

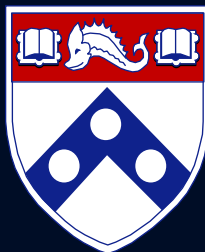
EACTS Master Class on Aortic Valve Repair

Type A Dissection and Aortic Repair for Regurgitation (AR):

Indications, Tips, and Tricks

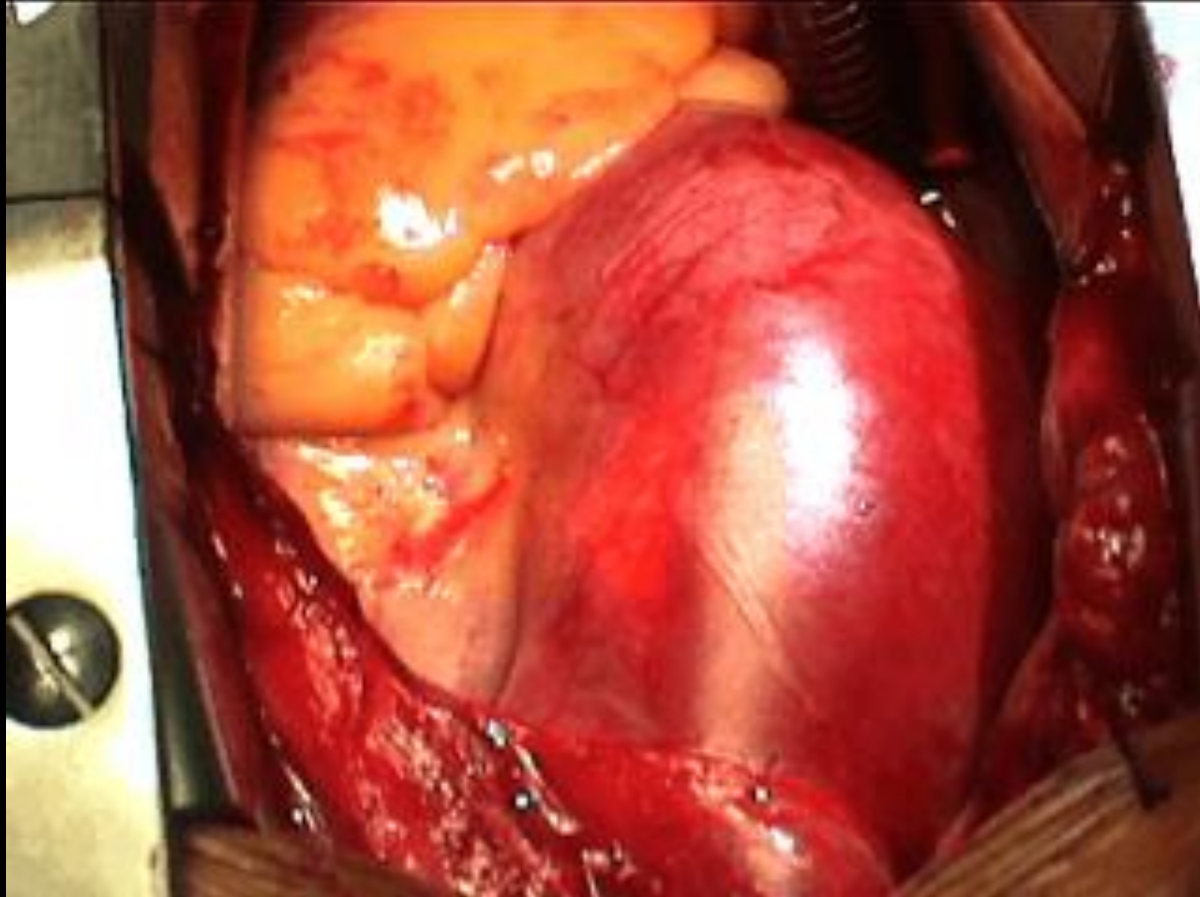
Joseph E. Bavaria, MD

Director, Thoracic Aortic Surgery Program
Roberts Measey Professor and Vice Chair of CV Surgery
University of Pennsylvania
Immediate-Past President STS



What about Acute Type A Dissection?

- Can we decrease late Proximal Aortic Complications of Re-operation, Aneurysm and AI?



The Concepts behind the Rational Design of a Therapeutic Operation for Type A Dissection (circa early- mid 1990's)



Acute Type A Dissection: Design of an Operation

Cause of death

Acute CHF due to AI

Coronary malperfusion

Cerebral malperfusion

Free Ascending rupture

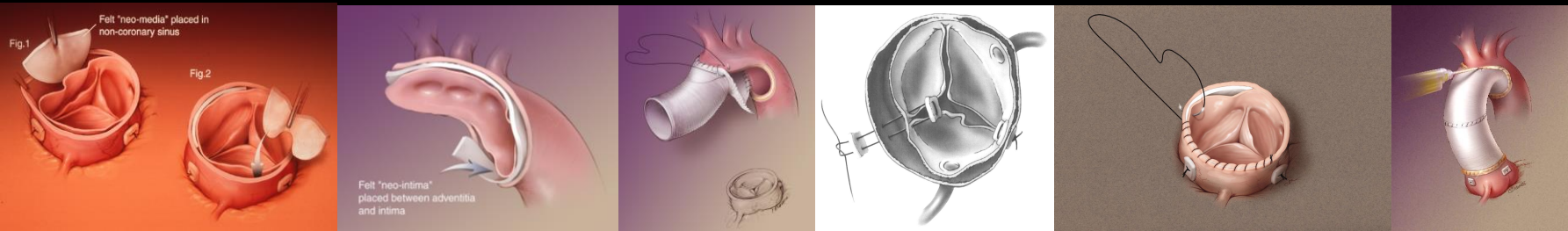
Treatment

Aortic valve resuspension

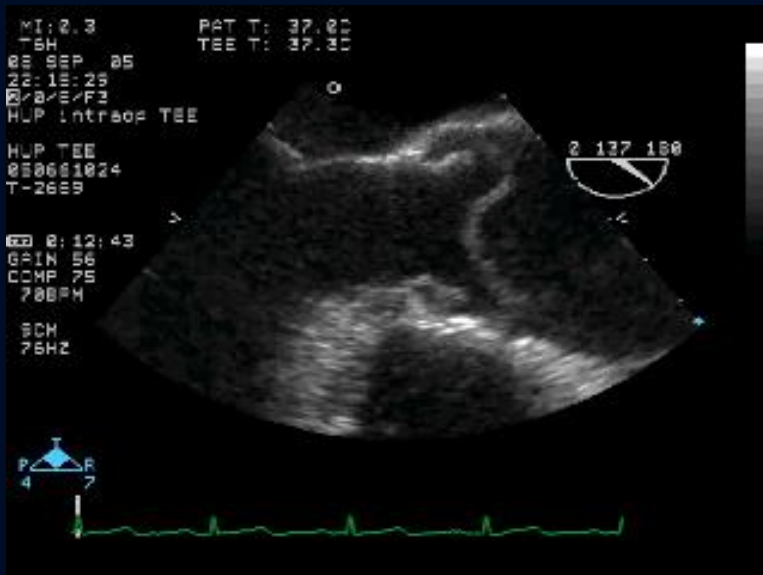
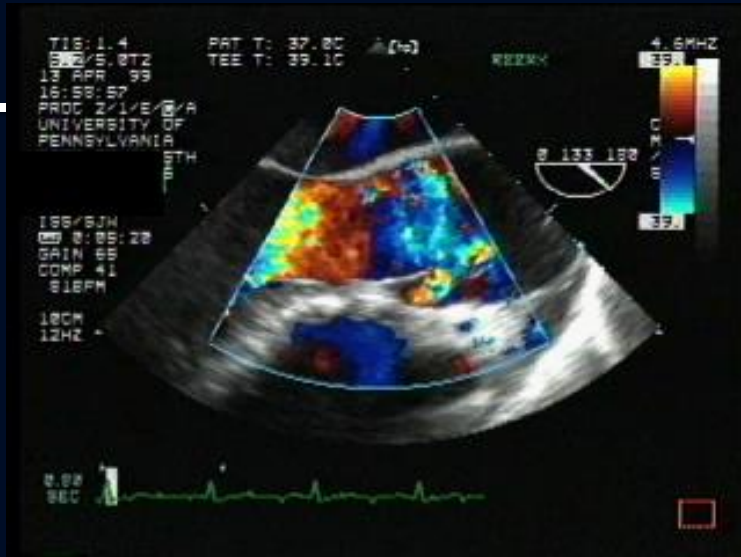
Aortic root repair

Arch replacement

Asc aortic replacement



Aortic Dissection: Mechanisms of Aortic Regurgitation

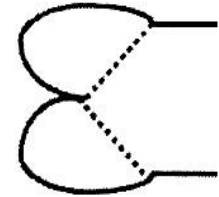


TEE ME AoV LAX

Normal



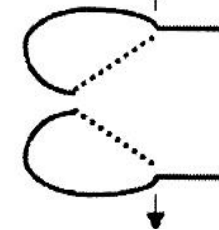
Resuspension



Tethering



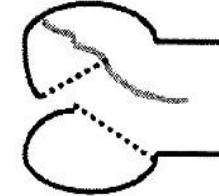
Reimplantation (Root)



