor; 5=excellent); also, an overall pass/fail grade was given. Five trainees with the highest final scores were invited to compete at a live "Top Gun" competition.

Results: Seventeen trainees submitted a baseline anastomosis video for evaluation; 15 submitted a final video. Overall average scores improved from a mean (± 1SD) of 3.24 ± 0.61 to 4.01 ± 0.33 ($p<0.001$) (Figure 1). The overall score in the lowest tertile improved by 1.39 ($p<0.002$), compared to the improvement of 0.5 ($p<0.02$) in the top tertile. Average time (min:sec) decreased from 11:10 (range 5:56-18:58) to 9:04 (range 5:52-16:23), $p<0.01$. Those achieving a pass from all three raters improved from 13% (2/15) to 73% (11/15), $p<0.002$. Thirteen of 15 residents completed a survey. Residents performed an average of 23 (range 10-40) anastomoses. The majority (10/13) agreed or strongly agreed that practicing on simulators will improve a trainee's technical skill acquisition.

Conclusions: Focused training results in improved technical skills in vessel anastomosis, especially in residents with lower baseline skills. Simulation, as with any educational endeavor, requires the motivation of the trainee, the commitment of the faculty educator, and a defined training curriculum.


Trainee Improvement
Final Score
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
1.00
2.00
3.00
4.00
5.00
"Poor"
"Average"
"Excellent"
Initial Score
Note: Solid Line = No improvement

Notes

11:30 AM ***Grand Ballroom 8B***

Apples to Apples? Redundancy and Variability in Quality and Outcome Reporting for Cardiac and Thoracic Surgery

J. L. Dixon, H. T. Papaconstantinou, B. Hodges, R. S. Korsmo, D. Jupiter, J. G. Shake, B. Sareyyupoglu, P. A. Rascoe, S. I. Reznik

Scott & White Hospital, Temple, TX

Purpose: Health care is evolving into a value-based reimbursement system focused on quality and outcomes. Health care consumers are increasingly aware of publicly reported hospital outcomes. Reported outcomes from national databases are used for quality improvement projects and public reporting. Each database has specific criteria and definitions for reporting performance and may overlap specialties. This leads to duplication of work and possible reporting inconsistencies. The purpose of this study was to compare reported outcomes in cardiac and thoracic surgery from two validated reporting databases.

Methods: Our institution is a tertiary care academic medical center that has an active quality improvement program that participates in both STS National Database and the National Surgical Quality Improvement Program (NSQIP). Reported data were compared between the two databases from January 2011 to June 2012. Quality metrics and outcomes included mortality, wound infection, prolonged ventilation, pneumonia, renal failure, stroke, and cardiac arrest. The rates were compared by chi-square analysis.

Results: There were 737 and 177 cardiac surgery cases and 451 and 105 thoracic cases captured by the STS National Database and NSQIP, respectively. Within cardiac surgery, there was a statistically significant difference in the reported (outcome or complication) rates of superficial wound infection, prolonged ventilation, renal failure, and mortality. No differences were found within thoracic surgery (Table 1).

Conclusions: Our data indicate a significant discordance in quality reporting for cardiac surgery between NSQIP and the STS National Database. The disparity between databases and duplication of database participation strongly indicates that a unified national quality reporting program is required. Consolidation of reporting databases and standardization of morbidity definitions across all databases may improve participation and reduce hospital cost.

	Cardiac Surgery		Thoracic Surgery	
	N (%)	P-value	N (%)	P-value
Superficial wound infection		<0.001		0.720
STS Database	0		10 (2.2%)	
NSQIP	12 (6.8%)		3 (2.9%)	
Deep wound infection		0.690		
STS Database	7 (0.9%)			
NSQIP	2 (1.1%)			
Prolonged ventilation		<0.001		0.580
STS Database	241 (32.7%)		17 (3.8%)	
NSQIP	20 (11.3%)		5 (4.8%)	
Pneumonia		0.130		0.800
STS Database	68 (9.2%)		22 (4.9%)	
NSQIP	10 (5.6%)		4 (3.8%)	
Renal Failure		0.031		1.000
STS Database	65 (8.8%)		8 (1.8%)	
NSQIP	7 (4.0%)		2 (1.9%)	
Stroke		0.096		1.000
STS Database	26 (3.5%)		1 (0.2%)	
NSQIP	2 (1.1%)		0	
Cardiac arrest		0.580		
STS Database	41 (5.6%)			
NSQIP	8 (4.5%)			
Mortality Rate		0.046		0.560
STS Database	56 (7.6%)		15 (3.3%)	
NSQIP	6 (3.4%)		5 (4.8%)	

Notes

11:45 AM **Grand Ballroom 8B**

The ACGME Case Log: General Surgery Residents' Thoracic Surgery Experience

N. Kansier[1], T. K. Varghese[1], E. D. Verrier[1], F. T. Drake[1], K. W. Gow[2]

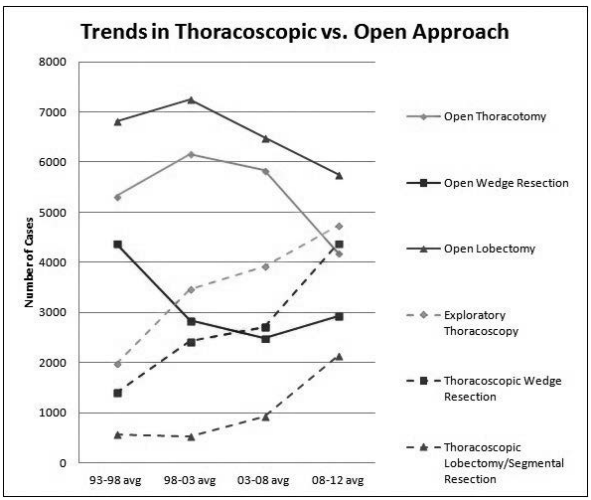
[1]University of Washington, Seattle, [2]Seattle Children's Hospital, WA

Purpose: To investigate changes in general surgery resident exposure to thoracic surgery using the national Accreditation Council for Graduate Medical Education (ACGME) case log.

Methods: ACGME case logs for graduating general surgery residents were reviewed from academic year (AY) 1989-1990 to 2011-2012 for defined thoracic surgery cases. Data were divided into five eras of training for comparison (I: AY89-93, II: AY93-98, III: AY98-03, IV: AY03-08, V: AY08-12). We analyzed quantity and types of cases per time period. Student t-tests compared averages among the time periods with significance at $p < 0.05$.

Results: A total of 21,803,843 general surgery cases were reviewed over the 20-year period. When analyzed as time blocks, residents averaged 33.6 thoracic cases each in Period I and 39.7 in Period V. Thoracic cases accounted for nearly 4% of total cases performed annually (Period I 3.7% [134,550/3,598,574]; Period V 4.1% [167,957/4,077,939]). Over all years, junior residents performed more thoracic procedures than senior residents. Within the three most frequently performed procedures, there was a statistically significant increase in thoracoscopic cases from Period II to Period V.

Conclusions: General surgery trainees of today have the same volume of exposure to thoracic surgery as their counterparts over the last 2 decades. This maintenance in thoracic surgery caseload has occurred in spite of the onset of work-hour restrictions. However, junior residents are performing the majority of thoracic procedures, and this has increased over the time period of study. Also, general surgery graduates today have a different thoracic surgery skillset at the end of their training despite performing the same number of procedures, due to the predominance of minimally invasive techniques. Thoracic surgery educators should take into account these differences when training future cardiothoracic surgeons.



12:00 PM ***Grand Ballroom 8B***

Multicenter, Community-Based Evaluation of Clinical Outcomes of Standardized Robotic Pulmonary Lobectomy Compared to Thoracotomy and VATS Outcomes in the STS National Database

R. D. Adams[1], W. D. Bolton[2], G. Henry[3], E. T. Robbins[4], E. Sommers[5], J. E. Stephenson[2], S. L. Sams[1]

[1]Owensboro Health, KY, [2]Greenville Memorial Hospital, SC, [3]Saint Agnes Hospital, Baltimore, MD, [4]Baptist Memorial Hospital, Memphis, TN, [5]Tampa General Hospital, FL

COMMERCIAL RELATIONSHIPS R. D. Adams: Speakers Bureau/Honoraria, Covidien; Consultant/Advisory Board, Intuitive Surgical Inc; W. D. Bolton: Consultant/Advisory Board, Covidien, Intuitive Surgical Inc; G. Henry: Consultant/Advisory Board, Intuitive Surgical, Inc; E. T. Robbins: Consultant/Advisory Board, Intuitive Surgical, Inc; E. Sommers: Speakers Bureau/Honoraria, Intuitive Surgical, Inc; J. E. Stephenson: Speakers Bureau/Honoraria, Covidien

Purpose: Video assistance (VATS) facilitates endoscopic lobectomy with its inherent patient benefits. Various issues, however, limit its broad adoption. Robotic assistance (Completely Portal Robotic Lobectomy-CPRL) may address these limitations. This multicenter study evaluates integration of a standardized CPRL in six community practices by examining outcomes compared to the 2009 and 2010 STS National Database for VATS and open lobectomy. Also evaluated were subsequent changes in each surgeon's minimally invasive lobectomy rate.

Methods: Six community cardiothoracic surgeons with varied pre-robotic lobectomy techniques and who now use a standardized CPRL platform were identified. Perioperative data from their robotic lobectomies performed between January 2010 and September 2012 were retrospectively gathered, combined (n=242), and compared to the 2009 and 2010 STS open (n=5,913) and VATS (n=4,612) lobectomy outcomes. Welch-Satterthwaite t-test was used with significance at 95% confidence level ($p < 0.05$).

Results: Preop characteristics were comparable for all three cohorts. In the CPRL group, 227 procedures (93.8%) were successfully completed robotically. With CPRL, operative time, length of stay, and chest tube duration were significantly shorter than with VATS or open. Compared to open, CPRL had significantly lower rates of Afib, persistent air leak, and transfusions. In other measures, all three cohorts were comparable. By adopting robotic assistance, all surgeons showed an increase in minimally invasive lobectomy rates, ranging from 23% to 85%.

Conclusions: This community multicenter study demonstrates that a standardized robotic lobectomy platform is safe, reproducible, and generates outcomes that are better than current VATS and open techniques in several key measures. Regardless of prior endoscopic experience, CPRL can be adopted by surgeons without excessive conversions or operative time, leading to an expansion of minimally invasive offerings.

Continues on next page.

Cardiothoracic Surgical Education – Continued

Table 1

Parameter	CPRL	VATS	OPEN
Mean age	65	66 (0.13)	65 (1.0)
Clinical Stage (T1 + T2)	195/227 (91.98%)	4612/4612 (100%)	5913/5913 (100%)
LOS (days)	4.0	5.27 (0.001)	7.26 (0.001)
30-day mortality	3/224 (1.3%)	40/4207 (0.95%) (0.6)	119/5396 (2.2%) (0.37)
Operative time (min)	227	239.02 (0.01)	243.65 (0.001)
Blood Transfusion (post-op)	7/222 (3.2%)	172/4573 (3.8%) (0.64)	458/5850 (7.83%) (0.01)
Chest tube (d)	2.8	3.74 (0.001)	4.84 (0.001)
Air Leak duration >5d	15/226 (6.6%)	408/4602(8.9%)(0.23)	634/5869(10.8%)(0.045)
A-fib; requiring treatment	13/227 (5.7%)	426/4599 (9.3%) (0.69)	713/5882 (12.1%) (0.003)
Conversion	15/242 (6.2%)		

Notes

12:15 PM *Grand Ballroom 8B*

Resident Perceptions of Technical Skills Education in Modern Cardiothoracic Surgery Training: Results From the 2013 In Training Examination Survey

D. D. Odell[1], R. Macke[1], V. Tchantchaleishvili[2], G. Loor[2], J. S. Nelson[2], D. J. LaPar[2], J. F. Lazar[2], B. Wei[2], W. F. DeNino[2], K. Berfield[2], W. Stein[2], S. J. Youssef[2], T. C. Nguyen[2]

[1]University of Pittsburgh Medical Center, PA, [2]Thoracic Surgery Residents Association, Chicago, IL

Purpose: Traditionally, technical surgical skills are taught and practiced in the operating room. However, changes in the health care policy and outcome-based evaluation have decreased trainee operative autonomy. To augment the operative experience, simulation will be a required part of resident curriculum. We examine cardiothoracic residents' perception of operative experience and the role of simulation.

Methods: The In Training Examination (ITE) is taken each year by all residents. To take this mandatory examination, residents must respond to a 30-question survey, ensuring a 100% response rate. Survey data related to operative experience, career preparedness, and simulation experience were analyzed. Opinion questions were asked on a 5-point Likert scale. Respondents were grouped into three cohorts as a function of training paradigm (2-year vs 3-year traditional programs and 6-year integrated programs [I-6]).

Results: 314 respondents completed the survey (122 2-year, 96 3-year, 96 I-6). Of the three groups, residents in 3-year programs had the highest levels of satisfaction (table). Advanced training was most common among residents in I-6 programs (66% vs 49% for 2-year and 26% for 3-year). Desire to specialize drove further training (97%), with 2% stating that further training was needed due to inadequacy and 1% due to a poor job market. In all assessed categories, the majority of residents felt that currently available simulation techniques were not adequate to afford the equivalent educational experience of a single operative case.

Conclusions: CT surgery residents largely feel well prepared for the transition to practice under the current educational paradigm. While many residents seek advanced training, this seems driven by the desire for specialization. Residents view simulation as an adjunct to traditional intraoperative education, but not a viable replacement. Further study is necessary to better understand how best to integrate simulation with operative experience.

Perceptions of Residents in ACGME-Accredited Programs Regarding the Adequacy of Training

	Feel Adequately Trained in their program	Feel Technically Well Trained	Feel Prepared to Enter Independent Practice
2 Year Traditional	83%	83%	83%
3 Year Traditional	92%	90%	90%
I-6 Program	90%	86%	79%

Agreement was assessed using a 5-point Likert scale. Data are reported as the aggregate measure of "agree" and "strongly agree" answers.

11:00 AM – 12:30 PM ***Grand Ballroom 8A***

Clinical Trials: Reflections on Old and Plans for New

This course will provide participants with a timely review of recent key clinical trials, as well as studies in progress. The trials covered in this session will focus on two topic areas: the use of adjuvant/neoadjuvant chemotherapy in non-small cell lung cancer (NSCLC) and adult cardiac valve trials.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Understand the critical trials leading to the current recommendations for adjuvant chemotherapy in resected NSCLC
- Describe the rationale for upcoming adjuvant/neoadjuvant chemotherapy trials in NSCLC
- Identify appropriate patients for and complications with TAVR vs sutureless AVR vs open AVR
- Discuss results of MitraClip studies and severe ischemic mitral regurgitation studies (Cardiothoracic Surgical Trials Network)

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of lectures that focus on the latest clinical trials. A brief question-and-answer session will follow each topic.

Moderators: *Gorav Ailawadi, Charlottesville, VA, and Stephen G. Swisher, Houston, TX*
COMMERCIAL RELATIONSHIPS S. G. Swisher: Consultant/Advisory Board, GlaxoSmithKline

Session I: Adjuvant/Neoadjuvant Chemotherapy Trials in NSCLC

11:00 AM **Introduction**
Stephen G. Swisher, Houston, TX
COMMERCIAL RELATIONSHIPS S. G. Swisher: Consultant/Advisory Board, GlaxoSmithKline

11:02 AM **Review of Adjuvant Chemotherapy Trials**
William N. William Jr, Houston, TX

11:12 AM **Where Are We Going in the Future: Adjuvant Chemotherapy**
David H. Harpole Jr, Durham, NC

11:22 AM **Where Are We Going in the Future: Neoadjuvant Chemotherapy**
William N. William Jr, Houston, TX

11:32 AM **Discussion**

Session II: Updates on Adult Cardiac Valve Trials

11:45 AM **Introduction**
Gorav Ailawadi, Charlottesville, VA
COMMERCIAL RELATIONSHIPS G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca

11:47 AM **Review of Aortic Valve Trials (TAVR, Sutureless AVR)**
Vinod H. Thourani, Atlanta, GA
COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

12:02 PM **Review of Mitraclip Studies and Severe Ischemic Mitral Regurgitation Studies**
Irving L. Kron, Charlottesville, VA

12:17 PM **Discussion**

Notes

11:00 AM – 12:30 PM ***Grand Ballroom 4-6***

Congenital Session: Pediatric Congenital III

Moderators: *Jeffrey P. Jacobs, St Petersburg, FL, and Glen S. Van Arsdell, Toronto, Canada*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:00 AM ***Grand Ballroom 4-6***

Fate of Hypoplastic Proximal Aortic Arch in Infants Undergoing Repair for Coarctation of the Aorta via Left Thoracotomy

Y. Kotani, S. L. Anggriawan, D. Chetan, L. Zhao, N. S. Liyanage, A. Saedi, L. Mertens, C. A. Caldarone, G. S. Van Arsdell, O. Honjo

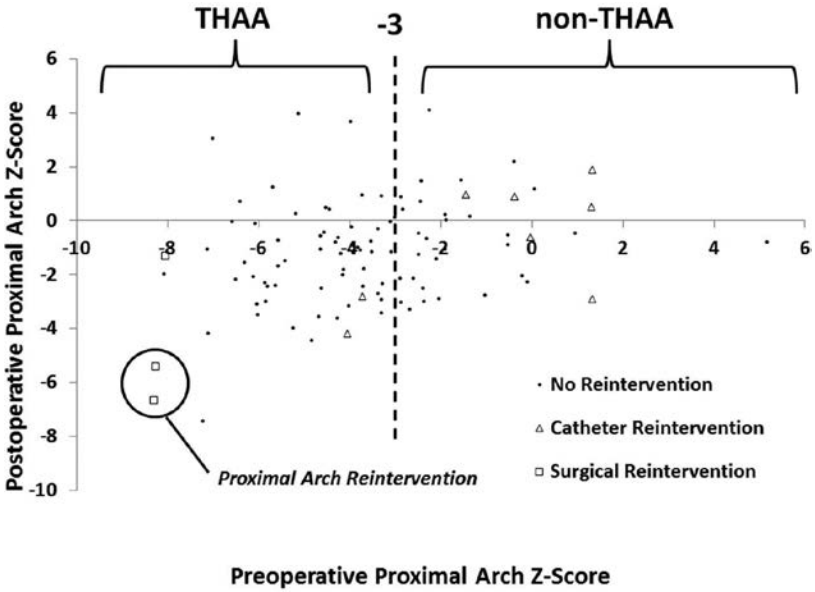
The Hospital for Sick Children, Toronto, Canada

Purpose: Extended end-to-end anastomosis (EEEA) via left thoracotomy for coarctation of the aorta (CoA) and tubular hypoplasia of the aortic arch (THAA) leaves an unaugmented hypoplastic proximal aortic arch (PAA) segment, which may increase late reintervention for PAA obstruction. We sought to assess PAA growth and reintervention for PAA obstruction after EEEA.

Methods: Preoperative and follow-up echocardiographic images of 140 patients who underwent EEEA for CoA from 2005-2012 were retrospectively reviewed. Median age and body weight at surgery were 8 days and 3.3 kg, respectively. Patients were divided into two groups based on the preoperative PAA z-score: THAA Group, z-score <-3 and non-THAA Group, z-score >-3. Kaplan-Meier analysis was used to compare freedom from reintervention between the groups.

Results: Eighty (57%) patients were identified as THAA. As a whole, there were three surgical (PAA in two patients and distal aortic arch in one patient) and nine catheter reinterventions (all related to anastomotic stenosis) during a median follow-up period of 18 (2-40) months. Both patients who required PAA reintervention had preoperative PAA z-score <-8. Freedom from reintervention at 3 years was comparable between the groups (THAA group, 90.0% vs non-THAA group, 87.9%, p=0.483). Follow-up echocardiography revealed PAA catch-up growth in THAA group (z-score, preop -4.63 vs follow-up -1.17, p<0.001); however, there was a non-significant trend towards smaller PAA in THAA group (z-score: THAA, -1.17 vs non-THAA, -0.55, p=0.057; Figure). All but two patients with preoperative PAA z-score >-6 did not have any PAA obstruction, requiring surgical reintervention (Figure).

Conclusions: The hypoplastic PAA segment in CoA/THAA grew significantly after EEEA but remained smaller compared to those without THAA. Reintervention related to PAA is rare. Our data supports that CoA and PAA as small as z-score of -6 can be repaired with thoracotomy approach with low risk of reintervention.


THAA
-3
non-THAA
Postoperative Proximal Arch Z-Score
6
4
2
0
-2
-4
-6
-8
-10
-10
-8
-6
-4
-2
0
2
4
6
No Reintervention
Catheter Reintervention
Surgical Reintervention
Proximal Arch Reintervention
Preoperative Proximal Arch Z-Score

11:15 AM ***Grand Ballroom 4-6***

Neonatal Mitral Valve Repair: Indications, Techniques, and Mid-term Outcomes

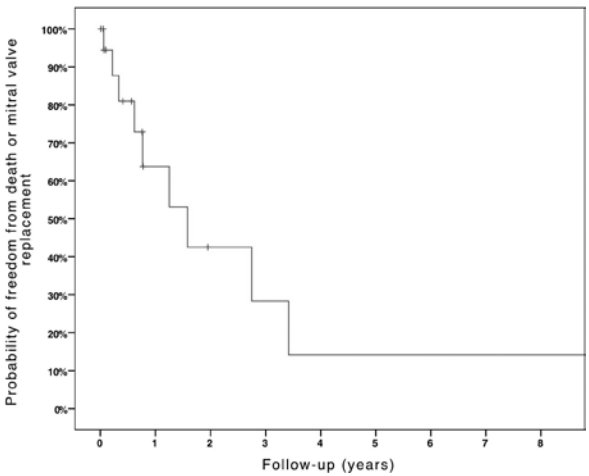
P. Myers, C. W. Baird, P. J. del Nido, F. A. Pigula, N. Lang, G. R. Marx, S. Emani
Boston Children's Hospital, MA

Purpose: Mitral valve repair is rarely required in neonates, and few data on this patient group are available. The aim of this study was to review the indications for surgery, mechanisms, repair techniques, and mid-term outcomes of neonatal mitral valve repair.

Methods: The demographic, procedural, and outcome data were obtained for all neonates who underwent mitral valve repair from 2005 to 2012. The primary endpoints included mortality, transplantation, mitral valve reoperation, and ≥moderate regurgitation or stenosis at follow-up.

Results: Twenty patients were included during the study period. Median age at operation was 11 days (range 3-25). Seven patients (35%) had associated hypoplastic left heart syndrome, six had critical aortic stenosis (30%), three had Shone's complex (15%), one had unbalanced atrioventricular canal, and three had other congenital heart defects. Eight patients had a fetal intervention, six had postnatal balloon aortic valvuloplasty, and two had prior operations to address other congenital heart defects. Eleven patients (55%) presented with mitral stenosis, three patients had regurgitation (15%), and six patients had mixed mitral disease (30%). During a mean follow-up of 15.1 months ± 19.4 months, six patients died at a mean of 62.4 months ± 79.8 months from repair and one patient required orthotopic heart transplantation. Six patients required mitral valve reoperation, five for mitral valve re-repair (two for planned secondary LV recruitment at bidirectional Glenn) and one for mitral valve replacement. Freedom from death or mitral valve replacement was 94.4 ± 5.4% at 1 month, 81.0 ± 10.0% at 6 months, 63.8 ± 13.4% at 1 year, and 42.5 ± 15.2% at 2 years.

Conclusions: Mitral valve repair can be done with low operative risk in neonates who require it and allows valve preservation in a majority of patients at mid-term follow-up. This patient group carries a high burden of late death and mitral valve reoperations.



Notes

11:30 AM ***Grand Ballroom 4-6***

Complete Autologous Aortic Arch Reconstruction ("Aortic Arch Advancement") for Hypoplastic Aortic Arch in Infants: A Superior Surgical Technique

C. M. Mery, F. A. Guzman-Pruneda, J. G. Chan, I. Adachi, J. S. Heinle, E. D. McKenzie, C. D. Fraser

Texas Children's Hospital, Baylor College of Medicine, Houston

COMMERCIAL RELATIONSHIPS J. S. Heinle: Other, Berlin Heart, faculty member of the Berlin Heart EXCOR North American Training and Reference Center with no direct financial compensation in this role

Purpose: The optimal treatment for infants with aortic coarctation and hypoplastic aortic arch is controversial. The goal of this study is to report the long-term outcomes of a single-stage all-autologous aortic arch reconstruction technique—aortic arch advancement (AAA)—in infants with hypoplastic aortic arch.

Methods: All infants that underwent AAA at our institution from 1995 to 2012 were included. AAA was performed by median sternotomy with cardiopulmonary bypass (CPB), deep hypothermic circulatory arrest (DHCA), and/or antegrade cerebral perfusion (ACP). AAA consisted of coarctectomy and end-to-side anastomosis of the descending aorta to the distal ascending aorta/proximal arch (Figure).

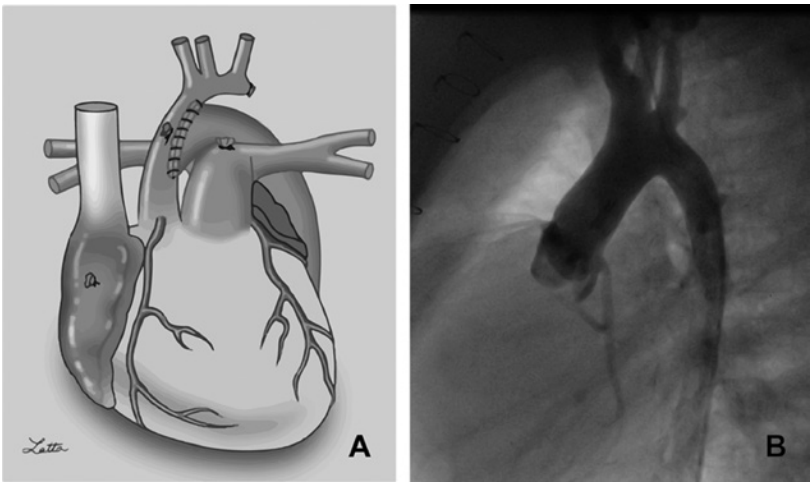
Results: There were 245 patients (110 [45%] females), median age 13 days (interquartile range 7-34 days) and weight 3.3 ± 0.9 kg. Genetic abnormalities were identified in 42 (17%). The table shows the distribution according to concomitant procedures. Duration of CPB, DHCA, and ACP were 178 ± 72 min, 15 ± 18 min, and 27 ± 16 min, respectively. Neurological complications (stroke or seizures) were seen in three (1%) patients and left bronchial compression in one (0.4%). Perioperative mortality was 2% (n=5). From 2007, all patients underwent routine postoperative laryngoscopy. Vocal cord paresis was noted in 33/81 (41%) patients. No patients had clinical residual paresis on follow-up. Recoarctation requiring reintervention was rare. At a median follow-up of 66 months, only seven (3%) patients had reintervention (four cath, three surgical) a median of 5 months (3-16 months) after repair. Actuarial 10-year survival was 84% for single ventricle patients and 93% for biventricular patients.

Conclusions: AAA is a safe, effective, and durable operation with low complication and long-term reintervention rates. Advantages include native tissue-to-tissue reconstruction and preserved potential for growth. As such, it is the ideal technique for management of infants with hypoplastic aortic arch.

Table. Associated Procedures Performed at the Time of Aortic Arch Advancement

Associated Procedures	N (%)
Isolated AAA (+/- ASD repair and PDA ligation)	27 (11%)
VSD closure	52 (21%)
Other procedures (biventricular)	102 (42%)
Non-Norwood single-ventricle palliation	64 (26%)

ASD: Atrial septal defect, PDA: Patent ductus arteriosus, VSD: Ventricular septal defect



11:45 AM ***Grand Ballroom 4-6***

Mitral Disease: The Real Burden for Ross-Konno Procedure in Children

M. Vergnat, D. Luu, A. Baruteau, M. Caliskan, M. Ly, R. Roussin, E. Lebret, E. Belli

Marie-Lannelongue Hospital, Le Plessis-Robinson, France

Purpose: Aortic valve replacement and surgical management of complex left ventricular outflow tract obstruction (LVOTO) in early life remains a surgical challenge. We assessed our recent institutional experience with the Ross-Konno procedure.

Methods: Since 2000, 49 consecutive patients (25 neonates and infants) underwent the Ross-Konno procedure. LVOTO release was performed by isolated septal myotomy in 47 or septal patch in two. Anatomical and clinical risk factors were analyzed.

Results: Median age was 12.2 months (range 4 days - 23 years). 82% had previous surgical (n=26), balloon (n=7), or balloon followed by surgical valvotomy (n=7). Preceding arch repair had been performed in 11 (22%). Sixteen patients (33%) required concomitant procedures: mitral valve repair (n=10) or replacement (n=1), endocardial fibroelastosis resection (n=4), and aortic arch repair (n=3). There were 5 hospital deaths: 10.2% (70% CI: 5.2-16.7). Mean follow-up was 5.7 ± 3.9 years. Ten patients underwent 14 reoperations (three autograft procedures). There were four late deaths, all because of persistent pulmonary hypertension despite subsequent mitral procedures. Ten years' actuarial survival and freedom from reoperation were 63.6 ± 7% and 59.1 ± 7.6%, respectively. Lower ejection fraction (30.6 ± 5.6% vs 42.9 ± 9.2%, p=.005) was associated with early mortality, while concomitant mitral surgery (p=.002), pulmonary hypertension (p=.002) were associated with late mortality. Age and weight at surgery, aortic annulus Z-score, endocardial fibroelastosis, preceding aortic, and concomitant arch procedure were not associated with adverse outcomes.

Conclusions: Ross-Konno remains a high-risk procedure allowing for the treatment of complex LVOTO. Indications in children with severe mitral disease or pulmonary hypertension should be balanced with univentricular repair options. Primary iterative conservative approaches and surgical techniques to improve mitral valve function in infants require further investigations.

12:00 PM ***Grand Ballroom 4-6***

Mitral Valve Repair for Congenital Mitral Valve Disease: Impact of the Biodegradable Annuloplasty Ring

S. Sivalingam, J. Dillon, M. Matsuhama, H. Abdul Latiff, M. Ramli, M. Yakub

National Heart Institute, Kuala Lumpur, Malaysia

REGULATORY DISCLOSURE This presentation will address the off-label use of the Parvulus Suisse Intra annular ring.

Purpose: This study compares the mid-term results of mitral valve repair using the biodegradable ring vs repair with non-ring annuloplasty techniques for congenital mitral valve disease in the pediatric age group, where it was not possible to use standard commercial rings.

Methods: Between February 2006 and November 2011, 68 patients underwent mitral repair for congenital mitral valve disease. Thirty-nine (57%) patients had annuloplasty using the biodegradable ring (Group A), while 29 (43%) patients had non-ring annuloplasty techniques (Group B). The median age at repair was 2.0 years in Group A and 1.8 years in Group B (p=0.672). The predominant lesion was mitral regurgitation in 64 (94%) patients.

Results: There were no hospital deaths. At a mean follow-up of 39 months (median 41, range 0.2 to 76 months), overall survival was 94 +/- 4% and 89 +/- 8% for Group A and B, respectively, at 5 years (p=0.595). Freedom from reoperation at 5 years was 100% in Group A and 53 +/- 17% for Group B (p=0.041). Freedom from valve failure at 5 years was 93 +/- 5% for Group A and 53 +/- 17% for Group B (p=0.041). At latest follow-up, there was no difference in the mean transmitral gradients between the groups, 5.0 +/- 3.7 mmHg in Group A and 4.0 +/- 2.1 mmHg in Group B (p=0.224).

Conclusions: Mitral valve repair using the biodegradable ring for the pediatric age group with congenital mitral valve disease was superior when compared to the non-ring annuloplasty repair. Excellent survival benefit and freedoms from reoperation and valve failure at mid-term was demonstrated. Furthermore, the use of the biodegradable ring did not result in elevated transmitral gradients, suggesting its important role in the pediatric population with small annular sizes where standard commercial rings are not available or recommended.

12:15 PM ***Grand Ballroom 4-6***

The Influence of Bidirectional Cavopulmonary Anastomosis on the Atrioventricular Valve in Patients With Functional Single Ventricles

T. Suzuki, S. Yamagishi, A. Masuoka, M. Uno, T. Katogi

Saitama Medical University International Medical Center, Japan

Purpose: We evaluated the influence of volume unloading by bilateral cavopulmonary anastomosis (BCPA) on the atrioventricular (AV) valve in patients with functional single ventricles.

Methods: Thirty-seven consecutive patients with functional single ventricles who survived after BCPA were enrolled in this study. The echocardiograms were reevaluated for AV valve regurgitation and the size of the AV valve annulus before and after BCPA. The size of the AV valve annulus was standardized to the body surface area. The grade of regurgitation was scored as 1 (none), 2 (mild regurgitation), 3 (moderate regurgitation), or 4 (severe regurgitation).

Results: The AV valve regurgitation before BCPA was none in 12, mild in 11, moderate in 11, and severe in three patients. Concomitant AV valvuloplasty was performed in eight patients. The mean z value of postoperative AV valve annulus of those who underwent valvuloplasty was significantly lower than preoperative value (-0.25 vs 3.91, $p<0.01$). The mean regurgitation score also decreased significantly after BCPA (2.25 vs 3.37, $p=0.031$). In the remaining patients without valvuloplasty, the mean z value of postoperative AV valve annulus was also significantly lower than preoperative value (0.45 vs 1.51, $p=0.021$). However, there was no significant change in the mean regurgitation score after BCPA (1.60 vs 1.78, $p=0.48$). In addition, the latest evaluation before Fontan operation revealed that the z value of AV valve annulus increased significantly compared to the value just after BCPA (1.36 vs 0.45, $p=0.026$). The later increase of AV valve annulus was more common in the patients with moderate AV valve regurgitation.

Conclusions: The size of the AV valve annulus in functional single ventricle decreases after BCPA. However, this remodeling of the ventricle does not improve the degree of AV valve regurgitation. Concomitant valvuloplasty should be considered in those patients with structural valve abnormalities and/or moderate or more regurgitation.

Notes

11:00 AM – 12:30 PM ***Grand Ballroom 7B***

General Thoracic Session: Mediastinal/Pulmonary

Moderators: *Daniel J. Boffa, New Haven, CT, and Jessica S. Donington, New York, NY*

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and a brief question-and-answer session after each topic.

11:00 AM ***Grand Ballroom 7B***

Three-Year Experience With Biodegradable Airway Stenting in Children

D. Vondrys

Innsbruck Medical University, Austria

REGULATORY DISCLOSURE This presentation will address the ELLA-CS Biodegradable Airway Stent, which is not FDA approved.

Purpose: Various stenting options are available for the pediatric airway narrowing. In our practice, we have used balloon-expandable permanent and retrievable self-expanding metal stents, as well as silicone and plastic retrievable stents. They all can cause a perforation and they do not grow. Here, we report our experience with biodegradable polydioxanone stents for tracheal narrowing in children.

Methods: Twenty custom-made polydioxanone stents were implanted into 10 patients with airway
narrowing due to intrinsic collapse or external compression. The median stent diameter was 9 mm (6-14 mm) and median length was 15 mm (13-70 mm).

Results: Relief of narrowing was achieved initially in all cases. There was no bleeding or perforation due to stent implantation. Size mismatching occurred in two cases. Seven patients needed at least one repeat stenting after stent degradation. There was one death, unrelated to the stent implantation. All nine survivors are in good clinical condition up to 3 years after first stenting.

Conclusions: This follow-up study shows that polydioxanone stents offer a safe alternative to metallic or silastic stents for collapse or external compression of the trachea in children. They may avoid the need for permanent stenting and allow subsequent growth of the airway.

11:15 AM ***Grand Ballroom 7B***

The Role of Postoperative Radiation Therapy in Completely Resected Masaoka-Koga Stage II Thymoma

I. Park[1], J. Jeon[1], H. Kim[1], Y. Hwang[1], C. Kang[1], Y. Kim[1], J. Kim[2]

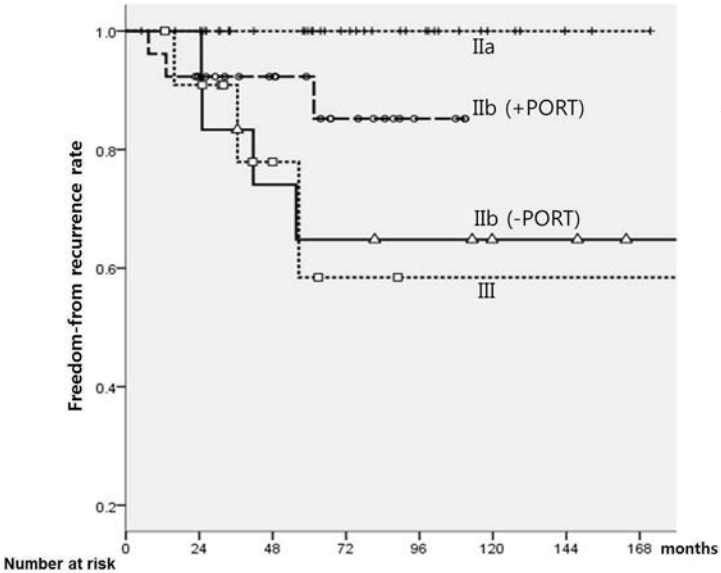
[1]Seoul National University Hospital, Seoul National University College of Medicine, Republic of Korea, [2]Lung Cancer Center, Dongnam Institute of Radiological and Medical Sciences, Busan, Republic of Korea

Purpose: We intended to evaluate effects of postoperative radiation therapy (PORT) in completely resected Masaoka-Koga stage II thymoma in terms of freedom from recurrence (FFR).

Methods: Out of 171 completely resected thymoma patients, 77 stage II patients were reviewed retrospectively. Patients were divided into R group (PORT) and N group (No PORT). FFR rates according to the status of PORT and stages were compared.

Results: There were 39 females (50.6%) and mean age was 53. Median follow-up time was 65 months. Thirty-nine patients (50.6%) were stage IIa and 38 patients were IIb. Mean tumor size was 5.7 cm. The overall 10-year survival rate was 93.5%. The 5-year and 10-year FFR rates were 92% and 89.5%. PORT was performed in 44 patients (57.1%). Recurrence was diagnosed in seven patients, exclusively in stage IIb (four in N group [12.1%] and three in R group [6.8%]). Local recurrence was diagnosed in one patient in N group. Six patients had regional recurrences and two of them had concomitant lung metastasis. Clinicopathologic characteristic of both groups were not significantly different except the proportion of stage. More patients in R group were stage IIb (59.1% vs 36.4%, p=0.048). FFR rates of both group were not significantly different (5-year; N 85.6% vs R 95.4%, p=0.58). Stage was a significant prognostic factor for FFR (5-year; IIa 100% vs IIb 83.4%, p=0.009). Sex, age, and size of tumor were not significant prognostic factors. In multivariate analysis, no parameter was a significant prognostic factor. In subgroup analysis for stage IIb, FFR of R groups showed a more favorable trend than N group (5-year; 92.3% vs 58.4%, p=0.2). Prognosis of IIb-N group was similar with that of stage III group who all underwent radiation therapy (p=0.57). (Fig 1)

Conclusions: PORT was not effective in terms of FFR in completely resected Masaoka-Koga stage IIa thymoma and is not recommended. However, subgroup analysis reveals that PORT can be beneficial in stage IIb thymoma.



Number at risk

+	39	39	39	39	39	39	39	39
o	26	24	24	23	23	23	-	-
Δ	12	11	10	9	9	9	9	9
□	12	12	10	8	8	8	8	8

11:30 AM ***Grand Ballroom 7B***

Minimally Invasive Transcervical Thymectomy With Partial Upper Sternotomy: Long-term Neurologic Outcomes in Patients With Nonthymomatous Myasthenia Gravis

E. Ruffini, F. Guerrera, P. Filosso, G. Bora, G. Nex, S. Gusmano, M. Giobbe, M. Bruna, R. Giobbe, P. Lyberis, A. Oliaro

University of Torino, Italy

Purpose: Thymectomy is a recognized treatment for myasthenia gravis (MG), but the optimal surgical approach is yet to be determined. Long-term follow-up is essential to correctly assess the efficacy of surgery. Over the last 40 years, we have consistently employed a transcervical access with partial upper sternotomy (TC-US, T-1c according to Myasthenia Gravis Foundation of America [MGFA] recommendations) in patients with nonthymomatous MG. This study analyzed the long-term outcome of MG patients treated at our institution using this approach.

Methods: In the period 1990-2011, 238 nonthymomatous MG patients underwent thymectomy using TC-US approach. Patients were surveyed for neurologic outcome by a telephone questionnaire, and 124 replied. There were 36 males and 88 females (age range 13-72, median 34 years). Primary endpoints were complete stable remission (CSR) and pharmacologic remission (PR) according to MGFA, as well as the cumulative incidence of remission (CIR). Clinical-pathologic predictors of CSR/PR were analyzed including age, gender, preoperative MG duration of symptoms, and MGFA class (I vs II-III-IV).

Results: Median preoperative duration of MG symptoms was 7 months (IQR 10, range 1-180). Median operative time was 55 min (range 40-105). Six patients died at follow-up (two of MG). Median follow-up period was 147 months. MG symptoms improved in 84% (n=104) of the patients. CSR rate was 29%, PR rate was 5%. Overall CIR was 30%, 37%, and 41% at 5, 10, and 15 years. Negative predictors of CSR/PR were age >34 years (p=0.009) and preoperative MG symptom duration >6 months (p=0.023).

Conclusions: Thymectomy by TC-US approach is a minimally invasive procedure in patients with nonthymomatous MG. It results in a reduced operative time compared to VATS or transternal techniques, with satisfactory remission rate and symptom improvement. The results of our study may be of help in the choice of the optimal surgical approach in these patients.

11:45 AM *Grand Ballroom 7B*

Imaging Surveillance for Surgically Treated, Early Stage Lung Cancer

L. M. Backhus[1], F. Farjah[1], S. B. Zeliadt[2], T. K. Varghese[1], A. M. Cheng[1], L. Kessler[2], D. Au[1], D. R. Flum[1]

[1]University of Washington School of Medicine, Seattle, [2]University of Washington School of Public Health, Seattle

COMMERCIAL RELATIONSHIPS D. Au: Research Grant, AHRQ, Department of Veterans Affairs, Gilead, NHLBI

Purpose: Current guidelines recommend routine imaging surveillance for non-small cell lung cancer (NSCLC) patients following treatment. Little is known about imaging surveillance patterns for operated, early-stage lung cancer patients in the community-at-large. We sought to characterize surveillance patterns in a nationally representative cohort.

Methods: We identified 18,400 stage I/II surgically resected NSCLC patients who survived at least 12 months using Surveillance, Epidemiology, and End-Results (SEER)-Medicare records from 1995 to 2009. Our primary outcome was receipt of imaging within 4-8 months following surgery. We also examined what type of initial imaging patients received, defined as the first radiologic study to occur within the observation period.

Results: A total of 19% of patients received no imaging within the first 4-8 months. Chest radiography (CXR) was the most frequent initial modality (52%), followed by chest computerized tomography (CT) (25%). Positron emission tomography (PET) was least frequent as initial imaging modality (3%). Adherence to National Comprehensive Cancer Network guidelines for chest CT was 42% overall and increased over time from 24% (1996-2000) to 55% (2006-2009). CXR imaging decreased (68% to 39%) while PET/CT increased (2% to 15%) over time. Older age was associated with reduced rates of CT and PET, but not CXR. Higher rates of imaging were associated with stage II disease, increasing comorbidity, mediastinoscopy, and adjuvant chemotherapy or radiation therapy.

