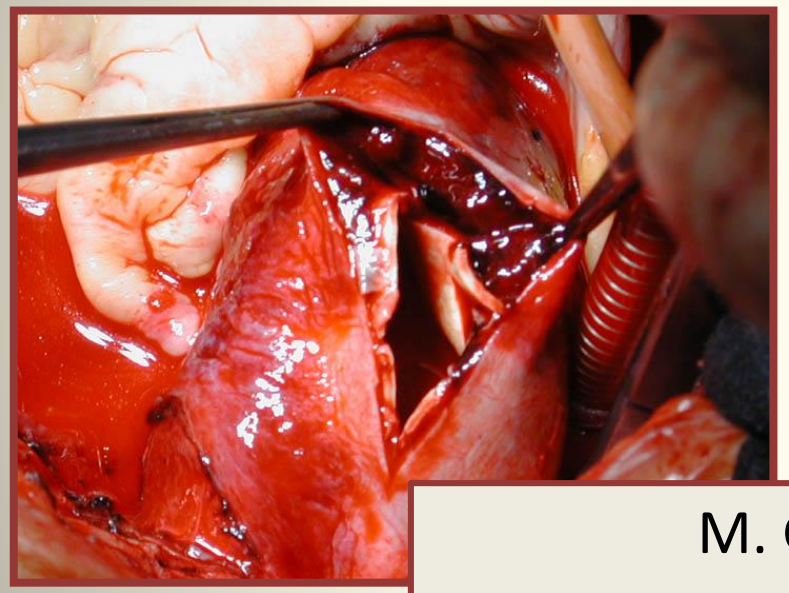
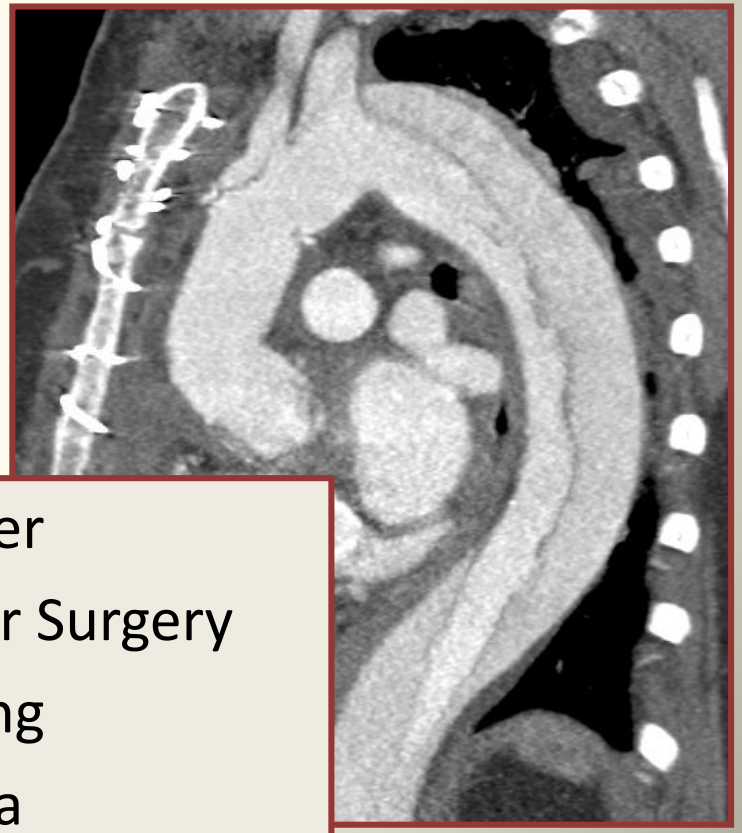
Aggressive Resection/Reconstruction of the Aortic Arch in Type A Dissection





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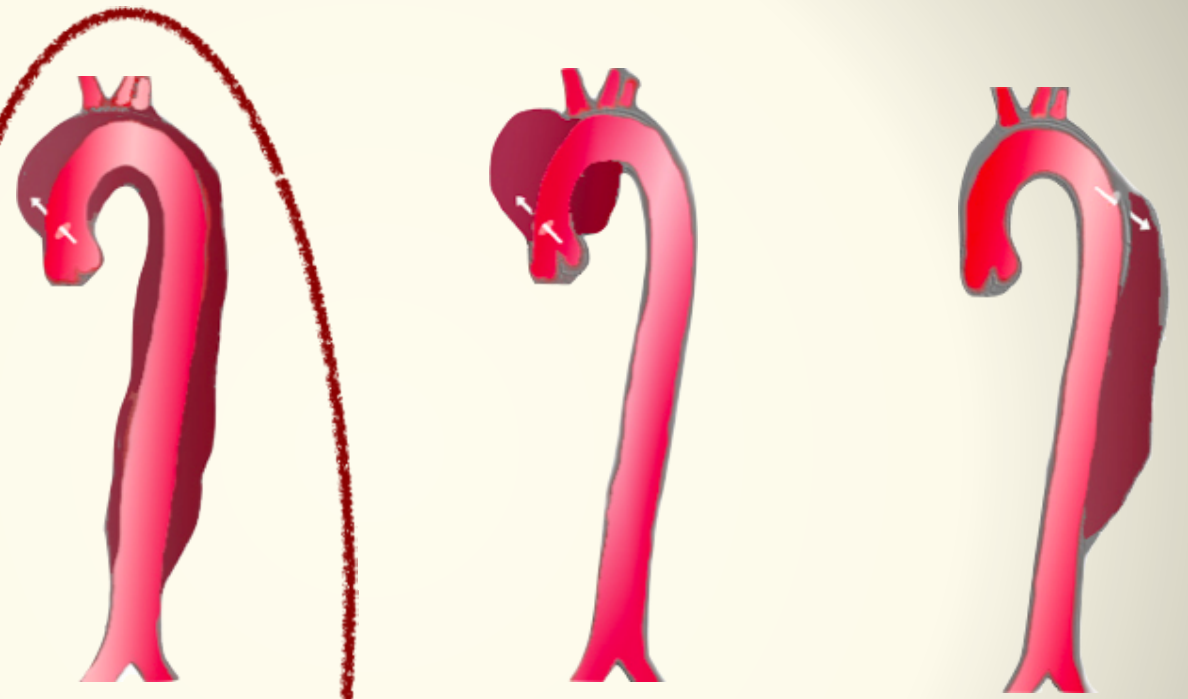
Disclosure Statement