Prolapse



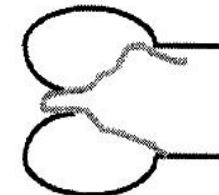
Resuspension/Neo-Media



Prolapsing Flap

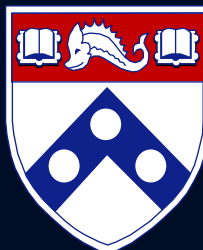
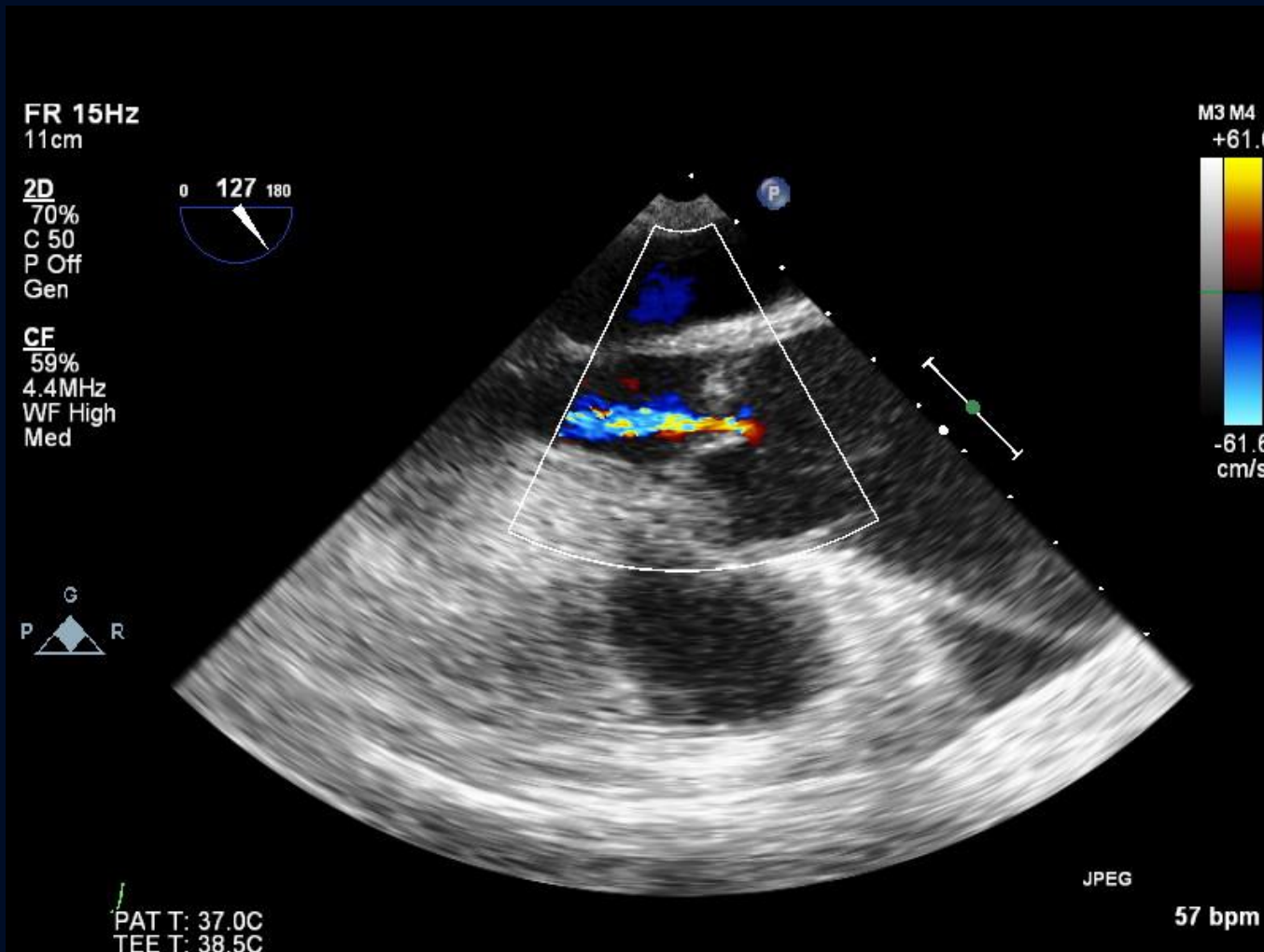


Resuspension Neo-Media



Type A Debakey II video: long axis

Best Case??



Reasons for Not Performing a Valve Re-suspension and Doing a Root

- **Marfan's** (Sinus Aneurysm; 5-10%)
- **Bicuspid** Valve or Primary Valve leaflet abnormality (10-15%)
- Intimal Tear (not dissection) into sinus segment (Could do a David V in this situation) (not simply a dissection down to the annulus)
- ?? Does the presence of Dissection layers into the Root = Re-implantation (or a Root) ???

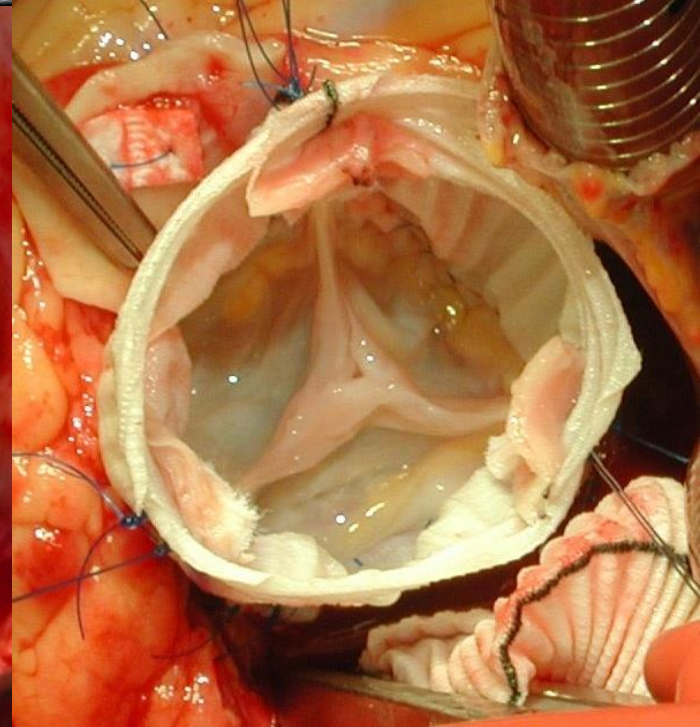
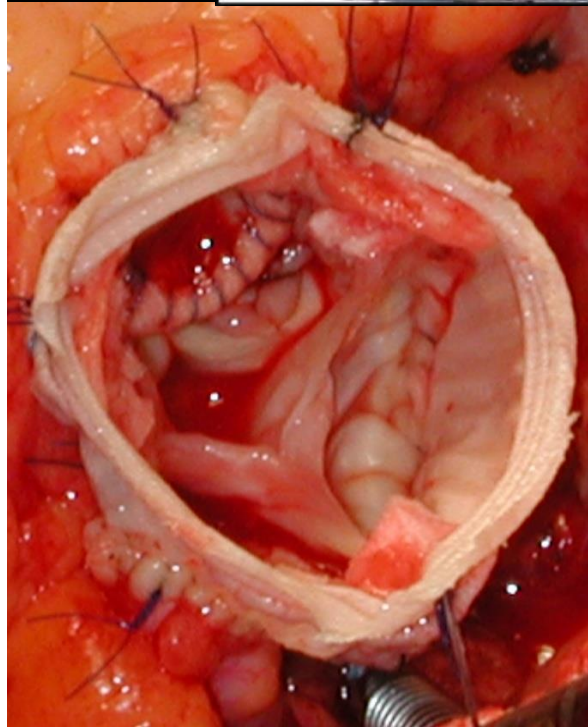
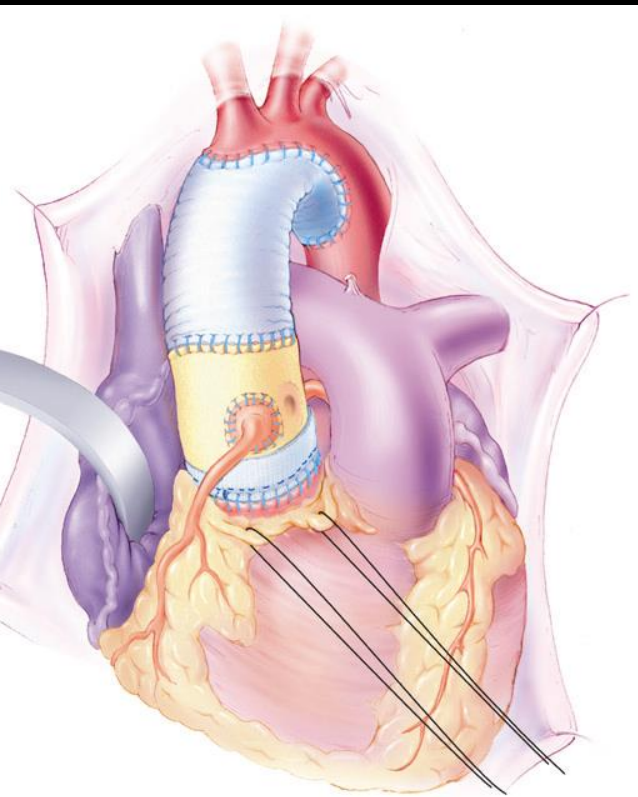
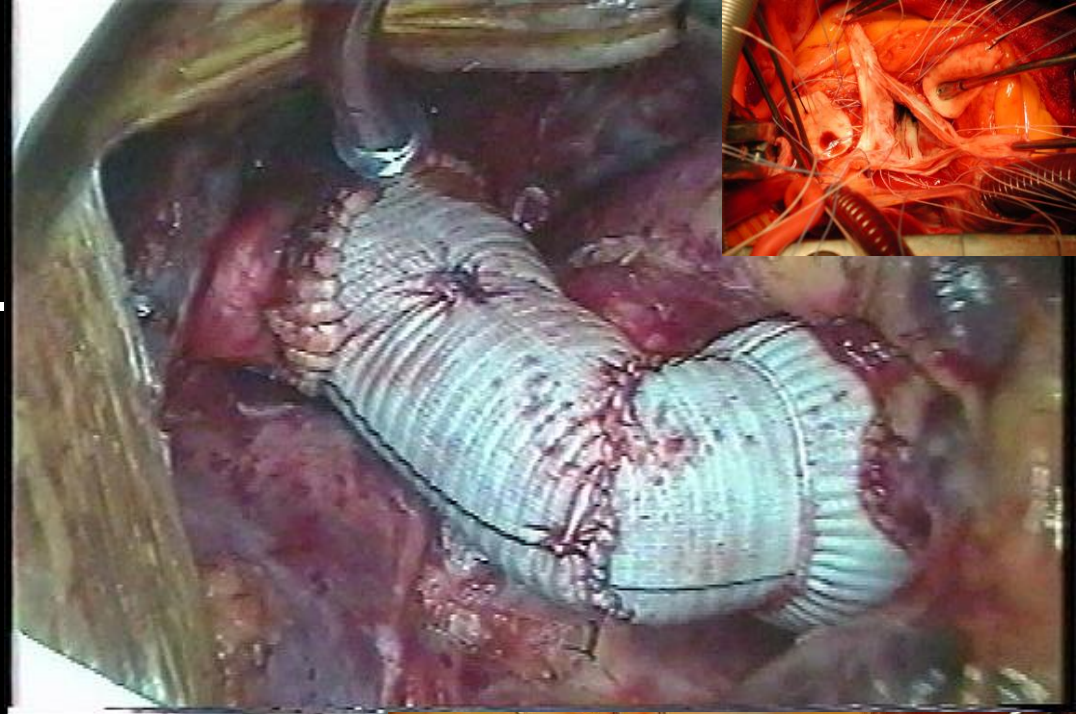