Conclusions: We observed large gaps in guideline-recommended imaging surveillance following definitive surgery for NSCLC. In this large community-based population, CXR was most common, which has been shown to have inferior detection rates for recurrence and detection of new cancers. Future studies identifying barriers and increasing awareness are needed to ensure delivery of quality in cancer care and survivorship.

12:00 PM *Grand Ballroom 7B*

Debate: Open vs Minimally Invasive Surgery

Open: *Cameron D. Wright, Boston, MA*

Minimally Invasive: *Robert J. Cerfolio, Birmingham, AL*

COMMERCIAL RELATIONSHIPS R. J. Cerfolio: Other, Intuitive Surgical, Inc, Faculty, Proctor, Speaker; Research Grant, Pfizer Inc, Precision Therapeutics, Inc

11:00 AM – 12:30 PM ***Grand Ballroom 12-14***

SVS @ STS

This session will focus on vascular surgery topics relevant to practicing cardiothoracic surgeons. Cardiothoracic and vascular surgeons will provide perspectives on the contemporary management of type B aortic dissection—both acute (uncomplicated / complicated) and chronic dissection—as well as on the management of severe (asymptomatic / symptomatic) carotid stenosis in patients undergoing CABG surgery.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Formulate a plan based on published data for management of patients with severe carotid stenosis undergoing CABG surgery
- Identify treatment options for patients with acute and chronic type B dissection
- Describe the advantages and disadvantages of best medical management vs endovascular intervention in type B dissection

The physician competencies addressed in this session are patient care, medical knowledge, and interpersonal and communication skills. These physician competencies will be addressed through a series of collaborative lectures by members of The Society of Thoracic Surgeons and the Society for Vascular Surgery.

Moderators: *A. Michael Borkon, Kansas City, MO, and Jeffery B. Dattilo, Nashville, TN*

11:00 AM **Contemporary Management of Type B Aortic Dissection**
STS: *Michael J. Reardon, Houston, TX*
SVS: *Christopher J. Kwolek, Newton, MA*
COMMERCIAL RELATIONSHIPS M. J. Reardon: Consultant/Advisory Board, Medtronic, Inc

11:30 AM **Discussion**

11:45 AM **Management of Severe Carotid Stenosis in Patients Undergoing CABG Surgery**
STS: *Keith B. Allen, Kansas City, MO*
SVS: *Jeffery B. Dattilo, Nashville, TN*

12:15 PM **Discussion**

Notes

12:30 PM – 1:30 PM ***Grand Ballroom 9-11***

Ethics Debate: Another Surgeon's Error—Must You Tell the Patient?

The question of whether medical errors should be disclosed to patients and their families has been controversial, but there is a growing consensus that such errors should be disclosed. A much less settled question is whether physicians have an obligation to report errors made by others. This question will be explored in a debate between two experts who have broad risk management experience in medical centers.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Identify their roles and responsibility for reporting the errors of others
- Discuss the conditions under which one would not need to report the errors of others
- Describe the importance of avoiding litigation in the face of medical errors

The physician competencies addressed in this session are patient care, interpersonal and communication skills, and professionalism. These physician competencies will be addressed through lectures, a debate, and questions from the audience.

Facilitator: *Robert M. Sade, Charleston, SC*

Pro: *Susan D. Moffatt-Bruce, Columbus, OH*
Con: *Chadrick E. Denlinger, Charleston, SC*

12:30 PM – 1:30 PM ***Vinoy & Sawgrass***

Residents Luncheon

Notes

1:30 PM – 5:30 PM ***Crystal Ballroom G-Q***

General Session II

Moderators: *Douglas E. Wood, Seattle, WA, and Keith S. Naunheim, St Louis, MO*

COMMERCIAL RELATIONSHIPS D. E. Wood: Research Grant, Spiration, Inc; Consultant/Advisory Board, Spiration, Inc

Unless otherwise noted in this program or by the speakers, speakers have no relevant financial relationships to disclose and will be presenting information only on devices, products, or drugs that are FDA-approved for the purposes they are discussing.

Unless noted with an asterisk (*), presenting authors are listed first on each abstract.

The physician competencies addressed in this session are patient care and medical knowledge. These physician competencies will be addressed through a series of individual lectures and focused discussion on key points of presentations.

1:30 PM ***Crystal Ballroom G-Q***

C. Walton Lillehei Lecture

The Future of Transplantation: Personalized Medicine for the Organ

Shaf Keshavjee, Toronto, Canada

Dr. Keshavjee will describe the paradigm shift that has occurred in the field of transplantation. The opportunity to more accurately diagnose and treat donor organs in a targeted fashion to improve organ utilization and outcomes after transplantation is a reality. This will bring the science of transplantation to the bedside for a personalized medicine approach to the management of the donor organ.

2:30 PM ***Cypress Ballroom***

BREAK—Visit Exhibits and Scientific Posters

3:15 PM ***Crystal Ballroom G-Q***

50th Anniversary Tribute

Douglas E. Wood, Seattle, WA

COMMERCIAL RELATIONSHIPS D. E. Wood: Research Grant, Spiration, Inc; Consultant/Advisory Board, Spiration, Inc

3:30 PM ***Crystal Ballroom G-Q***

Award Presentations

3:45 PM – 4:30 PM *Crystal Ballroom G-Q*

Hot Topics in Cardiothoracic Surgery

3:45 PM *Crystal Ballroom G-Q*

Hot Topics in Cardiothoracic Surgery—General Thoracic

Detection of Early Lung Cancer Using Exhaled Breath

M. Bousamra, M. Li, R. J. Knipp, M. Nantz, X. Fu

University of Louisville School of Medicine, KY

Discussant: *Thomas K. Varghese Jr, Seattle, WA*

Purpose: The analysis of exhaled breath is a promising noninvasive tool for diagnosis of early lung cancer (LC). Previous techniques have not achieved clinical significance due to a lack of specificity and difficulties related to complex volatile mixtures. We report the analysis of carbonyl volatile organic compounds (VOCs) in exhaled breath and identification of specific LC VOCs that can accurately differentiate benign from malignant nodules.

Methods: Silicon chips (2x2 cm) were microfabricated yielding thousands of micropillars coated with 2-(aminooxy)-N,N,N-trimethylethanammonium iodide (ATM) enclosed in a microfluidic channel. The ATM functionalized micropillars capture carbonyl VOCs by means of oximation reactions. ATM-VOC adducts are eluted from the chip with methanol and analyzed by Fourier transform-ion cyclotron resonance mass spectrometry. Exhaled breath samples were collected into a 1-liter Tedlar bag from 88 smoker (45) and nonsmoker controls and 10 initial patients with LC. Comparing these groups, four carbonyl compounds were identified as VOC markers of LC. Then samples were collected preoperatively from 48 patients (pts) with early LC, Stage I (32), or Stage II (16), and 32 pts with benign pulmonary nodules. Analysis of VOCs was performed blinded to the preoperative diagnosis and to the pathological results.

Results: Elevation of ≥3 VOC was predictive of LC in 97% (32/33), Table 1. The absence of VOC elevation was predictive of benign disease in 90% (18/20). Elevated VOC concentrations in LC pts decreased to the ranges of healthy controls (n=15/15) after resection.

Conclusions: Analysis of specific exhaled breath VOCs can be used as an adjunct to computed tomography for the diagnosis of lung cancer in its early stages and can distinguish benign from malignant nodules.

Number (N) of Elevated VOCs for Patients with LC and Benign Pulmonary Nodules

N, elevated VOCs	n, LC patients	n, benign nodule patients
4	10	0
3	21	1
2	11	5
1	4	8
0	2	18

4:00 PM ***Crystal Ballroom G-Q***

Hot Topics in Cardiothoracic Surgery—Congenital

Pediatric Recipient Survival Beyond 15 Post-Heart Transplant Years: A Single Center Experience

H. Copeland, A. J. Razzouk, R. Chinnock, N. W. Hasaniya, L. L. Bailey

Loma Linda University, CA

COMMERCIAL RELATIONSHIPS R. Chinnock: Research Grant, Hoffmann-La Roche Inc

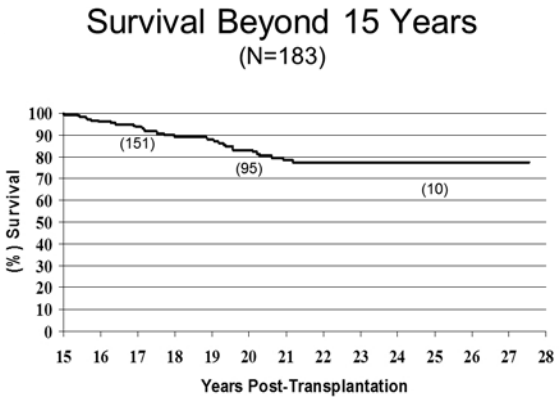
Discussant: *Thomas L. Spray, Philadelphia, PA*

Purpose: To evaluate late survival among pediatric heart transplant (tx) patients (pts) who have lived more than 15 years (y).

Methods: We conducted a retrospective chart review of 498 pediatric heart tx recipients in our institution since 1985 (recipient age less than 18 y). We evaluated pre- and post-tx demographics.

Results: 183 (36.7%) of the total recipients (115 males; 62.8%) lived at least 15 y. Age at transplant ranged from 0 days-17.48 y (median 56 days). Pretransplant diagnosis included: complex congenital heart disease 142 (77.6%), cardiomyopathy 38 (20.8%) and tumor three (1.6%). Currently, 151 (82.5%) pts are alive (Figure 1) with a mean ejection fraction greater than 62% on follow-up (median 20.2 y). Thirty-six (19.7%) required re-tx and four (2.2%) a re-re-tx. Indications for re-tx were graft vasculopathy (GV) 30 (83.3%) and graft failure 6 (16.7%) and for re-re-tx were GV 4. Currently, known immunosuppressive for 148 alive pts consists of: monotherapy 30 patients (20.3%); dual therapy 87 patients (58.7%); triple therapy 26 patients (17.6%); and quadruple therapy five patients (3.4%). Of the patients on monotherapy, the majority were on cyclosporine or tacrolimus, except for four patients on sirolimus. Ninety-nine pts were diagnosed with renal insufficiency/failure, of which 17 had renal transplant (9.3% of the total; 17/183) and one patient required chronic hemodialysis after kidney tx. Causes of late death in this group included: GV 11 (34.3%), PTLD 6 (18.8%), acute rejection 4 (12.5%), sepsis 2 (6.3%), multiorgan failure 1 (3.1%), and unknown 8 (25%).

Conclusions: Infants and children may undergo heart transplantation with excellent survival beyond 15 years. Graft vasculopathy remains the main factor limiting long-term survival. Repeat heart transplantation and renal transplantation can be successfully performed in this population to treat graft vasculopathy and renal complications.


Survival Beyond 15 Years
(N=183)
100
90
80
70
60
50
40
30
20
10
0
(%) Survival
(151)
(95)
(10)
15 16 17 18 19 20 21 22 23 24 25 26 27 28
Years Post-Transplantation

Notes

4:15 PM ***Crystal Ballroom G-Q***

Hot Topics in Cardiothoracic Surgery—Adult Cardiac

Impact of Pump Status and Conduit Choice in Coronary Artery Bypass Grafting: A 15-Year Follow-up of 2,012 Propensity-Matched Patients

*J. B. Grau[1], C. K. Johnson[1], G. Ferrari[2], R. E. Shaw[1], M. E. Brizzio[1], *A. Zapolanski[1]*

[1]The Valley-Columbia Heart Center, Ridgewood, NJ, [2]The University of Pennsylvania Perelman School of Medicine, Glenolden

***Discussant:** Joseph F. Sabik III, Cleveland, OH*

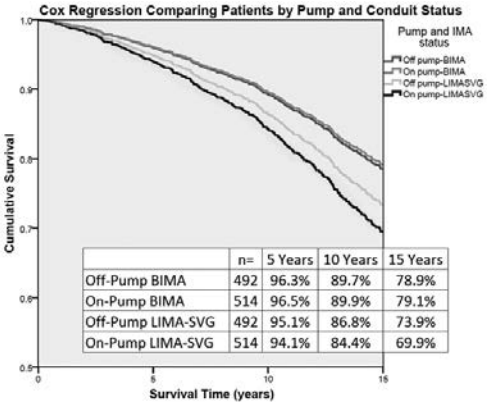
COMMERCIAL RELATIONSHIPS J. F. Sabik: Consultant/Advisory Board, Medtronic, Inc, ValveXchange, Inc; Other Research Support, Abbott Vascular, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Medistem, Inc

Purpose: The benefits of off-pump coronary artery bypass grafting (CABG) have recently been contested in the literature. The ROOBY trial showed no significant differences in outcomes between on- and off-pump CABG. Previous studies have demonstrated that bilateral internal mammary artery (BIMA) grafts have superior outcomes over the use of a single IMA. The goal of this study was to examine the effect of cardiopulmonary bypass on the conduit-dependent outcomes after CABG.

Methods: From 1994 to 2013, 6,666 patients have undergone CABG at our institution. Of these, 3,548 (53.2%) were performed off-pump. Overall, 1,544 received BIMA + Saphenous Vein Grafts (SVG) vs 5,122 in whom left IMA-SVG was used. Propensity matching based on 22 preoperative variables was used to produce two balanced groups of 1,006 patients (2,012 in total). Thirty-day and long-term mortality were collected using the STS National Database and Social Security Death Index, respectively.

Results: Thirty-day mortality was low in all four groups: 1.0% in Off-Pump BIMA, 0.6% in On-Pump BIMA, 1.0% in Off-Pump LIMA-SVG, and 1.2% in On-Pump LIMA-SVG. The 5-, 10-, and 15-year survival rates are displayed in Figure 1. There was no difference in 15-year survival between patients receiving BIMA grafts on- or off-pump (78.9% vs 79.1%). The BIMA grafts outperformed the LIMA-SVG grafts regardless of pump status.

Conclusions: This 15-year follow-up demonstrates the superiority of BIMAs as conduit material at the time of CABG. Pump status seems to have a greater influence on the survival of patients receiving LIMA-SVG. These results reinforce the notion that conduit selection should take precedence over pump status in order to maximize long-term benefits of coronary revascularization.



	n=	5 Years	10 Years	15 Years
Off-Pump BIMA	492	96.3%	89.7%	78.9%
On-Pump BIMA	514	96.5%	89.9%	79.1%
Off-Pump LIMA-SVG	492	95.1%	86.8%	73.9%
On-Pump LIMA-SVG	514	94.1%	84.4%	69.9%

Notes

General Session II – Continued

4:30 PM ***Crystal Ballroom G-Q***

Thomas B. Ferguson Lecture

Bassem Youssef, Cairo, Egypt

Notes

6AM

6:30 AM – 9:30 AM
Registration: STS University

7AM

7:00 AM – 9:00 AM
STS University Courses

8AM

9AM

9:30 AM – 11:30 AM
STS University Courses

10AM

11AM

12PM

1PM

2PM

3PM

4PM

5PM

6PM

7PM

8PM

9PM

New

50 Anniversary Tribute

6:30 AM – 9:30 AM **Registration: STS University**

7:00 AM – 9:00 AM **STS University**

9:30 AM – 11:30 AM **STS University (courses repeated)**

6:30 AM – 9:30 AM *Convention Center Entrance and Grand Ballroom Foyer*

Registration: STS University

7:00 AM – 9:00 AM and repeated from 9:30 AM – 11:30 AM *Grand Ballroom*

STS University

The physician competencies addressed in each STS University course are medical knowledge and practice-based learning and improvement. These physician competencies will be addressed through interactions with faculty and hands-on sessions to gain knowledge and practical application experience.

Course 1: TAVR/TEVAR, Guidewires, and Sheaths

Grand Ballroom

Course Directors: *Juan A. Crestanello, Columbus, OH, and Vinod H. Thourani, Atlanta, GA*

COMMERCIAL RELATIONSHIPS J. A. Crestanello: Research Grant, Medtronic, Inc; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

New skills are required for transcatheter aortic valve replacement (TAVR) and thoracic endovascular aortic repair (TEVAR). This course will introduce attendees to novel endovascular techniques for the treatment of aortic stenosis and thoracic aortic disease. The hands-on lab experience will provide participants with the opportunity to either practice or observe an expert perform a variety of procedures utilizing the latest technology, including transfemoral, direct aortic, and transapical aortic valve replacement, introduction to wires and catheters, and all aspects of TEVAR.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Compare techniques on transfemoral, direct aortic, and transapical aortic valve replacement
- Classify the techniques required to expertly perform TEVAR and to practice the implant procedure with consideration of technical pitfalls
- Compare and appraise techniques with multiple different wires and catheters utilized in the performance of TAVR and TEVAR

Course 2: ICU/Echo

Grand Ballroom

Course Directors: *Haney Mallemat, Catonsville, MD, and Glenn J. R. Whitman, Baltimore, MD*

This course will review the utilization of a focused ultrasound examination of the heart, pleural space, and central veins. Attendees will gain hands-on experience with ultrasound simulators and live models. Topics will include: basic cardiac anatomy and physiology, as visualized by three common transthoracic views; IVC evaluation to determine intravascular volume; pleural space pathology (eg, pneumothorax and pleural effusions); and ultrasound techniques for central vein visualization and cannulation.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Generate an echocardiographic parasternal, apical, and subcostal view of the heart
- Evaluate the inferior vena cava to help determine volume status
- Identify the pleura and sliding lungs
- Use ultrasound to safely accomplish subclavian and internal jugular venous cannulation

Course 3: Advanced Endoscopy for Thoracic Surgeons — *Grand Ballroom*

Course Directors: *Moishe Liberman, Montreal, Canada, and Douglas J. Minnich, Birmingham, AL*

COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc; D. J. Minnich: Consultant/Advisory Board, Varian Medical Systems, Inc; Other, Covidien, Honoraria for physician training

Endobronchial ultrasound (EBUS) and endoscopic ultrasound (EUS) have attained firm places in the endoscopic diagnostic and staging armamentarium of mediastinal lymph nodes. Electromagnetic navigation bronchoscopy (ENB) is an interesting technology aimed at facilitating the endoscopic biopsy of peripheral lung lesions. Airway stenting and rigid bronchoscopy are important tools for the palliation of malignant disease and the treatment of benign disease in general thoracic surgical practice. In this course, leaders in the field will direct focused, hands-on stations where attendees can practice these techniques on models and simulators. Small group sessions will facilitate opportunities for close instructor/learner interaction.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Discuss how EBUS and EUS are used in mediastinal staging
- Explain the complementary roles of EBUS and EUS
- Describe potential indications and limitations of ENB
- Identify potential pitfalls and ways in which to avoid complications during rigid bronchoscopy and airway stent insertion

Course 4: Short- and Long-term Circulatory/Respiratory Support — *Grand Ballroom*

Course Directors: *Aaron M. Cheng, Seattle, WA, and Nicholas G. Smedira, Cleveland, OH*

This course is designed to familiarize participants with the currently available forms of short- and long-term mechanical circulatory or respiratory support. Instructors will focus on techniques for optimal device insertion, minimizing both short- and long-term complications, and optimization of the device settings. At each station, the instructor will provide a brief overview of the surgical techniques or the device itself. Participants will then have the opportunity to work directly with the instructor to discuss issues related to insertion of the device or management of the device.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Select optimal short-term devices for the presenting clinical condition
- Discuss strategies to minimize limb complications using short-term devices
- Summarize the technical pearls for the insertion and exchange of ventricular assist devices
- Discuss troubleshooting and device optimization

Course 5: VATS Lobectomy

Grand Ballroom

Course Directors: *Shanda H. Blackmon, Houston, TX, and Scott J. Swanson, Boston, MA*

COMMERCIAL RELATIONSHIPS S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau, Covidien; S. J. Swanson: Consultant/Advisory Board, Covidien, Ethicon, Inc

This course will review the indications, patient selection, technical steps, and recent advances for performance of VATS lobectomy. This session is dedicated to hands-on training utilizing porcine heart lung blocks for course participants to perform a VATS left upper lobectomy. Additional stations include instrument and energy device options.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe the indications and steps to perform VATS
- Discuss potential pitfalls and strategies for intraoperative troubleshooting to successfully achieve minimally invasive lobectomy
- Identify instruments and other technologies available for performance of minimally invasive lobectomy

Course 6: Mitral Valve Repair

Grand Ballroom

Course Directors: *Vinay Badhwar, Pittsburgh, PA, and Aubrey C. Galloway Jr, New York, NY*

COMMERCIAL RELATIONSHIPS A. C. Galloway: Other, Edwards Lifesciences Corporation, valve technology (Intuity Valve) development and IP, Medtronic, Inc, royalties for IP for valve repair products

Surgical correction for complex bileaflet or anterior leaflet disease can often be a technical challenge. Handling annular calcium and leaflet fusion or restriction can be particularly demanding when focused on a repair objective. Obtaining, interpreting, or performing intraoperative transesophageal echocardiographic assessment when necessary is critical to the effective planning of advanced mitral repairs. This course will provide hands-on experience with the following:

1) Mitral valve analysis and interpretation, including hands-on performance of transesophageal echocardiography
2) Bileaflet repair techniques for mitral leaflet prolapse using resectional and neochordal techniques
3) Anterior leaflet techniques, including chordal relocation and leaflet augmentation
4) Repair using the thoracoscopic minimally invasive thoracotomy approach
5) Repair using the robotic-assisted minimally invasive approach

Participants will practice advanced mitral valve repair guided by expert faculty who are international leaders in advanced open and minimally invasive/robotic repair. The objective is to guide participants in performing mitral valve repair for a broad range of pathologic subsets, encompassing both simple and more complex disease with a particular focus on hands-on experience.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Recall and identify mitral anatomy with attention to the pitfalls associated with complex pathology
- Review the basic technical aspects of transesophageal echocardiographic performance and interpretation
- Review technical aspects and options for focal posterior leaflet pathology
- Review technical aspects and options for anterior leaflet, bileaflet degenerative, and restrictive pathology

Course 7: Enabling Technologies Facilitating Minimally Invasive Surgery (canceled)

Course 8: Valve-Sparing Aortic Root Replacement

Grand Ballroom

Course Directors: *Duke E. Cameron, Baltimore, MD, and Edward P. Chen, Atlanta, GA*

This course will provide interactive, hands-on instruction of the surgical techniques and critical steps necessary for performing a successful valve-sparing aortic root replacement (VSRR). Several faculty members and proctors who are familiar with the operation will be readily available to provide assistance and consultation throughout the course. Online video-based instruction will be provided prior to the course, illustrating the surgical nuances for the procedure.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Describe the anatomy of the aortic root
- Summarize the technical steps necessary for successful performance of a VSRR
- Apply different methods in choosing a graft size
- Discuss leaflet repair and annuloplasty methods

Course 9: Fontan Conversion and Maze Procedure

Grand Ballroom

Course Directors: *Jeffrey P. Jacobs, St Petersburg, FL, and Constantine Mavroudis, Orlando, FL*

This hands-on wet lab will familiarize the clinician with the different types of arrhythmias that patients with congenital heart disease—specifically, single ventricle physiology—may experience. The course will cover the mechanisms of action, surgical ablation, and therapeutic pacemaker strategies.

Attendees will use porcine hearts to examine the landmarks used for intraoperative electrophysiologic mapping, applying cryoablation lesions, and lead placement strategies for pacemaker implantation. Actual cryoablation probes with freezing capabilities will be available to give attendees the experience necessary to perform this operation in humans.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Explain the principles and mechanisms of various atrial arrhythmias
- Review the clinical characteristics of therapeutic arrhythmia surgery
- Demonstrate the application of cryoablation lesions on the heart
- Identify the various atrial to pulmonary artery Fontan connections and learn how to manage the various confounding anatomic challenges that complicate Fontan conversion surgery

Course 10: Novel Techniques in Esophageal and Tracheal Surgery *Grand Ballroom*

Course Directors: *Sidhu P. Gangadharan, Boston, MA, and Christopher R. Morse, Boston, MA*

Tracheal and esophageal resection and reconstruction require unique technical skills to achieve success and minimize complications, such as leaks and stricture. Participants will be introduced to several techniques for airway and esophageal reconstruction with emphasis in the different technical aspects ("pearls") of the anastomosis. This course will provide a hands-on experience that participants can incorporate into their practices. Techniques will include tracheal and sleeve anastomosis, hand-sewn and stapled anastomosis (linear and end-to-end), and tracheobronchoplasty.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Perform tracheal/airway resection and reconstruction
- Demonstrate esophageal hand-sewn anastomosis techniques
- Perform esophageal stapled anastomosis (linear and end-to-end)
- Use tracheobronchoplasty procedure

Course 11: Robotic Simulation *Grand Ballroom*

Course Directors: *Robert J. Cerfolio, Birmingham, AL, and Richard S. Lazzaro, New York, NY*

COMMERCIAL RELATIONSHIPS R. J. Cerfolio: Research Grant, Pfizer Inc, Precision/Chemo Fx; Other, Intuitive Surgical, Inc, Faculty, Proctor, Speaker; R. S. Lazzaro: Other, Intuitive Surgical, Inc, Proctor

This hands-on course has been added to STS University to provide in-depth training in the area of robotics. Participants will learn robotic techniques using simulation and animal models. This course will focus on programmatic training for the robotic surgeon team using robots available in practice today. It will also stress the importance of teamwork with the bedside assistant and anesthesiologist.

Learning Objectives

Upon completion of this activity, participants should be able to:

- Operate the robot, including the fourth arm
- Demonstrate teamwork with the bedside assistant
- Perform correct port placement
- Practice the distancing between the robotic ports and how to dock and drive the robot
- Drive the camera and set up the operation by themselves with extensive use of the third arm

P1

Effects of Induced Pluripotent Stem Cell (iPSC) vs Mesenchymal Stem Cell (MSC) Transplantation in the Treatment of Chronic Myocardial Ischemia

Y. Zhou, S. Wang, R. F. Hoyt, Z. Yu, C. Liu, W. Xie, Y. Du, K. A. Horvath
NIH National Heart, Lung, and Blood Institute, Bethesda, MD

Purpose: This study was designed to test the effects of iPSCs in vivo and compare to MSCs.

Methods: P3 myocardial fibroblasts were used for reprogramming using the lentiviral vector containing 4 human factors: OCT4, SOX2, KLF4, and cMYC. The iPSC Colonies at P12-17 were allogeneically transplanted into chronically ischemic myocardium of eight swine by direct intramyocardial injection. Cohorts of two animals were sacrificed at 2, 4, 6, and 8 weeks after injection.

Results: No signs of graft vs host disease were found at any time points. At 2 weeks, clusters of SSEA-4 positive iPSCs were detected in the injected area. Four to 8 weeks later, these cells started to proliferate into small spheres surrounded by thin capsules. The cells inside these masses demonstrated a homogeneous phenotype with no sign of differentiation into any specific lineage. In MSC-injected animals, cell clusters were also clearly found in the injected area. However in contradiction, there was no sign of cell proliferation, no capsules around the MSC clusters, and the number of MSCs decreased gradually in the period of 8 weeks postinjection. Increased smooth muscle actin or vWF positive cells were found inside and around the iPSC clusters, compared with non-injected areas. By RT-PCR, the levels of VEGF, FGF, and ANRT expression were significantly higher in the iPSC-treated myocardium compared to untreated areas. These results suggest that injected iPSCs might have contributed to the formation of new blood vessels to a level that is comparable with those injected with MSCs.

Conclusions: Allogeneic transplantation of iPSCs and MSCs in a large animal model is safe. Despite an ischemic environment, pig iPSCs continue to proliferate in vivo after injection. However, the proliferation ability of the iPSCs was limited within the immunocompetent hosts. Injected MSCs survived in the ischemic environment but showed no signs of proliferation. Both iPSCs and MSCs demonstrated paracrine proangiogenic effects.

P2

Minimally Invasive Coronary Artery Bypass Is Superior to Percutaneous Intervention With Drug-Eluting Stents in Proximal Left Anterior Descending (LAD) Artery Disease: A Systematic Review and Meta-Analysis

S. V. Deo[1], V. Sharma[2], I. Shah[2], P. Erwin[2], L. D. Joyce[2], S. J. Park[2]
[1]Adventist Wockhardt Heart Institute, Surat, India, [2]Mayo Clinic, Rochester, MN

COMMERCIAL RELATIONSHIPS S. J. Park: Consultant/Advisory Board, Thoratec Corporation

Purpose: We conducted a meta-analysis comparing early and mid-term cardiovascular adverse events between minimally invasive coronary artery bypass (MIDCAB) and percutaneous coronary intervention (PCI), with a focus on drug-eluting stents (PCI-DES).

Methods: A systematic literature review (MEDLINE, EMBASE, Scopus, etc) yielded 11 studies (7 RCT; 4 Observational) comparing 1,791 (PCI) and 975 pts (MIDCAB). A random effect, inverse variance meta-analysis was conducted and a subgroup analysis of the PCI-DES cohort was performed. Events were compared as risk ratios using a 95% confidence interval. Heterogeneity of results was evaluated by Eggers I2 test. Results are presented as early (0-1 year) and midterm (2-5 years).

Results: Mid-term mortality in PCI and MIDCAB (3.6% and 2.6%) was comparable [1.18 (0.53, 2.66); p=0.5; I2=0%]. Risk of early re-stenosis was lower in the MIDCAB cohort compared to PCI [0.40 (0.16, 0.99); p=0.05; I2 =57%]. While the early risk of recurrence of angina was comparable, over time it was 61% (43%-74%) lower in MIDCAB pts (p<0.001). Mid-term results on analysis of the entire cohort demonstrated an increased risk for target vessel reinterventions (TVR) [3.84 (2.7, 5.5); p<0.001] in the PCI cohort. A subgroup analysis revealed that the PCI-DES cohort (4 studies; 456 pts) had a higher risk of recurrent angina [RR= 3.4 (1.9, 6.2); p<0.001; I2 =0%] and TVR [RR=4.16 (2.7, 6.6); p<0.001; I2 =0%] at the end of 2-5 year follow-up.

Conclusions: Survival rates are comparable following either MIDCAB or PCI for proximal LAD disease. However, even the use of drug-eluting stents was associated with significantly higher rates of angina recurrence and the need of target vessel reintervention as compared to MIDCAB.

Adult Cardiac Posters – Continued

P3

Complex Aortic Valve Replacement and Concomitant Procedures With Perceval S Sutureless Aortic Valve Prosthesis: Combined Results of Three Prospective Multicenter European Trials

M. Shrestha, A. Haverich
Hannover Medical School, Germany

COMMERCIAL RELATIONSHIPS M. Shrestha: Consultant/Advisory Board, Vascutek Ltd

REGULATORY DISCLOSURE This presentation will address the Sorin Perceval valve, which has an FDA status of investigational.

Purpose: The Perceval S is a self-anchoring sutureless aortic valve prosthesis. We report the mid-term results of three consecutive (Pilot, Pivotal, and Cavalier) prospective, multicenter, European clinical studies evaluating this prosthesis in elderly patients undergoing aortic valve replacement (AVR) with concomitant procedures on behalf of the investigators.

Methods: From April 2007 to February 2013, 243 patients (mean age: 79.7 ± 5.1 years, female 61%, median EuroSCRORE 9%) underwent AVR along with concomitant procedures. The concomitant procedures in addition to AVR were CABG (n=182, 74.9%), septal myectomy (n=21, 8.6%), CABG + other cardiac procedures (n=18, 7.4%), and 22 other procedures (9%).

Results: Mean aortic cross clamp and ECC times were 50.7 min ± 22.8 min and 78.9 min ± 32.3 min, respectively. The 30-day mortality was 2.1% (n=5). Mean postoperative gradient and mean effective orifice area were 10.1 mmHg ± 4.7 mmHg and 1.5 cm^2 ± 0.4 cm^2, respectively. In follow-up, 221 patients were assessed 1 month postimplantation, 161 patients at 12 months, and 61 patients at 2 years. No migration, dislodgement, or degeneration of the valve occurred. There was one mild paravalvular leakage and no intravalvular insufficiency. At 1 year, gradient and mean effective orifice area were 8.9 mmHg ± 5.6 mmHg and 1.6 cm^2 ± 0.4 cm^2, respectively. Median follow-up was 444 days and the total accumulated follow-up was 296 patient-years.

Conclusions: Results of these trials confirm the safety and efficacy of the Perceval S sutureless aortic valve. Valve implantation resulted in significant improvement of patient's symptoms. In these elderly patients requiring AVR + concomitant procedures, shortening the aortic clamp time and ECC time may help to reduce the mortality and morbidity. Furthermore, sutureless valves may be advantageous as transcatheter valve implantations are not possible due to the need for concomitant procedures.

Notes

Adult Cardiac Posters – Continued

P4

Differential Expression of Thioredoxin in Human Arterial and Venous Coronary Artery Bypass Conduits: Relation to Metabolic State

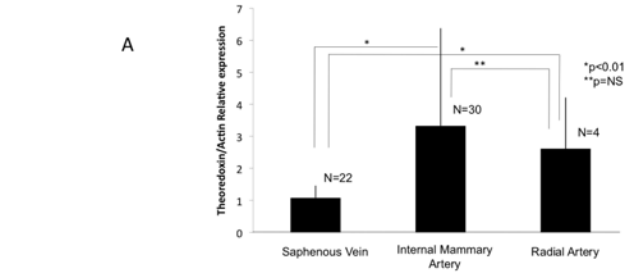
D. Matza, A. Korach, E. Rudis, G. Leibowitz, O. M. Shapira
Hadassah Medical Center, Jerusalem, Israel

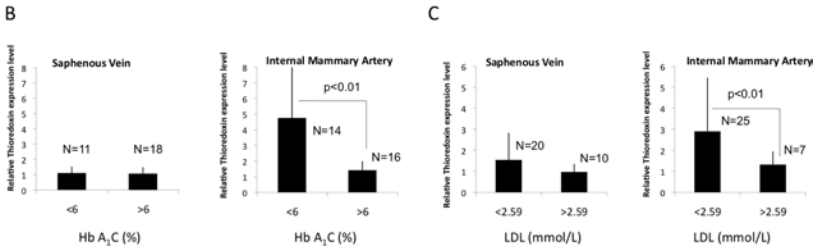
Purpose: Long-term saphenous vein graft patency is significantly lower than arterial grafts, mostly due to accelerated atherosclerosis. Excessive reactive oxygen species (ROS) were implicated in the pathogenesis of diabetes and hyperlipidemic-induced vascular complications, including accelerated coronary artery bypass graft atherosclerosis. We aimed to characterize the thioredoxin antioxidant system in arterial and venous conduits and correlate its expression with the patients' metabolic states.

Methods: Thioredoxin and thioredoxin-interacting protein (TXNIP) expression were measured by immunoblot assay in saphenous vein (SV), internal mammary artery (IMA), and radial artery (RA) segments obtained from patients (n=50) undergoing isolated coronary artery bypass grafting. We then correlated thioredoxin expression with risk factors of atherosclerosis.

Results: The expression of thioredoxin in the IMA and RA was similar and significantly higher compared to SV (Panel A, $p<0.01$). TXNIP levels were almost undetectable in all three conduits (data not shown). Impaired glucose control in diabetic patients with glycosylated hemoglobin levels greater than 6% was associated with a 5-fold decrease in thioredoxin expression in the IMA, but did not have a measurable effect in SV (Panel B, $p<0.01$). Similarly, serum LDL levels greater than 2.59 mm/L were associated with 3-fold decrease in thioredoxin expression in the IMA but not in SV (Panel C, $p<0.01$).

Conclusions: Arterial conduits express significantly higher amounts of thioredoxin compared to saphenous veins, rendering them more resilient to oxidative stress and possibly accelerated graft atherosclerosis. This protective mechanism is markedly impaired in patients with poorly controlled diabetes and abnormal lipid profile. The thioredoxin system may be a novel therapeutic target to enhance long-term graft patency.


A
Theoredoxin/Actin Relative expression
*p<0.01
**p=NS
N=22
N=30
N=4
Saphenous Vein
Internal Mammary Artery
Radial Artery


B
Saphenous Vein
N=11
N=18
<6
>6
Hb A1C (%)
Internal Mammary Artery
p<0.01
N=14
N=16
<6
>6
Hb A1C (%)
C
Saphenous Vein
N=20
N=10
<2.59
>2.59
LDL (mmol/L)
Internal Mammary Artery
p<0.01
N=25
N=7
<2.59
>2.59
LDL (mmol/L)

Adult Cardiac Posters – Continued

P5

Autologous Platelet-Rich Plasma (aPRP) Reduces Transfusions During Ascending and Arch Repair: A Prospective Randomized Controlled Trial

S. Zhou, A. L. Estrera, C. C. Miller, P. G. Loubser, C. Ignacio, S. Panthayi, R. Sheinbaum, H. J. Safi
The University of Texas Medical School at Houston, Memorial Hermann Heart and Vascular Institute

Purpose: Blood conservation using autologous platelet-rich plasma (aPRP), a technique of whole blood harvest that separates red blood cells from plasma and platelets before cardiopulmonary bypass (CPB) with re-transfusion of the preserved platelets after completion of CPB, has not been studied extensively. We sought to prospectively determine if aPRP reduces blood transfusions during ascending and transverse arch aortic repair.

Methods: We randomly assigned 81 patients undergoing elective ascending and transverse arch repair using deep hypothermic circulatory arrest to receive either aPRP (39) or no aPRP (42). Volume of aPRP re-transfused was 707 ml ± 144 ml. The primary endpoint was transfusion amount. Secondary endpoints were death, stroke, renal failure, pulmonary failure, and transfusion costs. Perioperative transfusion rate was defined as blood transfusions given during and 72 hours after surgery.

Results: Early mortality, stroke, and respiratory complications were similar between groups. Only acute renal failure was reduced in the aPRP group, 7% vs 0%, $p<0.01$. Mean transfusion rate of packed red blood cells was reduced by 46%, fresh frozen plasma by 56%, cryoprecipitate by 81%, and platelets by 59%, $p<0.02$. Hospital length of stay (9.2 ± 4.8 vs 12.4 ± 6.7, $p<0.02$) and transfusion costs (1,257 ± 1,472 vs 2,691 ± 2,327, $p<0.002$) were reduced in the aPRP group. (See Table 1.)

Conclusions: The use of aPRP reduced allogeneic transfusions during ascending and transverse arch repair with deep hypothermic circulatory arrest. This translated to less acute renal failure, decreased length of stay, and lower transfusion costs. Further studies examining the coagulation parameters of aPRP are required.

Table 1: Comparison Between Control and aPRP During Ascending and Arch Repair

Variable	Control (42) (mean, SD)	aPRP (39) (mean, SD)	p-Value
Age (years)	60.5 ± 12.4	56.4 ± 12.5	0.14
Preoperative Creatinine (mg/dl)	1.2 ± 0.6	1.1 ± 0.3	0.52
Circulatory arrest time (minutes)	19.4 ± 14.3	21.3 ± 12.6	0.54
Transfusions (units)			
Packed Red Blood Cell	5.9 ± 6.0	3.2 ± 4.0	0.02
Fresh Frozen Plasma	4.8 ± 4.5	2.1 ± 3.9	0.005
Cryoprecipitate	5.2 ± 7.4	1.0 ± 3.8	0.002
Platelets	9.1 ± 7.4	3.7 ± 5.4	0.003
Ventilator days	4.3 ± 7.0	2.7 ± 5.4	0.25
Pulmonary Failure	3 (7%)	3 (8%)	0.7888
Acute renal failure	3 (7%)	0 (0%)	0.0140
Stroke	2 (5%)	2 (5%)	1.00
Hospital Mortality	1 (2%)	1 (2.5%)	1.00
Length of Stay (Days)	12.4 ± 6.7	9.2 ± 4.8	0.02
Transfusion Costs (USD$)	2691 ± 2327	1257 ± 1472	0.002

Adult Cardiac Posters – Continued

P6

SynCardia Total Artificial Heart and Freedom Driver: A Single Center Experience With 11 Patients

N. R. Shah[1], D. E. Jaroszewski[1], A. Ashfaq[1], C. Pierce[1], L. Staley[1], R. Scott[1], A. Kalya[1], R. Gopalan[1], O. E. Pajaro[1], P. A. Devaleria[1], E. Steidley[1], L. A. Lanza[1], F. Arabia[2]
[1]Mayo Clinic Arizona, Phoenix, [2]Cedars-Sinai Medical Center, Los Angeles, CA

REGULATORY DISCLOSURE This presentation will address the investigational use of the SynCardia Freedom Driver.

Purpose: The SynCardia Total Artificial Heart (TAH-t) is used to support patients with biventricular heart failure as a bridge-to-heart transplantation (HTx). The portable Freedom Driver™ (FD) (SynCardia Inc, Tucson, AZ) was approved for an Investigational Device Exemption Study in March 2010. We reviewed our center's experience with this portable driver.

Methods: A retrospective review was conducted of patients who underwent TAH-t implantation and transfer to the portable driver from September 2008 to June 2012 at the Mayo Clinic Arizona with follow-up through December 2012.

Results: Eleven patients were transferred to the Freedom Driver™ (range 22-586, average 46 days). Total days supported on the FD was 906; median: 58 days (range: 4-249) and total days on the main console driver was 1,621; median: 83 (range 23-614). Six (55%) patients were returned back to the main driver console due to hypertension-related alarms, progressive pulmonary edema, and patient preference. Two of these patients went back on the FD after hypertension was controlled. Ten (90%) patients on FD successfully underwent HTx and one (10%) died due to multiorgan failure. Five (45.5%) patients were successfully discharged home on the FD. One patient was transplanted prior to discharge; the other five patients on the FD were not discharged due to social support issues and medical comorbidities. Four of the five (80%) patients discharged home required at least one hospital readmission. Rehospitalizations were due to hypertension (3), gastrointestinal bleed (2), epistaxis (1), infection (3), and pulmonary edema (3).

Conclusions: TAH-t allows stabilization and biventricular support for patients awaiting HTx. Patients on FD can be successfully discharged home while awaiting HTx. This could potentially decrease medical costs and improve quality of life. Further analysis and improvement is required to prevent rehospitalizations among patients discharged on FD.

P7

Subcostal HeartMate II LVAD Exchange Is Less Morbid With Equivalent Survival Compared to Repeat Sternotomy

A. Itoh, S. M. Prasad, S. C. Silvestry
Washington University in St Louis, MO

COMMERCIAL RELATIONSHIPS S. C. Silvestry: Other Research Support, ABIOMED, Thoratec Corporation; Consultant/Advisory Board, Heartware Inc, Thoratec Corporation

Purpose: Implantable LVADs have significantly improved but remain hindered by device failure due to pump thrombus leading to hemolysis and pump failure. Initial device malposition, migration, and inadequate anticoagulation are important factors in pump failure/thrombosis. LVAD exchange can be performed by repeat sternotomy, allowing full access of the LVAD including inflow/outflow for complete revision, or subcostal incision provides a limited access to change the pump only. This study compares the morbidity, mortality, and survival of LVAD exchange via sternotomy vs subcostal incision.

Methods: Among 315 consecutive patients who had HeartMate II (HMII) between January 2005 and May 2013 (bridge to transplant 216, destination therapy 99), 20 underwent HMII exchange (6.3%). Eleven had sternotomy and nine had subcostal approach. Prospectively collected INTERMACS and STS data were analyzed.

Results: Age, gender, etiology of heart failure, duration of support, and INTERMACS level were similar between groups. Pump thrombus was seen in eight (72%) patients with the sternotomy vs six (67%) in the subcostal group. Sternotomy was performed specifically for inflow/outflow issues in six (55%). OR time (sternotomy vs subcostal: 338 ± 74 vs 214 ± 52 min, p<0.01), cardiopulmonary bypass time (77 ± 37 vs 40 ± 16 min, p<0.01), intraoperative total blood transfusions (10 ± 5 vs 4 ± 3 U, P=0.01), length of hospital stay (19 ± 8 vs 10 ± 2, p=0.01) were markedly less in the subcostal group. No differences were seen in 30-day mortality (n=2 vs n=1) and survival (two late deaths in each group).