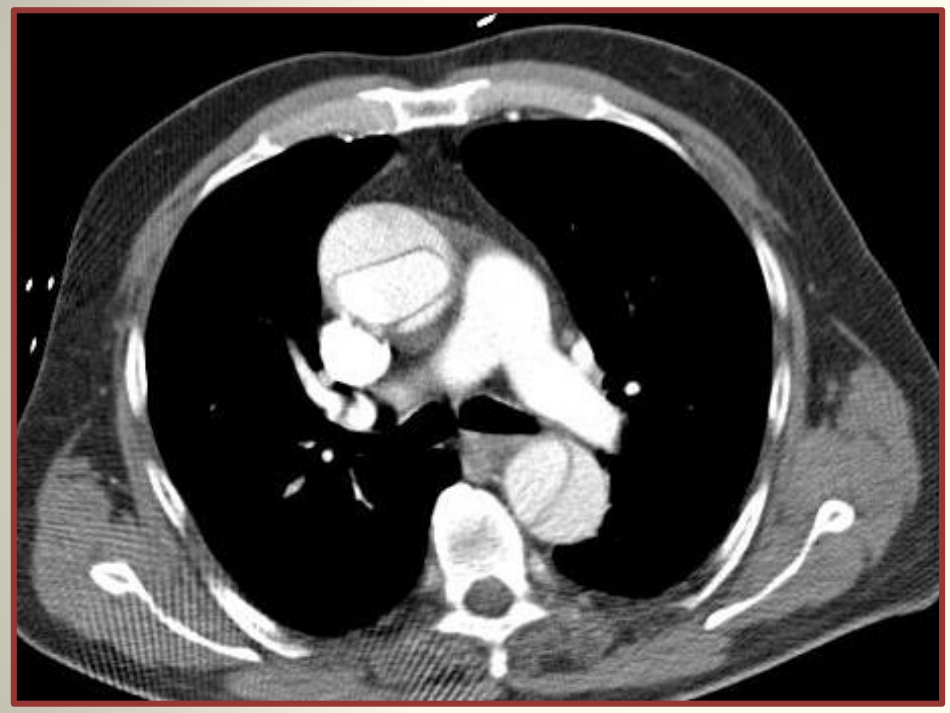
- Consultant of Jotec, Hechingen, Germany