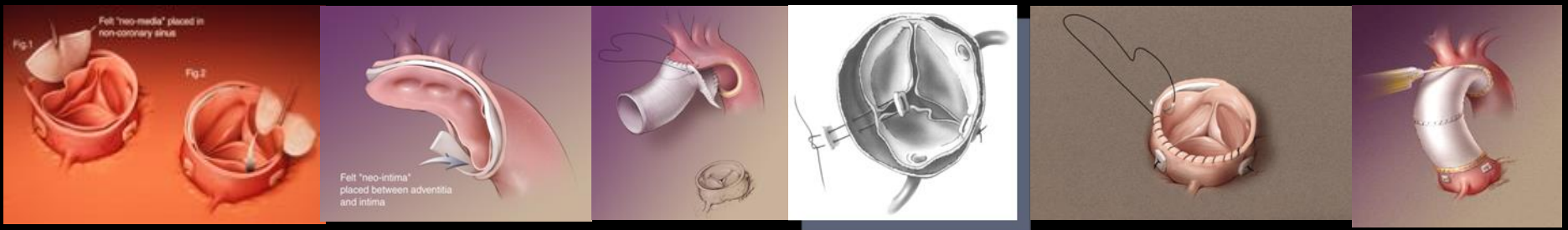
Malperfusion Syndrome in Acute Type A Dissection: Results/Coronary

- Coronary Malperfusion is 6-12% of cases
- Has high Hospital Mortality
 - 31% with vs 11% without in Penn Series
 - Multivariate odds ratio = 5.1 for in-hospital mortality from Emilia-Romagna AAD registry
- 56% Needed Root Replacement and 63% Coronary Revascularization (Usually RCA graft)
 - The Reason **WHY** Root Replacement has a **2.5 Odds ratio** for 30-day mortality: Penn Series n= 490, 2011
- No difference in Native CAD ... All Result of dissection



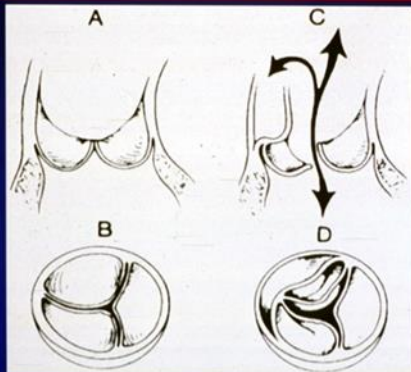
Aortic Root Options

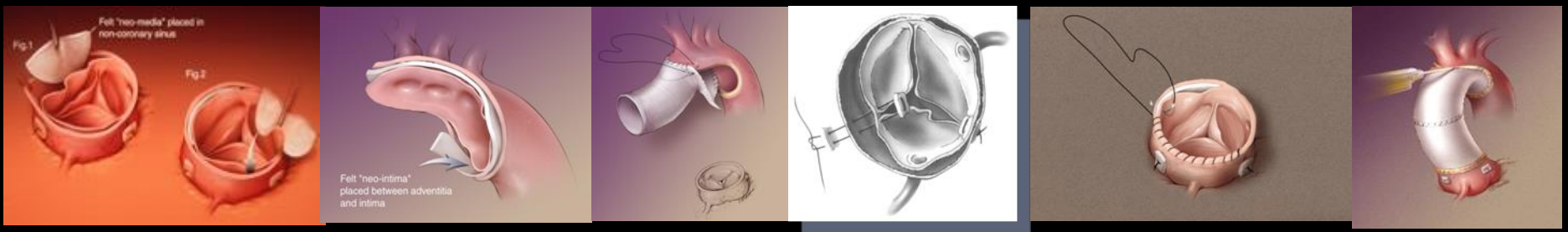




What About the Root?

Mechanism of Aortic Regurgitation in Type A Dissection



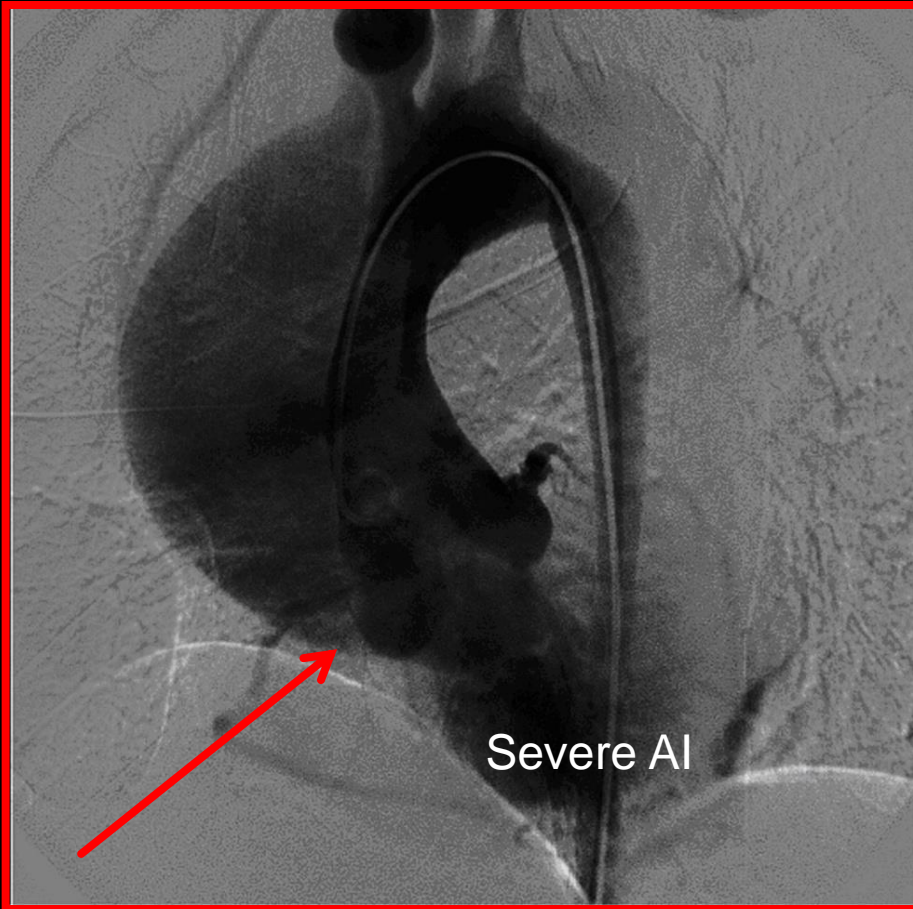


The Horizon Regarding the "Root Debate"

The Trans-Atlantic Rift



Type A (DeBakey Type I) Dissection: Pre and Post Proximal Repair with FET Distal Graft: Note Root Repair and AI

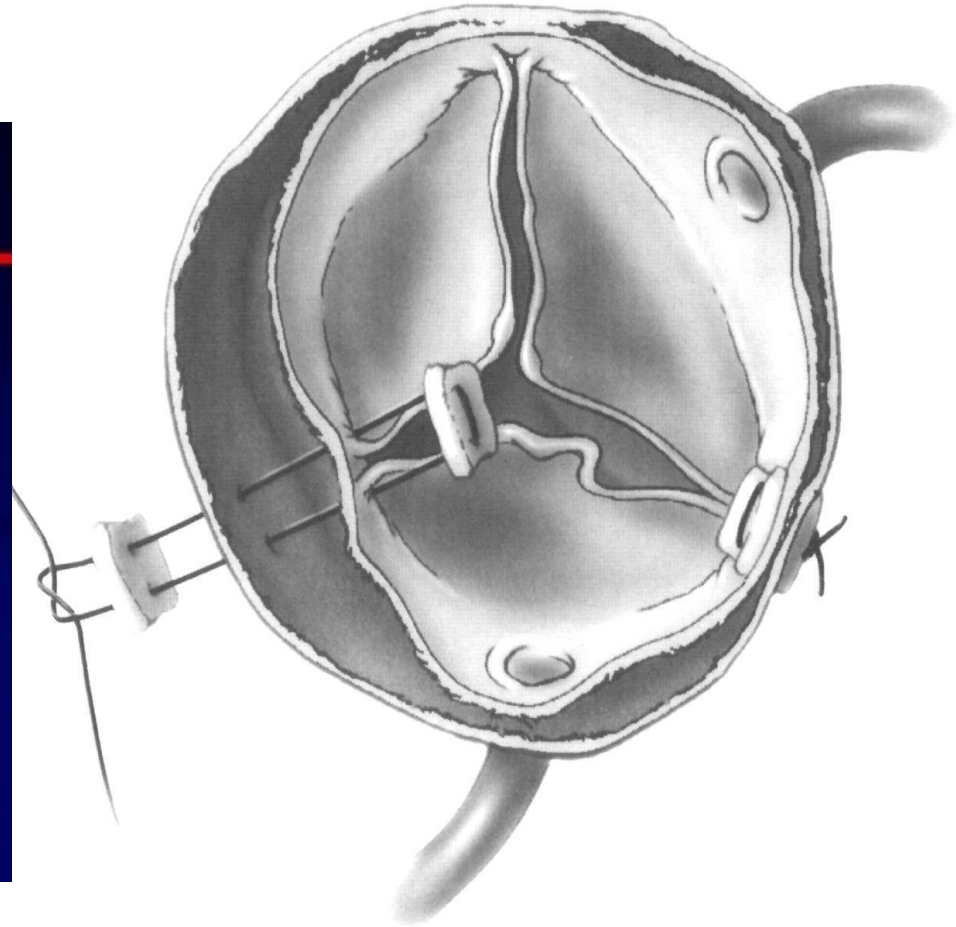
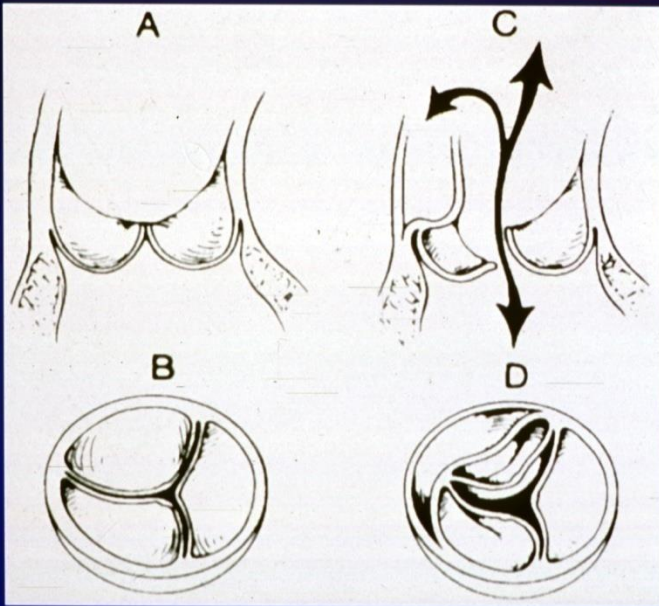