Conclusions: LVAD failure remains a devastating complication with high mortality. Subcostal exchange utilized fewer blood transfusions, shorter OR and CPB times, and shorter length of hospital stay compared to repeat sternotomy. These data suggest that a subcostal approach for LVAD exchange is associated with significantly less hospital resource utilization with equivalent long-term survival as repeat sternotomy.

Preoperative data

	Sternotomy	Subcostal	P
Serum LDH	2,821 ± 2,838	2,232 ± 2,099	N.S.
PT-INR	1.5 ± 0.3	1.5 ± 0.4	N.S.
Indication for Exchange (n)			
Pump failure (thrombus)	8	6	N.S.
Drive line issue	2	3	N.S.
Outflow graft issue	4	0	N.S.
Inflow issue	2	0	N.S.
Malposition	1	0	N.S.

Adult Cardiac Posters – Continued

P8

Results of Heart Transplantation Following Left Ventricular Assist Device-Related Infection

M. Z. Tong, N. G. Smedira, E. G. Soltesz, L. Porepa, R. C. Starling, N. Moazami
Cleveland Clinic, OH

COMMERCIAL RELATIONSHIPS E. G. Soltesz: Speakers Bureau/Honoraria, St Jude Medical, Inc; Consultant/Advisory Board, Estech, TransMedics, Inc; N. Moazami: Consultant/Advisory Board, Thoratec Corporation

Purpose: LVAD-related infections, including drivelines, pump pockets, and sepsis, are especially difficult to manage. Conservative treatments, such as antibiotic therapy and wound debridement, are usually not effective, as the infected foreign material remains. In this study, we compare the outcomes of heart transplants with and without an LVAD-related complication.

Methods: We performed a retrospective analysis of all 172 HeartMate II insertions as bridge-to-transplant (BTT) between 2004 and 2012 at our institution. Sixty-three developed either a culture-positive driveline infection, pump pocket infection, or bacteremia. Twenty-six out of 63 patients with an infection and 49 out of 109 patients without an infection went on to receive a heart transplant.

Results: The 6, 12, and 24-month freedom from LVAD infection was 71%, 59%, and 50%. 51% of patients without LVAD infections were transplanted within 1 year, whereas 42% of patients with LVAD infections were transplanted within 1 year of onset of infection (p-0.24). The 1, 2, and 4-year estimated Kaplan-Meier survival in patients receiving a heart transplantation following an LVAD infection was 96%, 91%, and 91% compared to 94%, 91%, and 83% in patients receiving a transplant without an infection (p=0.48). Patients who did not get transplanted had a 33% 1-year mortality without LVAD infection compared to 37% with LVAD infection. When we examined the long-term immunosuppressant consequences, five out of the 26 patients transplanted following LVAD infection had grade 2R or higher rejection that was easily treated and one patient had antibody-mediated rejection and died of coronary vasculopathy 1 year following his transplant.

Conclusions: The incidence of LVAD device infection is high. However, transplantation following LVAD infection does not carry additional risk of mortality or rejection. LVAD-related infection should not be considered a contraindication to heart transplant.

Notes

Adult Cardiac Posters – Continued

P9

Influence of Surgeon Volume on STS Quality Outcome Metrics and Cost in Isolated CABG and AVR

R. N. Damle, A. Damle, M. Darrigo, O. Okike, D. Mandapati
University of Massachusetts Medical School, Worcester

Purpose: STS has developed quality ratings for centers based on several 30-day outcome measures. While data regarding these metrics are available in the STS National Database, analyzing the association of individual surgeon volume with these outcomes is not possible. Given the previously demonstrated association between surgeon volume and mortality for isolated CABG and AVR, we sought to analyze this relationship for the outcome metrics used by STS in its quality ratings.

Methods: The University HealthSystem Consortium database was queried for patients who underwent isolated CABG or AVR from 2008 to 2011. Unique surgeon and hospital identifiers were used to analyze volume distribution by procedure type. Surgeon volume was categorized into low, medium, high, and very high, (0-50th, 50th-75th, 75th-90th, and >90th percentile, respectively) (Figure 1). Hospital volume was categorized by quartile. Quality and cost outcomes were analyzed by surgeon volume category using multivariable regression models to adjust for hospital volume and relevant confounders.

Results: We identified 61,674 isolated CABG patients and 29,376 isolated AVR patients for inclusion. Table 1 details results from the regression models. Increasing surgeon volume was associated with fewer ICU days, shorter inpatient length of stay, and lower cost for both procedures, while very high volume demonstrated a mortality benefit for CABG. Patients undergoing CABG by high and very high volume surgeons experienced lower overall complications; however, no difference was found for CVA or wound infection. There was no association between surgeon volume and complications or mortality for patients undergoing isolated AVR.

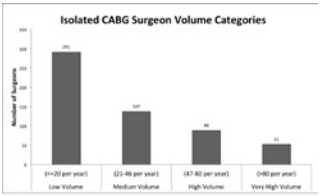
Conclusions: Independent of hospital volume, surgeon volume has an influence on some of the STS quality metrics for isolated CABG and AVR and a significant impact on cost. Further studies are required to identify predictors of STS high-quality designation.

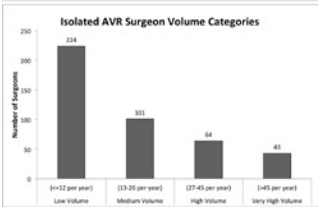
Adjusted Outcomes Compared to Low Volume Surgeon Group*†

Isolated CABG	Medium Volume (21-46 per year) (N=5,681)	High Volume (47-80 per year) (N=8,304)	Very-High Volume (>80 per year) (N=43,863)
Odds Ratio (95% Confidence Interval)			
Any Complication	0.9 (0.8 to 1.0)	0.8 (0.7 to 0.9)	0.8 (0.7 to 0.9)
Post-op CVA	0.9 (0.7 to 1.1)	0.9 (0.6 to 1.2)	0.9 (0.7 to 1.1)
Post-op Wound Infection	1.2 (0.9 to 1.7)	1.2 (0.8 to 1.6)	1.1 (0.8 to 1.5)
Mortality	0.9 (0.7 to 1.2	0.8 (0.6 to 1.1)	0.7 (0.6 to 0.9)
Beta-Coefficient (95% Confidence Interval)			
Intensive Care Unit Days	-0.6 (-0.8 to -0.3)	-1.1 (-1.3 to -0.8)	-1.0 (-1.2 to -0.8)
Inpatient Length of Stay	-0.7 (-1.0 to -0.4)	-0.7 (-1.0 to -0.4)	-0.9 (-1.2 to -0.6)
Hospital Direct Cost	-$1,335 (-$1,964 to -$707)	-$2,339 (-$2,935 to -$1,743)	-$3,308 (-$3,849 to -$2,766)
Isolated AVR	Medium Volume (13-26 per year) (N=821)	High Volume (27-45 per year) (N=1,552)	Very-High Volume (>45 per year) (N=26,361)
Odds Ratio (95% Confidence Interval)			
Any Complication	1.2 (0.9 to 1.7)	0.9 (0.7 to 1.2)	0.8 (0.7 to 1.1)
Post-op CVA	1.6 (0.9 to 3.0)	1.0 (0.6 to 1.9)	1.1 (0.6 to 1.8)
Post-op Wound Infection	2.1 (0.7 to 6.7)	1.7 (0.6 to 5.1)	1.7 (0.6 to 4.7)
Mortality	1.7 (1.0 to 2.7)	0.9 (0.6 to 1.5)	0.8 (0.5 to 1.1)
Beta-Coefficient (95% Confidence Interval)			
Intensive Care Unit Days	0.3 (-0.1 to 1.1)	-1.1 (-1.8 to -0.4)	-1.3 (-1.9 to -0.7)
Inpatient Length of Stay	-0.5 (-1.6 to -0.6)	-1.8 (-2.7 to -0.9)	-2.0 (-2.9 to -1.2)
Hospital Direct Cost	$598 (-$1,660 to $2,857)	-$3,082 (-$5,080 to -$1,083)	-$5,713 (-$7,438 to -$3,988)

**Results are compared to low volume surgeons: CABG: <=20 per year; n=3,826, AVR: <=12 per year; n=642, †Results adjusted for: age, sex, insurance status, severity of illness on admission, hospital volume category*

Categorization of Surgeon Volume by Procedure





Adult Cardiac Posters – Continued

P10

Aortic Valve Replacement Through Right Anterior Minithoracotomy: Can Sutureless Technology Improve Clinical Outcomes?

D. Gilmanov, M. Solinas, A. Miceli, M. Ferrarini, P. Farneti, M. Murzi, M. Glauber
G. Monasterio Tuscany Foundation, G. Pasquinucci Heart Hospital, Massa, Italy

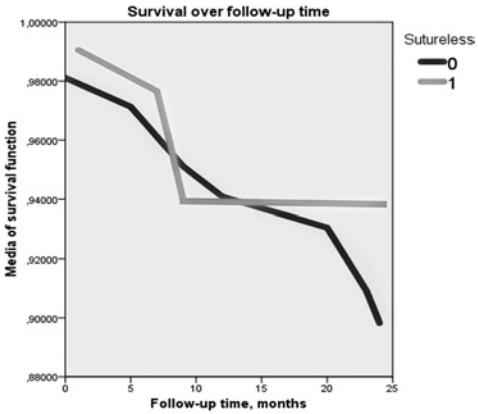
REGULATORY DISCLOSURE This presentation will address the Sorin Perceval valve, which has an FDA status of investigational.

Purpose: The impact of sutureless and conventional valve prostheses on clinical outcomes in patients undergoing minimally invasive aortic valve surgery is not yet clear. Our objective was to assess mid-term results of sutureless and conventional valves implanted through right anterior minithoracotomy (RAMT).

Methods: We reviewed 391 (254 conventional vs 137 sutureless prostheses) patients undergoing primary aortic valve replacement through RAMT between 2004 and 2013. The most common sutured prostheses were Carpentier-Edwards Perimount and Medtronic Mosaic, and Sorin Perceval S composed sutureless prosthesis group. 106 pairs of patients were propensity matched and retrospectively analyzed.

Results: Cross-clamping (90.1 vs 62.0 min, $p<0.000001$) and cardiopulmonary bypass time (125.4 vs 95.4 min, $p<0.000001$) were significantly shorter in the sutureless group. No significant difference for bleeding revision ($p=1.0$) and postoperative stroke ($p=1.0$) rate was observed. However, a trend toward higher rate of permanent pacemaker implant (3.8% vs 0%, $p=0.12$), lower conversion rate (0% vs 3.8%, $p=0.12$), and lower in-hospital mortality (0% vs 1.9%, $p=0.17$) was registered for sutureless valves. The mean follow-up was longer for sutured valves: 45.1 (median 45.5) vs 8.9 (median 8.0) months. Kaplan-Meier survival rate at 6, 12, 18, and 24 months was 97.1 vs 99.1%, 94.1 vs 94.0%, 93.1 vs 94.0%, 89.8 vs 94.0%, for sutured vs sutureless prostheses, respectively. Freedom from reoperation at follow-up ($p=1.0$) and transaortic gradients (12 vs 10 mmHg, $p=0.78$) did not differ in the two groups.

Conclusions: In the present limited cohort of patients, sutureless prostheses reduced operative times for minimally invasive aortic valve replacement and might have influenced early and mid-term survival.


Survival over follow-up time
Media of survival function
1,00000
,98000
,96000
,94000
,92000
,90000
,88000
0
5
10
15
20
25
Follow-up time, months
Sutureless
0
1

Adult Cardiac Posters – Continued

P11

Catastrophic Immunologic Reaction and Pseudoaneurysm Formation After Stentless Porcine Aortic Bioprosthetic Implantation: A Word of Caution

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COMMERCIAL RELATIONSHIPS G. C. Hughes: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Speakers Bureau/Honoraria, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Research Grant, Vascutek Ltd

Purpose: Growing literature describes pseudoaneurysm formation after Medtronic Freestyle stentless porcine aortic bioprosthesis (MFB) when used as a full root implant; however, disjointed reports make the significance difficult to interpret. We address this concern by aggregating available data.

Methods: We reviewed institutional data, the FDA's MAUDE registry, and the current medical literature for mention of pseudoaneurysm after MFB. Case details were aggregated for analysis. Rate of pseudoaneurysm formation was estimated with studies reporting both cases and overall MFB population. Event-free survival curve was generated for patients who eventually developed pseudoaneurysm. Immunohistopathologic examination of institutional explanted specimens was performed to elucidate a cause.

Results: Thirty-six pseudoaneurysms were found with adequate detail for analysis. The overall rate of pseudoaneurysm formation was 0.74% (11 of 1,480; 95% CI: 0.37-1.32%) compared to 4.4% (4 of 90; 95% CI: 1.2-11.0%) at our institution alone, where yearly surveillance computed tomography or magnetic resonance angiography (CTA/MRA) are performed on nearly all patients. The range of time from surgery to pseudoaneursym was 2.5 months–82 months (Table). The rate of pseudoaneurysm formation appeared constant until 5 years after surgery; however, one event was reported after nearly 7 years (Figure). Consistent with previous reports, pathologic exam demonstrated an immune cell infiltrate in areas of MFB wall breakdown.

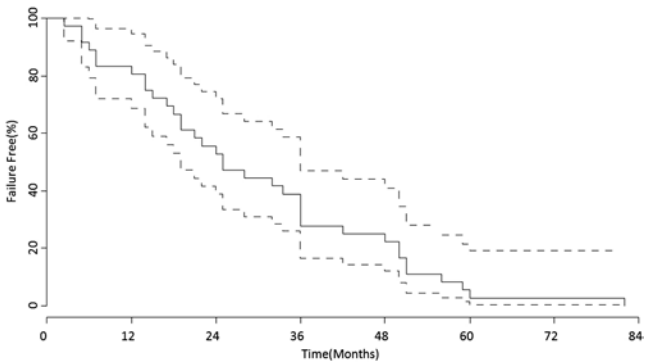
Conclusions: Pseudoaneurysm formation is a rare but increasingly described complication of MFB when implanted as a full root, with an incidence near 1%. Patients with these prostheses require annual surveillance with CTA/MRA for early recognition and correction of this complication. Consideration of this complication should factor into preoperative decision making, as its correction mandates redo-aortic root replacement, an operation that may not be feasible in certain high-risk patients.

Table. Details of Pseudoaneurysm Formation

Pseudoaneurysm (n)	36
MAUDE (%)	25 (69.4)
Medical Literature (%)	7 (19.4)
Institution (%)	4 (11.1)
Time to pseudoaneurysm (months)	
Mean (SD)	29.6 (19.2)
Median (IQR)	25 (15, 44)
Range	2.5-82
Female (%)	4 (36.4)
Valve size (%)	
23 mm	2 (22.2)
25 mm	3 (33.3)
27 mm	1 (11.1)
29 mm	3 (33.3)
Location of pseudoaneurysm (%)	
Not in Coronary Sinus	13 (44.8)
Any Coronary Sinus	16 (55.2)
Left Coronary Sinus	7 (24.1)
Right Coronary Sinus	4 (13.8)
Non-coronary Sinus	5 (17.2)
Endocarditis (%)	4 (11.1)
Death (%)	2 (9.1)

Note: Not all data fields were available for all patients. Percentages represent only patients with non-missing data for the given variable.

Figure. MFB pseudoaneursym-free survival in patients with eventual pseudoaneurysm



n=36. Solid line represents pseudoaneurysm-free curve for patients who develop an eventual pseudoaneurysm. Dotted lines represent 95% confidence intervals.

Adult Cardiac Posters – Continued

P12
Differences in Aortic Hemodynamics After Valve-Sparing Aortic Root Replacement Compared to Aortic Root Replacement Using Bioprosthesis

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[1]Northwestern University, Chicago, IL, [2]Northwestern Memorial Hospital, Chicago, IL

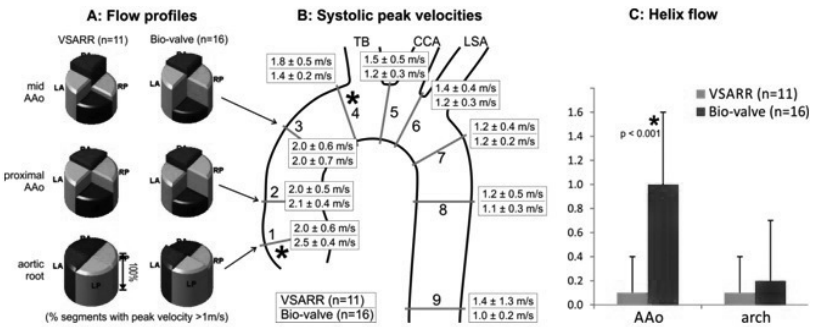
COMMERCIAL RELATIONSHIPS P. M. McCarthy: Consultant/Advisory Board, Abbott Laboratories, AtriCure, Inc, Edwards Lifesciences Corporation, MiCardia Corporation; Ownership Interest, Edwards Lifesciences Corporation; S. C. Malaisrie: Consultant/Advisory Board, Edwards Lifesciences Corporation; Speakers Bureau/Honoraria, Abiomed, Inc; Research Grant, Medtronic, Inc

Purpose: The aim of this study was to assess the hemodynamic outcome using in vivo 4D flow MRI to systematically evaluate differences in thoracic aortic hemodynamics in patients following valve-sparing aortic root replacement (VSARR) compared to patients who underwent aortic root replacement with bioprosthetic valves (BIO-ARR).

Methods: In vivo 4D flow MRI was performed in 11 patients after VSARR (47 ± 18 years, 6 BAV, 5 TAV) and 16 patients after BIO-ARR (52 ± 14 years). Analysis included 3D blood flow visualization and grading of helix flow in the ascending aorta (AAo) and arch (3-point scale: flow rotation during one cardiac cycle <180o, 180-360o, 360.1-720o). For each patient, peak systolic velocity was quantified in nine analysis planes at defined anatomical landmarks in the AAo, aortic arch, and descending aorta. In addition, flow profile uniformity was evaluated in analysis planes 1-3 by identifying regions with systolic peak velocities >1m/s.

Results: 4D flow MRI analysis revealed overall high systolic peak velocities (2.0-2.5m/s) in the aortic root and AAo in both cohorts. 3D blood flow visualization demonstrated increased flow asymmetry in BIO-ARR patients (figure A), consistent with a higher prevalence of AAo outflow jets (9 of 16 BIO-ARR patients, 0 of 11 in VSARR patients). In addition, there was a significant increase in peak systolic velocities at the aortic root for BIO-ARR (2.5 vs 2.0m/s). VSARR patients had higher velocities in the distal AAo (figure B, * indicates $p<0.05$) with a trend towards higher velocities in the arch. BIO-ARR patients exhibited significantly ($p<0.001$) increased helix flow in the AAo as a measure of increased flow derangement compared to VSARR (figure C).

Conclusions: Our findings suggest that VSARR results in favorable hemodynamic outcomes as indicated by reduced peak velocities in the aortic root and less helix flow in the AAo when compared with outcomes following BIO-ARR.



P13

Quantitative Analysis of Solid and Gaseous Cerebral Microembolization During Aortic Valve Replacement and Transcatheter Aortic Valve Implantation Using Transcranial Doppler

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COMMERCIAL RELATIONSHIPS S. Kennon: Other, Edwards Lifesciences Corporation, Medtronic, Inc, conference sponsorship

Purpose: Transcatheter aortic valve implantation (TAVI) is a viable alternative for treating severe aortic valve stenosis in patients at high risk for surgical aortic valve replacement (AVR). Compared to AVR, TAVI has been reported to carry a significantly higher risk for neurological sequelae. We tested whether the quantity of both solid and gaseous cerebral emboli during each procedural step of AVR and TAVI, both transfemoral and transapical, might be significantly different.

Methods: Embo-Dop dual frequency transcranial Doppler ultrasound of the middle cerebral artery was used to quantify solid and gaseous micro-emboli. Cerebral micro-embolic load was quantified during each procedural step in patients with symptomatic severe aortic valve stenosis undergoing AVR (n=12), TAVI-transfemoral (n=14), and TAVI-transapical (n=11).

Results: Mean age of patients was similar between groups (AVR 80.2 ± 1.9 years, TAVI-transfemoral 83.3 ± 2.3, TAVI-transapical 81.6 ± 1.7, P=0.584). There was no significant difference in the number of emboli in the AVR, TAVI-transfemoral, and TAVI-transapical groups for either solid emboli (AVR 53.8 ± 10.1, TAVI-transfemoral 40 ± 8, TAVI-transapical 37.4 ± 18.3, P=0.606) or gaseous emboli (AVR 333 ± 103, TAVI-transfemoral 294 ± 70, TAVI-transapical 183 ± 47, P=0.406). Solid embolization peaked upon removal of the aortic cross clamp for AVR and during valve deployment for the TAVI groups. There were no in-hospital neurological complications.

Conclusions: The cerebral micro-embolic load did not significantly differ between AVR, TAVI-transfemoral, and TAVI-transapical procedures. The reported higher incidence of neurological events in TAVI may be related to factors other than cerebral embolization.

Adult Cardiac Posters – Continued

P14

Impact of Induction Immunosuppression on Survival in Heart Transplant Recipients: A Contemporary Analysis

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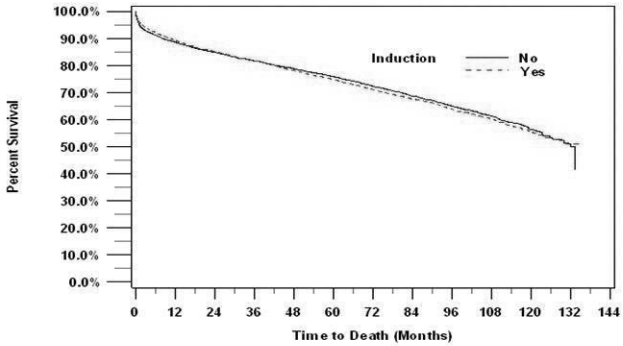
The Ohio State University, Columbus

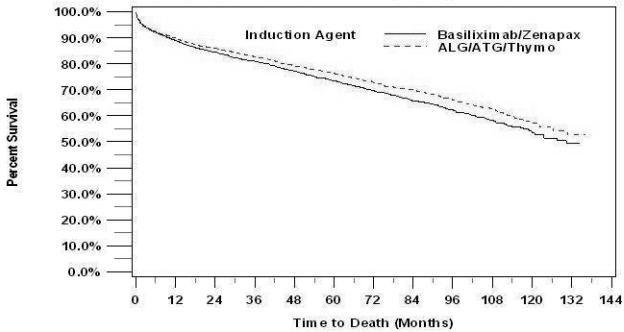
Purpose: The impact of induction immunosuppression on long-term survival in heart transplant recipients is unclear, as practices and agents have varied over time. We sought to evaluate the effect of contemporary induction immunosuppression agents in heart transplant recipients on survival and treated rejection, utilizing national registry data.

Methods: We queried the United Network for Organ Sharing (UNOS) data registry for all heart transplants from 1987 to 2012. We restricted our analysis to adult recipients performed from 2001 to 2011 (for a minimum of 12 months posttransplant follow-up) who received either: no antibody-based induction (NONE) or the contemporary agents (INDUCED) of either: basiliximab/daclizumab (IL-2Rab), alemtuzumab, or ALG/ATG or thymoglobulin. Kaplan-Meier estimates of the survival function, as well as Cox proportional hazard models, were used.

Results: Of the 17,857 heart transplants that met the inclusion criteria, 8,216 (46%) of patients were INDUCED. There were 4,635 (26%) reported deaths during the follow-up period. Of the INDUCED agents, 55% were IL-2Rab, 4% alemtuzumab, and 40% ALG/ATG/Thymo. Donor and recipient characteristics were evaluated. Overall, INDUCED did not significantly affect survival (Figure, log-rank p=0.52). However, among INDUCED, ALG/ATL/Thymo had a superior survival as compared with IL-2Rab (Figure, log-rank p=0.0070). This effect was seen in the Cox model as well: INDUCED vs NONE HR 1.019 (95% CI: 0.962-1.080, p=0.52); IL-2Rab vs ALG/ATG/Thymo HR 1.129 (95% CI: 1.034-1.233, p=0.0071). There was no effect of induction on rejection composite (INDUCED 32% vs NONE 33%).

Conclusions: In a contemporary analysis of heart transplant recipients, an overall analysis of induction immunosuppression agents does not appear to impact survival. ALG/ATG/Thymo appears to have a beneficial effect on survival, as compared to IL-2Rab and should be the agents of choice if induction therapy is utilized.


Percent Survival
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Induction
No
Yes
0
12
24
36
48
60
72
84
96
108
120
132
144
Time to Death (Months)


Percent Survival
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Induction Agent
Basiliximab/Zenapax
ALG/ATG/Thymo
0
12
24
36
48
60
72
84
96
108
120
132
144
Time to Death (Months)

Adult Cardiac Posters – Continued

P15

Urgent Cardiac Surgery During Pregnancy: A Continuous Challenge

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Purpose: Cardiac surgery during pregnancy is reserved for cases of failure of medical treatment due to its detrimental maternal and fetal effects, especially in emergency settings. We are reporting our series of cases.

Methods: Twenty-three pregnant women presented with severe valve malfunction that required open heart surgery between March 2003 and December 2012. The mean age was 30.3 ± 4.9 years. Gestational age ranged from 14 to 39 weeks. Twenty patients (87%) presented with signs of right ventricular failure and 13 cases showed oliguria and acidosis (56.6%). The main presenting lesion was severe aortic stenosis in three patients (13%), mitral stenosis in three patients (13%), and stuck mechanical mitral valve prosthesis in 17 patients (73.9%).

Results: Fourteen patients (60.9%) were operated upon on an emergency basis, and nine patients (39.1%) on an urgent basis. The mean CPB time was 95.4 min ± 26.2 min, with a mean lowest temperature of 35.65 °C ± 1.23 °C. Mean aortic cross clamp time was 49.5 min ± 12.3 min. Two patients continued their pregnancy to full term after cardiac surgery. Delivery was done immediately before surgery in 11 patients (47.8%); vaginal delivery was possible in only three cases (13%) and Caesarean section in eight cases (34.8%). There were 10 intrauterine fetal deaths, all of them at GA below 28 weeks, 4 (17.4%) were before induction of anesthesia and six (26.1%) after surgery. There were 13 surviving babies: seven premature babies (30.4%) and six full-term babies (26.1%). Neonatal complications included respiratory distress syndrome in (38.5%) and prolonged hospital stay (46.2%). Maternal hospital morbidities included oliguria (65.2%), bleeding (30.4%), prolonged ICU stay (56.5%), and prolonged hospital stay (26.2%). The in-hospital mortality was 8.7%.

Conclusions: Urgent valve replacement in pregnant women can be achieved with good maternal morbidity and mortality; however, high incidence of fetal loss might be expected when surgery is performed at an early gestational age.

Notes

Adult Cardiac Posters – Continued

P16

The Association of Chronic Lung Disease With Early Mortality and Respiratory Complications After AVR: What Can We Learn From the STS National Database?

J. A. Crestanello[1], R. S. Higgins[1], S. Sheng[2], P. Saha-Chaudhuri[2], B. R. Englum[2], J. Brennan[2], V. H. Thourani[3]
[1]The Ohio State University, Wexner Medical Center, Columbus, [2]Duke Clinical Research Institute, Durham, NC, [3]Emory University School of Medicine, Atlanta, GA

COMMERCIAL RELATIONSHIPS J. A. Crestanello: Research Grant, Medtronic, Inc; V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc

Purpose: Chronic lung disease (CLD) is a known risk factor for operative morbidity and mortality after aortic valve replacement (AVR), and many patients with severe CLD are deemed inoperable for surgical AVR. However, the assessment of lung disease severity is multifactorial, and the precise relation between markers of pulmonary status and outcomes after isolated AVR is not well characterized. In this study, we sought to characterize the contemporary association between components of a CLD assessment and operative outcomes in patients undergoing surgical AVR for valve stenosis (AS).

Methods: Between 2011 and 2012, 28,402 patients undergoing elective, isolated surgical AVR for AS were identified in The Society of Thoracic Surgeons Adult Cardiac Surgery Database and included in this study. Patients with missing CLD status, incomplete pulmonary function tests, or ABG data were excluded. We evaluated the prevalence of several markers of baseline lung disease and their unadjusted association with operative mortality and respiratory complications (prolonged intubation, reintubation, and pneumonia) using logistic regression.

Results: In this cohort (median age, 72 years; 43.2% female), CLD was prevalent in 25% (mild, 13.9%; moderate, 6.7%; severe, 4.5%), home oxygen use in 3%, and sleep apnea in 11%. A wide distribution was observed in the component markers of baseline lung function, including predicted FEV1 (76%, IQR 62-91) and DLCO (74%, IQR 57-91), paO2 (80.5 mmHg, IQR 72-91), and paCO2 (39 mmHg, IQR 36-43). Operative mortality, pulmonary death, respiratory complications, and length of hospital stay increased with increasing severity of CLD (Table). FEV1, low paO2, high paCO2, and home oxygen use were each associated with adverse postoperative outcomes, while sleep apnea was not.

Conclusions: Chronic lung disease is common in patients with AS selected for surgical AVR and is associated with adverse operative outcomes.

Baseline Characteristics and Outcomes

Baseline Characteristics							
	No CLD	Mild CLD	Moderate CLD	Severe CLD	p		
Predicted FEV1 %, median (IQR)	89 (80-100)	70 (65-75)	57 (53-62)	43 (37-48)	p <0.0001		
Predicted DLCO %, median (IQR)	82 (67-98)	72(58-88)	63 (51-82)	55 (42-70)	p <0.0001		
paO2<75mmHg (%)	25	37	45	62	p <0.0001		
paCO2 ≥45mmHg (%)	11	15	19	36	p<0.0001		
Home Oxygen (%)	1	5.5	8.9	21.5	p <0.0001		
Sleep apnea (%)	9.2	15.4	18.3	19.3	p <0.0001		
STS PROM	2.5	3.5	5.1	7.1	p<0.0001		
Outcomes							
		Operative mortality (%)		Any respiratory complication (%)		Prolonged length of hospital stay (%)	
Severity of Chronic Lung Disease	None	2.1	p<0.0001	10.4	p<0.0001	5.3	p<0.0001
	Mild	2.6		13.4		9	
	Moderate	3.8		18.4		12	
	Severe	6.8		25.9		17	
Predicted FEV1	≥80%	1.9	p<0.0001	9.4	p<0.0001	4.9	p<0.0001
	60-80%	2.6		13.1		8.8	
	<60%	4.8		22.9		15	
Predicted DLCO	≥75%	2.3	p=0.12	10.3	p<0.0001	6.8	p<0.0001
	<75%	3.1		17.3		12.3	
paO2	≥75mmHg	2.2	p=0.0005	10.9	p<0.0001	6.1	p=0.0005
	<75mmHg	4.1		17.7		9.3	
paCO2	<45mmHg	2.5	p=0.0043	12.3	p=0.0159	6.3	p=0.0042
	≥45mmHg	4.6		17.4		12.1	
Home Oxygen	No	2.4	p<0.0001	11.7	p<0.0001	6.5	p<0.0001
	Yes	5.6		25.7		18.3	

CLD: *chronic lung disease*

PROM: *predicted risk of operative mortality*

Adult Cardiac Posters – Continued

P17

RiaSTAP® Use to Increase Fibrinogen Levels During Thoracic Aortic Surgery Involving Deep Hypothermic Circulatory Arrest

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COMMERCIAL RELATIONSHIPS I. J. Welsby: Research Grant, CSL Behring, Terumo BCT, Inc; G. C. Hughes: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Speakers Bureau/Honoraria, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Research Grant, Vascutek Ltd

REGULATORY DISCLOSURE This presentation will address the off-label use of RiaSTAP® in coagulopathic bleeding after thoracic aortic reconstruction using deep hypothermic circulatory arrest.

Purpose: Fibrinogen concentrate (RiaSTAP®) is FDA approved to treat congenital afibrinogenemia at a dose of 70 mg/kg. The current study sought to test the hypothesis that this dose of RiaSTAP® can predictably increase the fibrinogen level in the setting of dynamic, coagulopathic bleeding after thoracic aortic reconstruction using deep hypothermic circulatory arrest (DHCA). The secondary aim was to assess the efficacy of RiaSTAP® using a propensity score matched recent historical cohort.

Methods: In a prospective, pilot, open label study, 70 mg/kg RiaSTAP® was administered after separation from cardiopulmonary bypass and protamine administration to 22 patients undergoing elective proximal thoracic aortic reconstruction including hemi-arch replacement utilizing DHCA. Fibrinogen levels were measured at baseline, just prior to and 10 minutes after RiaSTAP® administration, on skin closure, and on the day after surgery. A propensity score matching analysis compared bleeding and transfusion requirements with a recent historical cohort.

Results: The mean baseline fibrinogen level was 317 ± 49 mg/dL and fell to 235 ± 39 mg/dL (26 ± 9% decrease) post-cardiopulmonary bypass. After administration of 70 mg/kg of RiaSTAP®, the fibrinogen level rose to 331 ± 41 mg/dL (43 ± 17% increase) and averaged 372 ± 45 mg/dL the next day. No thrombotic complications occurred. The matched cohort received more packed red blood cells (p=0.04), fresh frozen plasma (p=0.03), and cryoprecipitate (p=0.04) (Table).

Conclusions: Administration of 70 mg/kg RiaSTAP® decreases intraoperative transfusion requirements and predictably raises the fibrinogen level by approximately 100 mg/dL (43%) without thrombotic complications in the setting of coagulopathic bleeding following proximal thoracic aortic surgery with DHCA.

Table. Propensity analysis and transfusion and chest tube output data in RiaSTAP® group (n=22) and propensity matched recent historical controls (n=22) undergoing elective proximal thoracic aortic surgery including hemi-arch replacement with DHCA and not receiving study drug.

	Riastap®	No Riastap®	p-value
Age (yrs, mean±SD)	51.9 ± 13.7	52.4 ± 13.5	0.25
Male	15 (68.2)	15 (68.2)	1
Race			0.71
African American	4 (18.2)	5 (22.7)	
White	18 (81.8)	17 (77.3)	
Body Mass Index (kg/m^2, mean±SD)	29.9 ± 6.6	29.2 ± 4.9	0.74
Hypertension	16 (72.7)	17 (77.3)	0.73
Hyperlipidemia	13 (59.1)	11 (50.0)	0.54
Smoker	12 (54.5)	12 (54.5)	1
Diabetes	2 (9.1)	5 (18.2)	0.22
Coronary Artery Disease	6 (27.3)	7 (31.8)	0.74
History of Stroke/TIA	2 (9.1)	1 (4.5)	0.55
Chronic Obstructive Pulmonary Disease	1 (4.5)	2 (9.1)	0.55
Renal Insufficiency (Cr>1.5mg/dL)	1 (4.5)	2 (9.1)	0.55
Peripheral Vascular Disease	0 (0)	0 (0)	1
Redo-Sternotomy	3 (13.6)	4 (18.2)	0.68
Root Replacement	9 (40.9)	12 (54.5)	0.37
Bentall	7 (77.8)	11 (91.7)	
Valve-Sparing	2 (22.2)	1 (8.3)	0.37
Ascending	12 (54.5)	10 (45.5)	0.55
Supracoronary Ascending	6 (50.0)	6 (60.0)	
Wheat	6 (50.0)	4 (40.0)	0.64
Concomitant Procedure	5 (22.7)	6 (27.3)	0.73
Previous Aortic Surgery	3 (13.6)	5 (22.7)	0.43
Atherosclerotic Disease	8 (36.4)	9 (40.9)	0.76
Bicuspid Aortic Valve Syndrome	13 (59.1)	13 (59.1)	1
Chronic Type A Dissection	1 (4.5)	2 (9.1)	0.55
Previous Aortic Dissection	2 (9.1)	3 (13.6)	0.63
Presenting Aortic Symptoms	2 (9.1)	3 (13.6)	0.63
Ejection Fraction (%, mean±SD)	54.3 ± 1.8	51.4 ± 9.7	0.18
Aortic Insufficiency	10 (45.5)	10 (45.5)	1
Moderate	7 (70.0)	4 (40.0)	
Severe	3 (30.0)	6 (60.0)	0.18
Max Aortic Diameter (cm, mean±SD)	5.6 ± 0.7	5.9 ± 1.4	0.54
ASA			0.55
Class 2	1 (4.5)	2 (9.1)	
Class 3	21 (95.5)	20 (90.1)	
Retrograde Cerebral Perfusion	5 (22.7)	4 (18.2)	0.71
Antegrade Cerebral Perfusion	17 (77.3)	18 (81.8)	0.71
Total Cell Saver (mL, mean±SD)	681 ± 341	607 ± 425	0.52
Intraoperative Transfusion			
PRBCs (mL, mean±SD)	170 ± 210	573 ± 894	**0.04**
FFP (mL, mean±SD)	1079 ± 579	1611 ± 966	**0.03**
Platelet (mL, mean±SD)	469 ± 308	549 ± 302	0.39
Cryoprecipitate (mL, mean±SD)	20 ± 59	61 ± 65	**0.04**
Postoperative Transfusion (POD 0 to 2)			
PRBCs (mL, mean±SD)	102 ± 199	14 ± 64	0.07
FFP (mL, mean±SD)	56 ± 264	0 ± 0	0.33
Platelet (mL, mean±SD)	12 ± 58	0 ± 0	0.33
Cryoprecipitate (mL, mean±SD)	0 ± 0	0 ± 0	1
Chest Tube Drainage (POD 0 to 1) (mL, mean±SD)	555 ± 193	694 ± 304	0.13

SD=standard deviation; TIA=transient ischemic attack; Cr=creatinine; ASA=American Society of Anesthesiologists; DHCA=deep hypothermic circulatory arrest; SD=standard deviation; PRBCs=packed red blood cells; FFP=fresh frozen plasma; POD=post-operative day

Adult Cardiac Posters – Continued

P18
Leaflet Reconstructive Techniques for Aortic Valve Repair

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COMMERCIAL RELATIONSHIPS D. Mazzitelli: Consultant/Advisory Board, BioStable Science & Engineering, Inc; J. Rankin: Consultant/Advisory Board, BioStable Science & Engineering, Inc; Ownership Interest, BioStable Science & Engineering, Inc; T. J. Fischlein: Consultant/Advisory Board, SORIN GROUP; R. Lange: Consultant/Advisory Board, Boston Scientific, Medtronic, Inc

REGULATORY DISCLOSURE This presentation will address the investigational use of the HAART 300 Aortic Annuloplasty Ring, which is currently undergoing clinical trials in Europe.

Purpose: Since the development of ring annuloplasty, refining leaflet reconstruction has become the primary issue in aortic valve repair. This analysis reviews leaflet pathology, repair techniques, and early results of a prospective trial of aortic valve repair.

Methods: Forty patients underwent valve repair for aortic insufficiency (AI) using a geometric annuloplasty ring, with regulatory approval and informed consent. Age ranged from 32 to 83 years, and 74% were male. Ring annuloplasty was performed initially, and leaflet techniques included: symmetrical perinodular leaflet plication for prolapse, double patching of commissural defects using glutaraldehyde-fixed autologous pericardium, complete pericardial leaflet replacement, pericardial leaflet extension, and Gore-Tex (GT) free margin reinforcement. Ascending aortic and/or root replacement was required in 45%. Adverse outcome (AO) was defined as AI grade =/> 2 or reoperation.

Results: There were no hospital mortalities, and mean follow-up was 7 months. Average annular diameter was reduced from 26 mm to 22 mm after ring annuloplasty, and 90% of patients required repair of leaflet defects: leaflet prolapse (33), ruptured commissures (5), leaflet holes (2), and nodular scarring (5). Average preoperative AI grade of 3.2 ± 0.7 (SD) fell to 0.7 ± 0.7 postrepair ($p<0.0001$), with an average mean systolic gradient of 9.6 mmHg ± 4.9 mmHg. Leaflet plication and double pericardial patching performed well, but leaflet extension and GT reinforcement produced four of the five AOs. Two of these (5%) required interval valve replacement due to rupture of a reconstructed leaflet and endocarditis.

Conclusions: In patients with significant AI, leaflet defects were present in 90%, and leaflet plication and double pericardial patching performed well. GT reinforcement and leaflet extension were less effective and have been abandoned. Standardization of leaflet reconstructive techniques could further improve outcomes after aortic valve repair.

P19

Acoustic Spectral Analysis for Pump Thrombosis Determination in Rotary Blood Pumps

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Purpose: Implantation of rotary blood pumps is an established treatment for end-stage heart failure. In spite of refined design, these pumps still need anticoagulation medication. Pump thrombosis is a severe complication occurring in up to 5% of patients, and its early and exact detection is mandatory for optimal treatment. The acoustic spectrum emitted by centrifugal rotary blood pumps (cRBP) indicates the presence of thrombi in the pump.

Methods: In 105 patients, the sound produced by implantable cRBP was sequentially recorded using a data acquisition device combined with a laptop. The acoustic spectra calculated by runtime-FFT were investigated. The results were compared with respect to no suspicion of thrombotic complications (97 pts) and to clinical and technical signs of pump thrombosis (8 pts). All eight because of detected pump thrombosis exchanged pumps were opened and investigated.

Results: Characteristic frequency peaks exist at the rotational speed of the pump (fundamental frequency - first harmonic), the 2-fold (second harmonic) and the 4-fold frequency (fourth harmonic), which corresponds with the frequency at which the blades of the rotor pass the outflow volute. The amplitudes of the lower peaks are normalized to this fourth harmonic with the highest amplitude. In all eight exchanged pumps, thrombus formation was confirmed. The existence of a sound peak with the 3-fold frequency (third harmonic) of the pump speed correlated with the presence of thrombi inside the pump ($p<0.0001$). An increased sound amplitude of the basic frequency of the rotating impeller compared to previous measurements also denotes pump thrombosis with high significance (+75%, $P=0.002$).

Conclusions: Analysis of the acoustic spectrum emitted by cRBP can be used as a reliable method for early detection of pump thrombosis. The appearance of third harmonics of the basic frequency strongly indicates the presence of thrombotic particles on the rotor of the blood pump.

Adult Cardiac Posters – Continued

P20

The Long-term Outcome of Tricuspid Valve Replacement and Valve-Related Complication in the Current Era

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COMMERCIAL RELATIONSHIPS R. C. Daly: Other, NeoChord, Inc, Royalty; R. M. Suri: Research Grant, Edwards Lifesciences Corporation, SORIN GROUP, St Jude Medical, Inc; Other, SORIN GROUP, Principal Investigator Perceval Trial; S. J. Park: Consultant/Advisory Board, Thoratec Corporation

Purpose: Tricuspid valve replacement (TVR) is being increasingly performed in acquired heart disease. Yet little is known about prosthetic valve-related complications at the tricuspid position

Methods: Retrospective review of all patients who underwent TVR during the 10-year period ending in 2007. Patients with congenital heart disease, carcinoid syndrome, or heart transplant were excluded. Valve-related complication rates (expressed in % per patient year) were compared between tissue and mechanical prosthetic valves.