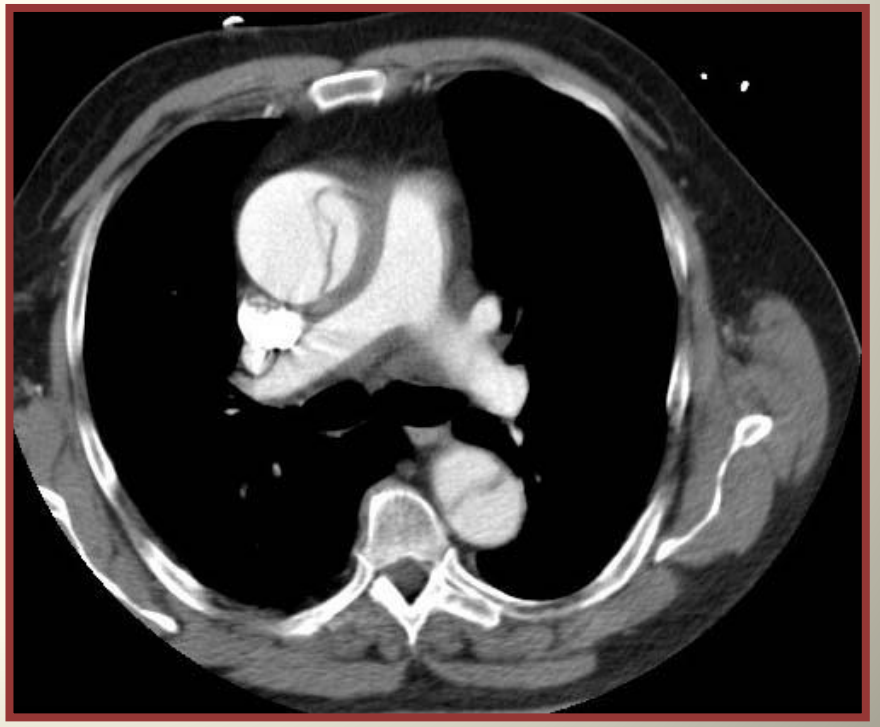
Classification



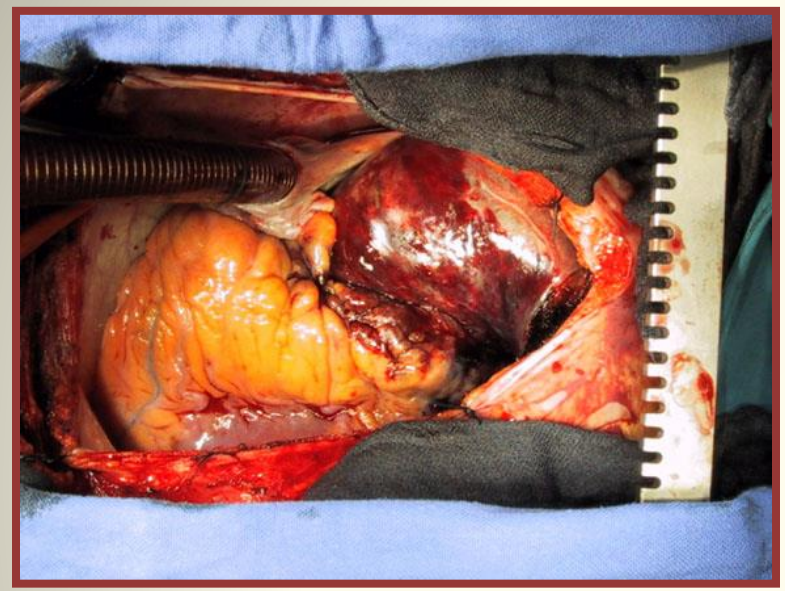
Typ	DeBakey I	DeBakey II	DeBakey III
	Stanford Type A		**Stanford Type B**
Percentage	60 %	10-15%	25-30%