Repaired Valve/Root



Aortic Valve Resuspension

Mechanism of Aortic Regurgitation in Type A Dissection



ROBUST: Aortic Root Reconstruction/Sinus of ValSalva Repair

Fig.1 Felt "neo-media" placed in non-coronary sinus

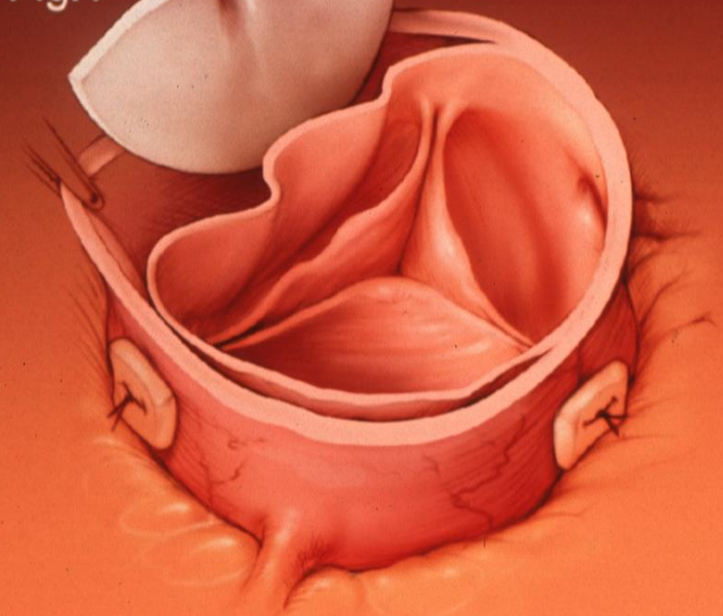
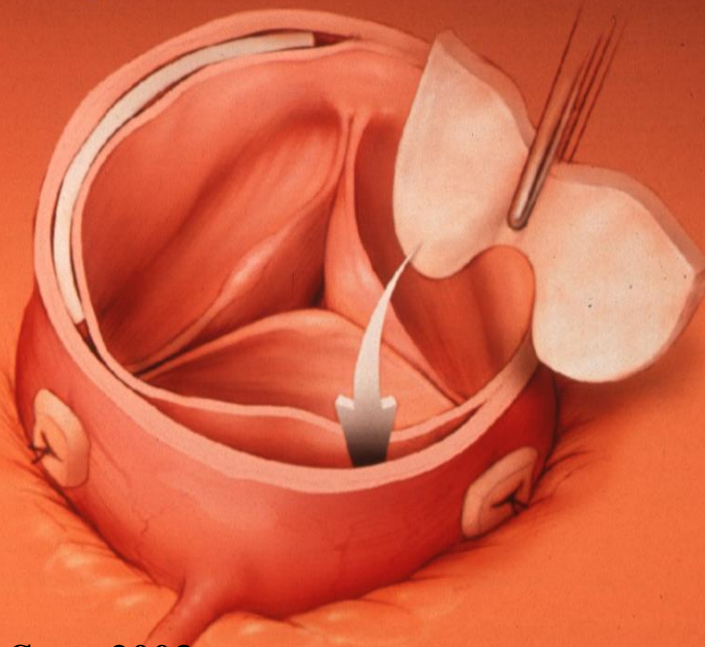


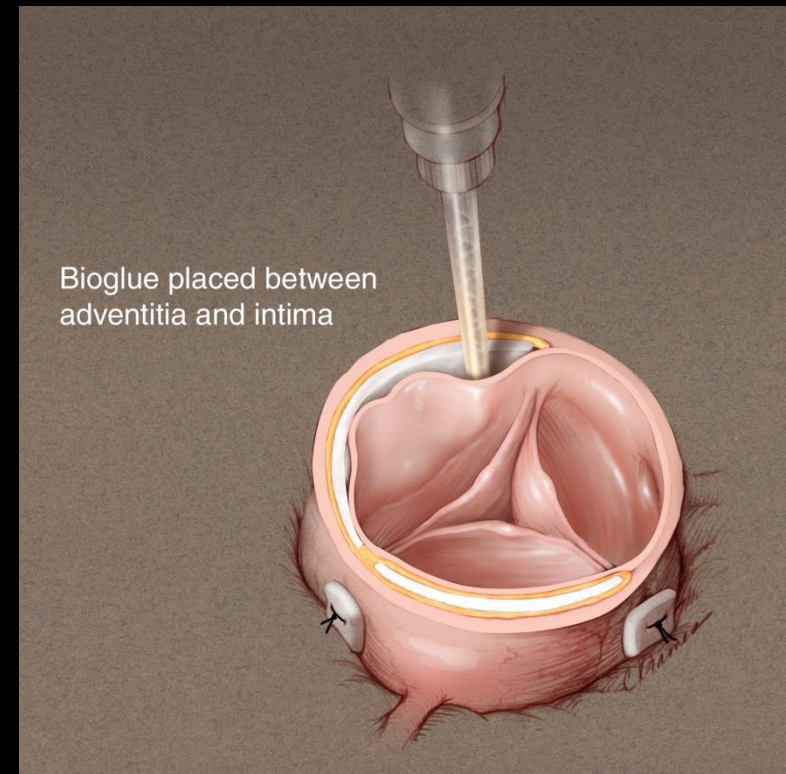
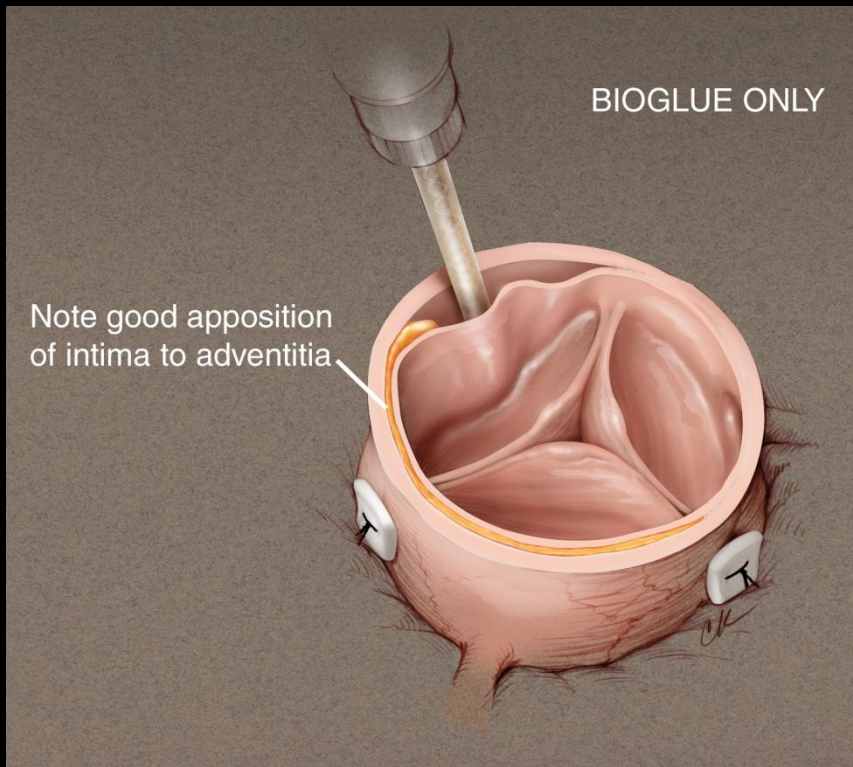
Fig.2