Results: We identified 275 patients (median age 70.5 years) with a median follow-up of 6.3 years. The mean LVEF was 57 +/- 10% and 69% of patients had prior cardiac surgery. RV dysfunction (72.36%), renal (20.3%), hepatic impairment (21.09%), and atrial fibrillation (46.5%) were present at the time of surgery. Tissue valves were used in 75.6% of patients, while the rest had mechanical valves. TVR with concomitant other cardiac procedures were done in 68% of patients. Bleeding due to anticoagulation was the most common complication, noted both in tissue and mechanical groups (4 vs 1.7, p = 0.3). An increased risk for valve thrombosis was noted for mechanical valves (0.79 vs 0.1, p = 0.002). Structural and non-structural valve deterioration (SVD/NSVD) were noted only in tissue valves at 2.8% and 1.5%. The overall freedom from reintervention rates were comparable between tissue vs mechanical valves (p=0.52). SVD/NSVD of the tissue valve was the most common indication (35.2%) for reintervention at 5.2 years ± 2.9 years as compared to thrombosis of the mechanical valve (33.3%) at 3.4 years ± 3.9 years.

Conclusions: Valve-related complication profiles are quite different between tissue and mechanical valves, but the overall rates of freedom from reintervention are comparable. Both prosthetic valve types seem to be acceptable, and selecting a valve for an individual patient should be based on understanding the different valve-related complications.

Notes

Adult Cardiac Posters – Continued

P21

Natural Course of Nonsurgically Treated Mild-to-Moderate Mitral Dysfunction in Patients Undergoing Aortic Valve Replacement

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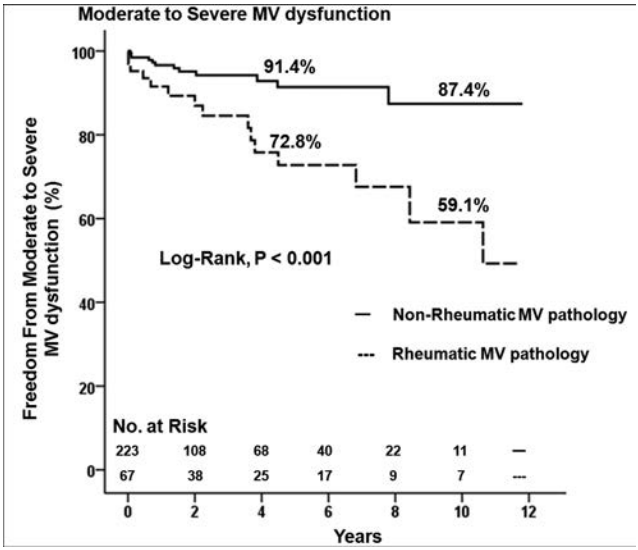
Purpose: It is still controversial whether to surgically manage the mitral valve (MV) for patients with mild-to-moderate mitral dysfunction undergoing aortic valve replacement. We investigated the echocardiographic data of patients with mild-to-moderate mitral dysfunction who did not have MV surgery.

Methods: From January 1989 to June 2012, a total of 2,731 patients underwent aortic valve replacement. Among these, 561 patients with mild-to-moderate mitral dysfunction, defined as mitral regurgitation of grade 2 to 3 or mitral stenosis of 1.1 cm^2 ≤ mitral valve area ≤ 2.0 cm^2, were screened. Of those, 295 patients (mean age, 61.9 years ± 13.1 years; 114 females) had no MV surgery, forming the study cohort. Survival, valve-related complications, and echocardiographic data were evaluated.

Results: There were three (1.0%) early deaths. During the mean follow-up period of 56.4 ± 46.5 months, there were 24 late deaths and 30 valve-related complications. Valve-related event-free survival at 5 years was 84.9% ± 2.5%. In serial postoperative echocardiographic evaluations (mean follow-up duration: 40.8 months ± 44.4 months), 28 patients showed either mitral regurgitation (≥moderate; n=24) or mitral stenosis (mitral valve area ≤1.5 cm^2; n=6). At 5 years, 86.4% ± 2.9% of the patients did not suffer from moderate-to-severe mitral dysfunction. By multivariate analysis, rheumatic pathology of MV was an independent predictor of significant mitral dysfunction (HR: 3.56, 95% confidence intervals (CI) 1.68-7.55, P=0.001), whereas females had borderline significance (HR: 2.14, 95% CI 1.00-4.61, P=0.051).

Conclusions: Conservatively treated patients with mild-to-moderate mitral dysfunction showed acceptable clinical outcomes. Rheumatic pathology of the mitral valve is associated with higher risk of progressive native mitral valve dysfunction.


Moderate to Severe MV dysfunction
Freedom From Moderate to Severe MV dysfunction (%)
100
80
60
40
20
0
91.4%
87.4%
72.8%
59.1%
Log-Rank, P < 0.001
Non-Rheumatic MV pathology
Rheumatic MV pathology
No. at Risk
223 108 68 40 22 11 —
67 38 25 17 9 7 ---
0 2 4 6 8 10 12
Years

Adult Cardiac Posters – Continued

P22

Donor Heart Utilization Following Cardiopulmonary Arrest and Resuscitation: Influence of Donor Characteristics and Wait Times in Transplant Regions

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COMMERCIAL RELATIONSHIPS V. Kasirajan: Consultant/Advisory Board, AtriCure, Inc, SynCardia Systems, Inc; Research Grant, AtriCure, Inc, SynCardia Systems, Inc, Thoratec Corporation

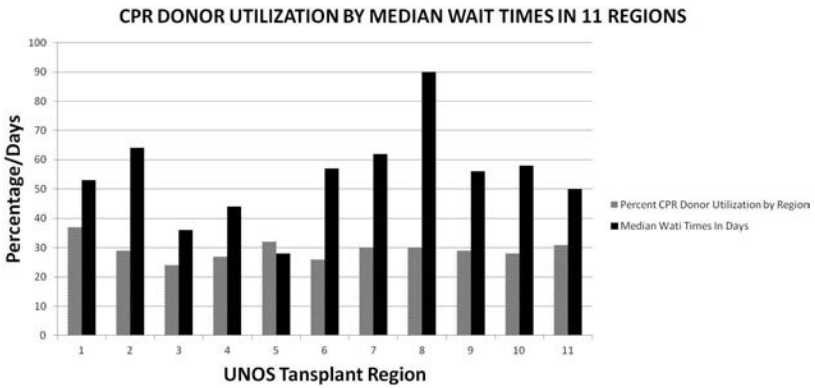
Purpose: Over the last decade, cardiopulmonary arrest and resuscitated (CPR) donors have increased by 90%; however, less than 30% of these donors were utilized for heart transplantation. We sought to study the influences of donor factors and regional wait times on CPR donor heart utilization.

Methods: From the UNOS database (1998 to 2012), we identified 44,744 organ donors, of which 4,964 (11%) received CPR. Based on donor heart utilization, CPR donors were divided into two groups: successful donation (Yes Tx) or unsuccessful donation (No Tx). Regional transplantation and donor data was systematically analyzed. Logistic regression was used to identify predictors of organ utilization.

Results: Of the 4,964 CPR donors, there were 1,427 (28.8%) donors in Yes Tx group. Donor characteristics that favored successful heart donation include (Table): younger age (25.5 ± 15 years vs 39 ± 18 years p=<0.0001), male gender (34% vs 23% p=<0.0001), and shorter CPR duration (less than 15 min 31% vs 25% for over 30 min p= <0.0001). Head trauma leading to brain death significantly favored organ donation 40% compared to anoxia 29% or stroke 15%. Donor ethnicity also influenced heart utilization, Hispanics 37%, Blacks 33%, Whites 27%, and Asians 24%. Heavy alcohol use and cigarette smoking negatively influenced organ usage. Among the 11 UNOS regions, highest utilization was in region 1 (37%) and least in region 3 (24%) (Fig). Regional transplant volumes and median waiting times had no influence on heart utilization rates.

Conclusions: Only 28.8% of CPR donor hearts were utilized for transplantation. Donor factors favoring successful heart donation include younger age, male gender, short CPR duration, head trauma leading to brain death, and absence of cigarette smoking or heavy alcohol consumption. Donor heart utilization varied by region but not by transplant volumes or wait times. Identifying favorable CPR donor characteristics should help expand the donor pool.

Donor Variables	Donor Heart Utilized For Transplantation		P Value
	Yes 1,427 (28.8%)	No 3,537 (67.2%)	
Age in Years	25.5±15yrs	39±18yrs	<0.0001
Gender- Male Female	 34 23	 66 77	<0.0001
Duration of CPR <15 min 15 to 30 min >30 min	 51 29 20	 47 29 24	<0.0001
Cause of Death- Head Trauma Anoxia Cerebrovascular / Stroke	 40 46 12	 24 47 27	<0.0001
Ethnicity- Hispanic Black White Asian	 37 33 27 24	 63 67 73 76	<0.0001
Hypertension	11	33	<0.0001
Social History- CDC High Risk Cigarette use Heavy ETOH use	 14 15 11	 13 32 15	0.7666 <0.0001 0.0001
UNOS Region 1 3	 37 24		<0.0001



Adult Cardiac Posters – Continued

P23

Moderate Hypothermia and Antegrade Cerebral Perfusion via Direct Central Innominate Artery Cannulation: A Novel and Safe Circulatory Arrest Strategy for Aortic Arch

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COMMERCIAL RELATIONSHIPS N. Desai: Research Grant, SORIN GROUP; J. E. Bavaria: Research Grant, Edwards Lifesciences Corporation, Medtronic, Inc, St Jude Medical, Inc; W. Y. Szeto: Research Grant, Bolton Medical, Inc, Edwards Lifesciences Corporation, Medtronic Vascular, Inc, SORIN GROUP; Consultant/Advisory Board, Micro Interventional Devices, Inc

Purpose: As traditional institutional practice, we have performed transverse hemi-arch distal aortic reconstruction under deep hypothermic circulatory arrest with retrograde cerebral perfusion (DHCA group) for ascending aortic aneurysm disease. Recently, we adopted moderate hypothermic (>24°C) circulatory arrest with antegrade cerebral perfusion (ACP) via direct central innominate artery cannulation (MHCA group) as an alternative circulation management strategy. We compare outcomes for these two strategies.

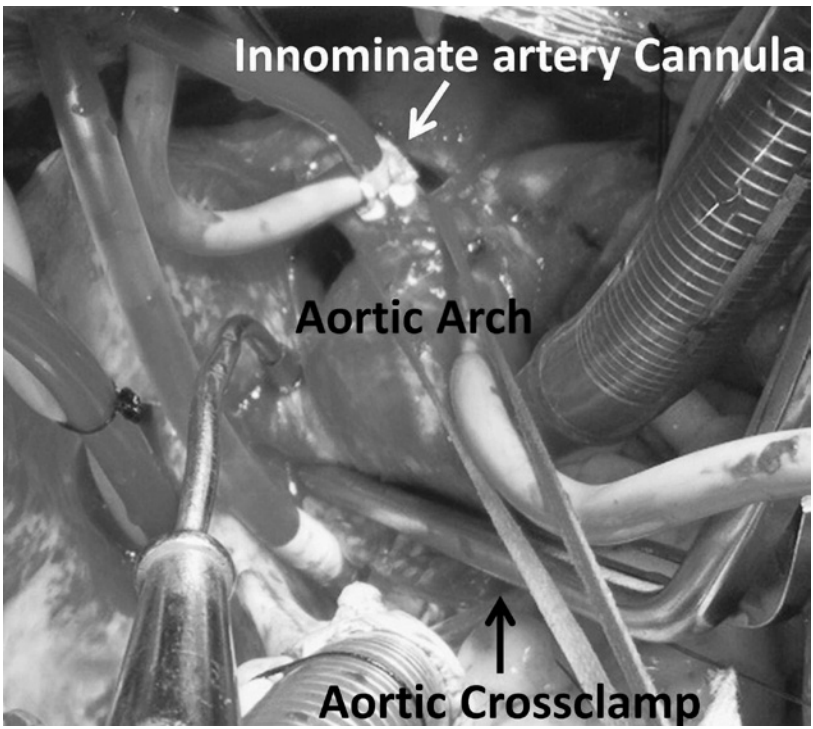
Methods: From 2008 to 2012, 376 patients (DHCA=301, MHCA=75) underwent elective hemi-arch distal aortic reconstruction under circulatory arrest. Incidence of concomitant root replacement (DHCA=140, 47%; MHCA=33, 44%, p=0.79) and wheat procedure (DHCA=87, 29%; MHCA=16, 21%, p=0.24) was similar. In MHCA group, ACP was established via direct central cannulation of the innominate artery using a 9 French aortic root cannula, thus avoiding separate axillary artery exposure (Figure).

Results: Patients in the MHCA group were older (65.7 ± 10.8 vs 60.4 ± 13.7 years, p<0.01) and had less diabetes (3% vs 11%, p=0.02); other demographics were similar. Transfusion requirement (38% vs 61%, p<0.01), time for total incision (275 ± 74 vs 331 ± 95 min, p<0.01), cardiopulmonary bypass (167 ± 49 vs 222 ± 61 min, p<0.01), aortic crossclamp (128 ± 46 vs 163 ± 57 min, p<0.01), and circulatory arrest (18 ± 5 vs 24 ± 8 min, p<0.01) were decreased in the MHCA group (Table). Direct innominate artery cannulation did not result in any vascular complications (dissection or hematoma). Postoperative outcomes were similar, with one mortality and zero stroke in MHCA group (Table).

Conclusions: ACP via direct innominate artery cannulation with moderate hypothermia yields equivalent postoperative outcomes to DHCA group, while decreasing operative times and transfusion requirement. This technique is safe and simplifies the surgical treatment of elective ascending aortic aneurysms.

Table: Intraoperative and Postoperative Outcomes

	MHCA/ACP N=75 (%)	DHCA/RCP N=301 (%)	P-value
Intraoperative outcomes			
Cardiopulmonary bypass (min)	167±49	222±61	<0.01
Aortic Crossclamp time (min)	128±46	163±57	<0.01
Circulatory arrest time (min)	18±5	24±8	<0.01
Total Incision time (min)	275±74	331±95	<0.01
Transfusion requirement (%)	28 (38	183 (61)	<0.01
Postoperative outcomes			
In- hospital mortality (%)	1 (1)	4 (1)	1
Stroke (%)	0	7 (2)	0.35
Transient ischemic attack (%)	0	2 (1)	1
Renal failure requiring Dialysis (%)	0	1 (0.3)	1
Reoperation for bleeding (%)	4 (5)	8(3)	0.26
Ventilation >24 hours (%)	11 (15)	41 (14)	0.85
Tracheostomy (%)	0	6 (2)	0.60
Deep sternal infection (%)	1(1)	1 (0.3)	0.35
Heart block (%)	1(1)	7 (2)	1
Sepsis(%)	0	2 (1)	1
Multisystem organ failure (%)	0	5 (2)	0.58
Length of stay (days)	8.2 ± 3.4	9.1 ± 5.6	0.18



Adult Cardiac Posters – Continued

P24

Outcomes of Aortic Valve and Concomitant Ascending Aorta Replacement Performed via a Minimally Invasive Right Thoracotomy Approach

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COMMERCIAL RELATIONSHIPS J. Lamelas: Speakers Bureau/Honoraria, Medtronic, Inc, I-Flow, LLC; Ownership Interest, Miami Instruments

Purpose: Replacement of the aortic valve with concomitant replacement of the ascending aorta performed via a minimally invasive right anterior thoracotomy approach has not been reported. We evaluated the feasibility, safety, and short-term outcomes of patients who underwent such procedure.

Methods: We retrospectively reviewed all the minimally invasive aortic valve replacements with concomitant replacement of the ascending aorta performed at our institution between January 1, 2012, and December 30, 2012. The operative times, intensive care unit and hospital lengths of stay, postoperative outcomes, and mortality were analyzed.

Results: We identified a total of 20 consecutive patients with aortic valve disease and dilatation of the ascending aorta who underwent minimally invasive aortic valve replacement with concomitant replacement of the ascending aorta. There were 16 (80%) males, with a mean age of 61 ± 13 years. The mean left ventricular ejection fraction was 58 ± 8%. The aortic valve was bicuspid in 18 (80%) patients, with 14 (70%) being stenotic. The mean ascending aorta diameter was 4.5 ± 0.4 cm. The median aortic cross clamp and cardiopulmonary bypass times were 163 minutes (IQR 141-170) and 291 minutes (IQR 177-215), respectively. There were 19 (95%) patients who required hypothermic circulatory arrest, with a median hypothermic circulatory arrest time of 35 minutes (IQR 33-39.5). The median intensive care unit and postoperative length of stay were 24 hours (IQR 23-41) and 5 days (IQR 4-6), respectively. There were no strokes, reoperations for bleeding, or conversions to sternotomy. The 30-day mortality was zero.

Conclusions: Minimally invasive aortic valve replacement with concomitant replacement of the ascending aorta, via a right anterior thoracotomy approach, can be performed safely with low morbidity and mortality.

Patient Demographics and Operative Outcomes

Mean age (years ± SD)	61 ±13
Males	16 (80%)
Body mass index (kg/m)	27.7 ±5
Ejection fraction (mean ± SD)	58 ± 8%
Aortic valve pathology:	
Calcific degeneration	2 (10%)
Bicuspid aortic valve with fusion of the right and left coronary cusps	14 (70%)
Bicuspid aortic valve with fusion of the right and non-coronary cusps	4 (20%)
Aortic valve lesion:	
Stenosis	14 (70%)
Insufficiency	3 (15%)
Combined stenosis and insufficiency	3 (15%)
Ascending aortic diameter (mm, mean ± SD)	45 ± 4
Congestive heart failure	1 (5%)
Diabetes mellitus	4 (20%)
Hypertension	15 (75%)
Pre-operative creatinine level (mg/dl, mean ± SD)	0.9 ± 0.2
Aortic cross-clamp time (minutes, median IQR)	163 (141-170)
Cardiopulmonary bypass time (minutes, median, IQR)	201 (177-215)
Number of patients requiring hypothermic circulatory arrest	19 (95%)
Hypothermic circulatory arrest time (minutes, median, IQR)	35 (33-39.5)
Number of units of packed red blood cells transfused (median, IQR)	1 (0-3)
Ventilation time (hours, median, IQR)	10.9 (5.6-24.7)
Prolonged intubation	1 (5%)
Intensive care unit length of stay (hours, median, IQR)	24.3 (22.1-48.2)
Post-operative atrial fibrillation	2 (10%)
Hospital length of stay (days, median, IQR)	5.3 (4-6)
Thirty day mortality	0

There were no episodes of intensive care unit readmissions, sepsis, reoperation for bleeding, cerebrovascular accidents, or acute kidney injury.
SD=standard deviation, IQR=interquartile range

Adult Cardiac Posters – Continued

P25
Adult Surgical Experience With Loeys-Dietz Syndrome

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COMMERCIAL RELATIONSHIPS R. L. McCann: Speakers Bureau/Honoraria, Medtronic, Inc, W. L. Gore & Associates, Inc; G. C. Hughes: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Speakers Bureau/Honoraria, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Research Grant, Vascutek Ltd

Purpose: Loeys-Dietz syndrome (LDS) results from mutations in receptors for the cytokine TGFβ. This leads to aggressive aortic pathology sometimes accompanied by specific phenotypic features, including bifid uvula, hypertelorism, cleft palate, and generalized arterial tortuosity. We reviewed our adult surgical experience with LDS in order to validate the outcomes and recommendations currently in the literature regarding the management of this newly described disease.

Methods: All adult (≥18 years old) patients with LDS undergoing surgical treatment at a single referral institution from September 1999 to November 2012 were retrospectively reviewed.

Results: Ten adult patients with LDS were identified by clinical criteria and/or genotyping (Table). Seven of these patients (70%) experienced an acute type A dissection at some point in their lives. All patients eventually required replacement of their aortic root, and eight patients (80%) required multiple vascular surgical interventions. Twenty-nine total cardiovascular procedures were performed on these 10 patients (2.9 procedures per patient) over a mean follow-up interval of 58 ± 46 months from index operation. In patients with type A dissection, a mean of 3.4 operations were performed, whereas a mean of 2.0 operations were performed on patients who did not sustain a dissection. Total aortic replacement was required in five patients (50%) and two patients (20%) required neurosurgical intervention for cerebrovascular pathology. There was one late death from infectious complications, and no deaths occurred as a result of a vascular catastrophe.

Conclusions: The current results confirm the aggressive nature of the aortic pathology of this disorder. However, the improved survival in the present surgical series compared to earlier reports of LDS indicate that aggressive treatment strategies can alter outcomes and improve the quality of life and the natural history of this syndrome.

Table 2. Operative characteristics at index operation of 10 adult patients undergoing aortic surgery for pathology related to Loeys-Dietz syndrome

Age (yrs)	Maximum Aortic diameter (cm)	Index operation * (I.O.)	Other vascular operations	
			Prior to I.O.	After I.O.
44	4.8	VSRR		
30	5.0	VSRR		1. Ligation Cerebral Aneurysm
35	4.0 ¥	Aortic Root Homograft	1. Coiling of cerebral AVM	2. Mechanical Bentall
20	6.7	Mechanical Bentall/MVR (Type A)	1. MVr	1. OHT/ Total Arch Replacement 2. Open TAAA repair
26	6.8	Ascending/Total Arch Replacement (Type A)	1. VSRR	1. Open TAAA repair 2. Open repair of innominate artery and SCA aneurysms
31	4.8	Mechanical Bentall/Total Arch Replacement	1. Ascending Replacement (Type A)	1. Open TAAA repair
29	6.7	Open TAAA repair	1. Ascending/ Hemi-arch Replacement (Type A)	1. VSRR/Arch Debranching 2. TEVAR
39	3.2 ¥	Re-do Mechanical Cabrol	1. Coarctation Repair 2. Ascending Replacement (Type A) 3. Mechanical Cabrol	
51	6.2	Open TAAA Repair	1. Bio-Bentall (Type A)	1. Total Arch Replacement 2. TEVAR
31	5.6	VSRR/Hemi-arch Replacement (Type A)		

* The first operation performed at our institution is considered the index operation
¥ Aortic root diameter at the time of first root replacement is unknown
VSRR, David-V Valve Sparing Root Replacement; AVM, Arterio-Venous Malformation; MVR, mitral valve replacement; MVr, mitral valve repair; OHT, Orthotopic Heart Transplant; TAAA, thoracoabdominal aortic aneurysm; Type A, Acute Type A Aortic Dissection; SCA, subclavian artery; TEVAR, Thoracic Endovascular Aortic Replacement

Adult Cardiac Posters – Continued

P26
Transapical Aortic Valve Implantation: Effects of Poor Left Ventricular Function on Survival and Myocardial Contractility

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COMMERCIAL RELATIONSHIPS A. Unbehaun: Other, Edwards Lifesciences Corporation, Proctor; M. Pasic: Other, Edwards Lifesciences Corporation, Proctor

REGULATORY DISCLOSURE This presentation will address the off-label use of the Edwards SAPIEN prosthesis for transapical aortic valve implantation in very high-risk patients with poor and very poor left ventricular function.

Purpose: The purpose of this study was to identify what happens to the left ventricular function after transcatheter aortic valve implantation (TAVI) in patients with failing ventricles.

Methods: We compared left ventricular ejection fraction (LVEF) and end-diastolic diameter (LVEDD) before TAVI and 1 week after TAVI in 96 patients with very poor and poor left ventricular function. There were 39 patients (41%) with LVEF of 20% and 57 patients (59%) with LVEF of 21-30%. The mean EuroScore II was 37 ± 23% (range 2-95%). Cardiogenic shock was present in 23 patients (24%).

Results: During the first week after TAVI, LVEF increased from 23.2 ± 6.4% to 40.3 ± 11.8% ($p<0.001$) and LVEDD decreased from 57.2 ± 8.1 mm to 54.6 ± 8.1 mm ($p<0.001$). More than 50% improvement in LVEF was found in 62 patients (65%) and 100% improvement in 37 patients (39%). Changes in LVEF were independent of the preoperative value ($p=0.208$). Survival at 1, 2, and 4 years was 81 ± 5%, 64 ± 7%, and 45 ± 9%, respectively. There was no significant difference in survival in patients with LVEF of 20% and LVEF of 20-30% ($p=0.623$).

Conclusions: In the majority of patients with failing ventricles, left ventricular function is quickly restored after TAVI and elimination of aortic stenosis. Without the additional trauma of cardioplegic arrest, TAVI is the potentially superior treatment option in patients with poor and very poor left ventricular performance.

Notes

Adult Cardiac Posters – Continued

P27

Is Aortic Valve Repair Reproducible? Analysis of the Learning Curve for Aortic Valve Repair

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COMMERCIAL RELATIONSHIPS M. Ruel: Research Grant, Medtronic, Inc; Speakers Bureau, Medtronic, Inc

Purpose: Aortic valve (AV) preservation and repair, while effective, is performed in a limited number of centers. The lack of wider application may be due to challenges in dissemination of tacit surgical knowledge. We examined the learning curve in two centers initiating dedicated programs in AV repair.

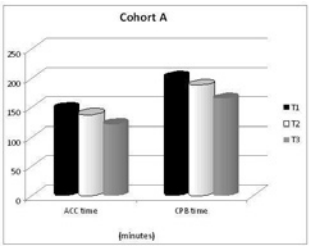
Methods: Prospectively collected clinical and echocardiographic data on the first 100 (Cohort A) and 150 consecutive patients (Cohort B) undergoing AV surgery was analyzed. Safety endpoints included mortality, myocardial infarction or stroke, early AV reoperation, reexploration for bleeding, or pacemaker implantation. Efficiency was assessed through aortic crossclamp (ACC) and cardiopulmonary bypass (CPB) times. Efficacy parameters included residual aortic insufficiency (AI) or stenosis, intraoperatively and at follow-up. Each cohort was divided into three equal terciles (T1, T2, and T3) and outcomes were compared.

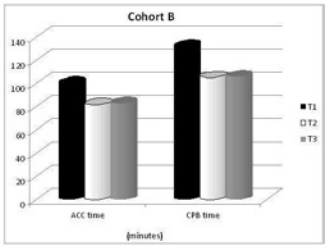
Results: Indices of procedural complexity were similar across terciles (Table). No patients required early AV reoperation in Cohort A, and four (2.6%) required early AV reoperation in Cohort B. In Cohort A, a total of 14 safety events occurred with a significant reduction in incidence over the terciles (18%, 15%, and 3%, in T1, T2, and T3, $p = 0.05$). In Cohort B, 20 safety events occurred in 18 patients with a trend toward reducing incidence over terciles (20%, 12%, and 8%, in T1, T2, and T3, $p=0.14$). ACC and CPB times decreased significantly following T2 in Cohort A and T1 in Cohort B (Figure, $p <0.01$). Intraoperative procedural efficacy was similar across terciles in both cohorts. At follow-up, presence of AI >2+ and mean gradients >20 mmHg showed a decreasing trend in Cohort A.

Conclusions: Analysis of early experience with aortic valve repair in two centers reveals that procedural safety and efficiency improves with experience, whereas efficacy is consistent over time. Aortic valve repair is reproducible, with a learning curve of approximately 40-60 cases.

Table (Endpoints)

	Cohort A		
	T1	T2	T3
Safety Endpoints n, (%)	6 (18%)	5 (15%)	1 (3%)
Efficacy Endpoints - Follow-up AI > 2+ - Mean AV gradient > 20	2 (6%) 1 (6%)	0 (0%) 0 (0%)	0 (0%) 0 (0%)
Case Complexity - Preoperative AI > 1+ - Non-trileaflet AV - Associated Procedures	24 (72%) 16 (48%) 10 (30%)	19 (57%) 14 (42%) 18 (54%)	16 (47%) 14 (41%) 13 (38%)
	Cohort B		
Safety Endpoints n, (%)	10 (20%)	6 (12%)	4 (8%)
Efficacy Endpoints - Follow-up AI > 2+ - Mean AV gradient > 20	5 (10%) 0 (0%)	10 (20%) 2 (4%)	4 (8%) 4 (8%)
Case Complexity - Preoperative AI > 1+ - Non-trileaflet AV - Associated Procedures	41 (82%) 16 (32%) 15 (30%)	48 (96%) 23 (46%) 13 (26%)	46 (92%) 19 (38%) 20 (40%)





Adult Cardiac Posters – Continued

P28
Initial Experience With a Novel Two-Part Aortic Valve Bioprosthesis

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COMMERCIAL RELATIONSHIPS M. Shrestha: Consultant/Advisory Board, Vascutek Ltd; M. A. Borger: Speakers Bureau, Edwards Lifesciences Corportation, St Jude Medical, Inc, Medtronic, Inc; B. Kapelak: Research Grant, BioVentrix; L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax

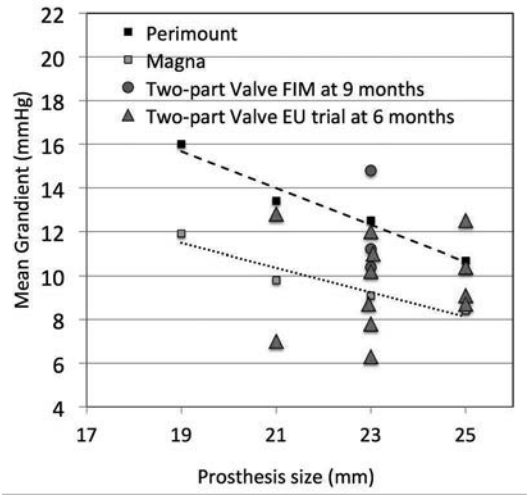
REGULATORY DISCLOSURE This presentation will address the ValveXchange Bioprosthesis device, which is not FDA approved.

Purpose: Two-part valves offer the advantage of easier implant and the potential for rapid, less traumatic replacement of the worn-out components later in life. Two designs have been attempted previously but both failed in clinical use for technical reasons. This study reports on the first clinical experience with an improved design, two-part bovine pericardial bioprosthesis.

Methods: After a three-patient First-in-Man (FIM) study, a 45-patient European (EU) clinical trial was designed in which the valve was implanted using a two-step method. The Base was sewn in first using conventional suturing and the Leaflet Assembly was then attached. Endpoints of the trial were ease of use (subjective) and 6-month transvalvular gradients (objective).

Results: Placement of the Base alone enabled easier implant as the tall commissural posts found in current pericardial valves were not present to obstruct suture tying. The absence of leaflets during Base implantation allowed additional infravalvular sutures to be placed without difficulty (four cases) and debris to be removed from the inside of the ventricle (1 case). All valves were implanted successfully with zero surgical mortality. Of the three FIM and 28 EU patients available at 9- and 3-month follow-up, respectively, two had trace PV leak. Six-month echo follow-up on the first 15 EU patients suggests that gradients are lower than for the current gold standard bioprostheses (see figure).

Conclusions: The two-part valve tested in this trial is an alternative to revalving failed bioprostheses with transcatheter valves and offers no reduction in valve area or concerns over long-term durability. The two-step implant technique is easy, safe, provides excellent visibility and control, and enables the smaller incisions being demanded by patients, without the additional risks of paravalvular leaks, sizing issues, and greater costs of sutureless valves. Gradient to date are excellent.



Perimount and Magna data obtained from: Dalmau, MJ et al. The Carpentier-Edwards Perimount Magna aortic xenograft: a new design with an improved hemodynamic performance. Interactive CardioVasc Thorac Surg 2006;5:263-267.

Adult Cardiac Posters – Continued

P29

Mid-term Echocardiographic Outcomes of Bentall and Aortic Valve-Sparing Root Replacement: A Propensity-Matched Analysis

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COMMERCIAL RELATIONSHIPS M. Ruel: Research Grant, Medtronic, Inc; Speakers Bureau, Medtronic, Inc

Purpose: Composite valve and root replacement (Bentall procedure) is typically used to treat patients with aortic valve and root disease. However, valve-sparing root replacement (VSRR) with aortic valve (AV) repair is associated with lower risk of valve-related events and is increasingly being performed in these patients. Little comparative data exists between these two approaches.

Methods: Consecutive non-emergent patients undergoing VSRR and AV repair were compared with contemporary historical controls undergoing the Bentall procedure for aortic root pathology with or without AV insufficiency. VSRR was performed preferentially using the reimplantation technique. Bentall procedure utilized a mechanical valve, biologic valve, and homograft in 64%, 25%, and 11% of patients, respectively. Clinical and echocardiographic data was obtained at baseline and follow-up. Bicuspid AV disease was more prevalent in the VSRR/AV repair group (51% vs 19%, p <0.007). Propensity scores were generated using multivariable logistic regression models incorporating preoperative patient and disease characteristics and were used to create matched pairs (n=48 per group).

Results: The matched cohorts were similar with respect to all preoperative characteristics (Table). Survival at mean follow-up time of 37 ± 4 months was similar between groups (100% vs 98%, p = ns). The mean transvalvular gradient was slightly lower in the VSRR group (9.4 ± 0.7 vs 12.8 ± 0.7 mmHg, p = 0.002). Persistence of LV dysfunction (LVEF <55%) (13% vs 4%, p = 0.26) and LV mass were both greater (225 ± 74 vs 207 ± 57 gm, p = 0.18) in the Bentall group, but did not reach statistical significance. The incidence of persistent mild AI was 25% in the Bentall group and 36% in the VSRR/AV Repair group (p = 0.80).

Conclusions: Valve-sparing root replacement with AV repair provides similar mid-term echocardiographic outcomes compared to the Bentall procedure, except for slightly lower aortic valve gradients.

Preoperative Characteristics of Patients in the Bentall and VSRR Group after Propensity Score Matching

Variables	Bentall Group (N=48)	VSRR +/- AV Repair group (N=48)
Age (years)	56 ± 1.6	55 ± 1.4
Sex (% in male)	87.5 %	89.6%
LV function (Grade in %) -Grade 1:	90%	87.3%
-Grade 2	8.3%	10.4%
-Grade 3	2.1%	2.1%
-Grade 4	0%	0%
Surgical Indication (%) -Degenerative	43.7%	37.5%
-Bicuspid aortic valve	35.4%	33.3%
-Marfans	8.3%	8.3%
-Endocarditis	6.3%	12.5%
-Aortic dissection	4.2%	6.3%

P30

Aortic Valve Reconstruction Surgery With Leaflet Replacement and Sino-Tubular Junction Fixation for the Treatment of Aortic Valve Disease: Early and Mid-term Results

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Purpose: Most mitral and tricuspid valve diseases can be managed by valve repair, but aortic valve diseases are typically treated by prosthetic valve replacement, mainly due to technical challenges. A novel aortic valve reconstruction surgery (AVRS) technique, consisting of aortic leaflet reconstruction with tailored pericardial patches and fixation of the sino-tubular junction (STJ) with properly sized fabric rings, is performed for the treatment of aortic valve diseases. The early and mid-term outcomes of AVRS were analyzed.

Methods: Between December 2007 and December 2012, a total of 262 patients underwent AVRS for significant aortic valve disease, without other valve surgery, in one center. The first step of AVRS was to determine the location of three new commissures and the new STJ. The size of the pericardial leaflets for reconstructing the valve was decided based on the diameter of the new STJ. The new STJ was fixed or reduced with fabric rings.

Results: There was no hospital mortality, but there were three late deaths (1.1% late mortality). Seven patients (2.7%) required reoperation: five due to endocarditis and two due to suture disruption of the leaflets. Ten patients (3.8%) experienced neurologic events. Aortic valve regurgitation was absent or trivial in 226 patients (87.3%), mild in 29 (11.2%), mild to moderate in three (1.2%), and moderate to severe in one (0.4%). The mean valve gradient and valve orifice indices were 10.6 mmHg ± 5.3 mmHg and 1.3 cm^2/m^2 ± 0.4 cm^2/m^2, respectively. Those were significantly lower in the 26-mm or larger leaflets than the 22-mm leaflets.

Conclusions: The data from the first 5 years after AVRS reveal good clinical and hemodynamic outcomes, suggesting that AVRS is therapeutically equivalent or superior to the practice of valve replacement using bioprosthetic or mechanical valves.

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P31

Perioperative Results of the Implantation of the Perceval S Sutureless Aortic Valve Compared to Standard Aortic Valve Replacement in High-Risk Cardiac Surgery Patients

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REGULATORY DISCLOSURE This presentation will address the Sorin Perceval valve, which has an FDA status of investigational.

Purpose: Sutureless aortic valves have been introduced in practice since 2009. This new technology is deemed suitable for patients that are considered for surgery but that are considered as high-risk patients. The objective of this study was to evaluate the perioperative results of implanting a sutureless valve, the Perceval S, compared to the standard aortic valve replacement (AVR) in high-risk octogenarian patients.

Methods: Between 2011 and 2013, 58 patients with severe aortic stenosis underwent AVR with the Perceval prosthesis. The group was matched to the last 58 consecutive patients who had standard AVR reported in our hospital database from 2008 to 2010.

Results: Mean age was 80 years in both groups. Preop peak aortic gradient was higher in the Perceval group (77 mmHg ± 30 mmHg) vs the standard AVR group (50 mmHg ± 19 mmHg). Mean preoperative left ventricular ejection fraction was normal in both groups. Mean cardiopulmonary bypass time and cross-clamp time were lower in the Perceval group compared to the standard AVR group (55 min ± 18 min vs 96 min ± 28 min and 40 min ± 14 min vs 77 min ± 23 min) respectively. There were two perioperative mortalities in the Perceval group (respiratory failure and multiorgan failure) and no mortality in the standard AVR group. There were 14 pacemaker implantations in the Perceval group compared to four in the standard AVR group and 15 renal insufficiencies in the Perceval group and none in the standard AVR group. However, there were two reexplorations for bleeding in the standard AVR group.

Conclusions: The implantation of a Perceval sutureless valve is an interesting option for high-risk patients considered to have AVR according to decreased bypass and cross-clamp time. However, more perioperative mortality, renal insufficiency, and pacemaker implantation were found in that group compared to the standard AVR group. Long-term clinical results need to be evaluated.

P32
Transmitral Septal Myectomy: Technique and Lessons Learned

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COMMERCIAL RELATIONSHIPS J. S. Gammie: Research Grant, Edwards Lifesciences Corporation; Ownership Interest, Correx, Inc, Harpoon Medical, Inc

Purpose: Left ventricular outflow tract (LVOT) obstruction in hypertrophic obstructive cardiomyopathy (HOCM) results from systolic anterior motion of the mitral valve and contact between the hypertrophied septum and the mitral valve apparatus. While transaortic septal myectomy effectively reduces outflow tract gradients, it has limitations. Given the frequent association of mitral valve abnormalities and LVOT obstruction in HOCM, we initiated a programmatic approach to septal myectomy using a transmitral technique that addresses both the septal and mitral pathology, and now describe our technique.

Methods: Retrospective review. Operations were performed through a median sternotomy on the arrested heart. The mitral valve was exposed through a left atriotomy. The anterior leaflet of the mitral valve was detached entirely, resulting in a panoramic view of the septum from the base of the septum to the apex. An aggressive myectomy was performed in a clockwise fashion from 9 o'clock to 1 o'clock, and was extended to the level of the base of the papillary muscles. The anterior leaflet was reattached with a single running monofilament suture and the posterior mitral valve leaflet was pulled posteriorly with e-PTFE sutures. Annuloplasty rings were used in all repairs. The valve was replaced with a bileaflet mechanical prosthesis if a satisfactory repair was not possible.

Results: See Table.

Conclusions: Transmitral septal myectomy is an attractive alternative method for relieving LVOT obstruction in HOCM. In this initial experience, we have observed multiple advantages to this approach, including greatly enhanced visibility of the ventricular septum that enables extended myectomy, access to the mitral valve to perform adjunctive procedures to assure mitral competence and posterior repositioning of the line of coaptation, freedom from concern of injuries to the aortic cusps, and excellent relief of LVOT obstruction.

Operative Outcomes

Patient	Age	Maximal Septal Thickness (cm)	Peak Preoperative LVOT Gradient (mmHg)	Preoperative MR Grade	Peak Postoperative LVOT Gradient (mmHg)
Case 1	69	2.7	129	severe	11
Case 2	66	3.2	10	severe	0
Case 3	49	1.5	82	severe	8
Case 4	66	2.1	224	moderate	13

Adult Cardiac Posters – Continued

P33

Influence of Donor Downtime (History of Cardiac Arrest) on Heart Transplantation Outcomes in a National Cohort

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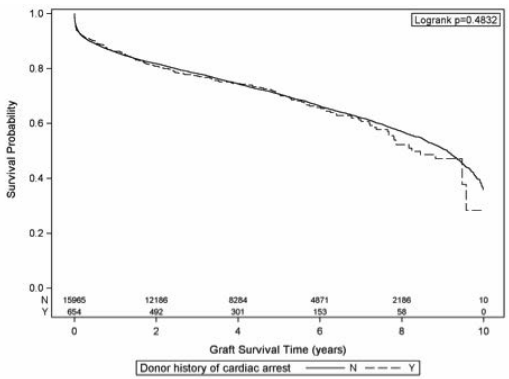
Purpose: Cardiac arrest can result in ischemic damage to myocardial tissue. Surgeons are cautious about accepting donor organs with a history of cardiac arrest, though outcomes are unknown. This study analyzed whether such a history impacts graft function and survival.

Methods: We analyzed all first-time adult cardiac transplants in the US between 1988 and 2010 in the United Network of Organ Sharing (UNOS) database. Stratification was between donors with and without a history of cardiac arrest for univariate and multivariate analyses. The primary endpoint was all-cause graft failure.

Results: Of 17,941 recipients that met inclusion criteria, 700 had a donor with a history of cardiac arrest. These donors were more likely to be on three or more inotropes at donation, female, diabetic, black, and to have a history of cocaine use ($p<0.05$). They were also more likely to have died of anoxia, with higher ($p<0.01$) rates of asphyxiation, drug intoxication, and cardiovascular causes as mechanism of death. Recipients of these hearts were sicker: at waitlist status 1A ($p=0.04$), on ECMO ($p=0.02$), hospitalized, on IV inotropes, or on LVAD ($p=0.01$). They were more likely to be black ($p=0.03$), cigarette users, and to have had prior cardiac surgery ($p<0.01$). In univariate analysis, donor history was not associated with a difference in 30-day ($p=0.81$), 5-year ($p=0.31$), or 10-year ($p=0.97$) graft survival; this held in multivariate analysis (hazard ratio 1.06, $p=0.44$). However, recipient cause of death was more likely to be attributed to graft failure ($p=0.01$) than other causes in this group, and incidence of primary graft failure was slightly higher (9.04% vs 6.12%, $p=0.11$).

Conclusions: Donor history of cardiac arrest is not a contraindication for heart transplantation in these selected donors. Clinically, there is no impact on survival and rejection over time, though there is a slight preponderance of primary graft failure in the arrest group.



P34

Percutaneous vs Surgical Myocardial Revascularization in Patients With Diabetes: 5-Year Outcomes of the CREDO-Kyoto PCI/CABG Registry Cohort-2

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Purpose: We sought to investigate 5-year clinical outcomes of percutaneous coronary intervention (PCI) with drug-eluting stent (DES) vs CABG in a real-world population of diabetic patients with advanced coronary disease.

Methods: We identified 3,982 patients with triple-vessel and/or left main disease out of 15,939 patients with first myocardial revascularization enrolled in the CREDO-Kyoto PCI/CABG Registry Cohort-2. Among them, 5-year outcomes in patients with (n=1,998) or without (n=1,984) diabetes were examined.