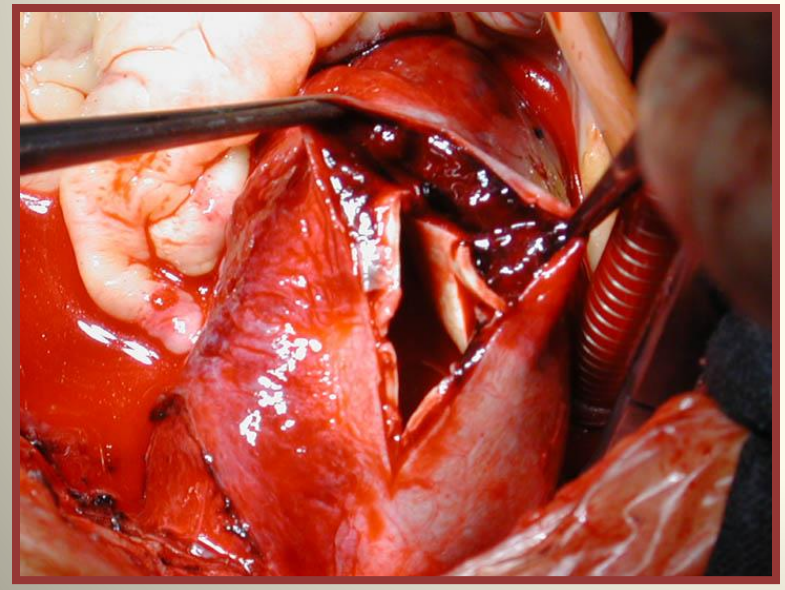
CT – scan – acute type A dissection

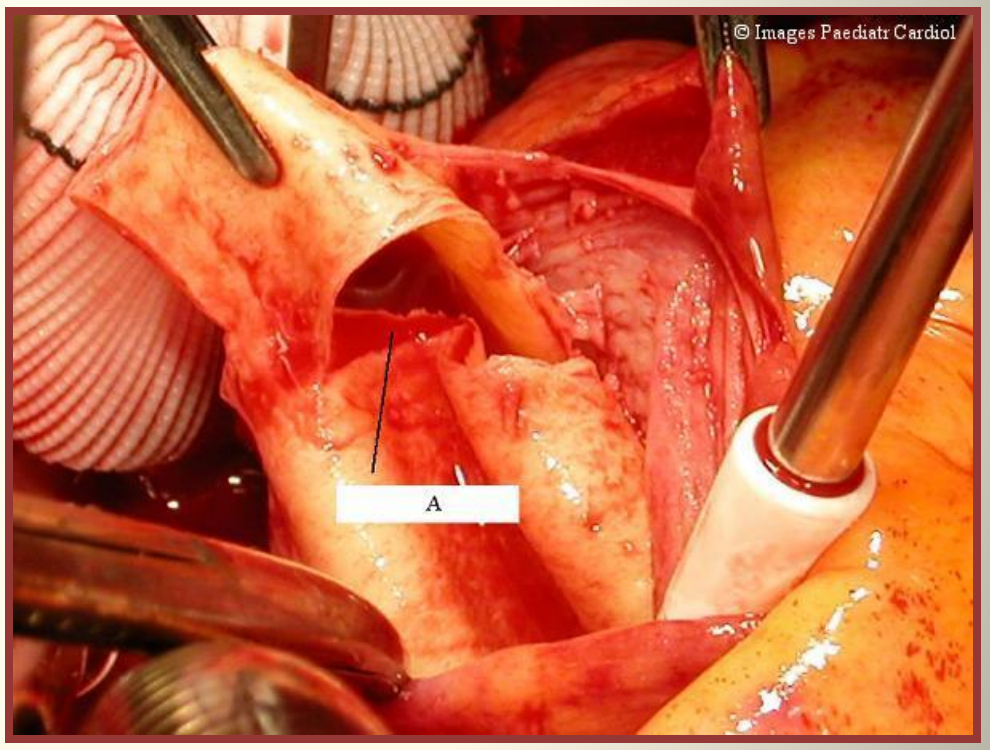




Aortic Dissection Type A







Recommendations for treatment of aortic dissection

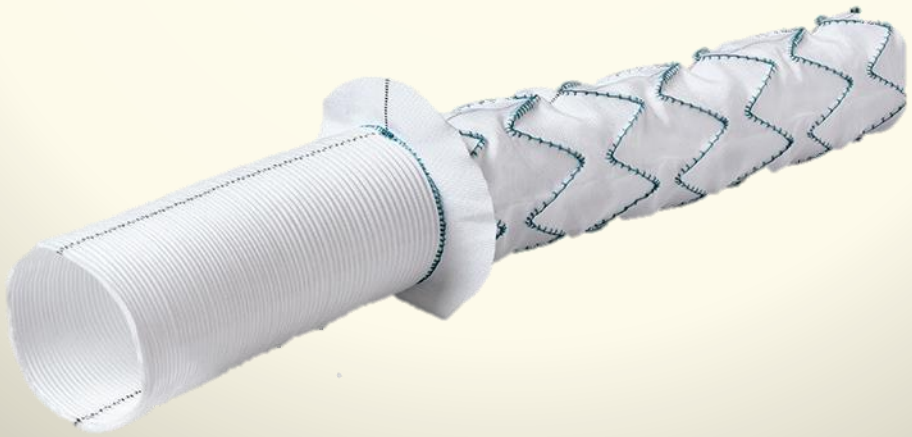
Recommendations	Class[a]	Level[b]	Ref.[c]
In all patients with AD, medical therapy including pain relief and blood pressure control is recommended.	I	C	
In patients with Type A AD, urgent surgery is recommended.	I	B	1,2
In patients with acute Type A AD and organ malperfusion, a hybrid approach (i.e. ascending aorta and/or arch replacement associated with any percutaneous aortic or branch artery procedure) should be considered.	IIa	B	2,118, 202–204, 227
In uncomplicated Type B AD, medical therapy should always be recommended.	I	C	
In uncomplicated Type B AD, TEVAR should be considered.	IIa	B	218,219
In complicated Type B AD, TEVAR is recommended.	I	C	
In complicated Type B AD, surgery may be considered.	IIb	C	

Question to be answered

- Should we limit the emergency operation to the resection of the primary entry tear – asceding aortic and probably hemiarch replacement
  - Short perfusion and circulatory arrest times
  - Minimize the operative risk
- Should we resect as much as possible – Complete arch replacement and open stent grafting of the descending aorta (frozen elephant trunk procedure)
  - Extended perfusion and circulatory arrest times
- Extended Approach (frozen elephant trunk)
  - Positive impact on late survival?

Hybrid Procedure
Frozen Elephant Trunk Technik

- Combination of conventional aortic arch surgery with antegrade endovascular stent grafting of the proximal descending aorta