Bavaria, Pochettino, Gleason, et al; Ann Thor Surg 2003

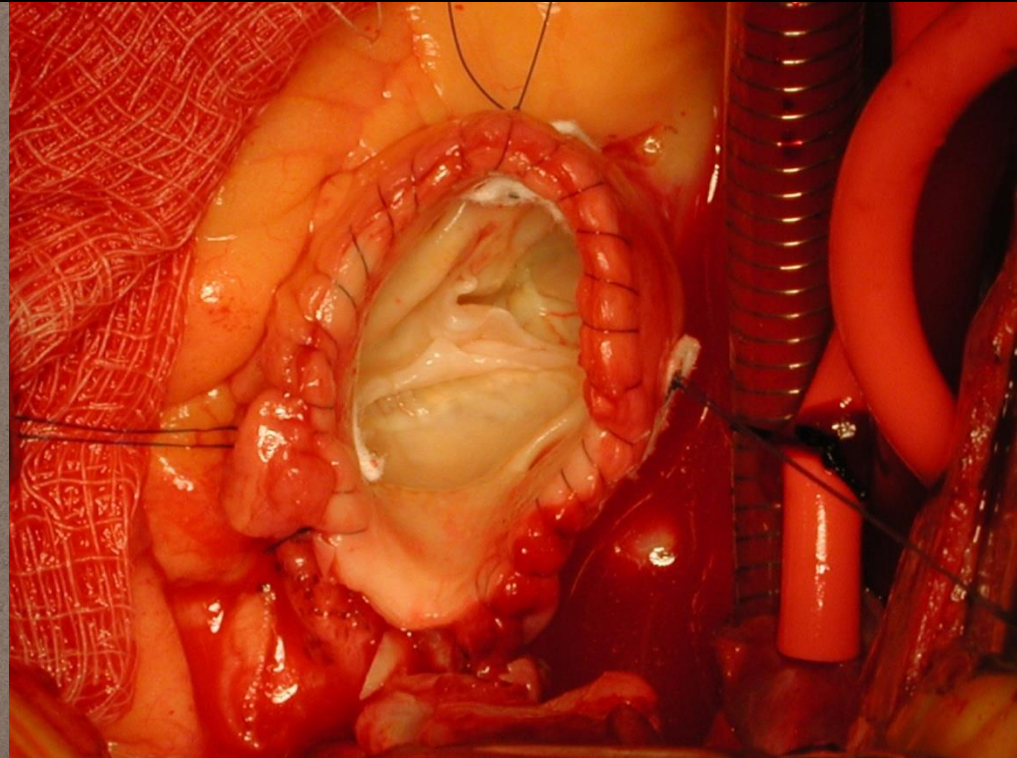


Obliteration of Proximal False Lumen



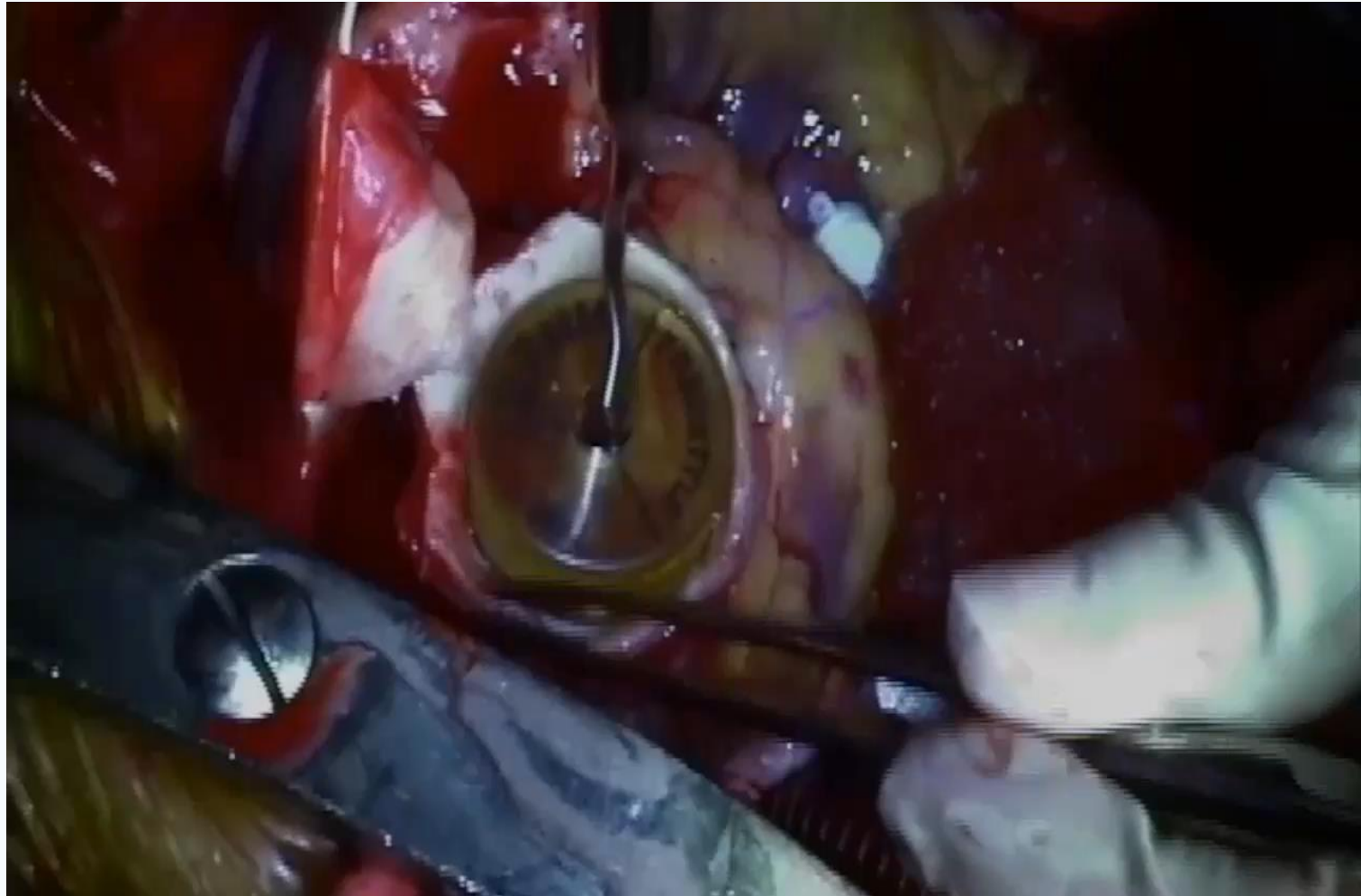
Completed Root Repair and Aortic Valve Resuspension with Neo-Media

Bavaria, Pochettino, Gleason, et al; Ann Thor Surg 2003

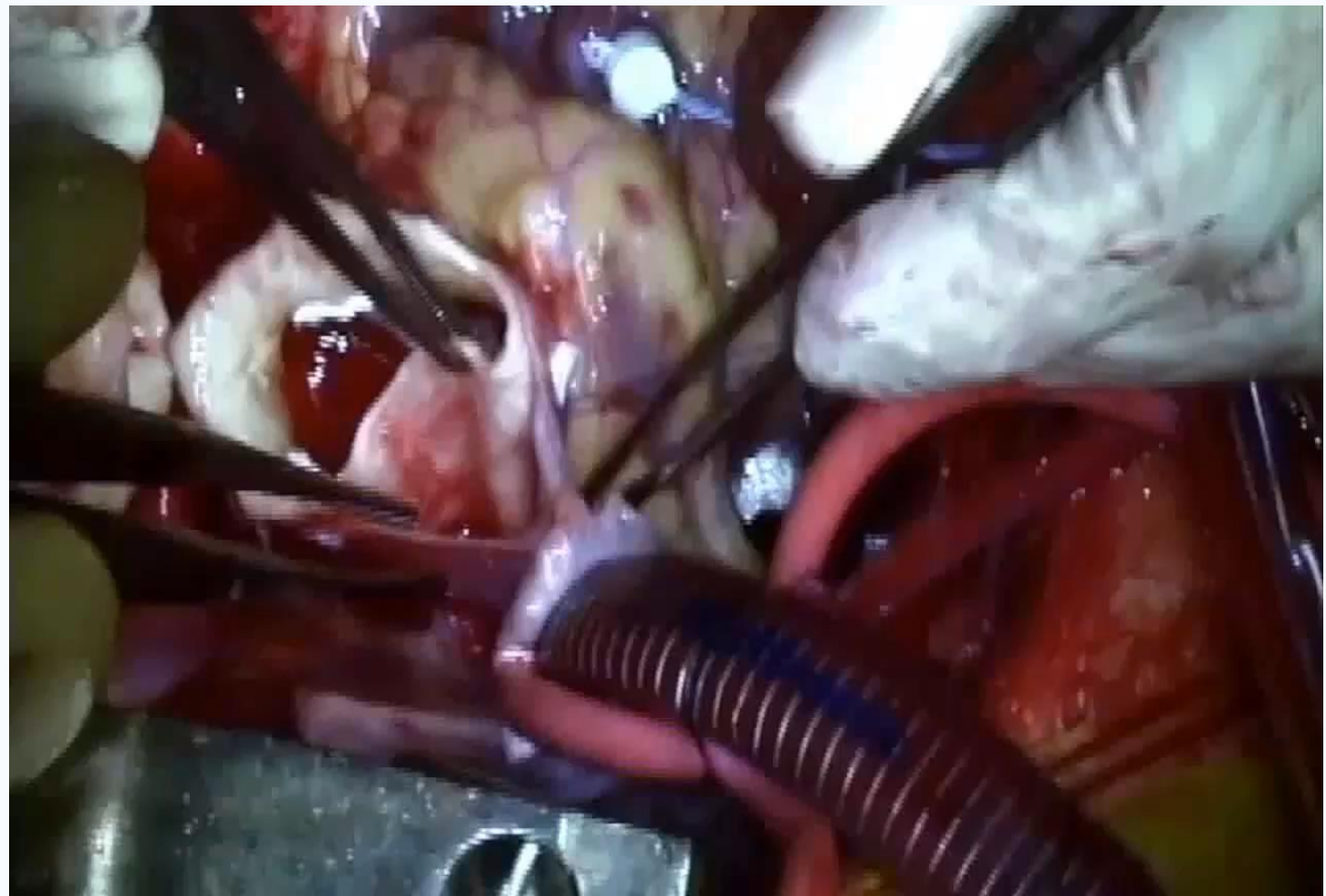
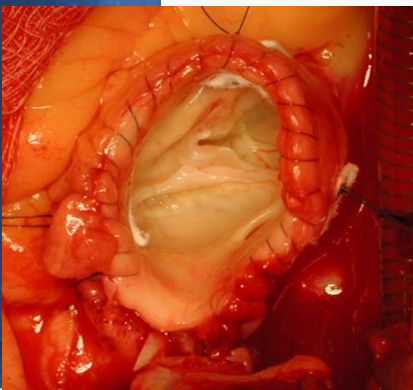
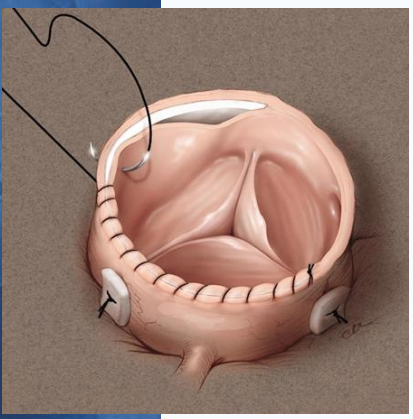


IMPORTANT: **72%** of Aortic Roots/Valves were **NORMAL** prior to Dissection!