Results: [Diabetic patients]: There were 1,065 patients (53%) who received PCI and 933 CABG. In-hospital mortality was not different between PCI and CABG (1.3% vs 1.9%, p=0.27). However, cumulative 5-year mortality was higher after PCI than CABG (22.9% vs 19.0%, p=0.046). Adjusted 5-year mortality after PCI was also higher than CABG (hazard ratio [95% confidence interval]: 1.63 [1.25-2.11], p<0.01). Similarly, the risk of myocardial infarction (MI) and repeat revascularization after PCI was higher than CABG (1.93 [1.37-2.72], p<0.01) and 3.72 [2.83-4.88], p<0.01). The risk of stroke was not different between PCI and CABG (1.13 [0.82-1.55], p=0.47). [Non-diabetic patients]: There were 1,123 PCI (57%) and 861 CABG. In-hospital mortality was not different between PCI and CABG (0.9% vs 1.4%, p=0.29). Cumulative 5-year mortality was higher after PCI (19.8% vs 16.2%, p=0.01). Adjusted 5-year mortality after PCI tended to be higher than CABG (1.27 [0.97-1.66], p=0.08). The risk of MI and repeat revascularization after PCI was higher than CABG (1.52 [1.14-2.04], p<0.01) and 3.23 [2.39-4.35], p<0.01). The risk of stroke was not different between PCI and CABG (0.89 [0.64-1.24], p=0.49).

Conclusions: In both diabetic and non-diabetic patients, PCI with DES was associated with higher risk of death, MI, and repeat revascularization at 5 years. CABG is a better treatment option for patients with more complex disease, especially with concurrent diabetes.

Adult Cardiac Posters – Continued

P35
Contemporary Management and Outcomes of Acute Type A Aortic Dissection: An Analysis of the STS Adult Cardiac Surgery Database

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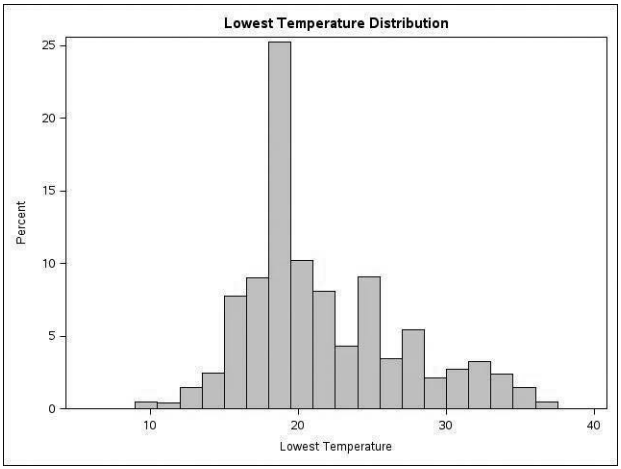
COMMERCIAL RELATIONSHIPS V. H. Thourani: Research Grant, Edwards Lifesciences Corporation, MAQUET, SORIN GROUP; Consultant/Advisory Board, St Jude Medical, Inc; Ownership Interest, Apica Inc; G. Ailawadi: Consultant/Advisory Board, Abbott Vascular, Edwards Lifesciences Corporation, SORIN GROUP; Speakers Bureau/Honoraria, AtriCure, Inc; Research Grant, AstraZeneca; G. C. Hughes: Consultant/Advisory Board, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Speakers Bureau/Honoraria, Medtronic, Inc, Vascutek Ltd, W. L. Gore & Associates, Inc; Research Grant, Vascutek Ltd; L. G. Svensson: Consultant/Advisory Board, Cardiosolutions, Inc, ValveXchange, Inc; Other, Postthorax; J. S. Gammie: Research Grant, Edwards Lifesciences Corporation; Ownership Interest, Correx, Inc, Harpoon Medical, Inc

Purpose: Management of acute type A aortic dissection (AAAD) is challenging and varies greatly among centers. We used the STS Adult Cardiac Surgery Database to describe contemporary surgical strategies and outcomes for AAAD.

Methods: Between July 2011 and September 2012, 2,982 patients with AAAD underwent primary repair at 640 centers in North America.

Results: In this cohort, median age was 60 years old, 66% were male, and 80% had hypertension. The most common arterial cannulation strategies included femoral only (36%), axillary only (27%), and direct aortic only (19%). The median perfusion and cross-clamp times were 181 min and 102 min, respectively. The lowest temperature on bypass showed significant variation (Figure). Hypothermic circulatory arrest (HCA) was used in 78% of cases. Among those undergoing HCA, brain protection strategies included antegrade cerebral perfusion (31%), retrograde (25%), both (4%), and none (40%). Median HCA plus cerebral perfusion time was 40 min. Major complications included prolonged ventilation (53%), reoperation (19%), renal failure (18%), permanent stroke (11%), and paralysis (3%). Operative mortality was 17%. The median ICU and hospital length of stays were 4.7 and 9.0 days, respectively. Among the 640 centers, the median number of cases performed during the study period was three, with only 11% of centers performing 10 or more cases. The analysis yielded the following unadjusted preoperative risk factors for increased mortality: resuscitation, unresponsive state, cardiogenic shock, inotrope use, age >70, creatinine >2 mg/dL, diabetes, and female sex.

Conclusions: These data describe contemporary patient characteristics, operative strategies, and outcomes for AAAD. Mortality and morbidity for AAAD remain high. Large variations in cannulation, brain protection, and temperature management strategies exist. Prospective studies to determine the optimal treatment strategies for this challenging disease are needed.


Lowest Temperature Distribution
Percent
25
20
15
10
5
0
10
20
30
40
Lowest Temperature

Adult Cardiac Posters – Continued

P36

Outcomes of Minimally Invasive Approach for Exchange of the HeartMate II (HMII) Left Ventricular Assist Device (LVAD)

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COMMERCIAL RELATIONSHIPS A. El Banayosy: Speakers Bureau/Honoraria, Thoratec Corporation; Consultant/Advisory Board, HeartWare Inc, MAQUET; W. E. Pae: Research Grant, Heartware Inc; Consultant/Advisory Board, Thoratec Corporation

Purpose: The safety and efficacy of exchange of the HMII LVAD through a less invasive subcostal approach remains unclear. We hypothesized that adopting a subcostal approach for exchange of the HMII LVAD, thus avoiding a redo sternotomy, would result in a reduction in operative mortality and morbidity.

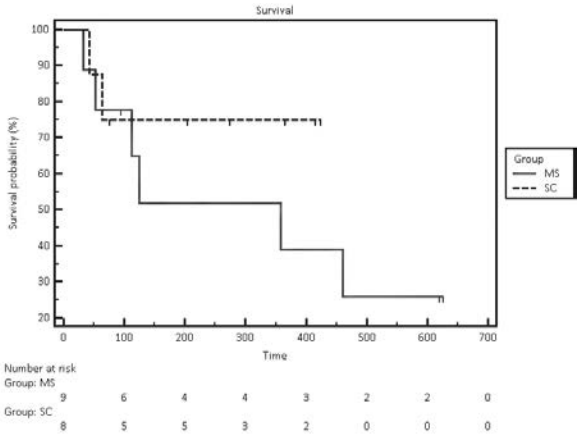
Methods: We conducted a retrospective review of all continuous flow LVADs implanted between June 2006 and September 2012 at our institution. Patients who underwent a HMII pump exchange were identified and divided into a subcostal (SC) and median sternotomy (MS) group. Data pertaining to their short- and long-term outcomes were collected.

Results: Of the 123 patients who had a continuous flow LVAD implanted, 21 (17%) had pump failure needing pump exchange (pump failure rate of 0.18 events per patient year). Cause of pump failure was driveline lead fracture (8), inflow cannula malposition (3), pump thrombosis (7), and infection (3). Three patients did not undergo pump change and expired. Of the 18 who underwent pump exchange, 17 had HMII and one had Heartware (HW) pump. Of the 17 HMII exchanges, nine were done through MS and eight through SC approach. Mean LVAD support duration before exchange was 540 ± 450 days and was not significantly different between MS and SC groups. There were no 30-day perioperative deaths with either approach. Compared with sternotomy, patients with subcostal approach had significantly shorter operative times, lower reoperation rates for bleeding, and required fewer transfused blood products. Additionally, patients with subcostal approach had shorter postoperative intensive care unit stays and total hospital stays (Table). Long-term survival after mean follow-up of 260 days for the subcostal group and 232 days for the sternotomy group was 75% and 33%, respectively (Figure).

Conclusions: Exchange of the HeartMate II pump can be accomplished with low morbidity and mortality and good long-term outcomes, through a less invasive subcostal approach.

	MS(n=9)	SC(n=8)	p
Age (years)	63.7±12.3	67±5.7	0.48
Male	7(77.8%)	6(75%)	0.66
Indication for Exchange			
Lead Fracture	3 (33.3%)	3 (37.5%)	0.74
Thrombosis	5 (55.5%)	4 (50%)	0.79
Infection	1 (11.1%)	1 (12.5%)	0.50
Time to Exchange (days)	625±479	445±425	0.43
Operation Time (min)	222	131	0.001
Re-operation for Bleeding	44%	0%	0.05
Packed Red Cell Transfusion (units)	7.1	3.5	<0.05
Fresh Frozen Plasma Transfusion (mL)	1717	899	<0.05
Platelet Transfusion (mL)	762	292	<0.05
Cryoprecipitate Transfusion (mL)	209.3	50.7	<0.05
ICU Length of Stay (days)	13.8	5	<0.05
Hospital Length of Stay (days)	27.2	16.4	<0.05
30-day Mortality	0%	0%	0
Mean Long-term follow up (days)	232	260	0.8

Kaplan-Meier Survival Curves Following HeartMate II LVAD Pump Exchange by Median Sternotomy (MS) or Subcostal (SC) Approach



P37

An Assessment of the Scope and Frequency of Palliative Procedures in Thoracic Surgery: Are There Implications for the Residency Curriculum?

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Purpose: The specialty of palliative care is focused on improving the quality of life of patients with life-threatening illness and their families by preventing or relieving suffering. An assessment of a thoracic surgery service was performed to identify the scope and frequency of care that was considered palliative and any implications the findings might have on the current thoracic surgery residency curriculum.

Methods: A retrospective review of a prospectively collected database of general thoracic surgery procedures performed over a 5-year period at a single institution was performed. Procedures considered palliative were reviewed for demographics, diagnoses, palliative care performance status, treatment, morbidity, operative mortality, and survival. Excluded were referrals from thoracic surgery to other specialties for palliative procedures.

Results: During the study period, 3,842 procedures were performed, of which 884 (23%) were palliative. Indications included pleural and/or pericardial effusion, dysphagia, hemoptysis, tracheobronchial obstruction, bronchopleural fistula, and tracheoesophageal fistula. The majority were related to a malignancy. Demographics including mean palliative care performance score are displayed in Table 1. Only 127 patients (14%) had a palliative care assessment prior to thoracic surgery consultation. Mean survival following thoracic surgery intervention was 110 days for patients with malignancy.

Conclusions: This investigation found that thoracic surgeons commonly care for patients when the intention is palliation. The majority of these patients have an associated malignancy, a poor performance status, and a significantly decreased survival compared to the general population. Thoracic surgeons should be familiar with the concepts of palliative care and consideration should be given to expanding exposure to the principles of palliative care in the cardiothoracic residency training curriculum.

An Assessment of Palliative Procedures in Thoracic Surgery

	Palliative Procedures	Total Procedures	p
N	884	3842	
Age (mean years)	69 ± 22	61 ± 28	<0.0001
Palliative performance scale (mean)	38%	-	
Associated malignancy	734 (83%)	2344 (61%)	<0.0001
Palliative care assessment	127 (14%)	-	
Survival (mean days)	110 ± 91	-	

P38

Will the Implementation of a National CT Screening Program for Lung Cancer Change Thoracic Surgery Workforce Requirements? Results of a Novel Supply-Demand Model

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Purpose: To predict thoracic surgery workforce requirements with the introduction of a national chest computed tomography (CT) screening program for individuals at high risk of lung cancer.

Methods: Using Canadian Census Microdata and the Canadian Community Health Survey, data on 300,000 individuals were used to develop a microsimulation model representing the national population. The demand component of the model simulates the incidence of lung cancer, accounting for population demographics, mortality, geographic location, smoking, and socioeconomic status. The supply component simulates the number of practicing thoracic surgeons and new graduates, including age distribution and retirement plans. A national CT screening program in high-risk individuals (>30-pack-year smoking, age 55-74 years) was introduced into the model to predict changes in the number of operable lung cancers per thoracic surgeon.

Results: From 2011 to 2030, the Canadian population will increase from 33 to 43 million. The number eligible for screening varies from 1,112,840 (2013) to 835,820 (2030), peaking at 1,147,700 (2017). With CT screening, overall lung cancer diagnoses increase by 5% by 2030. A 30% increase in stage IA lung cancers was noted by 2030 (peak 34% in 2017). Stage IB and Stage II increase by 4% and 8% respectively by 2030. Assuming a base of 100 early lung cancers per thoracic surgeon at present, by 2030 the rate of operable early lung cancers per thoracic surgeon will be 173 without and 239 cases with screening. Doubling the current number of trainees would still result in an increase to 134 operable lung cancers per surgeon.

Conclusions: With the implementation of a CT screening program, there will be a dramatic increase in the number of operable lung cancers, resulting in increased surgical volume. A national strategy for the thoracic workforce is necessary to ensure an appropriate number of surgeons are being trained to meet the future needs of the national population.

Cardiothoracic Surgical Education Posters – Continued

P39
Issues Affecting Successful Childbearing Among Women in Thoracic Surgery

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COMMERCIAL RELATIONSHIPS S. H. Blackmon: Consultant/Advisory Board, MAQUET; Speakers Bureau, Covidien

Purpose: As the number of women entering thoracic surgery grows, so should discussions and awareness about pregnancy. We set out to assess the childbearing characteristics of the female thoracic surgeon.

Methods: A 29-question anonymous survey was sent to members of Women in Thoracic Surgery, residents in thoracic surgery, and female diplomats of the ABTS. Findings were compared with 2012 National Vital Statistics.

Results: Published contacts were available for 196/228 ABTS-certified women. Eighty-eight responses were obtained, including 26.5% (52/196) of ABTS-certified women and 46.1% (36/78) of women residents. 69.3% (61/88) of respondents desired children, but 98.4% (60/61) delayed pregnancy because of their career, with 34.4% (21/61) participating in assisted reproductive technology (ART) and 23.0% (14/61) freezing eggs or embryos. Of the 33 women with children, 15 reported career-related difficulties navigating assisted reproduction. Of the 55 births from 56 pregnancies, 21.4% (12/55) underwent C-section and 50.9% (28/55) reported complications, including a 23.5% miscarriage rate. The average age at first-child birth was 34.3, which was almost 10 years older than the national mean age (25.4 years). 81.8% (72/88) of women respondents worried about the impact of pregnancy on their career, with 76% (67/88) requesting a related policy. The majority of female respondents, 54.5% (48/88), felt the most important issue related to the recruitment of women into thoracic surgery was mentorship.

Conclusions: Women thoracic surgeons have children later in life, have a smaller number of children, and have a higher pregnancy complication rate. These are likely related to the older age at pregnancy, which certainly contributes to the higher number of children conceived by ART. To avoid complications, residency programs and practice groups will need to develop programs that support the growing number of women thoracic surgeons.

P40

A Surgical Trainee-Driven Resource Utilization Protocol Reduces Hospital Direct Costs in Thoracic Patients

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Purpose: Health care cost containment in academic medical centers is limited by the competing interests of protocol driven care pathways (CP) and clinical autonomy of surgical trainees. Systems-based practice is one of the ACGME core competencies and includes cost awareness and risk-benefit analysis in patient care. We hypothesize that hospital direct costs can be contained without compromising the education of trainees by charging trainees with the responsibility of developing postoperative CP.

Methods: A trainee-driven CP for ordering chest x-rays (CXR) and laboratory tests (CBC, BMP, Mg, and Phos) following lobectomy was implemented. The utilization records of 45 consecutive patients undergoing a lobectomy (Group 2) following the protocol implementation were queried. These records were compared to a cohort of 69 previous consecutive lobectomy patients of the same surgeon (Group 1). Data are reported as median and range. Differences were examined using the Mann-Whitney U statistic, due to non-parametricity of the data.

Results: Hospital length of stay was 4.5 and 5.0 days (p=0.863) in Groups 1 and 2, respectively. Direct costs were $13,772 and $12,749 (p=0.047), pharmacy costs $701 and $552 (p=0.252), and lab costs $782 and $602 (p=0.009) in Groups 1 and 2, respectively. The median number of BMP (4 vs 1), CBC (3 vs 1), Mg (3 vs 1), and Phos (2 vs 1) ordered per patient in Groups 1 and 2 were significantly different (p<0.0005). The number of portable CXR (4 vs 3, p=0.272) and 2-view CXR (1 vs 1) in Groups 1 and 2 was similar.

Conclusions: A trainee-driven effort to reduce the number of postoperative laboratory tests and x-rays reduced the number of tests ordered and significantly decreased hospital direct costs. Furthermore, the direct involvement of surgical trainees in the establishment of these protocols preserved the educational value of patient management and addressed an ACGME core competency.

	Group 1 n=69	Group 2 n=45	p-value
LOS (days)	4.5 (2-10)	5 (2-10)	0.863
Direct Costs ($)	13,772 (7098 - 26971)	12,749 (7639-25089)	0.047
OR Time (mins)	272 (147-579)	258 (154-608)	0.337
Pharmacy Costs ($)	701 (220-3596)	552 (177-2572)	0.252
Lab Costs ($)	782 (262-2765)	602 (199-2379)	0.009
Radiology Costs ($)	280 (106-3085)	221 (199-2379)	0.148
OR Supplies ($)	3833 (1584-11406)	3535 (1950-6944)	0.2
BMP	4 (2-18)	1 (0-13)	<0.0005
CBC	3 (1-10)	1 (0-9)	<0.0005
Serum Mag	3 (1-16)	1 (0-12)	<0.0005
Serum Phos	2 (0-14)	1 (0-12)	<0.0005
Portable CXR	4 (1-14)	3 (1-10)	0.272
2 view CXR	1 (0-5)	1 (0-3)	0.230
Data are presented as median (range).			

P41
Lessons Learned From Bilateral Pulmonary Artery Banding

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Purpose: Bilateral banding has been developed as a part of hybrid procedure for initial palliation of hypoplastic left heart syndrome. We also used bilateral pulmonary artery banding as a palliation of complex congenital heart disease, especially with arch anomaly. We have reviewed our experience of bilateral pulmonary artery banding.

Methods: Consecutive 52 cases between 2003 and 2013 were retrospectively reviewed. Twenty-four cases during period 1 (2003-2009) and 28 cases during period 2 (2010-2013) were compared.

Results: Age and body weight at operation were 4.4 days ± 3.5 days and 2.7 kg ± 0.5 kg, respectively. Overall hospital mortality was 11% (6/52). Twelve patients (22%) required re-pulmonary artery banding for optimal hemodynamics. Mean wait time for next operation was 47.2 days ± 46.0 days. Forty-seven patients (89%) were able to wait for more than 2 weeks, and 28 patients (53%) could wait for more than 1 month. Nine patients gained more than 1 kg body weight. Mean weight gain per day was 6.5 ± 12.3 g, and only four patients had more than 20 g per day weight gain. Twenty-four patients (46%) required earlier intervention than we expected. The reasons for earlier intervention was PDA stenosis (six cases), heart failure (six cases), cyanosis (three cases), and others (nine cases). As a second-stage procedure, 30 patients had Norwood procedure, six had combined Norwood and bidirectional Glenn procedure, six had biventricular complete repair, and four others. Six patients (25%) died during period 1, but no patient died during period 2. Nine patients (38%) required re-pulmonary artery banding during period 1, but only three patients (11%) had re-pulmonary artery banding during period 2.

Conclusions: Surgical results were improved in recent years, and we did need a learning curve. Most of the patients could wait more than 2 weeks before next operation; however, only 53% of the patients could wait for more than 1 month. Nearly half of the patients required earlier intervention than the target time. More than 1 kg weight gain was difficult to expect.

Notes

Congenital Posters – Continued

P42

Geographic Variation of Congenital Heart Disease Requiring Operative Intervention Within the First Year of Life: An Analysis of the STS Congenital Heart Surgery Database

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Purpose: Limited understanding exists regarding the distribution of congenital heart disease (CHD) across geographic regions. The purpose of this study was to utilize a large clinical registry to evaluate the prevalence of CHD requiring operative intervention within the first year of life across regions of the United States.

Methods: Patients <1 year of age undergoing cardiac surgery in the STS Congenital Heart Surgery Database from January 2010 to July 2012 were included. Fundamental diagnoses were grouped into seven major categories and evaluated across 10 standard US Department of Health and Human Services geographic regions based on patient region of residence at time of surgery (Figure). The proportion of patients in each diagnostic category (out of all patients <1 year of age undergoing cardiac surgery in the region) was compared across regions using the chi-square test.

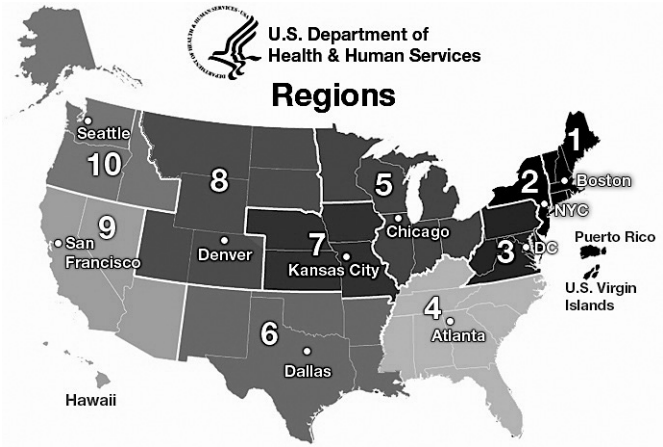
Results: Overall, 23,379 patients (94 centers) were included. There was significant variation across US geographic regions for all seven diagnostic categories. The proportion of patients undergoing surgery for septal defects ranged from 23.9% to 30.2% (p=.001), pulmonary venous anomalies 2.8% to 4.5% (p=.03), right heart lesions 15.7% to 21.4% (p<.0001), left heart lesions 22.7% to 30.4% (p=.0002), single ventricle lesions 7.3% to 11.4% (p<.0001), transposition of the great arteries (TGA)/double outlet right ventricle (DORV) 9.0% to 13.5% (p<.0001), and coronary artery anomalies 0.4% to 1.4% (p=.04). The degree of regional variation (max/min) appears to be greater for more complex diagnostic categories: TGA/DORV (1.68), single ventricle (1.56), right heart lesions (1.36) vs septal defects (1.24) (Table).

Conclusions: These data demonstrate significant variation in diagnostic categories of congenital heart disease across US geographic regions. Further study evaluating demographic, environmental, socioeconomic, or other factors underlying this variation is warranted.

Regional Variation for Select Diagnostic Categories

Region	Septal Defects	Right Heart Lesions	Single Ventricle Lesions	TGA/DORV
Region 1 (n=872)	263 (30.2%)	142 (16.3%)	70 (8.0%)	118 (13.5%)
Region 2 (n=1391)	333 (23.9%)	298 (21.4%)	147 (10.6%)	150 (10.8%)
Region 3 (n=2312)	565 (24.4%)	456 (19.7%)	228 (9.9%)	291 (12.6%)
Region 4 (n=5101)	1305 (25.6%)	1038 (20.4%)	579 (11.4%)	560 (11.0%)
Region 5 (n=4444)	1147 (25.8%)	827 (18.6%)	468 (10.5%)	552 (12.4%)
Region 6 (n=2509)	667 (26.6%)	465 (18.5%)	224 (8.9%)	274 (10.9%)
Region 7 (n=1120)	305 (27.2%)	202 (18.0%)	90 (8.0%)	171 (15.3%)
Region 8 (n=1281)	369 (28.8%)	201 (15.7%)	116 (9.1%)	115 (9.0%)
Region 9 (n=3149)	810 (25.7%)	674 (21.4%)	275 (8.7%)	383 (12.2%)
Region 10 (n=1201)	352 (29.3%)	204 (17.0%)	88 (7.3%)	146 (12.2%)
Total (23379)	p=.001	p<.0001	p<.0001	p<.001

US Department of Health and Human Services Health Regions



Congenital Posters – Continued

P43

Can We Predict Readmission Following Congenital Cardiac Surgery?

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Purpose: Readmission after congenital heart surgery has significant implications for patient care. Readmission rates vary between 10% to 20%. The aim of this study was to determine the incidence and risk factors predicting readmission.

Methods: 811 consecutive patients undergoing congenital heart surgery were analyzed. Readmission was defined as admission within 30 days of discharge for any cause. Demographic, preoperative, operative, and postoperative variables were evaluated. Univariate comparisons were made between the non-readmission and readmission group and multivariate logistic regression analysis was constructed to determine independent risk factors for readmission.

Results: There were a total of 92 readmissions in 79 patients (9.7%). Reasons included cardiac (36, 39%), pulmonary (20, 22%), gastrointestinal (13, 14%), infectious (20, 22%), and other complications (3, 3%). Patients with either single ventricle palliation or on nasogastric feeds accounted for 40 (50%) readmissions. On univariate analysis, there were significant differences between readmitted and non-readmitted patients in relation to patient age, chromosomal abnormality, STAT score, duration of mechanical ventilation, postoperative length of stay, single ventricle physiology, and nasogastric feeding at discharge ($p<0.05$). On multivariate analysis, significant risk factors for readmission were single ventricle physiology (OR 2.39; 95% CI 1.28 to 4.47; $p=0.005$), arrhythmia (OR 2.59; 95% CI 1.02 to 6.59; $p=0.04$), longer postoperative length of stay (OR 2.2; 95% CI 1.22 to 3.99; $p=0.008$), and nasogastric feeds at discharge (OR 2.2; 95% CI 1.15 to 4.19; $p=0.01$).

Conclusions: The incidence of readmission after congenital cardiac surgery remains high. Efforts focusing on patients with single ventricle palliation and those with preoperative arrhythmia, prolonged postoperative length of stay, and nasogastric feeding at discharge may be particularly beneficial.

P44

A Strategy of Neonatal Central Pulmonary Arteries Patching at the Time of Shunting to Treat and Prevent Juxta-Ductal Pulmonary Artery Coarctation

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COMMERCIAL RELATIONSHIPS C. P. Brizard: Consultant/Advisory Board, Allied Healthcare Group Ltd

Purpose: Coarctation of the left pulmonary artery may lead to its early obstruction. We investigated the outcomes of a strategy of aggressive reconstruction of the central pulmonary arteries in the neonatal period.

Methods: From 2000 to 2013, a total of 162 consecutive neonates (<90 days) underwent systemic-pulmonary shunts. Twenty-eight of them underwent the following concomitant reconstruction of the central pulmonary arteries: end-to-end anastomosis (4), or patch reconstruction of the pulmonary arteries (24) with either 0.4 mm Gore-Tex patch (18) or autologous pericardium (6). In 15 patients, a discrete narrowing was identified, and in the remaining, the reconstruction followed the extensive resection of a large ductus. Ten patients were directed to univentricular heart palliation and 18 to a biventricular repair.

Results: There was one in-hospital death (4%) and two after hospital discharge (inter-stage mortality: 7%). The follow-up of the 25 survivors was complete. After a mean of 3 ± 3 years, patients with single ventricle palliation reached the following stages: shunts (2), one and a half ventricle repair (1), bidirectional cavopulmonary shunt (4), and Fontan (2). Fourteen of the patients destined for biventricular physiology reached complete repair, while two patients were still with shunts. There was no pulmonary artery occlusion. Repeated augmentation of the pulmonary artery origin or shunt upgrade was performed in 5/9 patients with single ventricle and 14/16 with biventricular physiology. There was no reintervention on the pulmonary arteries after the patients reached final palliation or repair.

Conclusions: Neonatal pulmonary artery reconstruction should be recommended at the time of systemic-pulmonary shunting in patients with juxta-ductal coarctation of the pulmonary artery because it is an effective strategy to preserve pulmonary artery patency and growth.

Congenital Posters – Continued

P45

Factors Influencing Stem Cell Mobilization in Patients With Congenital Heart Defects

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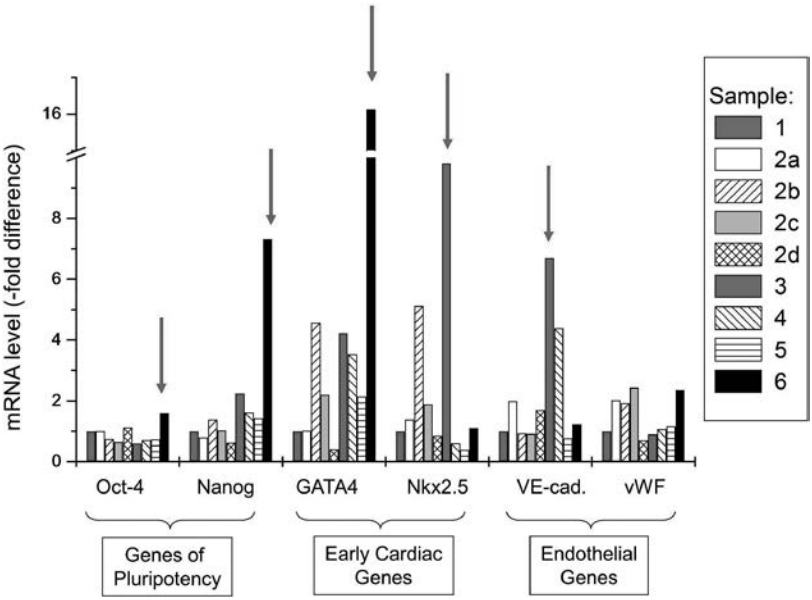
Purpose: Stem cells (SC) can be mobilized by tissue-specific signals and take part in the regeneration processes. In patients with congenital heart disease, sparse information exists on the application of SC. The purpose of this study was to assess the level of SC mobilization in patients undergoing CHD correction and identify factors influencing it.

Methods: Blood samples were taken before during and after surgery from 25 children (8 days to 13 years). Nitric oxide (NO) was inhaled into the oxygenator according to separate protocol. Hematopoietic (HSC), mesenchymal (MSC), very small embryonic-like (VSEL), and endothelial (EPC) SC were measured by flow cytometry. Expression of SC specific genes was evaluated by RtPCR. The panel of cytokines and angiogenic factors was evaluated by profiler arrays. The influence of pathophysiologic, procedure-related, and pharmacologic factors on SC mobilization was determined.

Results: The number of VSEL (p=0.0006), EPC (p=0.02), and HSC (p=0.01) correlated with younger age. The cyanosis influenced MSC (p=0.038), HSC (p=0.014), EPC (p=0.008), and VSEL (p=0.03) mobilization. Patients receiving NO had greater EPC (p=0.03) and MSC (0.04) mobilization, significantly lower bleeding, and notable anti-inflammatory and proangiogenic effect. Genes associated with EPC showed peak activation after the reperfusion followed by its rapid decline. The highest level of pluripotent and early cardiac gene activation was found 24 hours after surgery. A significant positive correlation of EPC number with CPB time (p=0.03) and aorta clamping time (p=0.04) and negative correlation with catecholamine's index (p=0.04) were noted.

Conclusions: Factors related to the pathophysiology of the defect and intraoperative management can influence SC mobilization. In cyanotic patients, larger mobilization of SC was noted. Age-related dependency of SC mobilization was observed. The regenerative and inflammatory response can be modulated by intraoperative inhalation of NO.


mRNA level (-fold difference)
16
8
6
4
2
0
Oct-4
Nanog
GATA4
Nkx2.5
VE-cad.
vWF
Genes of Pluripotency
Early Cardiac Genes
Endothelial Genes
Sample:
1
2a
2b
2c
2d
3
4
5
6

Congenital Posters – Continued

P46

Empiric Gastrostomy Feeding Tube Insertion in Patients Undergoing Norwood Procedure—Impact on Hospitalization Outcomes

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Purpose: Oral feeding in patients after the Norwood procedure is problematic, often requiring supplemental tube feeding. We hypothesized that empiric gastrostomy tube (GT) insertion prior to extubation in post-Norwood patients is associated with better feeding and respiratory outcomes.

Methods: This was a retrospective case-control study. Treatment group patients (September 2011 through February 2013) received empiric GT placement prior to extubation. Control patients (March 2010 through May 2011) received nasogastric or nasoduodenal tube feedings as supplementation to their oral feeding trials. Patients were excluded if they required ECMO support or did not survive the initial hospitalization.

Results: There were 11 patients in the treatment group and eight patients in the control group. The two groups were similar in gestational age (mean 37.6 weeks and 37.2 weeks, respectively) and birth weight (2.9 kg and 3.1 kg, respectively). Treatment group patients had shorter postoperative length of stay (15.6 vs 31.4 days, $p< 0.05$), a lower rate of reintubation (0 vs 2; 0% vs 25%, $p<0.05$), and higher incidence of tolerating at least partial oral feedings at discharge (12 vs 5; 100% vs 62%, $p<0.05$).

Conclusions: We conclude that empiric placement of a GT prior to initial extubation allows earlier postoperative recovery. We believe this is due to a lack of nasal feeding tubes obstructing nasal passages, irritating the oropharynx, and crossing the gastroesophageal junction. Furthermore, GT feedings allow safe tube feeding supplementation at home while oral feedings are increased. This study is limited by its small numbers, historical controls, and single institution practice patterns. A multi-institutional study would be required to better assess the benefit of empiric GT placement prior to initial extubation after Norwood operation.

P47

Right Ventricular Outflow Tract Reconstruction With Trileaflet Extracellular Matrix Valved Conduits in Infants and Children

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COMMERCIAL RELATIONSHIPS P. I. McConnell: Research Grant, CorMatrix; Other Research Support, Thoratec Corporation

REGULATORY DISCLOSURE This presentation will address the off-label use of the extracellular matrix patch in right ventricular outflow tract reconstruction.

Purpose: Available conduits for right ventricular outflow tract (RVOT) reconstruction in neonates and children have poor long-term performance. An extracellular matrix material (ECM) has become available with indications for use in several cardiovascular applications. This report describes the operative experience and early results of a novel, custom constructed ECM trileaflet valved conduit (ECM-VC) for RVOT reconstruction in infants and children.

Methods: A retrospective review of 13 patients treated with a RVOT ECM-VC from November 1, 2011, through April 18, 2013. Operative, discharge, and last follow-up data are presented including valve sizes, z-scores, ICU time, length of stay, survival, and valvular function.

Results: All but one child (DORV) had a diagnosis of TOF or its variants. The median age at operation was 15 months (range: 4 months to 16 years). The average follow-up was 190 ± 42 days (range: 45 to 540 days) and the longest follow-up was 18 months with no mortality or valve-related reinterventions. All patients had concomitant procedures performed with a cardiopulmonary bypass time of 206 ± 33 minutes and aortic clamp time of 87 ± 19 min. Conduits were placed in an orthotopic (n=3), orthotopic with RVOT patch (n=8), or heterotopic position (n=2). Mean conduit size was 16.9 ± 1.0 mm correlating to a z-score of +1.4 ± 0.3. Median length of stay and ICU time was 4.5 and 1 day(s), respectively. Six of 13 patients had more than 6 months of follow-up: 1 child (7.6%) had more than mild pulmonary regurgitation (moderate) and 1 child (7.6%) had an estimated conduit gradient >25 mmHg (38 mmHg) at 6 months of follow-up.

Conclusions: Experience with a custom constructed trileaflet valved conduit for RVOT reconstruction in children demonstrates early safety, feasibility, adaptability, and good early valve function that will require further evaluation to determine intermediate and long-term outcomes.

Congenital Posters – Continued

P48

Assessing Outcomes of Contemporary Repair of Anomalous Coronary From the Pulmonary Artery (ALCAPA): Beyond Conventional Parameters of Function

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Texas Children's Hospital, Baylor College of Medicine, Houston

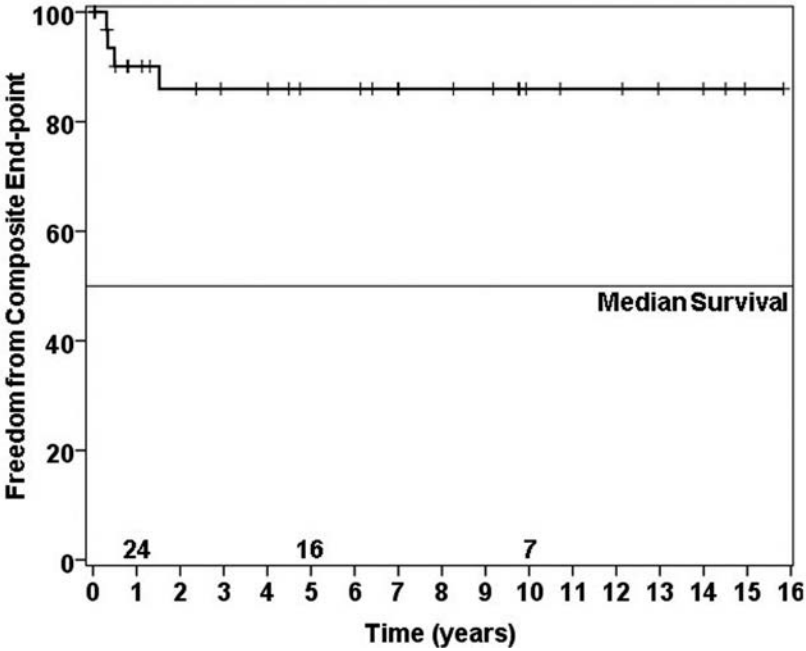
COMMERCIAL RELATIONSHIPS J. S. Heinle: Other, Berlin Heart Inc, faculty member of the Berlin Heart EXCOR North American Training and Reference Center

Purpose: To describe the long-term outcomes of children after ALCAPA repair and to determine ventricular function changes in late follow-up.

Methods: All patients who underwent repair of ALCAPA at our institution between January 1996 and April 2011 were reviewed. Ventricular function was assessed by standard echocardiographic methods: shortening/ejection fraction (SF/EF), left ventricular end diastolic dimension (LVEDD), and mitral regurgitation (MR). Speckle tracking echocardiography (STE) was used to assess abnormal ventricular mechanics as a predictor of future dysfunction.

Results: Total of 34 patients, median age 4 months (3 days–39 years) were included in the study. Of these, 30 underwent coronary reimplantation, three intrapulmonary baffle, and one ligation. No patient required mechanical circulatory support preoperatively or postoperatively. Sixteen (47%) patients required mechanical ventilation and/or inotropes preoperatively. Median follow-up was 6 years (1 month–14 years). Concomitant mitral valve repair was performed on five (15%) patients. In-hospital survival was 100%. Echocardiographic parameters showed EF improved from mean of 21% ± 6 (10-64%) to 60% ± 7 (43-69%); SF from 25% ± 14 (4-49%) to 38% ± 5 (31-49%); LVEDD Z-score absolute value from 6.0 ± 3.8 (0.6-12) to 0.9 ± 0.7 (0.1-2.9); and patients with moderate or severe MR from 44% (15/34) to 0% (0/17). However, STE at the end of follow-up on 15/34 patients with normal EF and SF showed that circumferential and longitudinal strain were significantly decreased when compared to normal values. The 1-, 5-, and 10-year freedom from the composite endpoint (death, transplant, or reoperation) was 90%, 86%, and 86% (Figure).

Conclusions: Excellent outcomes are achieved with the contemporary repair of ALCAPA without the assistance of mechanical circulatory support. Conventional echocardiographic parameters (EF, SF, LVEDD) do not convey subclinical dysfunction ascertained by modern imaging techniques. This suggests a need for more sophisticated follow-up.


Freedom from Composite End-point
100
80
60
40
20
0
Median Survival
24
16
7
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Time (years)

Congenital Posters – Continued

P49

Technical Performance Score Predicts Resource Utilization in Congenital Cardiac Procedures: Analysis of 27 Consecutive Months' Data

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COMMERCIAL RELATIONSHIPS J. E. Mayer: Consultant/Advisory Board, Medtronic, Inc; Ownership Interest, Eli Lilly and Company, Johnson & Johnson, Merck & Co, Inc

Purpose: Technical Performance Score (TPS) has been shown previously to be associated with early outcomes such as mortality, adverse events, and prolonged hospital stay. This study assesses the ability of TPS to predict resource utilization as measured by total hospital cost for index operation.

Methods: Prospective analysis of all unique patients undergoing congenital cardiac surgery between January 2011 and March 2013 was performed. We calculated TPS (Optimal vs Adequate vs Inadequate) based on: 1) Discharge echocardiograms (echo), and 2) unplanned reinterventions (RI) in anatomic area operated on at index operation prior to discharge from index operation. Multivariable regression examined the association of TPS with total hospital costs, adjusting for other significant patient factors.

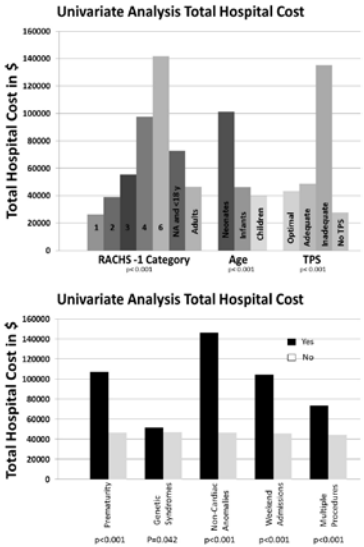
Results: Among 1,762 patients, the median total hospital cost for index operation was $47,241 ($7,275-$2,458,575). On univariate analysis, RACHS-1 category, age, prematurity, genetic syndromes, non-cardiac anomalies, weekend admission, multiple procedures at index operation, and TPS were all significant (Figure 1). On multivariable modeling (Table 1), TPS was an independent predictor of increased total hospital cost, with R2 increasing from 42% to 53% when TPS was added to the model, indicating that TPS explained a large additional fraction of variability in total hospital cost.

Conclusions: TPS is an independent predictor of resource utilization following congenital cardiac surgery. Patients with inadequate TPS have a significantly higher total hospital cost after adjusting for other significant patient factors known to be associated with higher resource utilization. Maximizing technical adequacy of the repair (accurate and high-quality pre- and intraoperative imaging and multidisciplinary preoperative planning) may play a significant role in reducing health care costs.

Multivariable Analysis for Total Hospital Costs

Variable	n	Coefficient	Confidence Interval	p value
RACHS-1 Category				
1	179	Ref	---	
2	474	1.31	(1.18, 1.44)	
3	532	1.89	(1.71 ,2.09)	
4	166	2.35	(2.07, 2.67)	<0.001 all
6	60	2.78	(2.32, 3.33)	
NA<18y	143	2.64	(2.32, 3.00)	
Adults	208	1.87	(1.67, 2.09)	
AGE				
Neonate	315	1.76	(1.62, 1.92)	
Infant	427	1.29	(1.21, 1.38)	<0.001 all
Children	779	Ref	----	
Prematurity	63	1.47	(1.28, 1.69)	<0.001
Genetic Syndromes	93	1.24	(1.11, 1.39)	<0.001
Extra Cardiac Anomalies	116	1.36	(1.22, 1.50)	<0.001
Weekend Admission	98	1.34	(1.20, 1.51)	<0.001
Multiple Procedures at Index Surgery	250	1.31	(1.21, 1.41)	<0.001
TPS				
Optimal	879	Ref	---	---
Adequate	544	1.07	(1.00, 1.13)	0.036
Inadequate	198	2.01	(1.84, 2.20)	<0.001
Not Scorable	141	0.61	(0.55, 0.67)	<0.001

Multivariable analysis for total hospital costs in 1,762 unique patients. Technical Performance Score was an independent predictor for total hospital costs after adjusting for other significant variables. RACHS-1 Category: Risk Adjustment for Congenital Heart Surgery, TPS: Technical Performance Score



Univariate analysis of total hospital costs following congenital cardiac operations in 1,762 unique patients. RACHS-1 category, age, prematurity, genetic syndromes, non-cardiac anomalies, weekend admission, multiple procedures at index operation, and TPS are all significant. RACHS-1: Risk Adjustment for Congenital Heart Surgery, TPS: Technical Performance Score

Congenital Posters – Continued

P50

Staged Biventricular Repair for Neonates With Left Ventricular Outflow Obstruction, Ventricular Septal Defect, and Aortic Arch Obstruction

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Purpose: Biventricular repair (BiV) for neonates presenting with critical left ventricular outflow tract obstruction (LVOTO) and aortic arch obstruction (AAO) (interruption [IAA] or coarctation [CoA]) in whom the native LVOTO cannot be used as the sole systemic outflow can be challenging. The staged Yasui operation may be necessary in cases of borderline size of the left ventricle. The purpose of this study was to evaluate outcomes of neonates who underwent a Norwood operation as a first step of a planned BiV repair and the impact of associated risk factors.