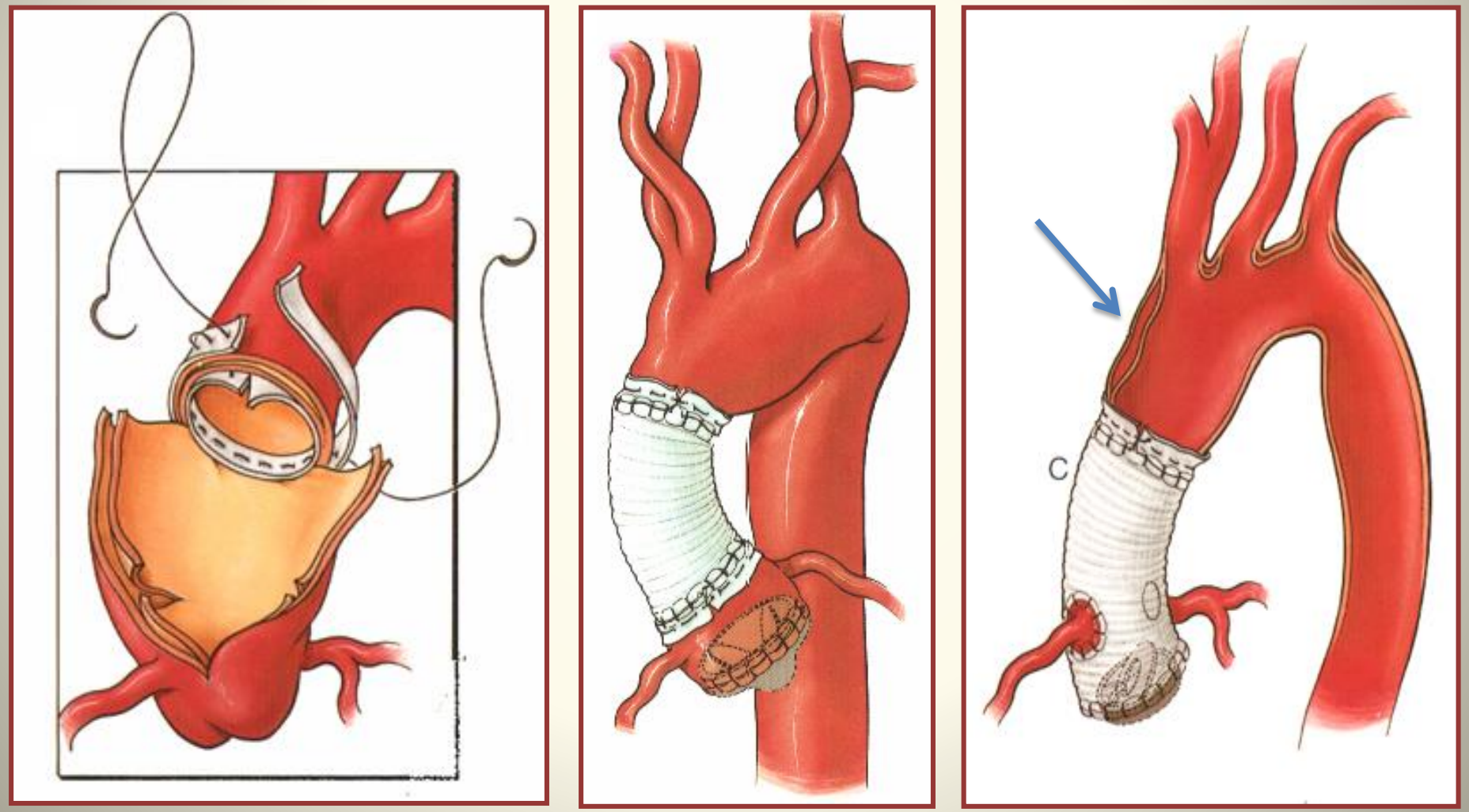


Rationale of FET in Acute Type A

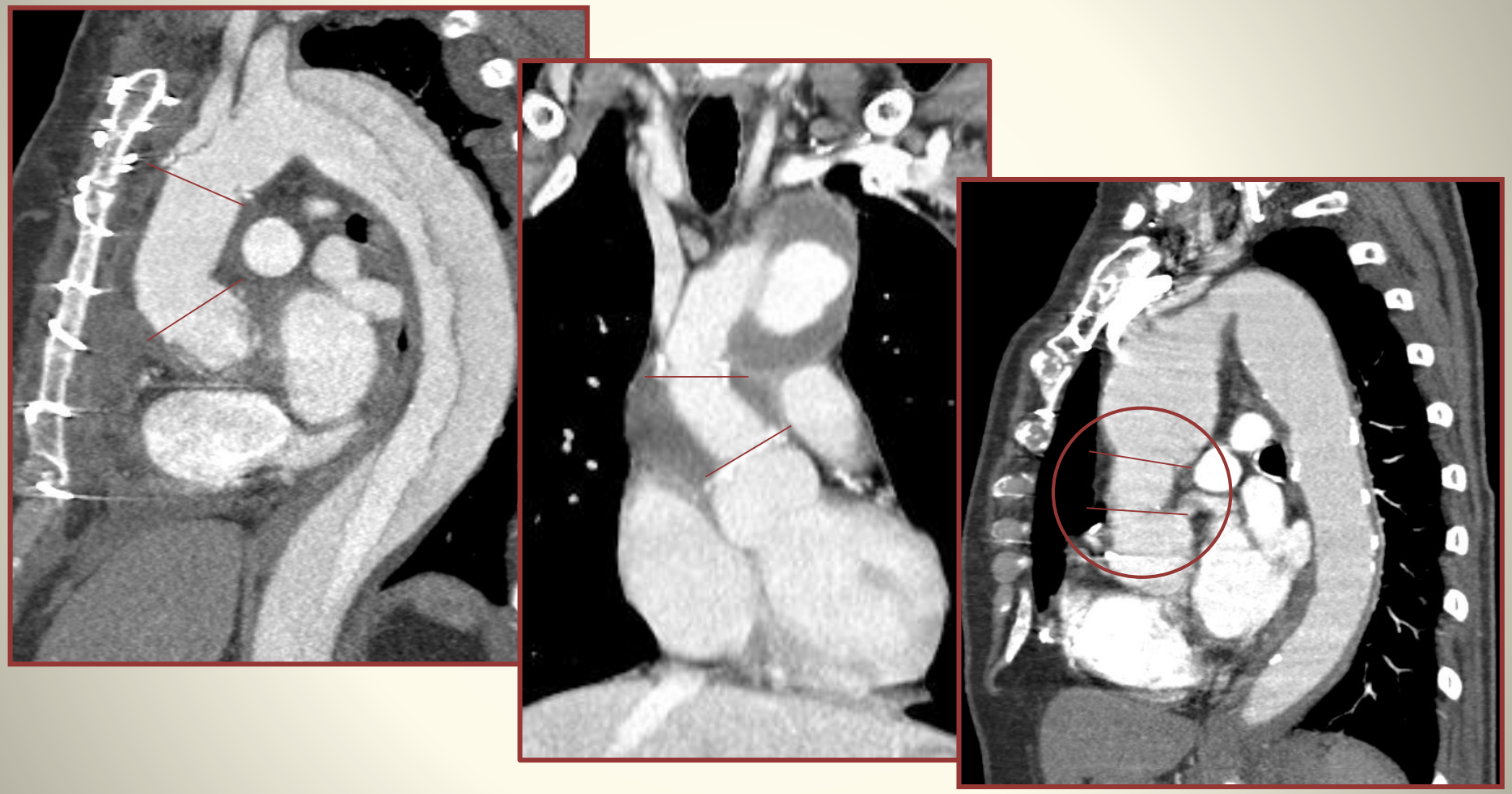
- Result of a conventionally operated type A aortic dissection
  - Chronic Type A Aortic Dissection
- Simultaneous treatment of aortic arch and proximal descending aorta may promote obliteration of the false lumen in the downstream segment
- Positive effect on:
  - Aortic growth rate in the downstream aorta
  - Late re-intervention rate
  - Late mortality