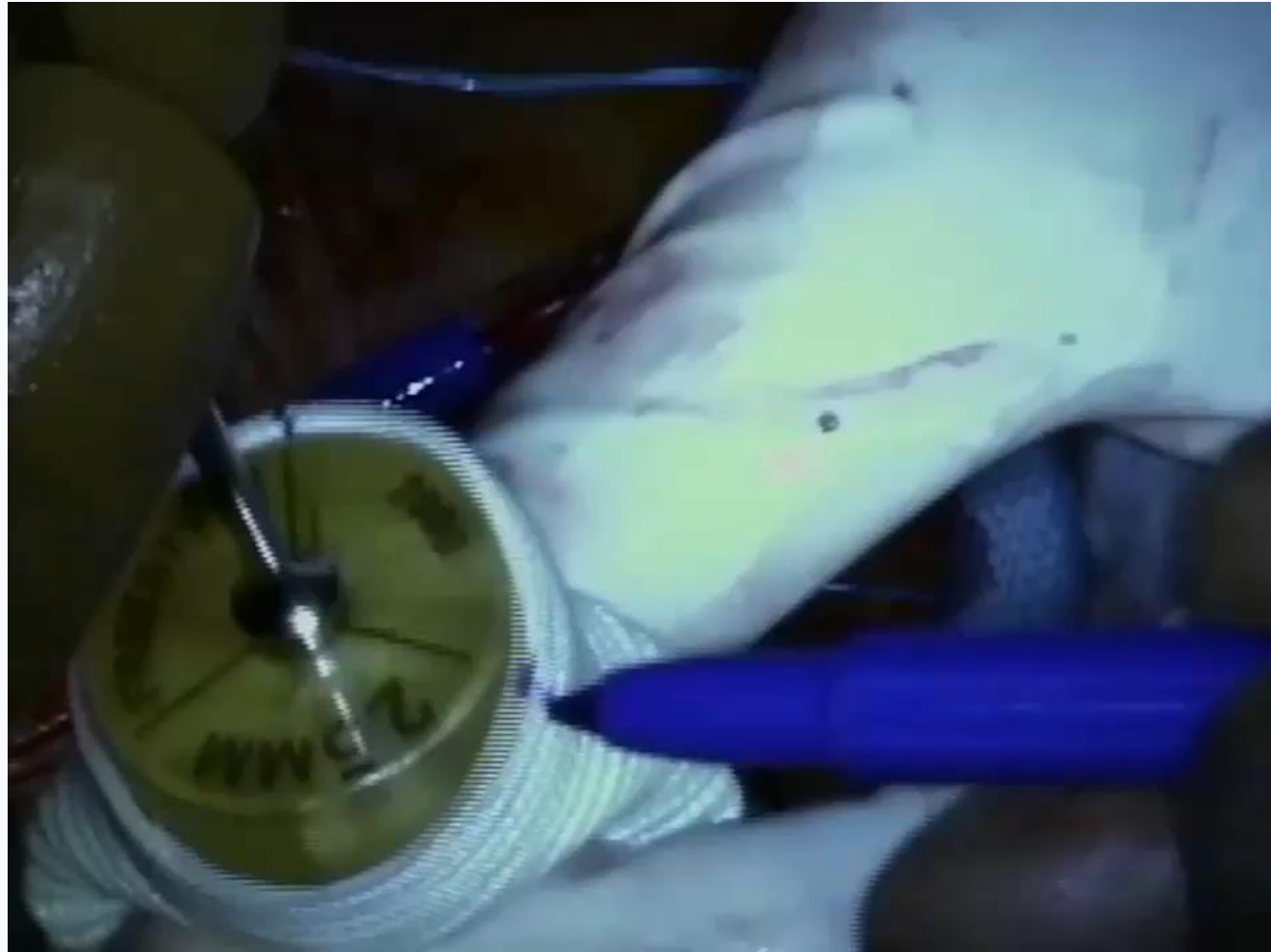
Aortic Valve Resuspension



Aortic Root Neo-media (Aggressive)

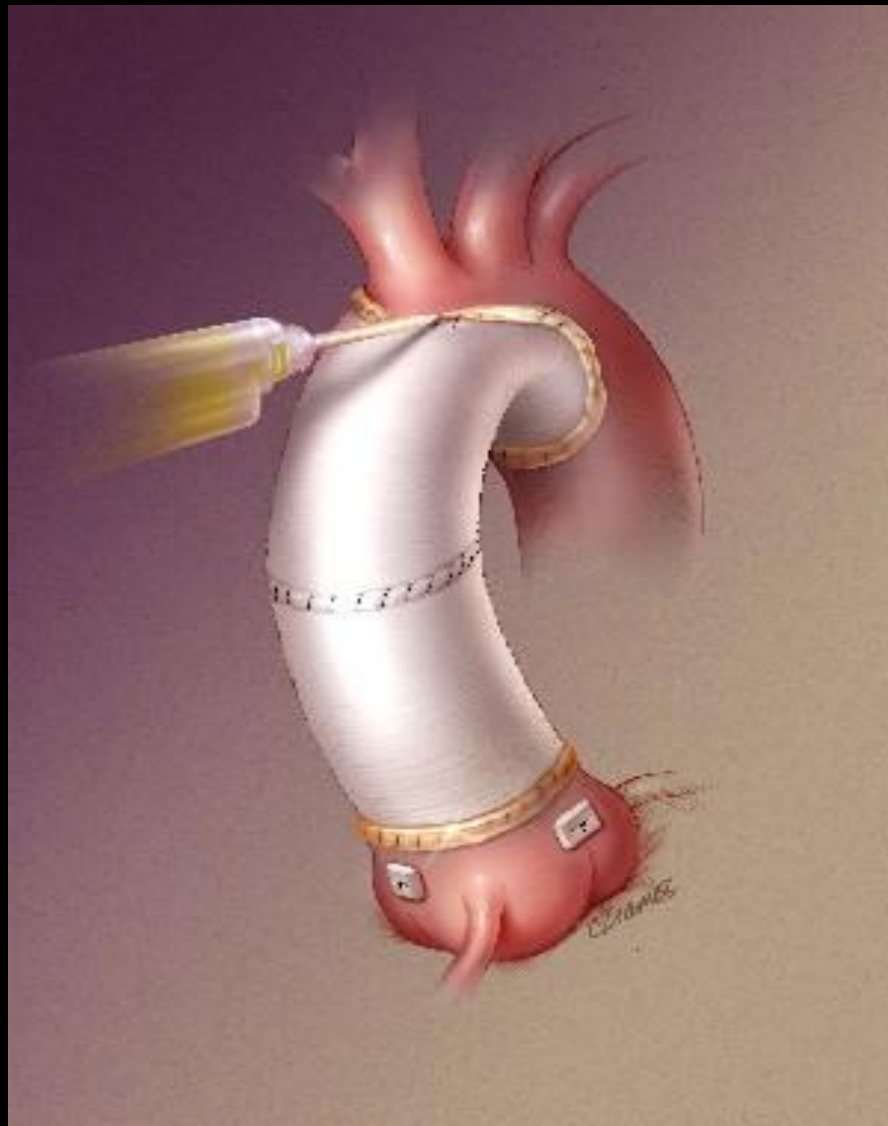


Proximal “Intussuscepted” Anastomosis after Root Repair with Neomedia and Resuspension

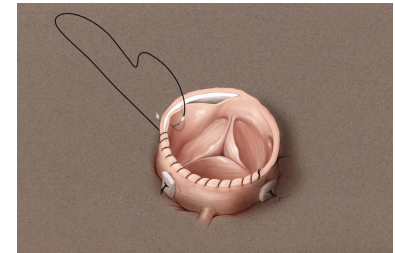
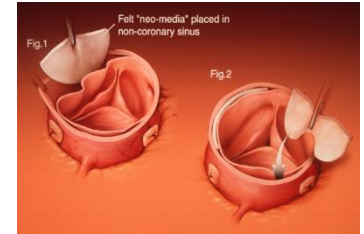
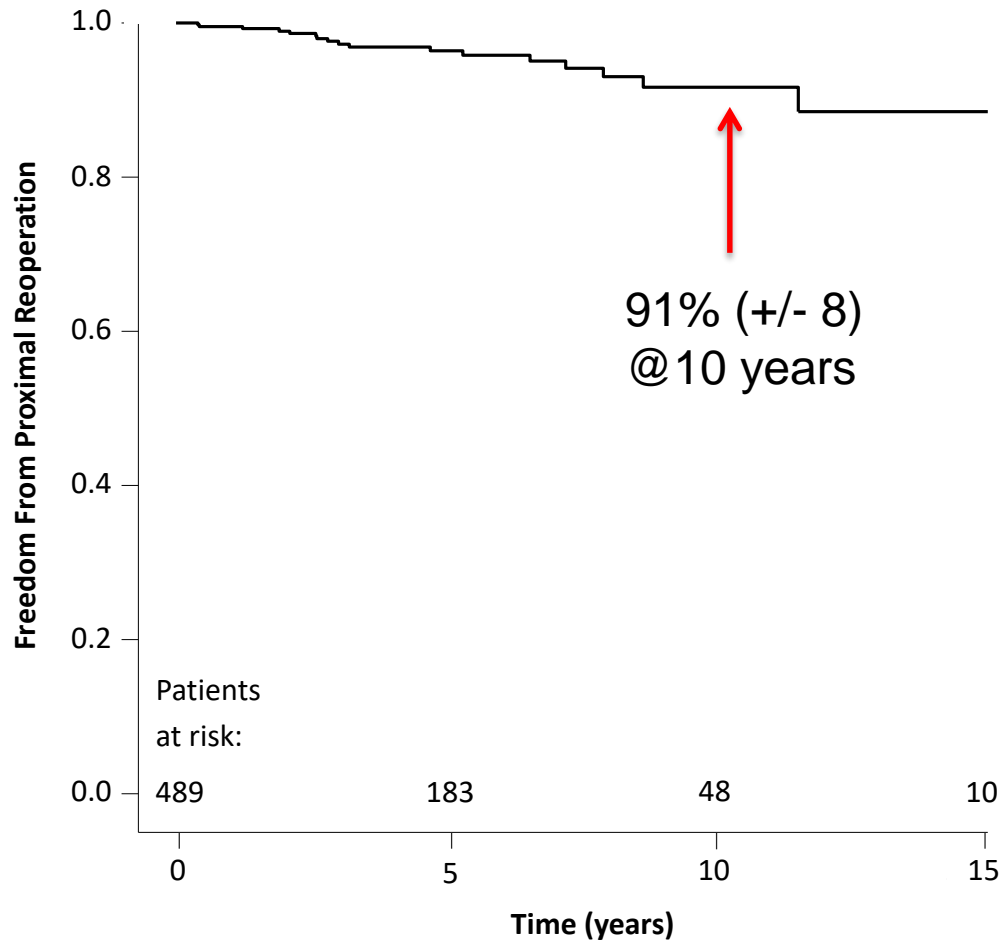


Type A Dissection with Valve Resuspension and Ascending & Hemi-Arch (+/- Biogluue)