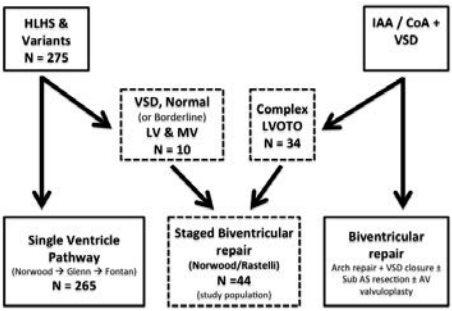
Methods: This is a retrospective study of all neonates undergoing the Norwood operation as a first stage of a BiV repair from 2000 to 2012 at a single center. Multivariable analysis was performed to identify predictors of survival.

Results: A total of 44 neonates were identified (table). Stage one survival was 91%. The overall survival for nonsyndromic and syndromic patients was 86% vs 43% respectively, $p=0.01$, and the interstage survival was 100% vs 46% respectively, $p<0.001$. Twenty-four patients underwent BiV completion repair with no mortality. Freedom from reintervention after BiV completion was 53% at 6 years.

Conclusions: Staged biventricular repair for patient with complex LVOTO, VSD, and AAO can be achieved with excellent outcomes in neonates without genetic syndromes. The staged approach is associated with longer time to reintervention following the BiV completion.

Patient Characteristics

	% (N)	Mean ± SD	Minimum	Maximum
Gestational Age (wk.)	-	37.5±2.4	30	41
Preterm	23 (10)	-	-	-
Gender (F)	43.2 (19)	-	-	-
Weight (kg)	-	2.9±0.63	1.6	3.9
BSA (m2)	-	0.19±0.03	0.13	0.24
IAA-B	70.5 (31)	-	-	-
CoA	29.5 (13)	-	-	-
Aortic stenosis	88.7 (39)	-	-	-
VSD	100 (44)	-	-	-
Aortic atresia	11.3 (5)	-	-	-
AV annulus (mm)	-	3.3±0.79	1.5	5
AV (z score)	-	-5.9±1.9	-10.3	-3.1
Borderline LV	16 (7)	-	-	-
Genetic syndromes	52.2 (23)	-	-	-



Congenital Posters – Continued

P51

Hilum to Hilum Gore-Tex Tube Replacement of Central Pulmonary Arteries in Complex Congenital Heart Disease

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COMMERCIAL RELATIONSHIPS C. P. Brizard: Consultant/Advisory Board, Allied Healthcare Group Ltd

Purpose: Patients born with hypoplastic pulmonary arteries necessitate repetitive procedures of shunting, patch reconstruction, and balloon dilatation to achieve adult-size vessels. We investigated the benefits of the excision of the central pulmonary arteries and their replacement by an adult-size Gore-Tex interposition tube graft.

Methods: From April 2008 to June 2013, 10 consecutive pts underwent a replacement of the central pulmonary arteries with a Gore-Tex tube of 14 mm (8 pts) or 12 mm (2 pts) at a median age of 6.7 years (1.6-16.9). Their morphology were pulmonary atresia, VSD, MAPCAs (3), tetralogy of Fallot (TOF) (3), double outlet right ventricle and AVSD (1), truncus arteriosus (1), pulmonary atresia intact ventricular septum (1), and hypoplastic left heart syndrome (2). These 10 pts had undergone a total of 8 previous patching of their pulmonary arteries and 12 balloon dilatations.

Results: The central pulmonary artery replacement took place at the time of the final repair (2) or during RV to PA conduit replacement (5) in the seven pts with biventricular repair and at the time of Fontan completion (1) or heart transplantation (2) in the three with single ventricle physiology. There was no mortality. The two patients undergoing Fontan completion were maintained on warfarin and the remaining on aspirin. After a mean follow-up of 20 +/- 23 months, patients were in NYHA class I (9) and II (1). There were no reinterventions. Central pulmonary arteries were visualized by echocardiography (10) and angiography (3). There was no reintervention and no restenosis.

Conclusions: The excision of the central pulmonary arteries and their replacement by a hilum to hilum Gore-Tex tube interposition graft is a technique that reliably provides effective relief of central pulmonary artery obstruction with excellent mid-term outcomes. It may be a simple alternative to extensive central pulmonary artery reconstruction.

P52
The End-to-Side Technique of Repair for Aortic Arch Offers Excellent Chances of Growth to Adulthood Without Reoperation

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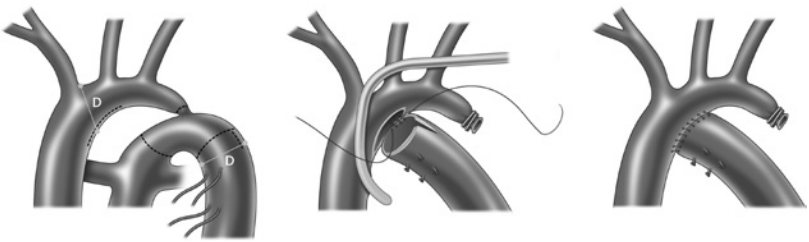
COMMERCIAL RELATIONSHIPS C. P. Brizard: Consultant/Advisory Board, Allied Healthcare Group Ltd

Purpose: To determine the rate of reinterventions from birth to adulthood after end-to-side anastomosis technique for interrupted and hypoplastic aortic arches. Multicentric data has shown that more than half of patients require arch reintervention in the 2 decades following repair.

Methods: The follow-up of 166 consecutive patients undergoing end-to-side repair via sternotomy for interrupted aortic arch (IAA) (93) or coarctation (73) in one institution between 1985 and 2012 was reviewed. Associated lesions included VSD (142), bicuspid aortic valve (49), LVOT obstruction (42), aberrant right subclavian artery (24), truncus arteriosus (13), univentricular physiology (8), small left heart structures (6), and aortopulmonary window (3). One-stage repair was performed in 154 patients (93%).

Results: There were 11 hospital deaths (7%) and four early arch reinterventions (two for bronchial compression). Sixteen hospital survivors (10%) were lost to follow-up. After a median of 11 (0.1-22) years, there were nine late deaths. Twenty-year survival was 90% (95%CI: 84-94). Nine patients in total developed bronchial compression, five during initial stay and four after hospital discharge; six of them required surgery. Eighteen-year freedom from arch reoperation was 86% (95% CI: 75-92). An additional 15 patients underwent a balloon dilatation for an 18-year freedom from reintervention (balloon dilatation or surgery) of 79% (95% CI: 68-86). Fourteen additional patients had an echo gradient >25 mmHg. Blood pressure was recorded in 130 patients and only 10 (8%) were noted to be hypertensive.

Conclusions: End-to-side anastomosis technique for aortic arch repair results in a very low rate of reoperation, providing the majority of patients with a reoperation-free outcome up to adulthood. The development of arch obstruction requiring balloon dilatation warrants a continuous follow-up of these patients.



End-to-side anastomosis technique for repair of aortic arch

Congenital Posters – Continued

P53

Application of Thromboelastrography in Pediatric Cardiac Surgery: Does It Reduce Blood Product Transfusions?

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Purpose: Numerous blood transfusions in pediatric cardiac patients are common. We sought to determine if thromboelastography (TEG) is a cost-effective tool to reduce blood product transfusion in open pediatric cardiac surgery.

Methods: A retrospective case-control study was undertaken for 150 pediatric cardiac patients requiring cardiopulmonary bypass (CPB) from January 2010 to May 2012. Fifty sequential patients operated upon when TEG was employed were compared to 100 control patients prior to TEG availability. Groups were matched 2:1 for age and Risk Adjustment for Congenital Heart Surgery (RACHS-1) score. Blood product utilization was compared between groups, as were outcomes metrics, such as postoperative complications, length of stay (LOS), and hospital costs of transfusions.

Results: Demographic variables, RACHS-1 classifications, and CPB times were similar. Red cell and plasma transfusion was comparable between groups. TEG patients saw a substantial reduction in use of platelet (1 vs 2.2 units; $p < 0.0001$) and cryoprecipitate (0.7 vs 1.7 units; $p < 0.0001$) transfusions. A greater than 50% reduction in hospital costs of platelet ($595 vs $1,309) and cryoprecipitate ($39 vs $94) transfusions in the TEG group was observed. Mortality, LOS, ventilator requirements, postoperative bleeding, and thrombotic events were equivalent.

Conclusions: Intraoperative TEG use reduces platelet and cryoprecipitate transfusions without an increase in postoperative complications. TEG is a cost-effective method to direct blood product replacement.

P54

In Search for Ideal Pulmonary Blood Source for the Norwood Procedure: Meta-Analysis and Systematic Review

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Purpose: A clear consensus is lacking regarding the optimal source of pulmonary blood flow in patients with hypoplastic left heart syndrome (HLHS) undergoing the Norwood procedure. Therefore, a systematic literature review and meta-analysis was undertaken to answer this question.

Methods: A literature search was undertaken to identify relevant articles from 2005 to 2012 utilizing Norwood, Stage I palliation, modified BT shunt (MBTS), and right ventricle to pulmonary artery conduit (RV-PAS) alone or in combination. A total of three endpoints were selected: early/stage 1 mortality, interstage mortality, and interstage total/shunt intervention.

Results: A total of 20 articles (19 observational and 1 randomized trial; MBTS n=1,343; RV-PAS n=1,028) met the inclusion criteria. Mortality following stage 1 was 22% and 16% in the MBTS and RV-PAS cohort respectively. A pooled analysis showed no difference in early mortality between the two groups (RR 1.20 [0.99, 1.45]; p=0.07). On pooling data from contemporary series (similar era) (eight studies; MBTS n=709, RV-PAS n= 631) to minimize variability in surgical and postoperative management practices, early mortality in both cohorts was comparable (RR 1.14 [0.89, 1.45]; p=0.29). Interstage mortality was 13.8% and 4.6% in the MBTS and RV-PAS cohort respectively and was significantly better for RV-PAS (RR 2.85 [1.65, 4.89]; p<0.00002). There was no difference in the total interstage interventions (neo-aorta, shunt, and pulmonary artery) between the two groups (RR 0.81 [0.55, 1.20]; p=0.3; I2=85%). However, patients with MBTS had lesser shunt interventions (RR 0.55 [0.44, 0.68]; p<0.001; I2=00%).

Conclusions: Our pooled analysis demonstrated no survival benefit for either the MBTS or RV-PAS in patients undergoing the Norwood procedure. There appears to be an advantage with the RV-PAS with regard to interstage mortality at the cost of an increased rate of shunt intervention.

Congenital Posters – Continued

P55

Costs and Outcomes of a Norwood Hospitalization: Beyond Morbidity and Mortality

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Purpose: The Norwood operation is performed in the newborn period for children with hypoplastic left heart syndrome. While much is known regarding the associated morbidity and mortality, there are limited data regarding resource utilization. Our objective is to set forth benchmark data for the hospital stay that will serve to guide future quality initiatives.

Methods: We retrospectively studied 86 newborns with hypoplastic left heart syndrome who underwent Norwood palliation within the first 2 weeks of life between 2008 and 2012, inclusive, at a single institution. Clinical and financial data were collected, particularly cost data for those patients operated on in 2011.

Results: At surgery, median age and weight were 4 days (range 1-13) and 3 kg (range: 2-4.8), respectively. The median time from admission to surgery was 4 days (range 1-10), with the postoperative ICU and total lengths of stay being 10 days (range 4-135), and 16 days (range 5-136), respectively. Survivorship to 30 days after surgery was 72/86 (84%) patients. Overall, the sum of the hospital charges was nearly $43 million, and the median charge per patient was $334,000. Looking specifically at cost data from 2011 (n=25), the greatest areas of hospital resource utilization (excludes physician fees) were the cardiac ICU (37%), laboratory (12.8%), pharmacy (11%), and operating room (9.9%). Interestingly, point of care laboratory evaluations accounted for almost half of the laboratory total (5.3%). ECMO, although only utilized in four patients in 2011, accounted for 5% of utilization. Despite numerous radiographs, general radiology only accounted for 2% of utilization.

Conclusions: Limited benchmark data are available that detail the hospitalization for newborns undergoing Norwood operations. Beyond morbidity and mortality, we hope this analysis will allow us to identify areas for quality improvement from both system and patient perspectives.

Cost Data

Area of hospital resource utilization	% of total
Anesthesia	0.9
Cardiac catheterization laboratory	2.1
Cardiac intensive care unit	36.6
Cardiac stepdown unit	3.8
ECMO	5
Laboratory	12.8
Non-invasive imaging	1.9
Operating room	9.9
Perfusion	4.1
Pharmacy	10.6
Radiology	2.1
Respiratory	7.3
Miscellaneous	2.8
	100

P56

Hybrid Procedure for Right Ventricular Outflow Tract Stenting in Complex Congenital Heart Disease

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Purpose: How to secure the pulmonary blood flow in the palliation of complex congenital heart disease with decreased pulmonary flow is still debating. Right ventricular outflow tract (RVOT) stenting would be an option in selected patients. This is the outcome of hybrid stenting in problematic cases such as unfavorable anatomy, low body weight, or failed catheter intervention.

Methods: Between May 2009 and March 2013, we performed hybrid procedures in 19 cases. Among them, pulmonary atresia with ventricular septal defect (PA with VSD) was in seven patients, tetralogy of Fallot (TOF) was in six, PA with intact ventricular septum (PAIVS) was in three, and PA with functional single ventricle was in three. Median age was 21 days (7-236), median body weight was 2.74 Kg (1.6-7.82). Median sternotomy was performed in all cases and cardiopulmonary bypass was used in 16. We reviewed medical records retrospectively.

Results: All patients underwent hybrid procedures successfully with pre-mounted coronary stents, diameter 4 mm, 5 mm, 6 mm, and 7 mm. There were no early deaths and no procedural complications. In TOF or PA with VSD, 11/13 (84.6%) underwent total correction successfully 6.0 ± 3.6 (median: 5.0) months after hybrid procedure, and two are waiting for total correction in stable condition. In the single ventricle group, all (3/3) were successfully moved to second stage. There was one late death 28 months after the procedure due to ventricular failure. In PAIVS, 2/3 (66.6%) underwent the second stage operation 8.7 ± 4.5 (median: 7.9) months after hybrid procedure. One late death occurred 3 months after the procedure. Overall, success rate was 94.7% (18/19).

Conclusions: RVOT stenting with hybrid procedure was shown to be highly effective even in high-risk cases compared to any other palliative procedure. We hope these good results could encourage a more generous trial of this method in the management of this group of patients.

Congenital Posters – Continued

P57

Association of Center Volume With Mortality, Morbidity, and Surgical Performance: Analysis of Verified Dataset of the EACTS Congenital Database

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Purpose: The relationship between surgical volumes and outcomes in congenital heart surgery (CHS) was investigated with no clear conclusions. Higher mortality observed at lower volume centers was related to higher rate of mortality in patients with postoperative complications. We sought to quantify the relationship between surgical volume and surgical performance defined as relation between outcome and STAT Mortality Score and STS Morbidity Score.

Methods: We have used only the verified data of the EACTS Congenital Database. The dataset consists of 17,861 procedures performed in 23 CHS centers between 2003 and 2011. The centers were divided into four volume-related groups with annual caseload of below 150, 150 to 250, 250 to 350, and over 350. There were four centers in group 1, five in group 2, six in group 3, and eight in group 4. Stepwise logistic regression was used to calculate the ratio between volume and mortality, as well as between volume and onset of complications. The relation between volume, STAT Mortality Score, and STS Morbidity Score was evaluated using Anova test. The surgical performance was calculated using two formulas: STAT Mortality Score x survival, and STS Morbidity Score x freedom from complications. The ratio between volume and surgical performance was calculated with regression model.

Results: The study showed no relation between volume and mortality ($p=0.94$) and between volume and freedom from complications ($p=0.06$). STAT Mortality Score and STS Morbidity Score were higher in bigger volume centers ($p<0.001$ and $p<0.001$, respectively). Surgical performances measured as related to mortality and morbidity were higher at high-volume centers ($R2=0.89$).

Conclusions: Our analysis suggests that although higher volume is not associated with lower mortality rates, the high-volume centers have higher STAT Mortality and STS Morbidity Scores and provide better surgical performance.

P58

Aortopulmonary Window Associated With an Interrupted Aortic Arch: Mid-term Results Using Single-Patch Technique

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Purpose: Aortopulmonary window (APW) associated with an interrupted aortic arch (IAA) had been reported to be associated with significant rates of perioperative mortality and recurrent arch obstruction. We assessed outcomes associated with the use of a single pericardial patch technique for primary repair.

Methods: Between 2002 and 2011, nine neonates and two infants with APW and IAA underwent single-stage repair, under hypothermic (28°C) continuous cardiopulmonary bypass with antegrade selective cerebral perfusion. A single autologous pericardial patch (glutaraldehyde-fixed) was used both to augment the IAA end-to-side anastomosis and close the APW using the "sandwich" technique. Mean follow-up time was 6 years ± 3 years. Postoperatively, all patients were assessed regularly by transthoracic echocardiography.

Results: Three patients had antenatal diagnosis. Preoperatively, the diagnosis was made with transthoracic echocardiography (n=7) and confirmed by CT scan (n=4). The IAA was type A (n=6) and type B (n=5). APW morphology was type I (n=6), type II (n=4), and type III (n=1). Median age and median weight at surgery were 11 days [6-180] and 2.6 kg [2.2-6.5], respectively. Mean cardiopulmonary bypass and aortic cross clamp time were 108.6 min ± 27.5 min and 49.3 min ± 13.4 min, respectively. One patient required additional ventricular septal defect closure. Delayed sternal closure was realized in eight patients. There were no hospital and no late deaths. Postoperative morbidity consisted in one postoperative stroke with no late sequelae. There were no reoperations. Last controls confirmed the absence of recurrent aortic arch obstruction and pulmonary artery branch stenosis in all.

Conclusions: Primary anatomical repair of APW associated with IAA can be safely performed. The efficiency of the single patch technique was confirmed by the restitution of normal functional anatomy of the great arteries and aortic arch in follow-up.

Congenital Posters – Continued

P59

Surgery for Non-Neonatal Ebstein's Anomaly: A Tre-Foiled Protocol (One and Half Ventricular Repair and Right Atrial Electrocautery Maze)

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Purpose: Favorable outcomes in Ebstein's anomaly are predicated on tricuspid valve competence, right ventricular function, and anti-arrhythmia procedures. We report our experience with a tre-foiled protocol; namely, one and a half ventricular repair (valve-sparing intracardiac repair, supplemented by bidirectional cavopulmonary anastomosis, BDCPA) and right atrial electrocautery Maze.

Methods: From January 2002 through December 2011, 21 consecutive non-neonatal patients out of 27 patients presenting with Ebstein's anomaly aged 13.6 (9.1-52.6) years underwent a new surgical tre-foiled protocol. The principal details of which are as follows: One and half ventricular repair: valve-sparing intracardiac repair, modified from surgical delamination of Carpentier's procedure, a limited plication performed only at the level of the displaced valve rather than complete plication of the entire atrialized RV, insertion of a homemade (ASUH) annuloplasty ring, and atrioplasty supplemented by right atrial electrocautery Maze. Additionally, a BDCPA is performed. Postoperatively, all patients were examined regularly with an actual prospective evaluation.

Results: No early or late deaths occurred. The postoperative course was uneventful in all patients. Mean follow-up is 4.3 years (range, 1 to 9 years). Doppler echocardiographic examination revealed significant improvement of valve regurgitation ($p<0.0001$) and favorable restoration of RV geometry and function in all patients. At follow-up, the mean saturation was 94.9% ± 3.0% ($p=0.003$). NYHA functional status improved from 2.8 ± 0.6 to 1.0 ± 0.2 ($p=0.0002$). Sinus rhythm has remained stable over the follow-up period in 19/21 (90.05%).

Conclusions: The tre-foiled protocol seems applicable to most forms of Ebstein's malformation and is reproducible. It can achieve a durable valve-sparing repair. Excellent functional mid-term outcomes can be obtained.

P60

A Defined Management Strategy Improves Early Outcomes Following the Fontan Procedure

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Purpose: To determine the efficacy of our intra- and postoperative Fontan management protocol in reducing pleural effusions and hospital and ICU length of stay.

Methods: Patients who underwent a Fontan procedure at our institution between June 2008 and present were analyzed (n=36). Our current postoperative management protocol incorporates six strategies: 1) diuresis, 2) afterload reduction, 3) fluid restriction, 4) oxygen, 5) low fat diet, and 6) anticoagulation, including monitoring and replacement of antithrombin III levels. All patients undergo an extracardiac fenestrated Fontan. Group A (n=28) had surgery prior to initiation of protocol. Group B (n=8) had perioperative management directed by current protocol.

Results: The median duration of chest tube drainage was lower in Group B (6 vs 11 days, p=0.001) as was ICU length of stay (3 vs 7 days, p=0.003) and hospital length of stay (8 vs 13 days, p=0.004). The total indexed chest tube drainage was also less in Group B (121 vs 259 ml/kg, p=0.0007). Of note, Group B had higher preoperative pulmonary artery pressures (12 vs 9 mmHg, p=0.034), left atrial pressures (9 vs 6 mmHg, p=0.004), and end-diastolic pressures (9 vs 7 mmHg, p=0.015). There was no statistically significant difference in age, weight, transpulmonary gradient, or pulmonary vascular resistance between groups.

Conclusions: A defined surgical and postoperative strategy has improved early outcomes following the Fontan procedure in our patients. Specifically, chest tube drainage and duration, and both ICU and hospital length of stay, have been reduced since initiation of this protocol. We continue to utilize these strategies in this patient population and urge other programs to adopt these techniques to improve early outcomes in Fontan patients.

Comparison of Variables Between Group A and Group B, Showing Medians and Associated p-values (Mann-Whitney Test)

	Group A	Group B	p-values
Age (days)	1480	1424	0.634
Weight (kg)	14.8	15.9	0.253
Hemodynamics at Pre-Fontan cardiac catheterization			
Mean PAP (mm Hg)	9	12	0.034
LAP (mm Hg)	6	9	0.004
TPG (mm Hg)	4	3	0.131
EDP (mm Hg)	7	9	0.015
PVR (U m^2)	1.9	1.4	0.248
Chest Tube output (indexed)			
Right (mL/kg)	141	64	0.003
Left (mL/kg)	89	40	0.042
Mediastinal (mL/kg)	19	20	0.894
Total (mL/kg)	259	121	0.0007
Days with chest tubes	11	6	0.001
ICU LOS	7	3	0.003
Hospital LOS	13	8	0.004

P61
Impact of Preoperative Prealbumin on Outcomes After Cardiac Surgery

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Purpose: Preoperative malnutrition is increasingly prevalent in patients undergoing cardiac surgery. Although prealbumin is a sensitive indicator of nutritional status, its use in the preoperative assessment of patients undergoing cardiac surgery is not well defined. The purpose of this study was to determine the impact of preoperative nutritional status as measured by prealbumin on outcomes after cardiac surgery.

Methods: Data were prospectively gathered from February 2013 to May 2013 on 47 patients undergoing cardiac surgery. Prealbumin levels were obtained within 24 hours of surgery. Patients were divided into two groups based on a prealbumin cutoff value of 20 mg/dL. The Mann-Whitney test was used to evaluate the comparability of continuous factors. The chi-square test was used to evaluate the comparability of categorical factors.

Results: Of the 47 patients, 22 (46.8%) had a preoperative prealbumin ≤20 mg/dL. There was no difference in albumin levels between the two groups (3.88 g/dL ± 0.5 g/dL vs 3.89 g/dL ± 0.6 g/dL, p=0.950). Similarly, there was no difference in body mass index between patients with low vs high prealbumin levels (30 ± 6.5 vs 28.5 ± 6.1, p=.495). Seven out of 22 (32%) of patients with low preoperative prealbumin levels had postoperative infections compared to two out of 25 (8%) of patients with high prealbumin levels (p=0.038). Patients with low prealbumin levels also had longer hospital length of stay (11.0 ± 7.3 days vs 8.8 ± 8.5 days, p=0.026).

Conclusions: Patients undergoing cardiac surgery with preoperative prealbumin levels of ≤20 mg/dL are at an increased risk for postoperative infections and prolonged hospital stay. If feasible, nutritional optimization of such patients should be considered prior to cardiac surgery.

P62

Postcardiotomy Rescue Extracorporeal Cardiopulmonary Resuscitation in Neonates With Single Ventricle After Intractable Cardiac Arrest: Attrition After Hospital Discharge and Predictors of Outcome

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Purpose: Extracorporeal cardiopulmonary resuscitation (ECPR) in children with cardiac arrest refractory to conventional cardiopulmonary resuscitation (CPR) has been reported with encouraging results. We reviewed outcomes of neonates with functional single ventricle (FSV) surviving postcardiotomy ECPR after hospital discharge

Methods: Fifty-eight patients who required postcardiotomy extracorporeal membrane oxygenation (ECMO) since the introduction of our ECPR protocol (January 2007-December 2011) were identified. Forty-one were neonates. Survival analysis was conducted.

Results: Of 41 neonates receiving postcardiotomy ECMO 32 had FSV. Twenty-one had ECPR. Fourteen underwent Norwood operation (NO) for hypoplastic left heart syndrome (HLHS). Seven had FSV other than HLHS. Four of seven underwent modified NO/DKS with systemic-to-pulmonary shunt (SPS) and 2 SPS and 1 SPS with anomalous pulmonary venous connection repair. Mean age and weight were 6.8 days ± 2.1 days and 3.35 kg ± 1.6 kg, respectively. ECMO median duration was 7 days (interquartile range [IQR] 4-18). Survival to ECMO discontinuation was 72% (15 of 21 patients) and at hospital discharge 62% (13 of 21 patients). The most common causes of late death were cardiac failure and neurological complications. At last follow-up (median: 18 months; IQR: 3-36), 47% of patients were alive. Duration on ECMO and failure of lactate clearance within 24 hours from ECMO deployment determined late attrition after hospital discharge ($p<0.05$).

Conclusions: Rescue postcardiotomy ECMO support in neonates with FSV carries significant late attrition. ECMO duration and failure in lactate clearance after ECMO deployment are associated with unfavorable outcome. Proper patient selection, emphasis on CPR quality, refinement of management directives early during ECMO, and aggressive early identification of patients requiring heart transplantation might improve late survival.

P63

Motion-Activated Prevention of Clogging and Maintenance of Patency of Indwelling Chest Tubes

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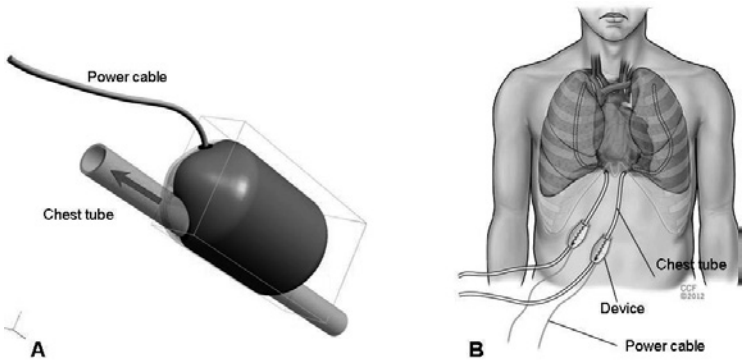
Purpose: To date, there is no reliable method to prevent chest tube clogging. To address the issue of chest tube clogging, we have designed a device that applies motion-activated energy (vibration) to prevent chest tube clogging and maintain its patency for unlimited time. The efficacy of the device vs standard chest tube was evaluated in acute hemothorax model.

Methods: The device assembly consisted of a direct current (DC) motor with an eccentric mass (3.2 g, centroid radius of 4.53 mm) affixed to its motor shaft. Vibratory forces were varied by adjusting the current. In nine healthy pigs (46.0 kg ± 3.3 kg), the bilateral minithoracotomy was constructed in the sixth intercostal space, and standard 32 Fr chest tubes were placed (with and without the device). The device was externally fixed on one of the chest tubes. A total of 120 mL of whole blood was periodically (every 15 min) injected into the right and left chest each for a total duration of 120 minutes.

Results: The total amount of the chest tube drainage for 2-hour duration with the device was significantly higher than that without the device (369 mL ± 113 mL vs 209 mL ± 115 mL; p = 0.027).

Conclusions: The motion-activated device showed significantly higher drainage volume and maintained the chest tube patency throughout the experiment. The device prevents the clot deposition and subsequent build-up of critical occlusions inside the tube. These results suggest that the application of motion-activated concept can be an effective measure to prevent the chest tube clogging postoperatively.



A. The 3D image of the motion activated chest tube clogging device. The drainage flow is indicated (red arrow).

B. B. The artistic rendering of the device in clinical use.

P64

Methylene Blue Attenuates Ischemia-Reperfusion Injury in Rat Lung Transplantation

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Purpose: Investigate the effects of methylene blue (MB) on ischemia-reperfusion injury in a rodent model of lung transplantation.

Methods: Forty female Sprague-Dawley rats (300-350 g) were divided into four groups (n=10) according to treatment (saline solution or MB) and graft cold ischemic time (3 or 6 hours). The animals underwent left-sided unilateral lung transplantation. Recipients received 2 mL of intraperitoneal saline or 1% MB. After 2 hours of reperfusion, the animals were killed, and blood gas, exhaled nitric oxide, histopathology, cell counts, cytokine levels in bronchoalveolar lavage fluid, and apoptosis were evaluated.

Results: At 3 hours of ischemia, PaO2 was significantly higher in the MB group than the saline (SAL) group (MB=150.2 ± 50.1 vs SAL=102.6 ± 40.4 mmHg, p=0.028). Exhaled nitric oxide was significantly different only between groups with 3 hours of ischemia (MB=3.2 ± 2.0 vs SAL=5.2 ± 2.3 ppb, p=0.05). Neutrophils in bronchoalveolar lavage (BAL) fluid were different between groups subjected to 6 hours of ischemia (MB=11.8 ± 7.4 vs SAL=30.0 ± 19.2 x 104/ml, p=0.023). IL-6 levels in BAL fluid were lower in the MB group for both ischemic durations (3 hours: MB=122.4 ± 24.9 vs SAL=175.6 ± 50.3 pg/ml, p=0.008; 6 hours: MB=142 ± 38.7 vs SAL=351.3 ± 80.7 pg/ml, p=0.002); TNF levels were also lower in the MB group undergoing 6 hours of ischemia (MB=189.5 ± 93.3 vs SAL=342.9 ± 130.4 pg/ml, p=0.007). The number of neutrophils in lung parenchyma was reduced in the MB group (6 hours: MB=2.8 ± 2.2 vs SAL=5.1 ± 3.1%, p=0.046); decreased edema was observed in MB perivascular (6 hours: MB: 35.2 ± 7.65 vs SAL: 44.8 ± 6.39%, p=0.001) and perialveolar tissues (3 hours: MB=18.4 ± 14.2 vs SAL= 28.1 ± 18.2%, p=0.041). There was no difference in the degree of apoptosis determined by caspase 3 expression between groups.

Conclusions: MB was able to prevent ischemia-reperfusion injury in this lung transplantation model and represents a new opportunity for further study.

General Thoracic Posters – Continued

P65

Prognostic Significance of a Pathologic Complete Response (ypT0N0) in Patients With Esophageal Adenocarcinoma

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COMMERCIAL RELATIONSHIPS J. D. Luketich: Research Grant, Accuray Incorporated, Precision Therapeutics, Inc, Torex; Speakers Bureau/Honoraria, Accuray Incorporated, Covidien, Stryker; Ownership Interest, Johnson & Johnson; A. Pennathur: Research Grant, Accuray Incorporated

Purpose: Esophageal adenocarcinoma (EAC) is often treated with neoadjuvant therapy followed by esophagectomy. Although pathologic complete response (pCR) may be associated with improved survival in mixed populations with SSC and EAC, the prognostic significance of pCR in EAC is unclear. This study examined the prognostic significance of pCR in patients who received neoadjuvant therapy for EAC.

Methods: We queried our prospectively maintained database for all patients with EAC who underwent esophagectomy from 1996 to 2011. We used the Kaplan-Meier method to examine survival, Cox proportional hazard model to identify variables affecting survival, and binary regression to identify variables predicting pCR.

Results: We identified 731 patients who underwent esophagectomy for EAC. Neoadjuvant therapy was given to 256/731 (35.0%). Most (133/256, 52.0%) received chemotherapy and radiation (CRT), 122/256 (47.7%) received chemotherapy only, and one patient received radiotherapy only. pCR was achieved in 34/256 (13.3%) patients. Patients who had pCR were older, were more often clinical stage II or N0, and were more likely to have received CRT (Table 1). Median survival was longer in patients with pCR (46 months vs 21 months, p=0.018) and survival was similar in patients with pCR and patients with stage II EAC (Fig. 1). Controlling for age, comorbidities, and pathologic stage, pCR (p<0.001), preoperative CRT (p<0.001), and postoperative chemotherapy (p=0.037) were important factors affecting survival. Preoperative CRT (p=0.005) and earlier clinical stage (p=0.040) were predictors of pCR.

Conclusions: In patients with EAC, earlier clinical stage and CRT are predictors of pCR. pCR appears to be a favorable prognostic factor with survival equivalent to that of patients with stage II EAC. Achieving pCR by delivering CRT to patients with earlier stage may improve survival in EAC.

Characteristics of Patients Who Received Neoadjuvant Therapy Before Esophagectomy (1996-2011)

	No Pathologic Complete Response	Pathologic Complete Response	p
Age (years)	62 (24-84)	65 (44-83)	0.039
Male	193/222 (86.9%)	30/34 (88.2%)	1.00
Caucasian	217/222 (97.7%)	33/34 (97.1%)	0.579
Clinical N0	23/183 (12.6%)	10/24 (41.7%)	0.001
Clinical Stage II	33/184 (17.9%)	12/24 (50%)	0.001
Pre op chemoradiation	103/222 (46.4%)	30/34 (88.2%)	<0.001

P66
Radiation Dose Mapping and Anastomotic Complications After Esophagectomy

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COMMERCIAL RELATIONSHIPS A. J. Seely: Employment, Therapeutic Monitoring Systems Inc

Purpose: Evidence suggests that there is no correlation between neoadjuvant chemoradiation and anastomotic outcomes after esophagectomy. The aim of this study was to examine the relationship between radiation dose mapping and anastomotic complications (AC).

Methods: Retrospective review of esophagectomy with right intrathoracic anastomosis after chemoradiation. Mean radiation dose to precise anatomic locations in the esophagus, stomach, and mediastinum were computed.

Results: From 2007 to 2010, complete radiotherapy planning records were available in 27 esophagectomy patients. Most were men (96%; n=26) with a median age of 64 (range=52-78). Most tumors were distal (96%; n=26) adenocarcinomas (82%; n=22). Anastomoses were hand sewn in 63% (n=17). Anastomotic complications occurred in 26% (leak=2; stricture=5). Age, histology, tumor location, anastomotic technique, and pathologic stage were similar regardless of anastomotic outcome. The esophageal radiation dose from 2.7-6.3 cm above the azygous vein was significantly higher in patients with anastomotic complications (see Table). Radiation exposure to the fundus of the stomach (AC=3,140 cGy; no AC=2,685 cGy; p=0.85) and to the subcarinal region was similar between groups (AC=2,491 cGy; no AC=2,650 cGy; p=0.85).

Conclusions: Anastomotic complications are directly related to esophageal radiation exposure above the azygous vein at the typical level of a right intrathoracic anastomosis. Proximal esophageal radiation dose can be minimized without compromising radiation to regional lymph nodes. Planned anastomotic location should be an important consideration in radiation therapy planning.

Esophageal Radiation Exposure Proximal to the Level of the Azygous Vein

	Radiation Dose (cGy)		
Distance above Azygous Vein	Anastomotic Complications (n=7)	No Anastomotic Complications (n=20)	p value
1.8 cm	1460	336	0.08
2.7 cm	1428	98	0.02
3.6 cm	1408	50	0.01
4.5 cm	1381	31	0.01
5.4 cm	1588	23	0.01
6.3 cm	1163	19	0.04

General Thoracic Posters – Continued

P67

Neoadjuvant Therapy for Esophageal Cancer Does Not Increase Postoperative Morbidity or Mortality: A NSQIP Analysis

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Purpose: Neoadjuvant therapy has proven to be effective in the reduction of locoregional recurrence and mortality for esophageal cancer. Induction treatment has been reported to be associated with increased risk of postoperative complications. We therefore compared outcomes after esophagectomy for esophageal cancer for patients who underwent neoadjuvant therapy and patients treated with surgery alone.

Methods: Using the ACS-NSQIP database (2005-2011), we identified 2,016 patients who underwent esophagectomy for esophageal cancer. 738 (36.61%) received neoadjuvant therapy (group 1), while 1,278 (63.39%) received no neoadjuvant therapy within 90 days prior to surgery (group 2). Primary outcome was 30-day mortality, and secondary outcomes included length of stay (LOS) and NSQIP-measured postoperative complications.

Results: Patients in group 1 were younger (62.4 vs 64.8, $p<0.001$), were more likely to have experienced recent weight loss (29.40% vs 16.28%; $p<0.001$), and had lower preoperative hematological cell counts (white blood cells x 109/L: 5.7 vs 7.0; $p<0.001$; hematocrit 35.8% vs 38.5%, $p<0.001$; platelets x 109 /L: 226 vs 238; $p=0.002$). On unadjusted and adjusted analysis, there was no significant difference in 30-day mortality, LOS, and overall and serious morbidity between the two groups. However, group 1 experienced a higher rate of bleeding requiring transfusion and venous thromboembolism, and a lower rate of pneumonia (Table 1).

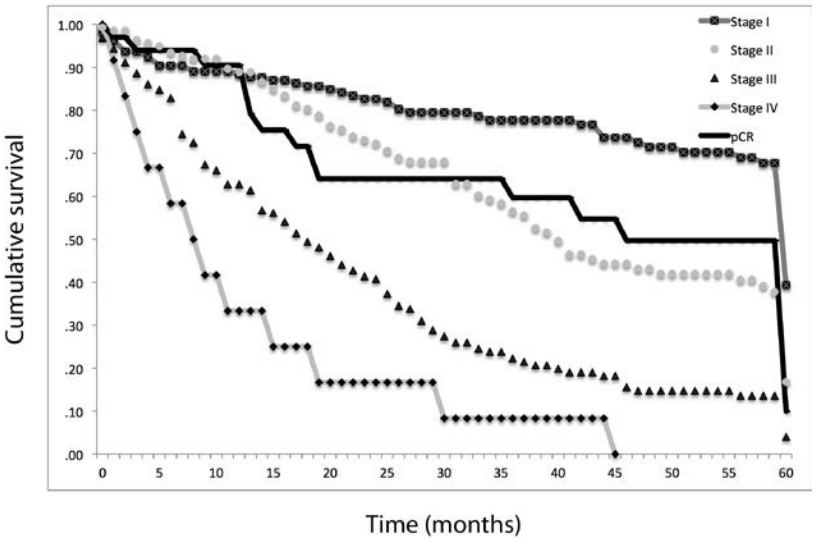
Conclusions: Preoperative neoadjuvant therapy for esophageal cancer does not increase 30-day mortality or the overall risk of postoperative complications after esophagectomy. Based on these data, surgeons should not be hindered by a perceived notion of higher operative risk in this patient population.

TABLE 1. Observed Unadjusted Rates of Postoperative Outcomes

	Total N=2,016	Group 1 Treatment n=738 36.61%	Group 2 No treatment n=1,278 63.39%	*p*
Length of stay , days (median)	16.1 (11)	15.6 (11)	16.3 (12)	0.467
30-day mortality	81 (4.02%)	27 (3.66%)	54 (4.23%)	0.532
Overall morbidity [1]	995 (49.36%)	360 (48.78%)	635 (49.69%)	0.695
Wound	272 (13.49%)	103 (13.96%)	169 (13.22%)	0.643
Pneumonia	321 (15.92%)	96 (13.01%)	225 (17.61%)	0.007
Urinary tract infection	71 (3.52%)	19 (2.57%)	52 (4.07%)	0.080
Return to OR	257 (12.75%)	104 (14.09%)	153 (11.97%)	0.169
Venous thromboembolism	134 (6.65%)	61 (8.27%)	73 (5.71%)	0.027
Cardiac	61 (3.03%)	18 (2.44%)	43 (3.36%)	0.242
Shock/sepsis	383 (19.00%)	127 (17.21%)	256 (20.03%)	0.120
Unplanned intubation	281 (13.94%)	94 (12.74%)	187 (14.63%)	0.237
Bleeding transfusion	166 (8.23%)	78 (10.57%)	88 (6.89%)	0.004
Renal complication	39 (1.93%)	10 (1.36%)	29 (2.27%)	0.151
On ventilator >48 hours	318 (15.77%)	107 (14.50%)	211 (16.51%)	0.233
Abscess	120 (5.95%)	45 (6.10%)	75 (5.87%)	0.834
Severe Morbidity [2]	671 (33.28%)	231 (31.30%)	440 (34.43%)	0.151

1 Overall morbidity: *wound, pneumonia, urinary tract infection, venous thromboembolism, bleeding transfusion, renal complication, return to OR, cardiac, shock/sepsis, unplanned intubation, and on ventilator >48 hours*

2 Serious morbidity: *return to OR, cardiac, shock/sepsis, unplanned intubation, and on ventilator >48 hours*



General Thoracic Posters – Continued

P68

VATS Approach to Lobectomy for Lung Cancer Does Not Compromise Oncologic Efficacy

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COMMERCIAL RELATIONSHIPS T. A. D'Amico: Consultant/Advisory Board, Scanlan International

Purpose: Video-assisted thoracoscopic (VATS) lobectomy has less morbidity compared to thoracotomy. We evaluated long-term survival after VATS lobectomy for non-small cell lung cancer (NSCLC).

Methods: Patients who had lobectomy for any stage NSCLC without previous chemotherapy or radiation from 1996 to 2008 were reviewed. Survival was evaluated using the Kaplan-Meier method and multivariate Cox regression analysis. The impact of selection bias was assessed using propensity scoring based on age, year of surgery, tumor size, TNM statuses, and gender.