Operative Technique

Principle goal: resection of the primary entry-tear

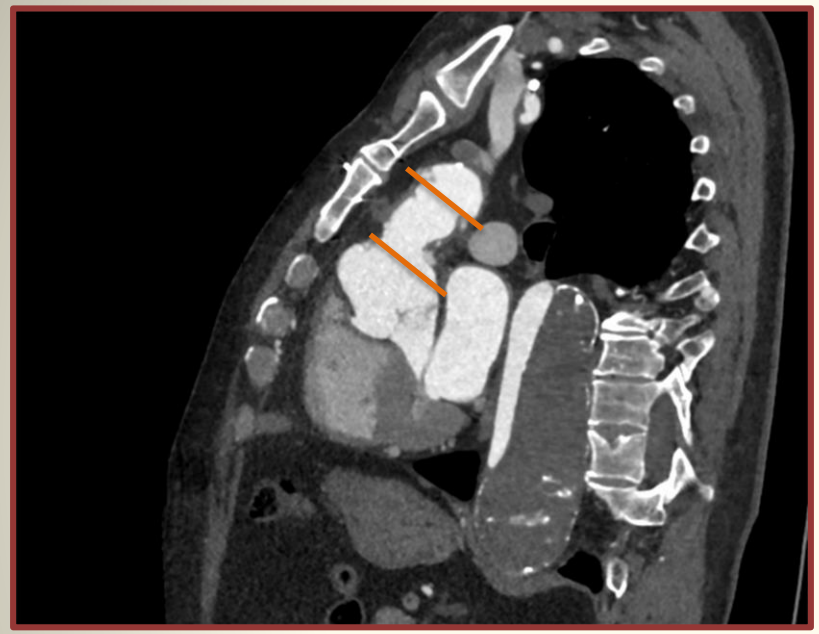


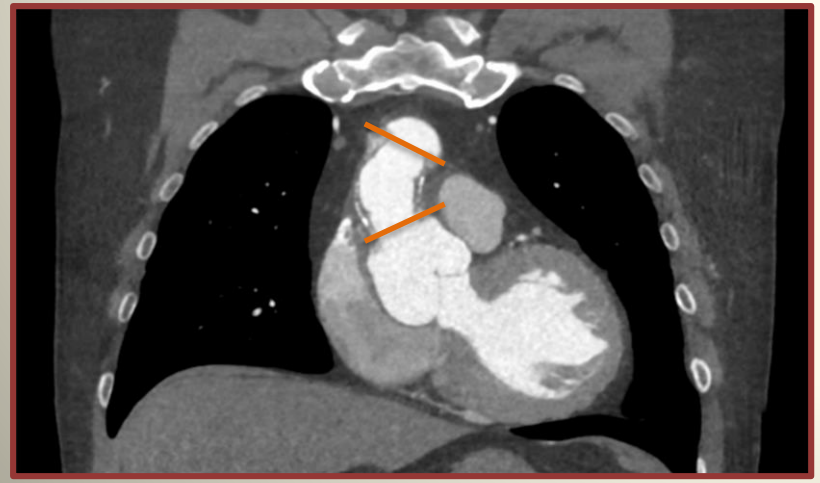
Result of Limited Resection



Opertion of an acute type A diss results in a chronic type A diss

8 years after „limited“ but successful type A operation



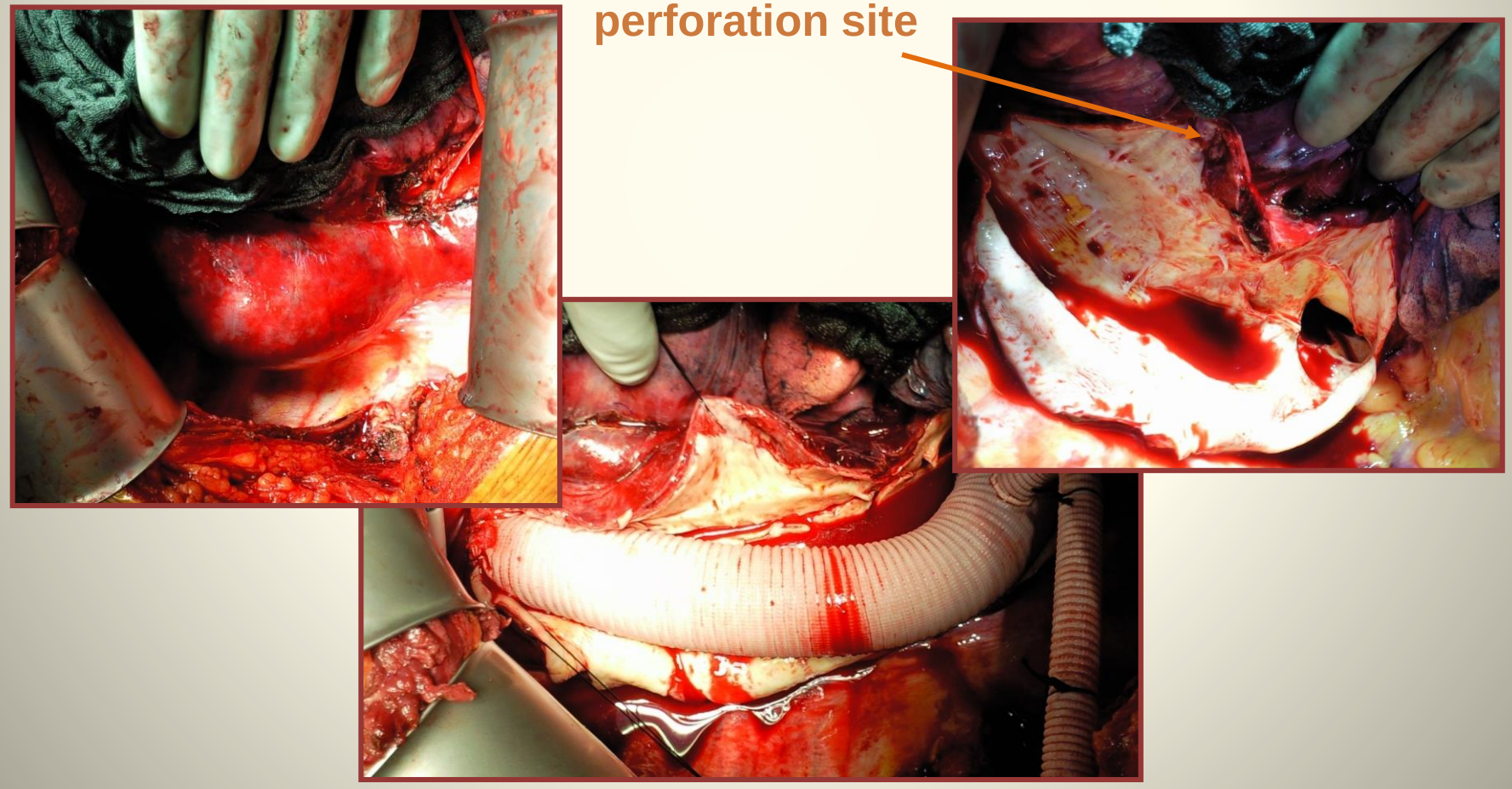


Do we have a problem with the downstream aorta ?