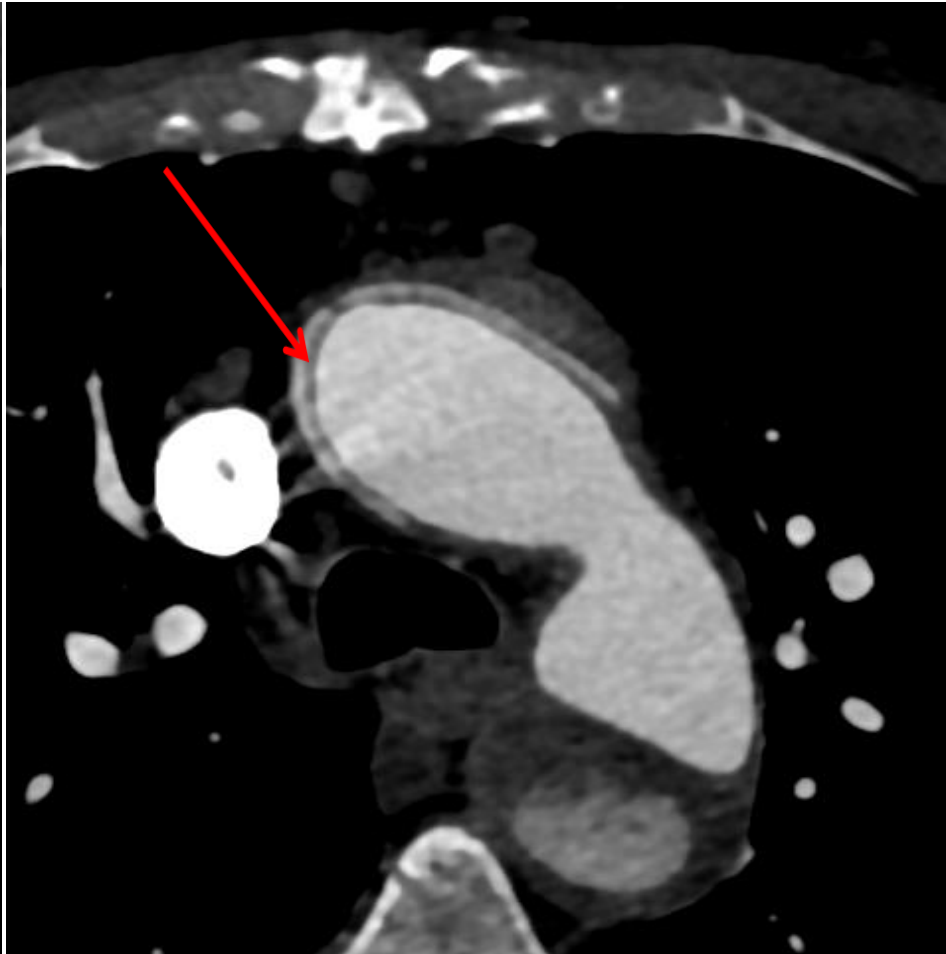
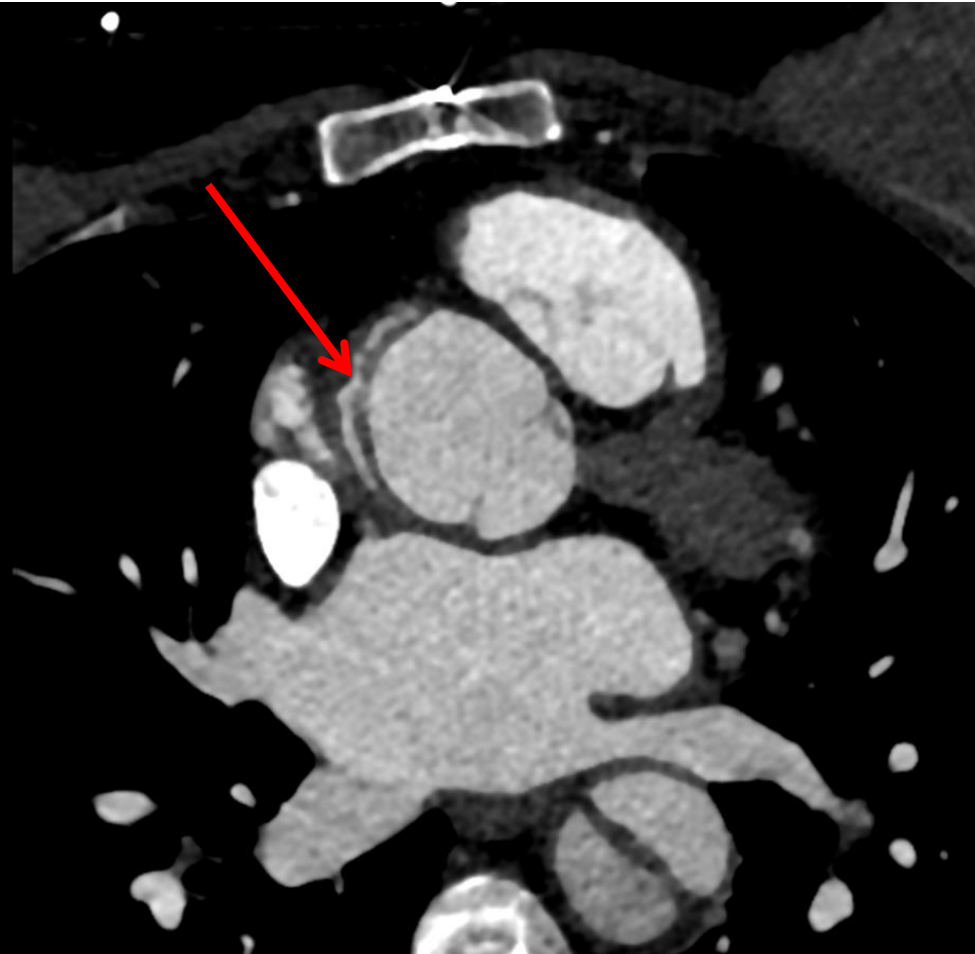
Note: Finished Product, Efficient Conduct of operation; Classic operation



Acute Type A Dissection: Freedom from Proximal Re-Operation using “Neo-Media” Resuspension and the Penn Aortic Root Decision algorithm



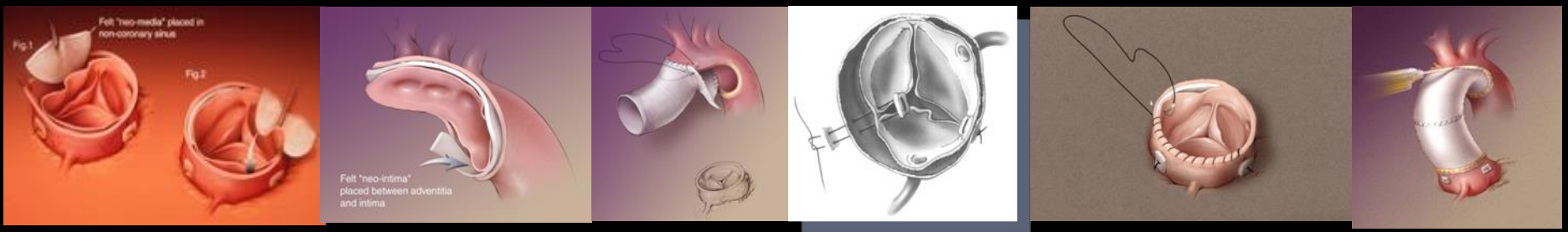
Felt neo-media: Proximal and Distal anastomosis (hemiarch): Type A Dissection Repair



Data and Outcomes

What is the present status of PROXIMAL Aortic (and Valve) Re-operation after Type A Dissection Repair?





What About Simple Ascending Supra- Coronary Graft with No Resuspension ??



Fate of the Preserved Aortic Root after Type A

Dell'Aquila AM, et al; JTCVS 2012 (Genova, Italy)

- Supra coronary
- No isolated Resuspension
- +/- glue
- 11% reop in survivors
- 92% Freedom from Reop @ 5 yrs.



Supracoronary Ascending Repair in Acute Type A : What Happens to the Aortic Root?

Rylski, B et al; JTCVS 2012 (Germany)

- 119/152 had this index operation (2001-2009)
- No isolated Resuspension or Aggressive Root procedure except use of glue
- 10% Proximal Reoperation rate @ 5.4 years

This is not very satisfactory



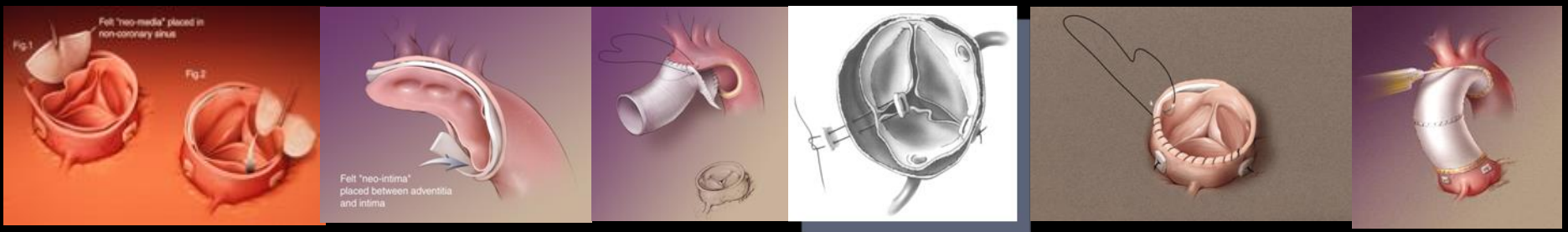
Cite this article as: Peterss S, Dumfarth J, Rizzo JA, Bonaros N, Fang H, Tranquilli M *et al.* Sparing the aortic root in acute aortic dissection type A: risk reduction and restored integrity of the untouched root. *Eur J Cardiothorac Surg* 2016;50:232–9.

Sparing the aortic root in acute aortic dissection type A: risk reduction and restored integrity of the untouched root[†]

Sven Peterss^{ab,*}, Julia Dumfarth^{ac,*}, John A. Rizzo^{ad}, Nikolaos Bonaros^c, Hai Fang^{ae}, Maryann Tranquilli^a, Thomas Schachner^c, Bulat A. Ziganshin^{af}, Michael Grimm^c and John A. Elefteriades^{ag*}

Root Sparing Techniques

- Freedom from Aortic Root Events = 92% at 10 years
- Growth of Aortic Root = 0.4 mm/year (very slow)



More Recent Series with "Aggressive" Resuspension and Native Root Repair



Acute Type A Dissection: Long Term Results and Reoperation

Bekkers JA, et al; EJCTS, 2013 (Rotterdam)

- Freedom from Aortic Valve reoperation (preserved valves) @ 10 yrs = 85.6%
- For Freedom from Proximal operation was 89% (20/182 survivors) @ 7.2 years (60% valve; 40% Root)



Hybrid Proximal Surgery plus Endo for Debakey Type I

S. Hofferberth, et al : JTCVS 2013 (Melbourne, Australia)

- 28/37 (76%) Debakey I had Root repair with Resuspension
- Mean F/U = 50 months
- Only 2/37 (5.4%) needed Proximal Reoperation



Aortic root Conservative Repair Acute Type A: Fate of the Root and valve

Ro SK, et al; JTCVS 2012 (Korea)

- 196 consecutive patients (1999-2011)
- Aggressive resuspension and root repair
- ONLY one proximal reoperation (10 distal reoperations)
- 99% freedom from proximal reop at 4 years



Proximal Reoperation After Acute Type A Dissection

Malvindi PG, WJ Morshuis, et al; ATS, 2013 (Netherlands)

- N= 104/592
- Mean F/U = 6.5 yrs
- Restoring the Root Geometry at STJ, Resuspension, obliteration of any “flap extension into root”
- = Lower Rate of Proximal Reoperation (p=.009)
- **Must obviate a “Pathological evolution of the Aortic root”**



Resuspension (aggressive); Felt Neo-media, Small amounts of glue With Root Algorithm

- K. Yamanaka et al; EJCTS 2012
 - N=140 (2002-2011); 9.3% operative mortality
 - Zero proximal aortic reoperation @ mean 44 months
- Geirsson and Bavaria (initial series 2007)
 - 95% freedom from proximal reoperation
 - Note: The Bioglue repair era



Reasons for Not Performing a Valve Re-suspension and Doing a Root

- Are These data equal or as good as Re-implantation??
 - Yes For Type A Dissection



Midterm Results of David V Valve-Sparing Aortic Root Replacement in Acute Type A Aortic Dissection

Bradley G. Leshnower, MD, Richard J. Myung, MD, LaRonica McPherson, RN, and Edward P. Chen, MD

Division of Cardiothoracic Surgery, Joseph B. Whitehead Department of Surgery, Emory University School of Medicine, Atlanta, Georgia

Background. The David V valve-sparing aortic root replacement (David V) has been shown to provide excellent long-term valve function and low rates of valve-related complications in the elective treatment of aortic root aneurysms. The safety and durability of the David V in the repair of acute type A aortic dissection (type A) are currently unclear. In this study, the midterm results of David V in the setting of type A aortic dissection were analyzed.