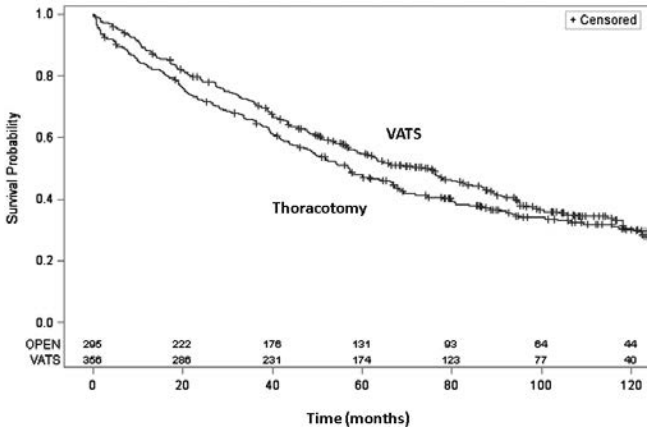
Results: During the study time period, 1,198 patients met inclusion criteria (614 VATS, 584 thoracotomy). Median follow-up was longer for VATS compared to thoracotomy for all patients (53.4 vs 45.6 months, p=0.04) but was longer for thoracotomy for surviving patients (93.5 vs 67.6 months, p<0.0001). In the overall cohort, thoracotomy patients were younger (65.8 ± 9.8 vs 67.1 ± 9.5 years, p=0.02), had larger tumors (4.1 ± 2.3 vs 2.8 ± 1.5 cm, p<0.0001), were more often male (55% [n=321] vs 49% [n=301], p=0.04), and more often had higher stage cancers (45% [n=261] vs 71% [n=435] stage I, p<0.0001) compared to VATS patients. In multivariate analysis, thoracotomy approach predicted worse survival (HR 1.17, p=0.04), as did increasing age (HR 1.02 per year, p<0.0001), pathologic stage (HR 1.48 per stage, p<0.0001), and male gender (HR 1.27, p=0.001). Propensity matching resulted in 651 patients (356 VATS, 295 thoracotomy) who were similar in age, overall stage and individual T and N status, tumor size, and gender (Table). In this cohort, operative approach did not impact survival (p=0.3), while increasing age (HR 1.02 per year, p=0.001), pathologic stage (HR 1.57 per stage, p<0.0001), and male gender (HR 1.30, p=0.008) predicted worse survival (Figure).

Conclusions: A VATS approach to lobectomy for NSCLC does not result in worse long-term survival compared to thoracotomy.

Characteristics of Propensity-Matched Patients Stratified by Operative Approach

	VATS (n=356)	Thoracotomy (n=295)	p
Age (years)	66.5±9.3	65.4±9.8	0.13
Peri-Operative Mortality	6 (1.7%)	16 (5.4%)	0.01
Pathologic Stage IA IB IIA IIB IIIA IIIB IV	 138 (39%) 94 (26%) 51 (14%) 42 (12%) 27 (8%) 2 (0.6%) 2 (0.6%)	 92 (31%) 74 (25%) 57 (19%) 37 (12%) 27 (9%) 3 (1%) 0	0.4
T Status T1a T1b T2a T2b T3 T4	 91 (26%) 72 (20%) 126 (35%) 24 (7%) 40 (11%) 3 (1%)	 73 (25%) 62 (21%) 94 (32%) 26 (9%) 37 (13%) 3 (1%)	0.9
N Status N0 N1 N2	 289 (81%) 47 (13%) 20 (6%)	 227 (77%) 47 (16%) 21 (7%)	0.4
M Status M0 M1	 355 (99.7%) 1 (0.3%)	 295 (100%) 0	1.0
Tumor Size (cm)	3.1±1.6	3.2±1.6	0.5
Gender Female Male	 173 (49%) 183 (51%)	 147 (50%) 148 (50%)	0.8
% predicted FEV1	71.9±20.4	68.8±18.7	0.08
% predicted DLCO	75.9±22.0	72.6±19.3	0.09

VATS = video-assisted thoracoscopic surgery; FEV1 = forced expiratory volume in one second; DLCO = diffusion capacity of the lung for carbon monoxide



General Thoracic Posters – Continued

P69

Perioperative Outcome of Extrapleural Pneumonectomy After Induction Chemotherapy in 242 Mesothelioma Patients From Three High-Volume Institutions

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COMMERCIAL RELATIONSHIPS I. Opitz: Research Grant, Swiss National Science Foundation

Purpose: Since publication of the results of the MARS trial, it is suggested that induction chemotherapy followed by extrapleural pneumonectomy (EPP) for mesothelioma (MPM) patients is associated with exceedingly high morbidity and mortality and the role of EPP is controversially debated. The present retrospective study analyzes the perioperative outcome of 242 patients treated at three high-volume mesothelioma institutions.

Methods: 242 MPM patients completed EPP after platinum-based induction chemotherapy at three institutions for thoracic surgery over a time period of more than 10 years. Thirty-day mortality and major morbidity (pulmonary embolism [PE], bleeding, ARDS, empyema, bronchopleural fistula [BPF], chylothorax, and patch failure) were recorded. Outcome was correlated to patients' characteristics (gender, side of disease, histotype, and tumor stage) to find risk factor predicting 30-mortality or major morbidity.

Results: The overall 30-day mortality was 5% (n=10), with most of the patients dying of acute pulmonary embolism. Major morbidity rate occurred in 30%. The frequencies for the different complications are summarized in table 1. The rate of major morbidity was significantly higher in mesothelioma of the right chest cavity compared to the left side (p=0.01), as BPF was mainly observed on the right side (95%).

Conclusions: Perioperative outcome of mesothelioma patients after induction CTX and EPP can be maintained at a reasonable level if patients are treated at high-volume institutions with long-term experience. Surgical morbidity but not mortality is increased after right-sided EPP related to increased rates of BPF and empyema on this side. Enhanced strategies to prevent PE and empyema have to be defined.

Bleeding	10 (4%)
Chylothorax	13 (5%)
Patch failure	10 (4%)
BPF	20 (8%)
Empyema	33 (14%)
ARDS	3 (1%)
Pulmonary embolism	7 (3%)

P70

Is Pleural Invasion a Significant Prognostic Factor in Lung Cancer Patients With Ground Glass Opacity on Thin-Section CT Scan?

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Purpose: Due to the recent amendment of lung cancer staging by the IASLC committee, pleural invasion (PL) has been considered to be a prognostic factor, and even pT1a-b lung cancers are included in pT2a if the tumors have pleural invasion. But controversies still remain as to the prognostic significance of pleural invasion in patients with radiologically early lung cancer with ground glass opacity (GGO).

Methods: Between 2004 and 2012, among 543 patients with surgically resected pN0 non-small cell lung cancer less than 30 mm in diameter, 466 patients that revealed radiologically "part-solid" and "pure-solid" appearance on thin-section CT scan were retrospectively reviewed. Several clinicopathological factors were evaluated to elucidate the prognostic factors for each group using a multivariate analysis. Survivals for each group were calculated by Kaplan-Meier estimation.

Results: Among 466 eligible lung cancers, 209 (45%) were pure-solid and 237 (55%) were part-solid nodule on thin-section CT scan. Pleural invasion was found in 79 (38%) patients with pure-solid nodule. Based on a multivariate analysis, pleural invasion, maximum tumor diameter, and CEA level were significant prognostic factors in patients with pure-solid nodule (p=0.0071, 0.0278, 0.0314). The 5-year survival in patients with PL (-) (81.3%) was significantly greater than that in PL (+) (70.1%) (p=0.0051). While pleural invasion was found in 24 (10%) of the patients with part-solid nodule, it was not a significant prognostic factor in these lesions (p=0.4697). Furthermore, the 5-year survival in patients with PL (-) was 94.9%, whereas that with PL (+) was 85.6% (p=0.3798).

Conclusions: Pleural invasion may not participate in the prognosis in patients with part-solid lung cancers. Thus, upgrading of TNM staging system and administration of postoperative chemotherapy due to pleural factor should be carefully considered in lung cancer patients with GGO predominance.

General Thoracic Posters – Continued

P71

Endobronchial Valves for Challenging Air Leaks

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COMMERCIAL RELATIONSHIPS M. F. Reed: Consultant/Advisory Board, Spiration, Inc; J. W. Toth: Consultant/Advisory Board, Spiration, Inc

REGULATORY DISCLOSURE This presentation will address the off-label use of the IBV Valve System.

Purpose: Air leaks result in increased morbidity and mortality. Endobronchial valves have recently been utilized as a nonoperative treatment. We evaluated the efficacy of endobronchial valves at achieving chest tube removal and hospital discharge for challenging air leaks resulting from a variety of causes.

Methods: Patients with persistent air leaks from October 2011 through May 2013 were evaluated for endobronchial valve placement by a multidisciplinary thoracic surgery and interventional pulmonology team in a single institution. Patients receiving valves underwent flexible bronchoscopy with balloon occlusion to identify airways contributing to the leak. After sizing the airways, unidirectional endobronchial valves were deployed.

Results: During an 18-month period, 22 patients underwent 25 valve placement procedures; 95 valves were placed. A median of three valves was placed per procedure (range 1-12). Patient age range was 16 months to 70 years. Indications for valve placement were postoperative air leak (n=8), pneumothorax (n=11), infection (n=3), postpneumonectomy bronchopleural fistula (n=2), and other (n=1). There were no valve-related complications during placement, dwell time, or removal. Three patients died from their underlying disease, unrelated to valve placement. Of those with chest tubes who survived and were discharged, all had successful removal of their chest tubes. Mean duration to chest tube removal after initial valve placement was 23 days (median 15, range 0-86). Mean length of stay after final valve placement was 7 days (median 5, range 0-37).

Conclusions: Clinically challenging air leaks, often occurring in medically compromised patients, may persist despite multiple unsuccessful interventions. Endobronchial valves offer a minimally invasive management option in these complicated situations. The time to chest tube removal and length of stay are highly variable, frequently due to the patient's clinical status and underlying disease.

P72

Lymph Node Assessment and Impact on Survival in VATS Lobectomy/ Segmentectomy

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Purpose: The total number of resected lymph nodes (RNs) and lymph node ratio (LNR = # positive lymph nodes/RNs) have been associated with prognosis in patients with NSCLC. The objective of this study was to evaluate the influence of RNs, LNR, and # lymph node stations (LNS) sampled on prognosis in patients treated with VATS anatomic resection.

Methods: A retrospective analysis was performed on all patients who underwent VATS lobectomy or segmentectomy for clinical early stage NSCLC from 2006 to 2012 at a single institution. All resected lymph nodes were categorized for each patient as positive, negative, N1, or N2. Disease-free survival (DFS) and overall survival (OS) were compared for cutoff values of RNs, LNR, and LNS using Kaplan-Meier methods and Cox regression models.

Results: 550 patients were analyzed with median follow-up = 2.7 years: 494 lobectomy and 56 segmentectomy. The median age = 68 (range 29-92) with 62% (342/550) females. There was no 30-day mortality. Pathologic stage I, II, and III was observed in 81.5% (448/550), 11% (64/550), and 7% (38/550) patients, respectively. Mean tumor size = 2.4 cm (range 0.2-9.5). Nodal stage (N0, N1, N2) was observed in 488, 28, and 34 patients, respectively. Five-year OS for T1aN0, T1bN0, and T2aN0 was 90%, 81%, and 74%, respectively. The mean LNR = 0.22 (range 0.02-1.0). Multivariate analysis identified only LNS ≥3 as an independent predictor for DFS (p=0.001) and OS (p=0.017). Total number of positive lymph nodes and LNR were not significant. Approximately 59% of patients had ≥10 lymph nodes analyzed. Patients with RNs ≥10 had no statistically significant improvement in OS or DFS.

Conclusions: Sampling ≥3 lymph node stations is an independent predictor of DFS and OS even in VATS lobectomy and segmentectomy. A threshold of ≥10 RNs and LNR appears less important in VATS lobectomy by virtue of selecting earlier stage disease.

General Thoracic Posters – Continued

P73

Women Have 3-Fold Better Survival Rate than Men With Malignant Pleural Mesothelioma

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Purpose: It has been sporadically reported that women with malignant pleural mesothelioma (MPM) experience longer survival compared to men. Single and even multi-institution studies to date have included too few female patients to allow an in-depth epidemiologic analysis. We queried a large population-based dataset to evaluate survival in MPM and its determinants in women.

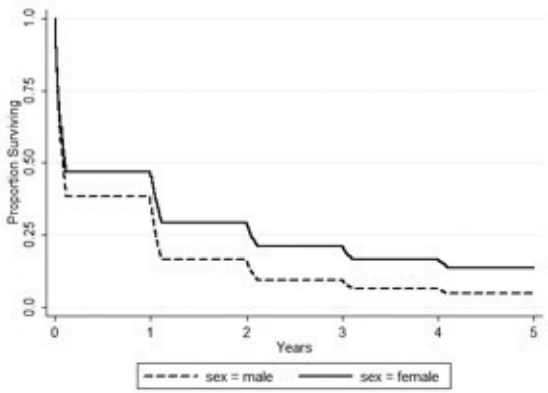
Methods: All pathologically confirmed cases of MPM in the Surveillance, Epidemiology and End Results (SEER) database from 1973 to 2009 were evaluated. Age, year of diagnosis, race, stage, cancer-directed surgery, radiation, and vital status were analyzed according to gender. Cox proportional hazard models were derived to assess the association between prognostic factors and survival.

Results: There were 14,228 cases of MPM, of which 3,196 (22%) were women. Despite similar baseline characteristics (Table), survival was better in women, with 13.4% 5-year survival in women and 4.5% in men (Figure, $p<0.0001$). The effect of female gender on survival persisted when stratified by age group (dichotomized at 50), stage, or race, but differed depending on treatment (Table). Even when adjusted for age, stage, race, and treatment, female MPM patients had longer survival than men (HR = 0.78, 95% CI 0.75 - 0.82).

Conclusions: With over 14,000 patients, this is the largest study to date evaluating the effect of gender on outcome in MPM. These data confirm that women compose only 22% of all MPM patients, present at similar stage, and are offered similar treatment options. Nevertheless, survival in MPM is far better in women compared to men, independent of age, stage, and treatment. Differences in asbestos exposure, tumor biology, and the impact of circulating hormones on host response must be investigated to understand this survival advantage and improve prognosis for patients of both genders with this disease.

Variable	*n* (%), Percentage 5-year survival (95% CI)		Univariate p value	Adjusted HR (95% CI)
	MALES	FEMALES		
Age				
< 50 years	539 (4.9%) 17.3 (14.0-21.0)	371 (11.6%) 38.6 (32.9-44.2)	<0.0001	1(Ref)
≥ 50 years	10,493 (95.1%) 3.7 (3.3-4.2)	2,825 (88.4%) 9.8 (8.5-11.2)	<0.0001	1.51 (1.44-1.59)
Stage				
Localized	1,236 (11.2%) 9.7 (7.8-11.7)	336 (10.5%) 29.1 (23.5-31.0)	<0.0001	1(Ref)
Regional	1,858 (16.8%) 5.5 (4.4-6.9)	497 (15.6%) 13.6 (10.2-17.4)	<0.0001	1.28 (1.19-1.37)
Distant	6,442 (58.4%) 3.2 (2.1-4.7)	1,925 (60.2%) 9.7 (6.5-13.8)	<0.0001	1.30 (1.23-1.39)
Race				
White	10,159 (92.1%) 4.3 (3.8-4.8)	2,887 (90.3%) 13.2 (11.7-14.7)	<0.0001	1(Ref)
Black	507 (4.6%) 8.1 (5.5-11.3)	181 (5.7%) 13.0 (8.1-19.0)	0.7	1.05 (0.96-1.14)
Other	366 (3.3%) 5.6 (3.3-8.8)	128 (4%) 16.3 (9.6-24.7)	0.01	0.98 (0.88-1.08)
Treatment				
No surgery, no radiotherapy	7,715 (69.9%) 2.8 (2.4-3.3)	2,066 (64.7%) 7.7 (6.4-9.2)	<0.0001	1(Ref)
Surgery	1,888 (17.1%) 11.4 (9.6-13.4)	754 (23.6%) 30.7 (26.5-34.9)	<0.0001	0.63 (0.60-0.66)
Radiotherapy	917 (8.3%) 1.6 (0.9-2.7)	218 (6.8%) 1.3 (0.3-4.1)	0.2	1.17 (1.10-1.25)
Surgery and radiotherapy	512 (4.6%) 9.0 (6.3-12.3)	158 (4.9%) 15.5 (9.3-23.1)	0.02	0.63 (0.58-0.69)

Overall Survival in MPM



General Thoracic Posters – Continued

P74

Radio-Guided Localization and Resection of Small or Ill-Defined Pulmonary Lesions

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Purpose: Diffusion of screening programs has allowed identification of an increasing number of small or indistinct pulmonary lesions, which are difficult to localize. We report our experience in their preoperative localization by radiotracer, localization, and resection.

Methods: Patients with pulmonary nodule of sub-solid morphology or smaller than 1 cm and/or deeper than 1 cm below the visceral pleura underwent computer tomography (CT)-guided injection of radiotracer technetium99m macroaggregates (99mTc-MAA) in the vicinity of the lesion. During the surgical procedure, a handheld gamma probe was used to detect the hot spot where radioactivity was localized, and this area was resected.

Results: From November 2007 to May 2013, 112 patients (58 men; median age 62 years) underwent preoperative radiotracer injection of 99mTc-MAA with a successful marking in all patients. Localization complications included 23 (20.5%) asymptomatic pneumothoraces, 33 (29.4%) parenchymal hemorrhage soffusions, and one (0.9%) mild allergic reaction to the contrast medium. In all cases except for two, the gamma probe revealed the pulmonary lesion. Mean distance from the pleura was 12 mm (range, 0 to 39 mm). Pulmonary resection was performed by thoracoscopy in 70 (62.5%) cases, intentional thoracotomy in 36 (32.1%), and converted thoracoscopy to thoracotomy in six (5.4%). Mean pathological nodule size was 9 mm (range, 2-24 mm). Fifty-eight (51.8%) nodules were nonsolid, 38 (33.9%) were partially solid, and 16 (14.3%) had a solid morphology. Histological examination showed nine (8.1%) benign lesions and 103 (91.9%) malignant lesions (84 primary lung cancers and 19 metastases).

Conclusions: This study confirms that radiotracer localization of small or indistinct pulmonary lesions is a simple and feasible procedure with a high rate of success. Optimal candidates for this technique are patients with suspicious nodules detected by screening or incidental CT due to a high rate of nonsolid morphology and small lesion size.

P75

90-Day Costs of VATS and Open Lobectomy for Lung Cancer

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COMMERCIAL RELATIONSHIPS D. E. Wood: Consultant/Advisory Board, Spiration, Inc; Research Grant, Spiration, Inc

Purpose: Complications after lung cancer surgery are associated with greater health care utilization and higher costs. A video-assisted thoracoscopic (VATS) approach to lobectomy is associated with fewer complications; thus, VATS is expected to lead to lower costs. Because some complications have a delayed presentation manifesting after discharge, we compared the 90-day costs of VATS and open lobectomy, and examined whether postdischarge health care utilization accounted for any observed differences in costs.

Methods: A cohort study (2007-2011) was conducted using MarketScan, a nationally representative sample of persons with employer-provided health insurance. Total costs reflect payments made by the insurer for inpatient, outpatient, and pharmacy claims up to 90 days after discharge.

Results: Among 9,962 patients, 31% (3,069/9,962) underwent a VATS lobectomy. Risk-adjusted 90-day costs were lower for VATS (-$3,476, p=0.001). Compared to open lobectomy, VATS was associated with lower rates of prolonged length of stay (3% [93/3,069] vs 7% [494/6,893], p<0.001), 90-day emergency department use (22% [668/3,069] vs 24% [1679/6,893], p=0.005), and 90-day readmission (10% [308/3,069] vs 12% [796/6,893], p=0.026). Differences in rates of prolonged length of stay accounted for differences in costs between VATS and open lobectomy (-$1,276, p=0.125). Prolonged length of stay was associated with the highest 90-day cost differential (+$58,020, p<0.001) followed by 90-day readmission (+$37,481, p<0.001).

Conclusions: VATS lobectomy is associated with lower 90-day costs. This relationship appears to be largely explained by lower rates of prolonged length of stay rather than postdischarge utilization. Strategies to mitigate prolonged length of stay will likely lead to substantial reductions in costs, so long as they do not lead to more readmissions.

P76

Diagnostic Accuracy of Mediastinal Lymph Node Staging Techniques in the Preoperative Assessment of Non-Small Cell Lung Cancer Patients

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COMMERCIAL RELATIONSHIPS M. Liberman: Consultant/Advisory Board, Ethicon, Inc; Other Research Support, Boston Scientific, Ethicon, Inc

Purpose: The objective was to assess the current diagnostic accuracy of noninvasive and invasive diagnostic tools for predicting mediastinal (MLN) and hilar lymph node (HLN) staging in biopsy-proven non-small cell lung cancer (NSCLC).

Methods: Retrospective analysis of 997 biopsy-proven NSCLC patients treated at a single academic medical center between January 2006 and April 2012. MLNs were evaluated with preoperative computed tomography (CT), positron emission tomography (PET) CT, endobronchial ultrasound-guided fine needle aspiration (EBUS-FNA), and endoscopic ultrasound-guided fine needle aspiration (EUS-FNA). All preoperative LN results were compared with "gold standard" pathological surgical biopsy.

Results: Over a 64-month period, 217 cervical mediastinoscopies, 15 anterior mediastinotomies (AM), and 952 MLN dissections were performed. The sensitivity of CT scan for MLN detection was 18.9% [30/159] and PET-CT scan was 33.8% [45/133]. Specificities were 94.9% [1,772/1,868] and 93.8% [1,537/1,639], respectively. For HLN detection, CT was less sensitive (17.0% [29/171] vs 39.7% [58/146]), however, more specific than PET-CT scan (94.7% [586/619] vs 80.3% [437/544]). EBUS-FNA (72.7% [40/55] sensitivity and 100% [187/187] specificity) and EUS-FNA (51.9% [14/27] sensitivity and 100% [91/91] specificity) both demonstrated superior results compared to CT and PET-CT. There was no statistically difference between the results of CT and PET-CT when comparing NSCLC histology subtypes. The mean primary dimensions of the primary pulmonary lesion were 3.28 cm for N0, 4.36 cm for N1, and 4.50 cm for the N2-N3 tumors.

Conclusions: The majority of biopsy-proven MLN metastases are not associated with positive results on preoperative CT or PET-CT scans. N staging can be correlated with the diameter of the primary tumor. This study supports the routine utilization of preoperative invasive mediastinal LN staging in NSCLC, especially for patients with tumors of greater than 4 cm in diameter, regardless of CT or PET-CT results.

Predictive Values of Preoperative Mediastinal Lymph Node Staging Techniques

Modality	Positive Predictive Value	[95% CI]	Negative Predictive Value	[95% CI]
CT scan - N1	46.8% (29/62)	[34.3 to 59.2]	80.5% (586/728)	[77.5 to 83.3]
CT scan - N2-3	23.8% (30/126)	[16.4 to 31.1]	93.2% (1772/1901)	[92.0 to 94.3]
PET-CT scan - N1	35.2% (58/165)	[28.2 to 42.9]	83.2% (437/525)	[80.0 to 86.5]
PET-CT scan - N2-3	30.6% (45/147)	[23.2 to 38.1]	94.6% (1537/1625)	[93.4 to 95.6]
EBUS-FNA	100% (40/40)	-	92.6% (187/202)	[89.0 to 96.2]
EUS-FNA	100% (14/14)	-	87.5% (91/104)	[81.0 to 93.8]
EBUS-FNA & EUS-FNA	100% (54/54)	-	90.8% (278/306)	[87.6 to 94.1]

CT: computed tomography; PET: positron emission tomography; EBUS-FNA: endobronchial ultrasound-guided fine needle aspiration; EUS-FNA: endoscopic ultrasound-guided fine needle aspiration; CI: confidence interval

General Thoracic Posters – Continued

P77

The Efficacy of Endobronchial Ultrasound (EBUS) in Patients With Non-Small Cell Lung Cancer After Neoadjuvant Therapy

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COMMERCIAL RELATIONSHIPS D. J. Minnich: Consultant/Advisory Board, Varian Medical Systems, Inc; Other, Covidien, Honoraria for physician training; R. J. Cerfolio: Research Grant, Pfizer Inc, Precision/Chemo Fx; Other, Intuitive Surgical, Inc, Faculty, Proctor, Speaker

Purpose: The management of stage IIIA non-small cell lung cancer (NSCLC) involves a multidisciplinary approach entailing surgery, radiotherapy, and chemotherapy. When considering surgical intervention with curative intent in patients with N2 disease, accurate staging is the cornerstone of this process. Invasive mediastinal staging was traditionally achieved with mediastinoscopy. There has been recent interest in the use of endobronchial ultrasound (EBUS), but little data to support its use in this setting. The objective is to assess the accuracy of restaging EBUS for mediastinal (N2) lymph nodes after neoadjuvant therapy.

Methods: A retrospective review of patients with NSCLC who underwent staging with initial and repeat computed tomography (CT) and positron emission tomography (PET) and had restaging EBUS for sampling of N2 lymph nodes. EBUS was performed for suspicious nodes in stations 2R, 2L, 4R, 4L, and 7. Selected patients who were N2 negative underwent thoracotomy with complete thoracic lymphadenectomy.

Results: There were 38 patients over a 5-year period with N2 disease who underwent neoadjuvant therapy and subsequently had restaging EBUS. There were three patients who had recalcitrant N2 nodal disease by EBUS. There were four patients with pulmonary function or comorbidities that were prohibitive for surgery. The remaining 32 patients underwent thoracotomy. Recalcitrant N2 disease was noted in four patients in the EBUS assessable nodal stations. The sensitivity and negative predictive value of restaging EBUS were 43% and 86%, respectively. Since patients with positive EBUS were not taken to thoracotomy, we could not generate any data of false positive results, and therefore, did not generate specificity and positive predictive value data.

Conclusions: Restaging EBUS is relatively accurate at predicting the absence of metastatic disease in N2 mediastinal lymph node in patients who underwent neoadjuvant therapy for non-small cell lung cancer.

P78

Large Cell Neuroendocrine Carcinoma of the Lung: A Multicenter Experience of 142 Patients

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Purpose: Large cell neuroendocrine carcinoma (LCNC) of the lung is a rare and aggressive tumor with a poor prognosis. The optimal treatment of this neoplasm remains controversial. The aim of this study was to report the outcome of surgical resection in patients with LCNC analyzing factors that might influence survival.

Methods: We retrospectively reviewed the clinical records of patients who underwent surgical resection for LCNC in 5 different institutions between January 1998 and December 2012. Long-term survival and 5-year disease-free survival were estimated by Kaplan-Meier method and compared by the log rank test.

Results: There were 113 men and 29 women; median age was 65 years (range, 35-83 years). Surgical resection included 9 segmentectomies, 102 lobectomies, 9 bilobectomies, and 22 pneumonectomies. Induction therapy was administered to 37 (26%) cases and adjuvant therapy to 38 patients. Pathologically, 64 (45.1%) were stage I, 38 (26.7%) stage II, and 40 (28.2%) stage III. Postoperative mortality was nil and morbidity was 29.6%. Median follow-up was 26 months (range, 1-140 months). Overall 5-year and disease-free survival were 47.2% and 50%, respectively. Survival was 69.9% for stage I, 27.8% for stage II, and 27% for stage III (p<.0001). A better prognosis was associated with induction treatment in stage I disease (p=.001). 52 patients (36.60%) experienced a relapse of the disease. Patients receiving wedge resection or lobectomy (p=.04), induction (p=.02) or adjuvant (p=.01), and without nodal involvement (p<.001) had the best long-term prognosis. At multivariate analysis, only induction therapy influenced long-term survival (HR: 3.24; 95% CI: 1.4%-6.1%; p=.002).

Conclusions: LCNC are aggressive tumors predominantly occurring in men. The prognosis is good for early stages and for those patients without nodal involvement receiving induction or adjuvant treatment demonstrating a high chemosensitivity.

P79

Anatomic Segmentectomy vs Lobectomy for Stage I Non-Small Cell Lung Cancer (NSCLC): Extent of Resection Is Important in Determining Preservation of Pulmonary Function

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COMMERCIAL RELATIONSHIPS A. Pennathur: Research Grant, Accuray Incorporated; J. D. Luketich: Research Grant, Accuray Incorporated, Precision Therapeutics, Inc, Torex; Speakers Bureau/Honoraria, Accuray Incorporated, Covidien, Stryker; Ownership Interest, Johnson & Johnson

Purpose: A suggested benefit of sublobar resection for stage I non-small cell lung cancer (NSCLC) compared to lobectomy is a relative preservation of pulmonary function. Very little objective data exist supporting this supposition. We evaluate the relative impact of both anatomic segmental and lobar resection on pulmonary function at 1 year in patients with resected clinical stage I NSCLC.

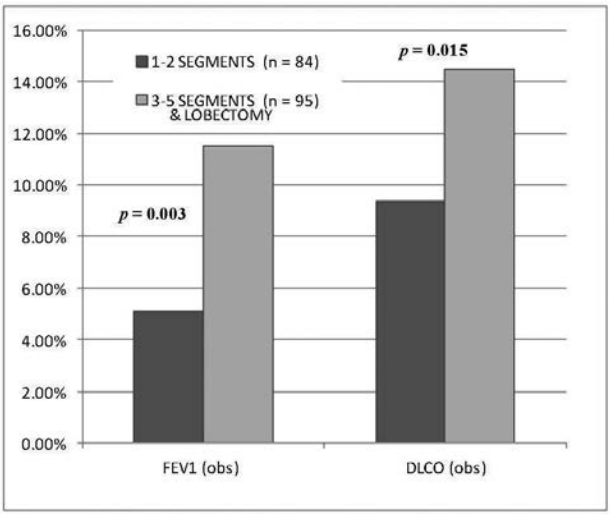
Methods: Retrospective review of 179 patients, disease-free at 1 year, following anatomic segmentectomy (n=94) or lobectomy (n=85) for clinical stage I NSCLC. The primary outcome variable was the change in FEV1 and DLCO 1 year following segmentectomy or lobectomy. In addition, comparisons were also made based on extent of resection (≤ 2 segments vs 3-5 segments OR lobectomy) [Table]. Comparative analysis of PFT results, including preoperative and postoperative values, as well as absolute and percent change, was performed using the Wilcoxan signed rank test and the Mann-Whitney U test. The statistical package STATA, version 11.2 (College Station, TX) was used for the analyses.

Results: Overall, anatomic segmentectomy was associated with a smaller reduction in pulmonary function compared with lobectomy (FEV1 -4.9% vs -7.8%, DLCO -3.9% vs -6.5%, FVC -5.0% vs -5.7%) at 1 year. These findings were primarily affected by the preservation in function seen among patients in whom two or fewer anatomic segments were removed compared to those patients undergoing resection of three to five segments or lobectomy [Figure].

Conclusions: Pulmonary function may be better preserved at 1 year when segmentectomy is limited to (two or fewer) anatomic segments. Larger tumors requiring resection of greater than three anatomic segments are probably best treated by lobectomy to achieve adequate surgical margins while fulfilling the observed oncologic superiority of lobectomy in these clinical circumstances.

Preoperative Demographics, Tumor Characteristics, and Operative Details

	1-2 Segments (n = 84)	3-5 Segments /Lobectomy (n = 95)	P value
Age	68 ± 9	70 ± 10	0.536
Gender (Male)	36 (42.9%)	48 (50.5%)	0.905
Tumor Size (cm)	1.9 ± 0.9	2.9 ± 1.8	<0.001
Tumor Location Right Left	 50 (60%) 34 (41%)	 48 (61%) 37 (39%)	0.943
Approach Thoracotomy VATS	 31 (37%) 53 (63%)	 48 (51%) 47 (50%)	0.072
Mean Number of Segments Resected	1.3 ± 0.5	3.9 ± 0.8	<0.001



P80

Methylation of Distal-Less Homeobox 4 (DLX4) Predicts the Outcome of Disease After Curative Resection of Stage I Non-Small Cell Lung Cancer

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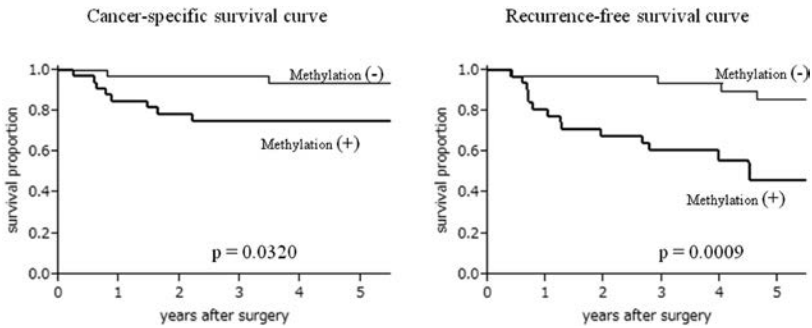
Purpose: Surgery with a curative intent is the standard treatment of choice for patients with stage I non-small cell lung cancer (NSCLC). However, even after curative resection of stage I NSCLC, a significant fraction of patients develop recurrent disease. The possibility that molecular biomarkers might better predict biological characteristics and outcomes should be investigated to establish the useful selection criteria for adjuvant therapy after curative resection of stage I NSCLC.

Methods: Using the methylation-specific polymerase chain reaction assay, the promoter methylation of distal-less homeobox 4 (DLX4) was assessed in cancer tissues of 67 patients who underwent curative resection for stage I NSCLC from May 2005 to January 2008. We evaluated the clinical relevance of DLX4 methylation status to the outcomes of the disease.

Results: Methylation of the DLX4 promoter was detected in 33 of 67 patients (49.3%). No statistically significant relationship between DLX4 methylation status and any of the clinicopathological features were found. Multivariate logistic regression analysis revealed that DLX4 methylation was an independent risk factor for recurrence (p=0.0026) and cancer-specific death (p=0.0023). Compared to patients without DLX4 methylation, those with DLX4 methylation showed significantly poorer recurrence-free survival (p=0.0009) and cancer-specific survival (p=0.0320) (see the attached Figure). Cox's proportional hazard regression analysis revealed that DLX4 methylation was an independent risk factor for recurrence-free survival (p=0.0026) and cancer-specific survival (p=0.0280).

Conclusions: Methylated DLX4 can be a potential biomarker that predicts prognosis after curative resection of stage I NSCLC. The results of this study indicate that identification of methylated DLX4 could provide information that is clinically relevant to tailored adjuvant therapy.



Notes

General Thoracic Posters – Continued

P81

Induction Therapy With Bevacizumab, Docetaxel, and Cisplatin Does Not Increase Operative Risk in Lung Cancer Patients

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COMMERCIAL RELATIONSHIPS M. G. Kris: Consultant/Advisory Board, Genentech, Inc

Purpose: Induction chemotherapy in patients with operable non-small cell lung cancer (NSCLC) is better tolerated than adjuvant chemotherapy. Bevacizumab (Bev) improves survival in patients with advanced NSCLC. Some surgical series suggest increased operative complications after induction treatment with Bev. We evaluated surgical complications in patients undergoing resection for NSCLC after induction therapy with Bev, docetaxel (D), and cisplatin (C).

Methods: Patients with resectable stage IB-IIIA, non-squamous NSCLC without history of hemoptysis were eligible for this phase II trial. Induction therapy was four cycles of D (75 mg/m^2) plus C (75 mg/m^2) and three cycles of concurrent Bev (15 mg/kg), followed by surgery. Two age-, gender-, and stage-matched controls from our surgical database who received induction chemotherapy were selected for each study patient. Conditional logistic regression was used to compare study vs control patients for 90-day complications.

Results: Fifty-one patients received Bev-DC and 43 had surgery. Demographics were similar between the two groups. In the Bev-DC group, 12 of 43 patients had complications vs 26 of 86 patients in the matched controls. There were six patients with grade 3/4 complications (8 complications) in the Bev-DC group (Table 1) as compared to five patients (7 complications) in the controls. There were no deaths in the Bev-DC group and three among the controls. Controlling for age, gender, and stage, there was no difference in risk of any complication (OR 0.89 [95% CI 0.39-2.02], p=0.782) or grade 3/4 complications (OR 3.14 [95% CI 0.76-13], p=0.115).

Conclusions: Unlike reported experience in abdominal malignancies, we observed no significant increase in serious postoperative events in NSCLC patients receiving induction therapy plus surgery, suggesting that it is safe to include Bev in novel treatment strategies.

Table 1. Complications in the Bev-DC Group

Complications	GRADE 1	GRADE 2	GRADE 3
THORACIC			
BP Fistula			2
Intrathoracic Abscess		1	
Empyema			1
Pneumonia		1	
Prolonged Airleak		1	
Hypoxemia		1	
Pneumothorax	1	1	
CARDIAC			
SVT*		2	
Atrial Fibrillation		1	
Pulmonary Embolism		1	
Myocardial Infarction		1	
GI			
GI Bleed			1
Sigmoid Volvulus			1
Ileus		1	
MISC			
Wound Infection			1
Wound Dehiscence			1
Oropharyngeal Infection	1		

**Supraventricular tachycardia*

General Thoracic Posters – Continued

P82

Stereotactic Body Radiosurgery for Treatment of Stage I Non-Small Cell Lung Cancer

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COMMERCIAL RELATIONSHIPS P. J. Gordon: Ownership Interest, ENDOCLEAR LLC

Purpose: To document the efficacy of stereotactic body radiosurgery (SBRT) in the treatment of early stage non-small cell lung cancer, a retrospective review of patients undergoing image-guided frameless stereotactic body radiosurgery was undertaken.

Methods: Between August 2007 and November 2010, 122 patients underwent SBRT for thoracic malignancy. Thirty-four patients were found to have T1N0M0 stage I non-small cell lung cancer after full staging, including work-up with PET/CT scanning and biopsy. They were deemed medically inoperable. These 34 patients had an average age of 78 years with 26 female (76%) and 8 males (24%). Twenty-three patients (68%) required fiducial tracking markers and 11 patients (32%) were treated with computer tracking. The average dose delivered was 5,376 centigray. The mode dose was 6,000 centigray. Nineteen patients (56%) received four fractions and 15 patients (44%) were treated in three fractions. Patients were followed up every 3 months utilizing alternating PET/CT scans and CT scans to assess local control of the treated tumor along with history and physical exam. After 24 months, CT scans were performed every 6 months.

Results: Follow-up ranged from 7 to 67 months with a mean follow-up of 35.9 months. In follow-up, 19 patients (56%) were alive and 15 patients (44%) were dead. In six of 34 patients (82%), the primary tumor was smaller or unchanged in size and in six of 34 patients (18%), the tumor had enlarged. In seven of the 34 patients (21%), tumor progressed in hilar or mediastinal region outside the treatment area. In 12 of 34 patients (35%), tumor recurred regionally or distantly. In follow-up or at time of death, there was no evidence of tumor in 19 of 34 patients (56%), while 15 of 34 patients (44%) had either local, regional, or distant treatment failure.

Conclusions: Local control was excellent with stereotactic body radiotherapy for stage I non-small lung cancer, but regional recurrence remains a concern in follow-up.

Notes

General Thoracic Posters – Continued

P83

Preoperative Maximum Oxygen Consumption Is Associated With Prognosis Following Pulmonary Resection in Stage I Non-Small Cell Lung Cancer Patients

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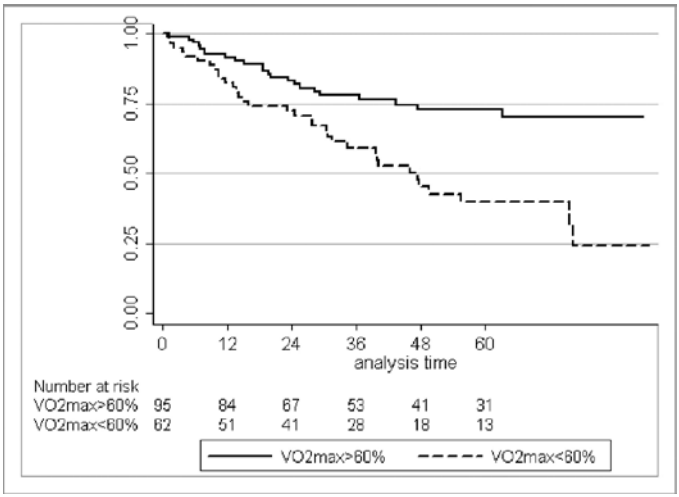
COMMERCIAL RELATIONSHIPS A. Brunelli: Consultant/Advisory Board, Medela

Purpose: Maximum oxygen consumption (VO2max) has been shown to be a useful test for preoperative risk stratification. The objective of this investigation was to evaluate whether this parameter could also be a reliable prognostic factor after lung resection for pathological stage I NSCLC.

Methods: Observational analysis was conducted on 157 patients submitted to pulmonary lobectomy or segmentectomy for pathological stage I (T1 or T2-N0 only) NSCLC, with preoperative measurement of VO2max and complete follow-up (2006-2011). Survival was calculated by the Kaplan-Meier method. The log-rank test was used to assess differences in survival between groups. Patients alive at the end of the study were censored. The relationship between survival and several baseline and clinical variables was determined by Cox's multivariate analysis.

Results: Median follow-up was 40 months. The average preoperative VO2max was 16.1 ml/kg/min and 69% of predicted value. Threshold analysis revealed a value of 60% as the best VO2max cutoff associated with survival. Sixty-two (40%) patients had a VO2max <60%. Median and 5-year overall survival of patients with preoperative VO2max >60% was significantly longer than those with VO2max <60% (median not reached vs 48 months; 73% vs 40%, p=0.0004) (figure). Cox regression model showed that age >70 years (p=0.005, HR 2.3) and VO2max <60% (p=0.001, HR 2.4) were independent prognostic factors associated with overall survival. Cancer-specific survival was also longer in patients with VO2max >60% (81% vs 61%, p=0.01). In pT1 stage patients, those with VO2max >60% lived significantly longer than those with VO2max <60% (82% vs 41%, p=0.007). In pT2 stage, this difference was not significant (68% vs 40%, p=0.2).

Conclusions: Exercise tolerance may influence physiologic outcomes associated with cancer that can potentially affect survival. Physical rehabilitation aimed at improving exercise tolerance can possibly improve long-term prognosis after lung cancer surgery.


1.00
0.75
0.50
0.25
0.00
0
12
24
36
48
60
analysis time
Number at risk
VO2max>60% 95 84 67 53 41 31
VO2max<60% 62 51 41 28 18 13
VO2max>60%
VO2max<60%

Notes

General Thoracic Posters – Continued

P84

Autologous Pulmonary Vein Conduit for Reconstruction of the Pulmonary Artery: Mid-term Results of a Novel Technique

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Purpose: The use of an autologous pulmonary vein conduit for reconstruction of the pulmonary artery (PA) has been first described in 2009, but to date, only two case reports appeared and no mid- and long-term results have been reported. We present the first case series with mid-term follow-up.

Methods: Between December 2009 and December 2012, nine patients undergoing PA sleeve resection for centrally located lung cancer received reconstruction by this technique. Three of these patients underwent induction chemotherapy. The venous graft was obtained from the proximal extra-parenchymal portion of the superior pulmonary vein and was sutured to the proximal and distal PA stumps with the standard anastomotic technique (Figure 1).

Results: All nine patients underwent left upper lobectomy with sleeve resection of the PA without associated bronchoplasty. Postoperative morbidity rate was 33% (one chylothorax, one atrial fibrillation, and one parenchymal atelectasis). No complications related to the reconstructive procedure occurred. There was no postoperative mortality. Complete patency of the reconstructed PA was showed in all patients by the postoperative contrast computed tomography performed every 6 months. All patients were alive at a mean follow-up of 32.6 ± 12.4 months (range 6-42). Tumor recurrence was observed in two patients (one local, one systemic). Median survival was 38 months. Median disease-free survival was 33 months.

Conclusions: The pulmonary vein graft is an ideal option for the conduit reconstruction of the PA. It provides adequate tissue characteristics and structural similarity with the arterial wall. This technique is safe and is supported by good mid-term results.