- R. Fattori et al. : Evolution of Aortic Dissection after Surgical Repair; Am J Cardiol 2000.
- Barron DJ et al.: Twenty year follow-up of acute type A dissection: the incidence and extend of distal aortic disease using MRI. J Card Surg 1997.
- Park KJ et al.: Midterm change of descending aortic false lumen after repair of acute type I dissection; Ann Thorac Surg 2009
- Results are conform !
- 70%-77% patent false lumen
- 27%-30% re-interventions related to downstream aorta 5 to 10 years after successful operation !
- Patent false lumen: significant increase in aortic diameter
- Thrombosed false lumen: shrinkage of the aorta
- Most common cause for late death: related to distal aortic disease

Yes, we have!

- Contained rupture 5 years after operation of an acute dissection type A (aortic diameter 5,5 cm)



Long-Term Results After Repair of Type A Acute Aortic Dissection According to False Lumen Patency

Khalil Fattouch, MD, PhD, Roberta Sampognaro, MD, Emiliano Navarra, MD, Marco Caruso, MD, PhD, Calogera Pisano, MD, Giuseppe Coppola, MD, PhD, Giuseppe Speziale, MD, and Giovanni Ruvolo, MD

Department of Cardiac Surgery, University of Palermo, Palermo, Italy

- 189 pat. after type A repair; 48 pat. patent false lumen; 49 pat. Marfan syndrom
- Survival at 10 years: 89,8% for pat. with occluded false lumen; 59,8% for pat. with patent false lumen !!!
- Predictor for late death and reintervention: patent false lumen
- Predictor for late re-treatment: Marfan syndrom and Ø>4.5cm

(Ann Thorac Surg 2009;88:1244–50)

Institutional report - Vascular thoracic

Patency of distal false lumen in acute dissection: extent of resection and prognosis

Genichi Sakaguchi*, Tatsuhiko Komiya, Nobushige Tamura, Chieri Kimura, Taira Kobayashi, Hiromasa Nakamura, Tomokuni Furukawa, Akihito Matsushita

Department of Cardiovascular Surgery, Kurashiki Central Hospital, 1-1-1 Miwa, Kurashiki City, Okayama, 710-8602, Japan

- 89 pat. w
- Replacen hemiarch (15pat.), 1pat.)
- Patency nced by extend o
- Discussic esc.aorta?
- Patent fa
  - signific heter
  - Poor long-term prognosis (76%survival rate at 5a)

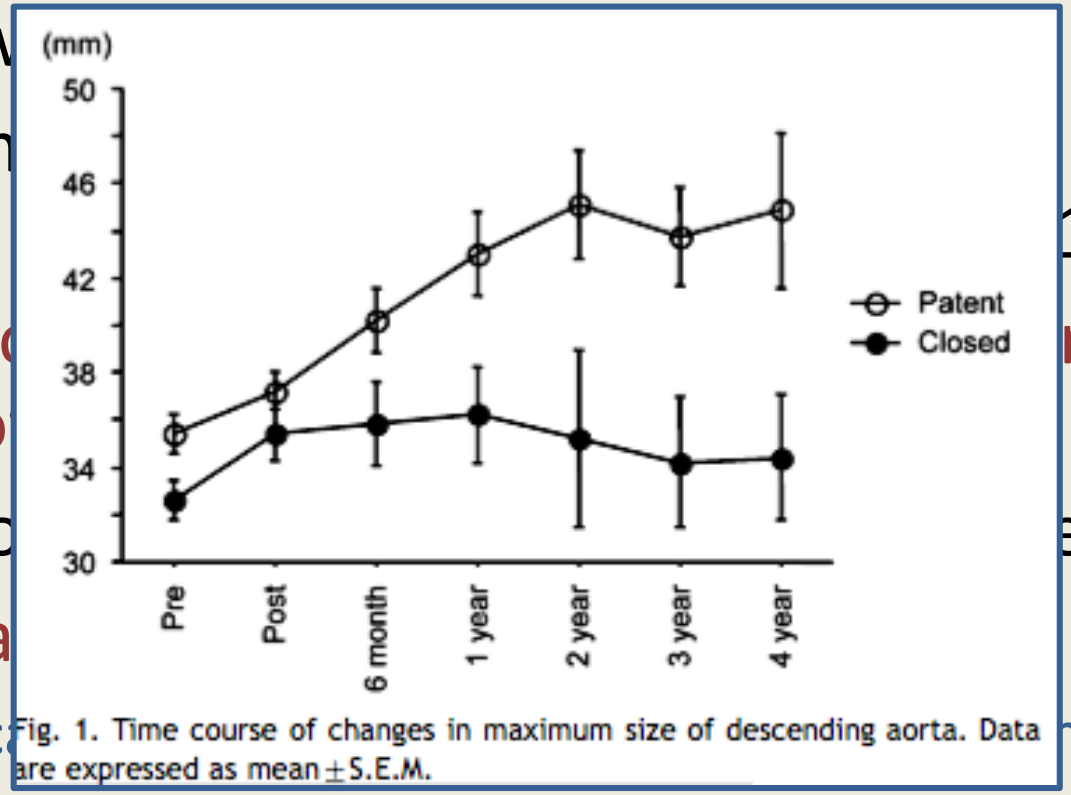
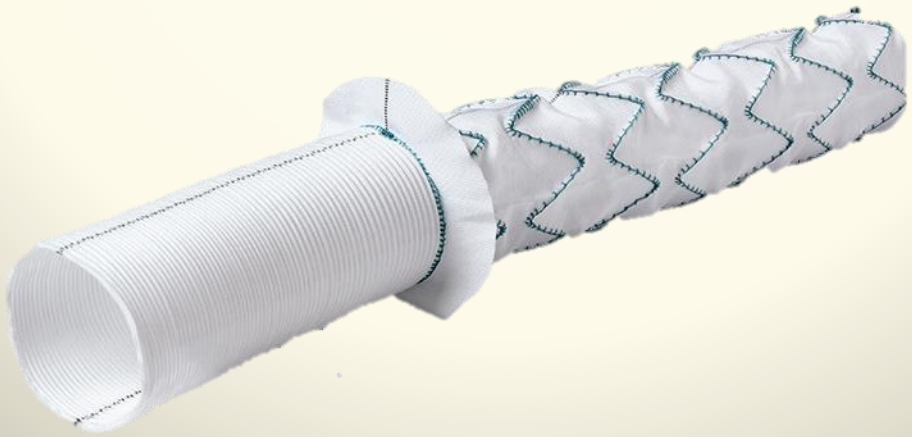