Methods. From 2005 to 2013, 350 patients underwent surgical repair of type A aortic dissection. Outcomes were analyzed in 43 consecutive patients who received a David V during repair of type A aortic dissection. Patients were followed with annual postoperative echocardiograms. Follow-up was 85% complete, with a mean duration of 40 ± 31 months.

Results. The mean age of these patients was 46 ± 10 years. There were two operative deaths (4.7%), and 93% of patients required a hemiarch replacement ($n = 32$) or a

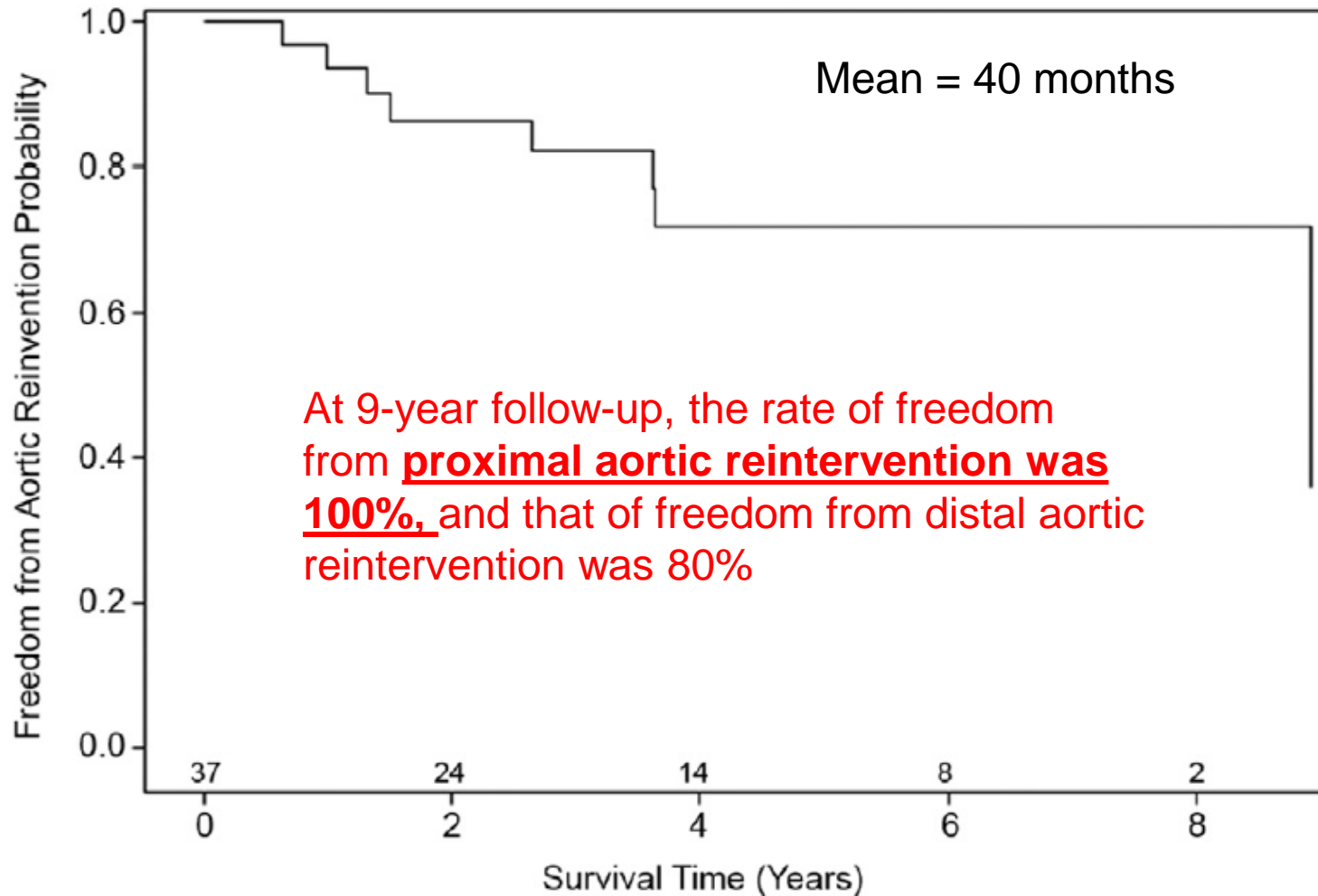
total arch replacement ($n = 8$) using hypothermic circulatory arrest. Cusp repairs were performed in 6 (14%) patients; 51% of patients had 3+ or greater preoperative aortic insufficiency (AI), 83% of patients left the operating room with zero AI, and the remainder had 1+ AI or less. No patient in the follow-up period developed endocarditis or required aortic valve replacement. At midterm follow-up, freedom from 2+ AI was 94%, and freedom from aortic valve replacement was 100%.

Conclusions. The David V can be performed with low morbidity and mortality in young patients presenting with type A aortic dissection who require aortic root replacement. At midterm follow-up, valve function is durable, and the incidence of valve-related complications is low.

(Ann Thorac Surg 2015;99:795–801)

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Freedom from Aortic Reintervention after VSRR in acute type A aortic dissection



Leshnower... Chen. *Ann Thorac Surg* 2015;99:795–801

Valve Sparing Root in Type A Dissection

Subramanian, Mohr, et al; Ann Thor Surg 2012 (Germany)

- 208/374 patients received a Root Procedure
- 78 received a Valve Sparing Procedure
- Valve Sparing Root surgery showed NO Difference in mid-term results with Bentall
 - 5% proximal reoperation rate for Valve Failure at mean = 4 years



Aortic root remodeling leads to good valve stability in acute aortic dissection and preexistent root dilatation



Takashi Kunihara, MD, PhD, Niklas Neumann, MD, Steffen Daniel Kriechbaum, MD, Diana Aicher, MD, and Hans-Joachim Schäfers, MD, PhD

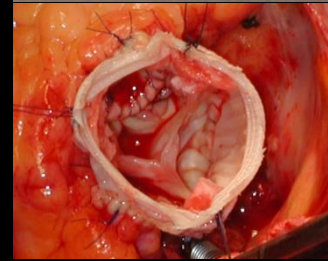
N= 59 patients with Remodeling Valve Sparing
Root procedure with Type A Dissection and Aortic
Root > 45 mm

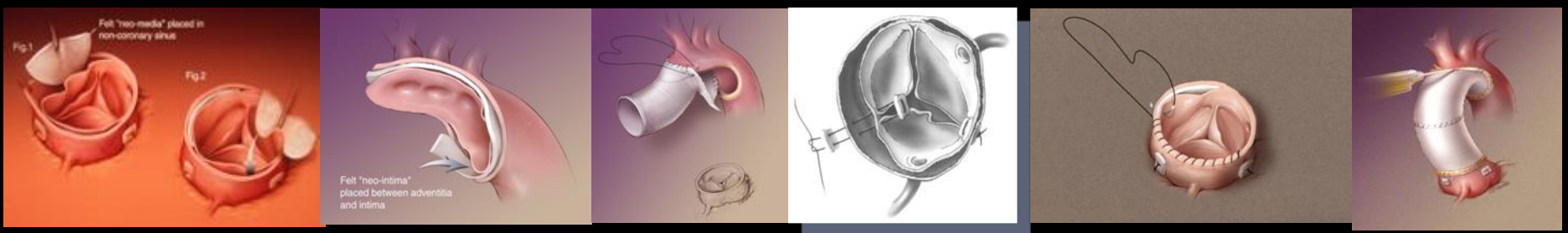
-Freedom from Proximal Reoperation = 98% at 10
years

excellent results

Goal: Keep Reoperation Low ... However Retain Native Valves when Possible

- Address the Root aggressively
- Do Root procedures in the appropriate cases: **DV unless Leaflets abnormal**
 - Sinus Dilation
 - “Extensive Destruction” of Root
 - ? left Cusp
 - Intimal TEAR into Sinus segment
 - Marfans/BAV
- Otherwise repair the Root/Valve and get good results





Summary/Conclusions

My Approach



VSRR in Acute Type A Dissection: When is it best Utilized?

Recently = 20% of Penn cases over past 3 years

- In Patients with a $> 10-15$ year life expectancy (< 60 years)
- In Patients who have Normal Aortic valves and have a Root indication (best cases!)
- Excellent in DeBakey II (with above)
- In Patients where an aggressive “Root Restoration” Neo-Media Resuspension may be difficult
- Caution in patients who require Total Arch or Extended Arch operations Too much??



Re-implantation (+ Total Arch) in Type A Dissection



European Journal of Cardio-Thoracic Surgery 48 (2015) 152-157
doi:10.1093/ejcts/ezu387 Advance Access publication 29 October 2014

ORIGINAL ARTICLE

Cite this article as: Minami H, Miyahara S, Okada K, Matsumori M, Kano H, Inoue T et al. Clinical outcomes of combined aortic root reimplantation technique and total arch replacement. *Eur J Cardiothorac Surg* 2015;48:152-7.

Clinical outcomes of combined aortic root reimplantation technique and total arch replacement

Hitoshi Minami, Shunsuke Miyahara, Kenji Okada, Masamichi Matsumori, Hiroya Kano, Takeshi Inoue, Toshihito Sakamoto and Yutaka Okita*

Department of Surgery, Division of Cardiovascular Surgery, Kobe University Graduate School of Medicine, Kobe, Japan

20 patients with Acute Type A Dissection and Total Arch procedure

- 0% Mortality; 0% CVA
- Freedom from +3 or +4 AI = 83% at 5 years

VSRR in Acute Type A Dissection: Do I do Anything Differently when Performing a VSRR in Type A Dissection??

- It is the one case type where I use the “Cameron” 3 Stitch (Sub-annular) technique at the primary suture line.
- Use a slightly smaller graft as the annulus is usually smaller in these **ACUTE** cases
 - **Nuance:** Also because sometimes the aorta has to be cut very close to the annulus so you don't want to “pull” the Coaption apart
- Careful about dissected RCA Button

Recently = 20% of Penn cases over past 3 years



$$6 - 3 = 6$$

Questions?