P85

A Simple Method for Detecting Aggressive Stage I Lung Cancer Using Computed Tomography (CT) and Positron Emission Tomography (PET)-CT

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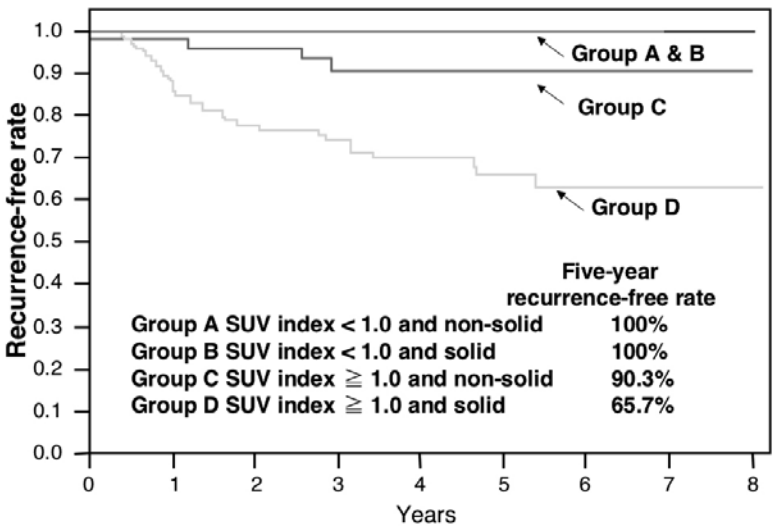
Purpose: The indications for limited resection in patients with small tumors remain controversial. The aim of this study was to explore chest computed tomography (CT) and positron emission tomography (PET)-CT findings as they relate to outcomes after lung cancer surgery, identifying candidates for limited resection.

Methods: Between May 2004 and March 2013, 716 lung cancer patients underwent surgery at our institution; 315 clinical stage I patients received chest CT and PET-CT for analysis. Four groups were defined by tumor solidity on CT and the standardized uptake value (SUV) index on PET-CT (tumor maximum SUV/mean right liver-lobe SUV). Invasive lung cancer was defined by lymph node metastasis, lymphovascular invasion, or pleural invasion. We analyzed the association between radiological findings and both pathological invasiveness and postoperative outcome.

Results: The median follow-up time was 31 months. Group A (n=84) had an SUV index <1.0 and non-solid tumors, group B (n=24) had an SUV index <1.0 and solid tumors, group C (n=54) had an SUV index ≥1.0 and non-solid tumors, and group D (n=153) had an SUV index ≥1.0 and solid tumors. Invasive lung cancer was found in 2/84 patients (2.4%) in group A, 1/24 (4.2%) in B, 13/54 (24.1%) in C, and 58/153 (37.9%) in D; the ratio increased with progression in radiological findings (p<0.01). The 5-year recurrence-free rate was 100% in groups A and B, 90.3% in C, and 65.7% in D (p<0.01). Cancer-specific survival was 100% in A and B, 94.6% in C, and 81.7% in D (p<0.01).

Conclusions: Non-solid tumors with a low SUV index are less likely to demonstrate invasiveness and recurrence. These patients have a good prognosis and may be candidates for limited resection.



General Thoracic Posters – Continued

P86

A Prospective Trial Comparing Pain and Quality of Life Measures After Anatomic Lung Resection Using Either Thoracoscopy or Thoracotomy

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Purpose: Minimally invasive techniques (VATS) for anatomic lung resection have been held to result in better quality of life (QOL) and less postoperative pain than open approaches. However, to date, there have been few prospective studies comparing the two approaches. We performed a prospective cohort study comparing QOL and pain scores in the first 12 months after anatomic resection by VATS or open techniques.

Methods: Patients with clinical stage I lung cancer scheduled to undergo anatomic lung resection were prospectively enrolled from May 2009 to April 2012. The brief pain index (BPI) and SF-36 Health Survey were obtained perioperatively and at four time points over 12 months. For QOL, two parallel sets of longitudinal, intention-to-treat analyses were performed (physical component score [PCS] and mental component score [MCS]). Mixed effects models were used to longitudinally model the effect of treatment on QOL.

Results: Overall, 74 patients underwent thoracotomy and 132 VATS (including 19 patients who were converted from VATS to thoracotomy and analyzed in the VATS arm); 40 and 80 patients completed 12 months of surveys, respectively. Baseline characteristics were similar in the two cohorts. We found that PCS and BPI scores were similar in the two groups throughout the 12 months and that MCS was consistently worse in the VATS group (Table 1).

Conclusions: Patient-reported QOL and pain scores after VATS were similar to or worse than those after thoracotomy in the first postoperative year.

Adjusted Means and Proportions of Quality of Life and Pain Scores

Test, time point	Group		P
	VATS	Thoracotomy	
MCS			
Post-op	43.6	44.9	0.149
4 months	44.6	46.1	0.036
8 months	45.8	47.6	0.024
12 months	47.2	49.1	0.08
PCS			
Post-op	44.5	45.7	0.85
4 months	45.5	45.7	0.86
8 months	46.7	46.9	0.89
12 months	48	48.1	0.93
BPI (average ≥4)			
Post-op	16%	28%	0.17
4 months	16%	24%	0.37
8 months	16%	18%	0.82
12 months	16%	13%	0.69

Notes

General Thoracic Posters – Continued

P87

Mid-esophageal and Epiphrenic Diverticula: A 15-Year Experience Using Minimally Invasive Approaches for Surgical Management

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COMMERCIAL RELATIONSHIPS J. D. Luketich: Research Grant, Accuray Incorporated, Precision Therapeutics, Inc, Torex; Speakers Bureau/Honoraria, Accuray Incorporated, Covidien, Stryker; Ownership Interest, Johnson & Johnson; A. Pennathur: Research Grant, Accuray Incorporated

Purpose: Mid-esophageal and epiphrenic esophageal diverticula are uncommon. Unfortunately, little consensus exists regarding the management of these patients. Indications for repair, optimal approach, and procedures included are a few of the controversies that exist. We currently favor a minimally invasive approach for patients with symptomatic diverticula. However, a variety of approaches have been used. The purpose of the current study was to review the results of a relatively large cohort of patients with these rare diverticula that were treated surgically.

Methods: Sixty patients over a 15-year period underwent surgical treatment of symptomatic diverticula. Median age was 70.2 years. Diverticula were located in the distal third of the esophagus (53/60), mid-esophagus (6/60), and both locations (1/60). Of those patients with the necessary information, 96% (43/45) had some form of esophageal motility disorder. The most common symptoms were dysphagia (46/60), regurgitation (37/60), and heartburn (23/60).

Results: Approaches included VATS (34/60), laparoscopic (19/60), and combined laparoscopic/VATS (7/60). Conversion to an open procedure occurred in four patients (one laparotomy, three thoracotomies). Procedures performed included diverticulectomy/myotomy (29/60), diverticulectomy/myotomy/fundoplication (23/60), and diverticulectomy alone (7/60). Complications occurred in 23 patients (38%). Postoperative leaks occurred in 12 patients, with only 2 requiring operative intervention. In-hospital/30-day mortality was 1.7% (1/60).

Conclusions: Minimally invasive approaches to mid-esophageal and epiphrenic diverticula are feasible in the hands of experienced esophageal surgeons. However, these operations are not without risk. The optimal approach and procedures performed should be determined on an individualized basis and requires a thorough preoperative investigation to best understand the cause of the diverticula.

Complications

Esophageal Leak	7 (12%)
Requiring reoperation	2 (3%)
Intraoperative perforation	3 (5%)
Pneumonia	6 (10%)
PE	2 (3%)
Empyema	3 (5%)
Pneumothorx	3 (5%)
MI	1 (2%)
AF	5 (8%)
CHF	3 (5%)
CVA	1 (2%)
ARF	1 (2%)
Readmission	1 (2%)
Reoperation	5 (8%)
Mortality	1 (1.7%)
Morbidity	23 (38%)

Notes

General Thoracic Posters – Continued

P88

Double Lung Transplants Have Significantly Improved Survival Compared to Single Lung Transplants in High LAS Patients

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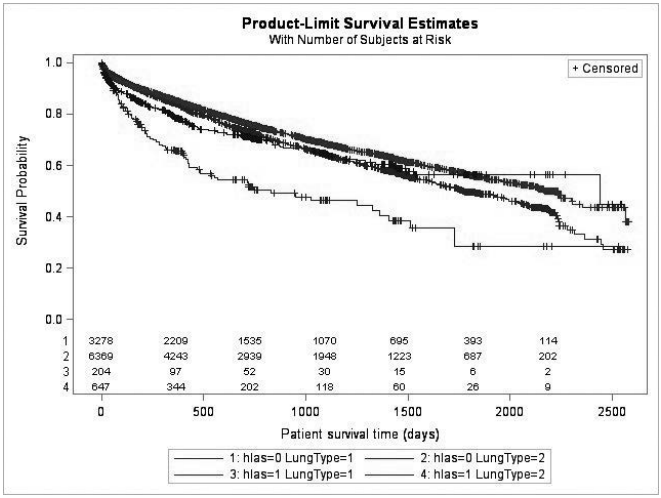
Purpose: To evaluate how survival is affected in patients who receive a single vs double lung transplant in patients that have a high lung allocation score (greater than 75). The LAS is used to determine relative priority in distributing donated lungs for transplantation, taking into account numerous variables, including both pulmonary function and overall health. Historically, double lung transplantation survival rates are higher than single lung transplantation, but in critically ill patients (those with a LAS >75), a single lung transplant, with less associated operative morbidity, could afford a better outcome.

Methods: The UNOS Thoracic Transplant Database for lung transplants from January 2005 to June 2012 was used for analysis. Exclusion criteria for analysis included re-transplants and those with no recorded LAS. SAS version 9.3 was used for statistical analysis.

Results: Within this database, there were 10,596 patients, of which 9,735 had an LAS less than 75 and 861 greater or equal to 75. Kaplan-Meier survival curves stratified by high and low lung allocation scores, and single vs double lung transplants showed a marked decrease in survival ($p<0.001$) in those with a high lung allocation score who received a single lung transplant when compared to those with high lung allocation scores who received a double lung transplant. This was a much greater difference in survival that was present in the low LAS patient population, with a 50% survival dropping to nearly 24 months (Figure 1).

Conclusions: Despite a higher operative morbidity, patients that had a high lung allocation score did substantially better in terms of survival if two lungs were transplanted rather than only one, with a larger difference in survival than for those patients with a lower LAS.



Survival for patients with high (>75) and low (<75) LAS who receive a double or single lung transplant. Condition 1 is single lung, low LAS; Condition 2 is double lung, low LAS; Condition 3 is single lung, high LAS; and Condition 4 is double lung, high LAS.

Notes

General Thoracic Posters – Continued

P89

Hospital Readmission Is Associated With Poor Survival Following Esophagectomy for Esophageal Cancer

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COMMERCIAL RELATIONSHIPS A. Pickens: Speakers Bureau/Honoraria, Ethicon, Inc; D. L. Miller: Consultant/Advisory Board, Ethicon, Inc

Purpose: Hospital readmissions are costly and associated with inferior patient outcomes. There is limited knowledge related to readmissions following esophagectomy for esophageal cancer. Our aim was to determine the impact of hospital readmission following esophagectomy on survival.

Methods: This cohort study utilizes Surveillance, Epidemiology, and End Results-Medicare linked data (2001-2009). Survival, length of stay (LOS), 30-day readmission, and discharge disposition were determined. Claims data were used to calculate modified Charlson comorbidity scores for risk adjustment. Multivariate logistic regression models were created to examine risk factors associated with readmission.

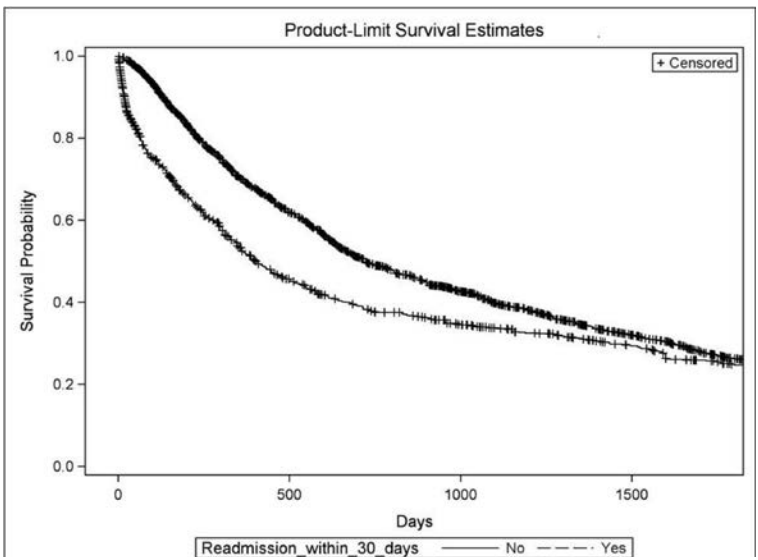
Results: 1,734 patients with esophageal cancer underwent esophagectomy. 80% (1,380) of patients were male and the mean age was 73 years. 71.8% (1,245) of tumors were adenocarcinomas and 68.2% (1,183) were located in the distal esophagus. 31% (542) of patients received induction therapy. Operative approach was transthoracic in 56.6% (984), transhiatal in 40.4% (701), and required complex reconstruction in 2.8% (49). Stage distribution was: Stage I 37.3% (647), Stage II 30.2% (523), Stage III 27.7% (481), and Stage IV 2.4% (41). Median LOS was 13 days, hospital mortality was 9.1% (158), and 30-day readmission rate was 18.0% (204/1,134 patients discharged home). 25.5% (442) were discharged to an institutional care facility. Overall survival was significantly worse for patients who were readmitted (Figure). Risk factors for readmission were a comorbidity score of 3+ and esophagectomy with complex reconstruction (Table).

Conclusions: Hospital readmissions following esophagectomy for esophageal cancer occur frequently and are associated with worse survival. Improved identification of patients at risk for readmission following esophagectomy can inform patient selection, discharge planning, and outpatient monitoring. Optimization of such practices can lead to improved outcomes at reduced cost.

Multivariate Analysis: Risk Factors for 30-Day Readmission

Variable	Odds Ratio	95% CI	p value
Age	1.009	0.976-1.043	0.6
Gender			
Male	1.00		
Female	1.165	0.749-1.810	0.4983
Race			
Caucasian	1.00		
African American	1.892	0.894-4.007	0.0957
Other	1.038	0.374-2.883	0.9430
Stage			
I	1.00		
II	1.235	0.842-1.812	0.2810
III	0.973	0.645-1.467	0.8949
IV	0.336	0.077-1.467	0.1477
Operative approach			
Transthoracic	1.00		
Transhiatal	1.033	0.749-1.425	0.8423
Complex reconstruction	3.053	1.282-7.273	0.0117
Induction therapy			
None	1.00		
Yes	1.280	0.912-1.796	0.1535
Comorbidity Score			
0	1.00		
1	1.121	0.761-1.652	0.5628
2	1.253	0.690-2.274	0.4585
3+	2.030	1.031-3.998	0.0406

Abbreviation: CI = confidence interval



Overall survival: 30-day readmission vs no readmission; p <0.0001 log-rank test

General Thoracic Posters – Continued

P90

Video-Assisted Limited Thoracotomy Surgery for Superior Sulcus Tumors Improves Recovery

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Purpose: To compare the postoperative recovery of patients with superior sulcus tumors following traditional operation or our new VALO (video-assisted limited thoracotomy) hybrid approach.

Methods: Between 1990 and 2013, 19 patients with Pancoast tumors were operated on by the authors. Patient data were retrospectively evaluated. All patients underwent induction chemoradiation followed by surgery. Conventional open anterior or posterior approaches were used in 10 patients up to 2004. Hybrid VALO surgical resection was performed in nine consecutive patients thereafter. Hilar and fissure disconnection, lymphadenectomy, and chest wall preparation were performed using VATS technique. Ribs resection and removal of the specimen were done through a limited anterior or posterior approach as determined by tumor location during VATS.

Results: There was no mortality in either group. Two patients from the thoracotomy group required mechanical ventilation due to pneumonia in the operated side. There was no major morbidity in the hybrid VALO group. Operative time was similar. Average length of hospital stay in the hybrid group (9 ± 2 days) was significantly shorter than in the thoracotomy group (16 ± 4). The short- and long-term average pain scores were significantly lower in the VALO group. Incidence of chronic pain was 11% and 50% in the hybrid VALO and thoracotomy group accordingly. Five-year survival for node negative patients was similar.

Conclusions: Hybrid VALO is a feasible and safe technique for treatment of superior sulcus tumors following induction chemoradiation. It carries less morbidity, recovery of patients is faster, and incidence of severe postthoracotomy pain syndrome is significantly lower. On the basis of these data, we suggest that centers experienced with VATS lobectomy consider hybrid VALO as the procedure of choice for superior sulcus tumors.

Notes

General Thoracic Posters – Continued

P91

Outcomes After Treatment of Locally Advanced (T3N0-2) Non-Small Cell Lung Cancer: A Population-Based Study of 17,378 Patients

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COMMERCIAL RELATIONSHIPS T. A. D'Amico: Consultant/Advisory Board, Scanlan International

Purpose: We examined treatment patterns and outcomes for locally advanced (T3N0-2) non-small cell lung cancer (NSCLC) in a population-based database.

Methods: Factors predicting the use of surgery for patients with T3N0-2M0 NSCLC in the Surveillance, Epidemiology, and End Results (SEER) database from 1988 to 2010 were assessed using a multivariable logistic regression model. Survival was analyzed using the Kaplan-Meier approach and Cox proportional hazard models.

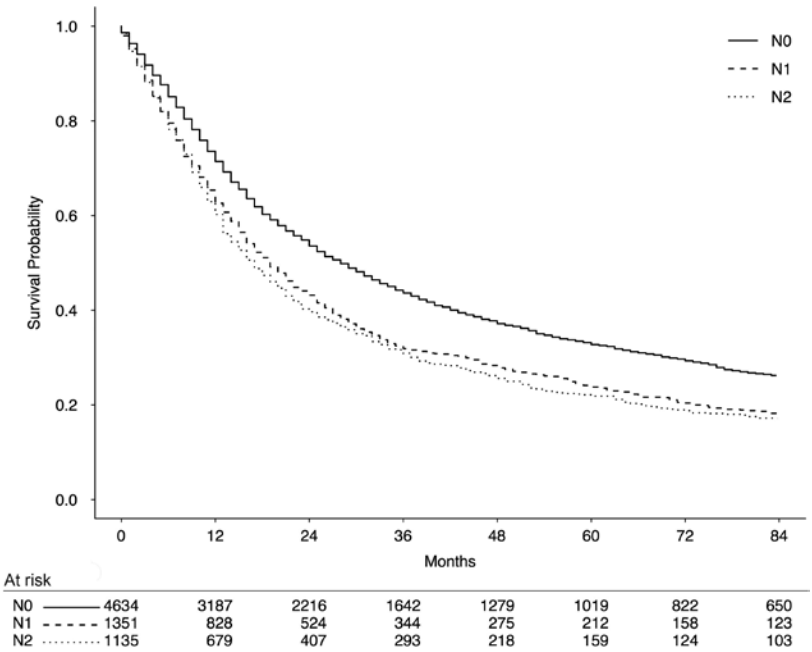
Results: Of 17,378 patients identified for study inclusion, surgery was used in 7,120 (40.7%) overall, and in 54% (4,634 of 8,597) of T3N0 patients, 59% (1,351 of 2,304) of T3N1 patients, and 18% (1,135 of 6,477) of T3N2 patients (Table). Older age (Odds Ratio [OR] 0.60 per decade, $p<0.001$), black race (OR 0.57, $p<0.001$), being unmarried (OR 0.61, $p<0.001$), male sex (OR 0.86, $p<0.001$), and N2 nodal disease (OR 0.17, $p<0.001$) predicted non-surgical management. Surgical patients had better 5-year survival than non-surgical patients (29.3% vs 6.8%, $p<0.001$). Sublobar resection (Hazard Ratio [HR] 1.22, $p<0.001$), pneumonectomy (HR 1.10, $p=0.02$), nodal disease (N1 HR 1.35, $p<0.001$, N2 HR 1.50, $p<0.001$), and advanced age (HR 1.03/year, $p<0.001$) predicted worse survival in patients who had surgery. In separate analyses stratified by nodal status, surgery was associated with improved survival for N0 (HR 0.39, $p<0.001$), N1 (HR 0.53, $p<0.001$), and N2 disease (HR 0.50, $p<0.001$). Surgery was significantly more beneficial in patients with N0 disease compared to those with N1 or N2 disease ($p<0.001$). Patients with N1 and N2 disease had similar survival after surgery (Figure).

Conclusions: Surgery is associated with better survival than nonsurgical treatment for potentially resectable T3 NSCLC even when nodal disease is present, but is used in a minority of patients. Additional research is needed to ensure that surgery is being appropriately considered for these patients.

Patient, Tumor, and Treatment Characteristics Stratified by the Use of Surgery

Characteristic	No surgery (n = 10,258)	Surgery (n = 7,120)	p-value
Age (yrs)	70 (62,77)	67 (58,73)	< 0.001
Female sex	3,820 (37.2%)	2,734 (38.4%)	0.13
Race			< 0.001
White	8,315 (81.1%)	6,049 (85.0%)	
Black	1,415 (13.8%)	643 (9.0%)	
Other	528 (5.1%)	428 (6.0%)	
Marital status			< 0.001
Married	5,242 (51.1%)	4,414 (62.0%)	
Not married	4,657 (45.4%)	2,485 (34.9%)	
Unknown	359 (3.5%)	221 (3.1%)	
N-stage			< 0.001
N0	3,963 (38.6%)	4,634 (65.1%)	
N1	953 (9.3%)	1,351 (19.0%)	
N2	5,342 (52.1%)	3,290 (47.3%)	
Radiation therapy	7,342 (73.1%)	3,290 (47.3%)	

Categorical variables reported as proportions and compared using Pearson's chi square test. Continuous variables reported as median (IQR) and compared using Student's t-test. P-values of <0.05 considered statistically significant.



Kaplan–Meier survival for patients undergoing surgery, stratified by nodal status

General Thoracic Posters – Continued

P92

Patency of Grafts After Total Resection and Reconstruction of the Superior Vena Cava: Postoperative Antithrombotic Agents Are Not Always Necessary

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Purpose: Resection and reconstruction of the superior vena cava (SVC) is one of the procedures needed for complete resection of advanced lung cancer. However, the optimal intraoperative decision and postoperative management for this procedure remains unknown. To clarify the optimal management, we investigated the relationship between intraoperative management and postoperative patency of the grafts.

Methods: Between January 2008 and May 2013, 1,897 patients with lung cancer and/or mediastinal tumor underwent surgical resection at our institute. Among them, 13 patients underwent combined resection and replacement with vascular graft of the SVC. Postoperative tests for the patency of the grafts with enhanced computed tomography were available for 12 patients. Men were 10 (83%). Ages ranged from 39 to 70 years, with median of 61 years. The SVC systems were replaced with ePTFE grafts for all cases and reconstructed with two vascular grafts in nine patients and single in three, including one Y-shape graft. Postoperative antithrombotic agents were not used postoperatively. Median follow-up time for patients ranged 7 to 1,613 days with a median of 474.

Results: Among 21 grafts, three (14%) were occluded. There were no acute occlusions resulting in acute SVC syndrome. Occlusion was observed in one (8%) right-side and two (22%) left-side grafts. The occluded right-side graft was bypassed between subclavian vein, which was outside the thoracic cavity, and the proximal orifice of the SVC. Thus, there were no occlusions for right-side grafts which were anastomosed inside thoracic cavity.

Conclusions: Revascularization of the left innominate vein tends to result in occlusion of the ePTFE grafts rather than right side. Postoperative antithrombotic agents are not always necessary to prevent the acute graft occlusion. Right-side intrathoracic revascularization is recommended for the reconstruction of the SVC systems whenever possible.

P93

Spontaneous Pneumomediastinum: An Extensive Workup Is Not Required

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Purpose: Spontaneous pneumomediastinum is a rare entity usually caused by alveolar rupture and air tracking along the tracheobronchial tree. Despite its benign nature, an extensive workup is often undertaken to exclude hollow viscus perforation. The purpose of this study was to review our experience with this condition and examine the optimal management strategy.

Methods: We conducted a retrospective review of all radiographic pneumomediastinum cases at a tertiary university-based hospital over a 6-year period (2006-2011). The main outcome measures included length of hospital stay, mortality, and need for investigative procedures.

Results: Forty-nine patients were identified, including 26 male (53%). Mean age was 19 ± 9 years. Chest pain was the most common presenting symptom (65%), followed by dyspnea (61%) and neck pain (34%). Forceful coughing (34%) or vomiting (20%) were the most common eliciting factors, while no precipitating events were identified in 46% of patients. Computed tomography was performed in 38 patients (78%) and showed a pneumomediastinum that was not seen on chest roentogram in nine patients. An esophagogram was performed in 17 patients (35%) and was invariably negative for a leak. No invasive procedure was performed except in two patients with significant neck complaints who underwent normal laryngoscopies. Thirty-eight patients (78%) were hospitalized for a mean of 1.8 days ± 2.6 days. Only one patient required intubation for a severe asthma attack. No mortality was recorded.

Conclusions: Spontaneous pneumomediastinum is a benign entity and rarely correlates with true esophageal perforation. Additional investigation with an esophagogram or other invasive procedure should be performed selectively with the aim of expediting the patient's care. The prognosis is excellent with conservative management and the risk of recurrence is low.

General Thoracic Posters – Continued

P94

Invasive Thymoma Disseminated Into the Pleural Cavity: Mid-term Result of Surgical Resection

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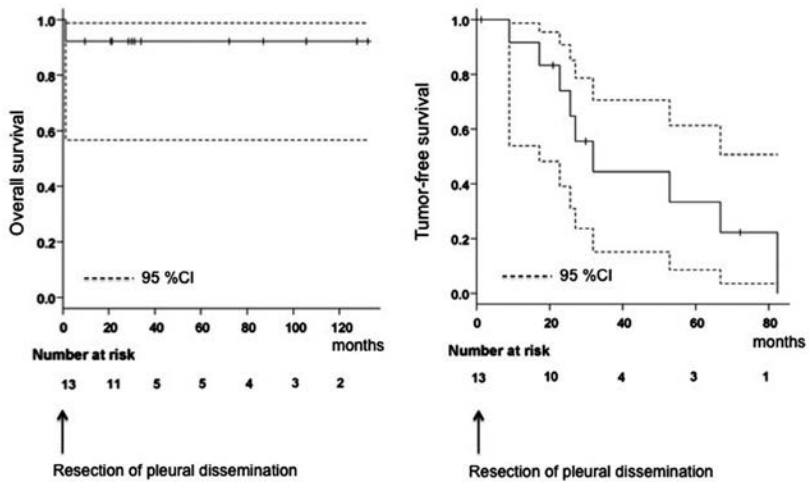
Purpose: The optimal strategy for pleural dissemination of advanced thymoma remains controversial, while a potential benefit from macroscopic clearance of dissemination has been reported. In this study, we reviewed our mid-term results of surgical resection of pleural dissemination of invasive thymoma.

Methods: Data of patients with pleural dissemination synchronously or metachronously to primary invasive thymoma who underwent surgical resection from 1991 to 2012 at our institute were retrospectively reviewed.

Results: Out of 136 thymoma patients who underwent surgery during the study period, 13 consecutive patients with pleural dissemination (male: 4, female: 9 / synchronous: 7, metachronous: 6 / B1: 3, B2: 6, B3: 4 / preoperative chemotherapy: 2, radiotherapy: 1 / postoperative chemotherapy: 2, radiotherapy: 2, chemoradiotherapy: 2) with a median age of 49 years (range: 27-78 years) at the time of dissemination resection were identified. No patients were associated with hematogenous metastases. Operative procedures were thorough resection of visible disseminated nodules in 11 patients and extrapleural pneumonectomy (EPP) in two. The median number of resected nodules was six (range: 1-52). Median follow-up was 948 days (range: 38-4025). One patient died of postoperative bleeding, but there were no tumor-related deaths during the study period. Pleural recurrence was found in nine cases, including two EPP cases, and among them, three underwent repeated resection. The overall survival and the recurrence-free survival ratio at 5 years were 92.3% (95% confidence interval: 56.6% to 98.9%) and 33.3% (95% confidence interval: 8.49% to 61.3%), respectively (Figure). Five, including two repeated resection cases, remained tumor-free status at the final observation.

Conclusions: Resection of pleural dissemination of invasive thymoma can be performed in selected patients and may offer an optimal local control in multimodality strategy.



P95
Emergent Esophagectomy for Esophageal Perforations: A Safe Option

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COMMERCIAL RELATIONSHIPS R. M. Reddy: Research Grant, GlaxoSmithKline

Purpose: Esophageal perforation is a rare injury with little understood about long-term outcomes. Treatment ranges from observation to esophagectomy. The aim of this study was to determine if patients undergoing esophagectomy for an acute esophageal rupture have higher morbidity and mortality than those who have surgery in an elective setting.

Methods: We performed a retrospective review of billing data and a prospective esophagectomy database from a single institution from 1977 to 2013. Patient charts were reviewed for surgical treatment, complication rates, length of stay (LOS), and long-term survival.

Results: 3,015 patients received an esophagectomy in elective and emergent settings. Ninety were for acute injuries (52 for benign and 38 for malignant causes). There was a longer median LOS associated with emergent esophagectomy compared to elective esophagectomy (13 days vs 10 days, p <0.0001), and the complication rates were higher in the emergent group (51.1% vs 35.6%, p=0.003). There was a significant difference in 30-day survival (92.7% in emergent group vs 97.3% in non-emergent group, p=0.035), but at 1 year and 5 years, there was no difference in survival (74.0% vs 75.2%, p=0.92 and 37.0% vs 35.8%, p=0.96 respectively). Within the emergent group, there was no difference in 30-day or 6-month survival based on benign or malignant causes, but a significant difference was seen at 1-year (85% in benign vs 65% in malignant, p=0.025), and 5 year-survival (72% vs 21%, p<0.001). Table 1 shows survival in the emergent group based on staging.

Conclusions: This is the largest published study of esophagectomy for acute injury. Esophagectomy is a viable and safe option for treatment of esophageal rupture with a slight increase in morbidity compared to elective esophagectomy. Short-term survival is decreased in the emergent setting, possibly due to concurrent illness at presentation, but long-term outcomes, especially in the benign group, are excellent.

Esophagectomies in Emergent Settings by Staging

	# patients	Median LOS	Complication Rate	30 day survival	1 year survival	5 year survival
Benign	52	13.0	48.1%	92.3%	85.4%	72.4%
Malignant	38	12.5 (p=0.131)	55.3% (p=0.65)	94.7% (p=0.982)	64.9%* (p=0.025)	21.2%* (p<0.001)
Stage 0	1	26	100%	100%	No data	No data
Stage I	4	12.5 (p=0.545)	75% (p=0.604)	100% (p=0.667)	100% (p=0.953)	66.7% (p=0.643)
Stage II	12	13.0 (p=0.464)	58.3% (p=0.751)	91.7% (p=0.598)	75.0% (p=0.667)	36.4% (p=0.083)
Stage III	14	9.0 (p=0.069)	50% (p=0.862)	100% (p=0.660)	57.1% (p=0.056)	0%* (p<0.001)
Stage IV	4	9.5 (p=0.056)	25% (p=0.71)	100% (p=0.667)	50.0% (p=0.267)	33.3% (p=0.461)

** p<0.05; staging data was available for 35 out of 38 emergent esophagectomy patients with known cancer.*

General Thoracic Posters – Continued

P96

Mediastinoscopy vs Endobronchial Ultrasound: A Cost and Waste Analysis

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University of Minnesota, Minneapolis

Purpose: Mediastinoscopy (MED) and endobronchial ultrasound with transbronchial needle aspiration (EBUS-TBNA) have similar diagnostic performance for mediastinal lymph node sampling (MLNS). The threatened financial and environmental sustainability of our health care system mandate that surgeons consider cost and environmental impact in clinical decision making of similarly effective procedures. We performed a single-institution cost analysis and medical waste comparison of MED vs EBUS-TBNA for MLNS to raise awareness of the financial and environmental implications of our practices.

Methods: We retrospectively reviewed outpatients who underwent MLNS under general anesthesia in the operating room with MED, EBUS-TBNA, or both (September 2007-December 2009). We constructed a system cost analysis (US Dollars [$]) exclusive of physician fees. We analyzed direct costs based on actual hospital charges, calculated expected payment using a decision support model, and reported profit margins (modeled expected payment minus direct costs). Our waste comparison was measured in pounds (lbs) of solid waste per case.

Results: We performed MLNS in 148 patients (89 EBUS-TBNA; 39 MED; 20 both). Total direct costs were lower for MED ($2,356) vs EBUS-TBNA ($2,503) while expected payment was greater (MED, $3,449; EBUS-TBNA, $3,249), the profit margin was $347 greater for MED. The amount of solid waste for each MED was 6.1 lbs vs 1.4 lbs for EBUS-TBNA.

Conclusions: Mediastinoscopy is more cost-effective than EBUS-TBNA in the operating room setting, but MED generates four times the solid waste of EBUS-TBNA. The cost-effectiveness of EBUS-TBNA may improve by selective performance in the endoscopy suite, and surgical pack revision can reduce the amount of solid waste generation from MED. We believe that this comparison sets the stage for further sophistication of our clinical decision making, taking into consideration some of the major threats to our current health care system.

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MITRACLIP CLIP DELIVERY SYSTEM INDICATION FOR USE

The MitraClip Clip Delivery System is indicated for the percutaneous reduction of significant symptomatic mitral regurgitation (MR ≥ 3+) due to primary abnormality of the mitral apparatus [degenerative MR] in patients who have been determined to be at prohibitive risk for mitral valve surgery by a heart team, which includes a cardiac surgeon experienced in mitral valve surgery and a cardiologist experienced in mitral valve disease, and in whom existing comorbidities would not preclude the expected benefit from reduction of the mitral regurgitation.

CONTRAINDICATIONS

The MitraClip Clip Delivery System is contraindicated in DMR patients with the following conditions:

- Patients who cannot tolerate procedural anticoagulation or post procedural anti-platelet regimen
- Active endocarditis of the mitral valve
- Rheumatic mitral valve disease
- Evidence of intracardiac, inferior vena cava (IVC) or femoral venous thrombus

WARNINGS

- **DO NOT use MitraClip outside of the labeled indication. Treatment of non-prohibitive risk DMR patients should be conducted in accordance with standard hospital practices for surgical repair and replacement.**
- MitraClip is intended to reduce mitral regurgitation. The MitraClip procedure is recommended to be performed when an experienced heart team has determined that reduction of MR to ≤2+ is reasonably expected following the MitraClip. If MR reduction to ≤2+ is not achieved, the benefits of reduced symptoms and hospitalizations, improved quality of life, and reverse LV remodeling expected from MitraClip may not occur.
- The MitraClip Device should be implanted with sterile techniques using fluoroscopy and echocardiography (e.g., transesophageal [TEE] and transthoracic [TTE]) in a facility with on-site cardiac surgery and immediate access to a cardiac operating room.
- Read all instructions carefully. Failure to follow these instructions, warnings and precautions may lead to device damage, user injury or patient injury. Use universal precautions for biohazards and sharps while handling the MitraClip System to avoid user injury.
- Use of the MitraClip should be restricted to those physicians trained to perform invasive endovascular and transseptal procedures and those trained in the proper use of the system.
- The Clip Delivery System is provided sterile and designed for single use only. Cleaning, re-sterilization and/or reuse may result in infections, malfunction of the device or other serious injury or death.
- Inspect all product prior to use. DO NOT use if the package is opened or damaged.

PRECAUTIONS

- Patient Selection:
  - Prohibitive risk is determined by the clinical judgment of a heart team, including a cardiac surgeon experienced in mitral valve surgery and a cardiologist experienced in mitral valve disease, due to the presence of one or more of the following documented surgical risk factors:
    - 30-day STS predicted operative mortality risk score of
      - ≥8% for patients deemed likely to undergo mitral valve replacement or
      - ≥6% for patients deemed likely to undergo mitral valve repair
    - Porcelain aorta or extensively calcified ascending aorta.
    - Frailty (assessed by in-person cardiac surgeon consultation)
    - Hostile chest
    - Severe liver disease / cirrhosis (MELD Score >12)
    - Severe pulmonary hypertension (systolic pulmonary artery pressure >2/3 systemic pressure)
    - Unusual extenuating circumstance, such as right ventricular dysfunction with severe tricuspid regurgitation, chemotherapy for malignancy, major bleeding diathesis, immobility, AIDS, severe dementia, high risk of aspiration, internal mammary artery (IMA) at high risk of injury, etc.
  - Evaluable data regarding safety or effectiveness is not available for prohibitive risk DMR patients with an LVEF < 20% or an LVESD > 60mm. MitraClip should be used only when criteria for clip suitability for DMR have been met.
- The major clinical benefits of MitraClip are reduction of MR to ≤2+ resulting in reduced hospitalizations, improved quality of life, reverse LV remodeling and symptomatic relief in patients who have no other therapeutic option. No mortality benefit following MitraClip therapy has been demonstrated.
- The heart team should include a cardiac surgeon experienced in mitral valve surgery and a cardiologist experienced in mitral valve disease and may also include appropriate physicians to assess the adequacy of heart failure treatment and valvular anatomy.
- The heart team may determine an in-person surgical consult is needed to complete the assessment of prohibitive risk. The experienced mitral valve surgeon and heart team should take into account the outcome of this surgical consult when making the final determination of patient risk status.
- For reasonable assurance of device effectiveness, pre-procedural evaluation of the mitral valve and underlying pathologic anatomy and procedural echocardiographic assessment are essential.
- The inside of the outer pouch is not a sterile barrier. The inner pouch within the outer pouch is the sterile barrier. Only the contents of the inner pouch should be considered sterile. The outside surface of the inner pouch is NOT sterile.
- Note the "Use by" date specified on the package.

POTENTIAL COMPLICATIONS AND ADVERSE EVENTS

The following ANTICIPATED EVENTS have been identified as possible complications of the MitraClip procedure.

Allergic reaction (anesthetic, contrast, Heparin, nickel alloy, latex); Aneurysm or pseudo-aneurysm; Arrhythmias; Atrial fibrillation; Atrial septal defect requiring intervention; Arterio-venous fistula; Bleeding; Cardiac arrest; Cardiac perforation; Cardiac tamponade/ Pericardial Effusion; MitraClip erosion, migration or malposition; MitraClip Device thrombosis; MitraClip System component(s) embolization; Coagulopathy; Conversion to standard valve surgery; Death; Deep venous thrombus (DVT); Dislodgement of previously implanted devices; Drug reaction to anti-platelet/ anticoagulation agents/contrast media; Dyspnea; Edema; Emboli (air, thrombus, MitraClip Device); Emergency cardiac surgery; Endocarditis; Esophageal irritation; Esophageal perforation or stricture; Failure to deliver MitraClip to the intended site; Failure to retrieve MitraClip System components; Fever or hyperthermia; Gastrointestinal bleeding or infarct; Hematoma; Hemolysis; Hemorrhage requiring transfusion; Hypotension/hypertension; Infection and pain at insertion site; Infection and pain at incision site; Injury to mitral valve complicating or preventing later surgical repair; Lymphatic complications; Mesenteric ischemia; Mitral stenosis; Mitral valve injury; Multi-system organ failure; Myocardial infarction; Nausea/vomiting; Peripheral ischemia; Prolonged angina; Prolonged ventilation; Pulmonary congestion; Pulmonary thrombo-embolism; Renal insufficiency or failure; Respiratory failure/atelectasis/pneumonia; Septicemia; Single leaflet device attachment (SLDA); Skin injury or tissue changes due to exposure to ionizing radiation; Stroke or transient ischemic attack (TIA); Urinary tract infection; Vascular trauma, dissection or occlusion; Vessel spasm; Vessel perforation or laceration; Worsening heart failure; Worsening mitral regurgitation; Wound dehiscence

Rx ONLY

STEERABLE GUIDE CATHETER INDICATION FOR USE

The Steerable Guide Catheter is used for introducing various cardiovascular catheters into the left side of the heart through the interatrial septum.

CONTRAINDICATIONS

- Patients who cannot tolerate procedural anticoagulation or post procedural anti-platelet regimen
- Evidence of intracardiac, inferior vena cava (IVC) or femoral venous thrombus.

WARNINGS

- Read all instructions carefully. Failure to follow these instructions, warning and precautions may lead to device damage, user injury or patient injury. Use universal precautions for biohazards and sharps to avoid user injury.
- Use the Steerable Guide Catheter with sterile techniques using fluoroscopy and echocardiography (e.g., transesophageal [TEE] and transthoracic [TTE]) in a facility with on-site cardiac surgery and immediate access to a cardiac operating room.
- The Steerable Guide Catheter is designed for single use only. Cleaning, re-sterilization and/or reuse may result in infections, malfunction of the device or other serious injury or death.
- Patients with the following considerations in whom the Steerable Guide Catheter is used may have an increased risk of having a serious adverse event which may be avoided with preoperative evaluation and proper device usage.
  - Previous interatrial septal patch or prosthetic atrial septal defect (ASD) closure device which could result in significant difficulty in visualization or technical challenges during transseptal puncture and/or introducing the SGC into the left atrium.
  - Known or suspected unstable angina or myocardial infarction within the last 12 weeks could increase the procedural morbidity and mortality, due to increased hemodynamic stress secondary to general anesthesia.
  - Patients with active infection have an increased risk of developing an intraoperative and/or postoperative infection, such as sepsis or soft tissue abscess.
  - Known or suspected left atrial myxoma could result in thromboembolism and tissue injury due to difficulty with device positioning.
  - Recent cerebrovascular event (CVA) may increase the procedural morbidity associated with a transcatheter intervention, such as recurrent stroke.

PRECAUTIONS

NOTE the "Use by" date specified on the package.

Inspect all product prior to use. Do not use if package is opened or damaged.

The inside of the outer pouch is not a sterile barrier. The inner pouch within the outer pouch is the sterile barrier. Only the contents of the inner pouch should be considered sterile. The outside surface of the inner pouch is NOT sterile.

Prior to use, please reference the Instructions for Use at www.abbottvascular.com/ifu for more information on indications, contraindications, warnings, precautions, and adverse events.

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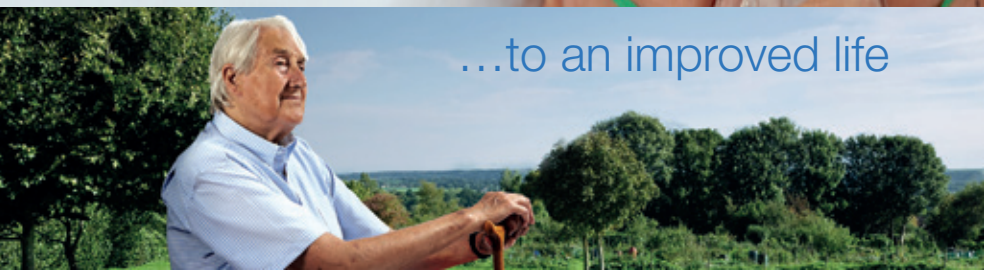
Now Available in the United States

MitraClip®

Percutaneous Mitral Valve Repair



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See Important Safety Information On Next Page.

Now available in the United States, MitraClip therapy offers a treatment option with an excellent safety profile[1] to significant, symptomatic, degenerative mitral regurgitation patients who are at prohibitive risk for surgery. Be a part of this change that is leading to improved quality of life.[1,2]

Contact Abbott Vascular. Your local representative will provide training and support to help you bring this first-in-class therapy to your heart valve center.

Valves repaired. Lives improved.

References: 1. MitraClip Clip Delivery System Instructions for Use. **2.** Lim S, et al. Effectiveness of Transcatheter Mitral Valve Repair for Degenerative Mitral Regurgitation in High Surgical Risk Patients. Presented at: TCT 2012; October 22-26, 2012; Miami, FL.

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