Fig. 1. Time course of changes in maximum size of descending aorta. Data are expressed as mean ± S.E.M.

Angioscopy of the desceding aorta

Hybrid Procedure
Frozen Elephant Trunk Technik

- Combination of conventional aortic arch surgery with antegrade endovascular stent grafting of the proximal descending aorta

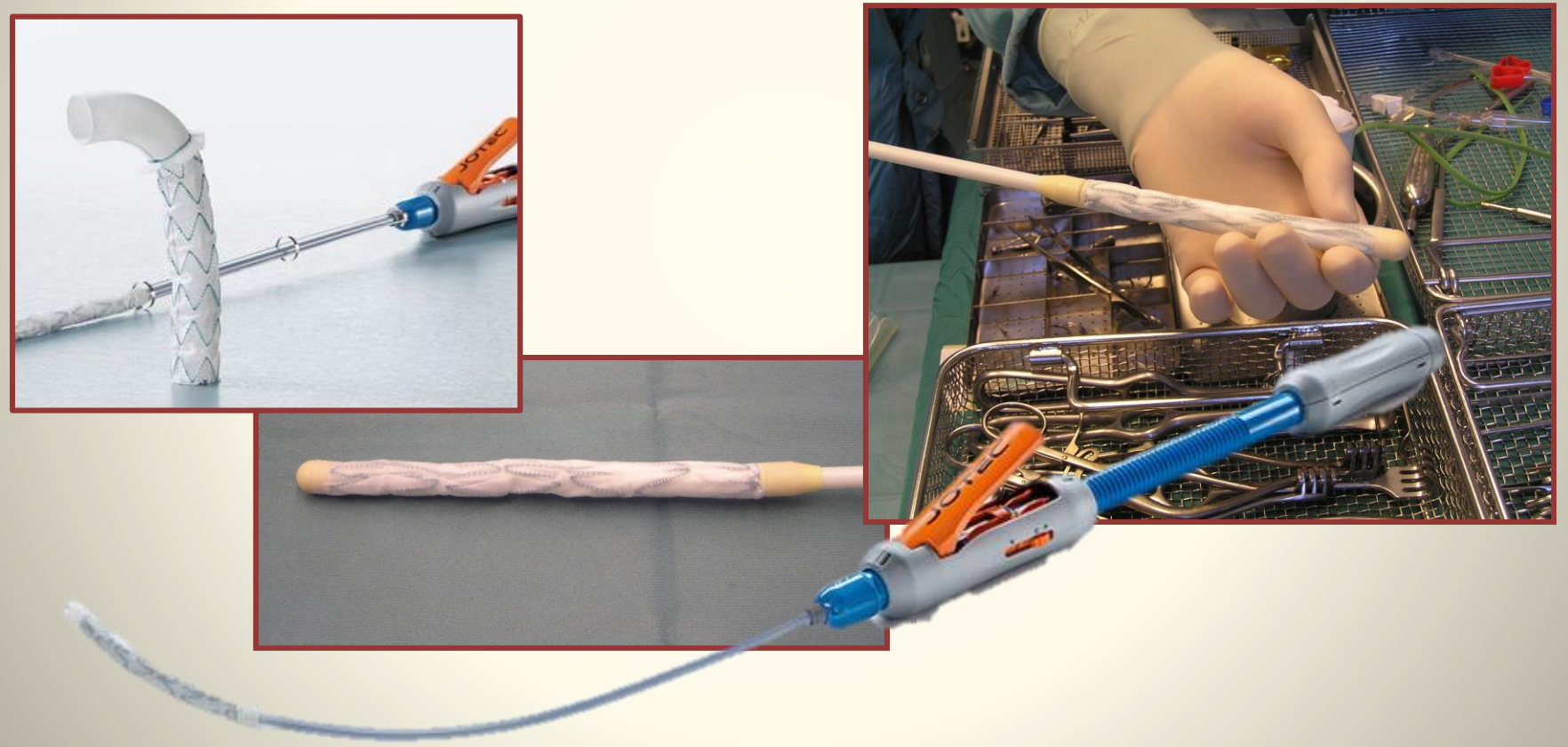


Rationale in Type A

- To promote thrombosis of the false lumen
- Closure of possible re-entries in descending aorta and aortic arch
- Expansion of true lumen
- To facilitate consecutive surgical and endovascular procedures of the descending aorta
- Goal:
  - Decreased re-intervention rate and improved survival in the long-term run

Antegrade Device

- E-vita^{R} „open“ stent graft; JOTEC^{R} (Germany)



Surgical Technique

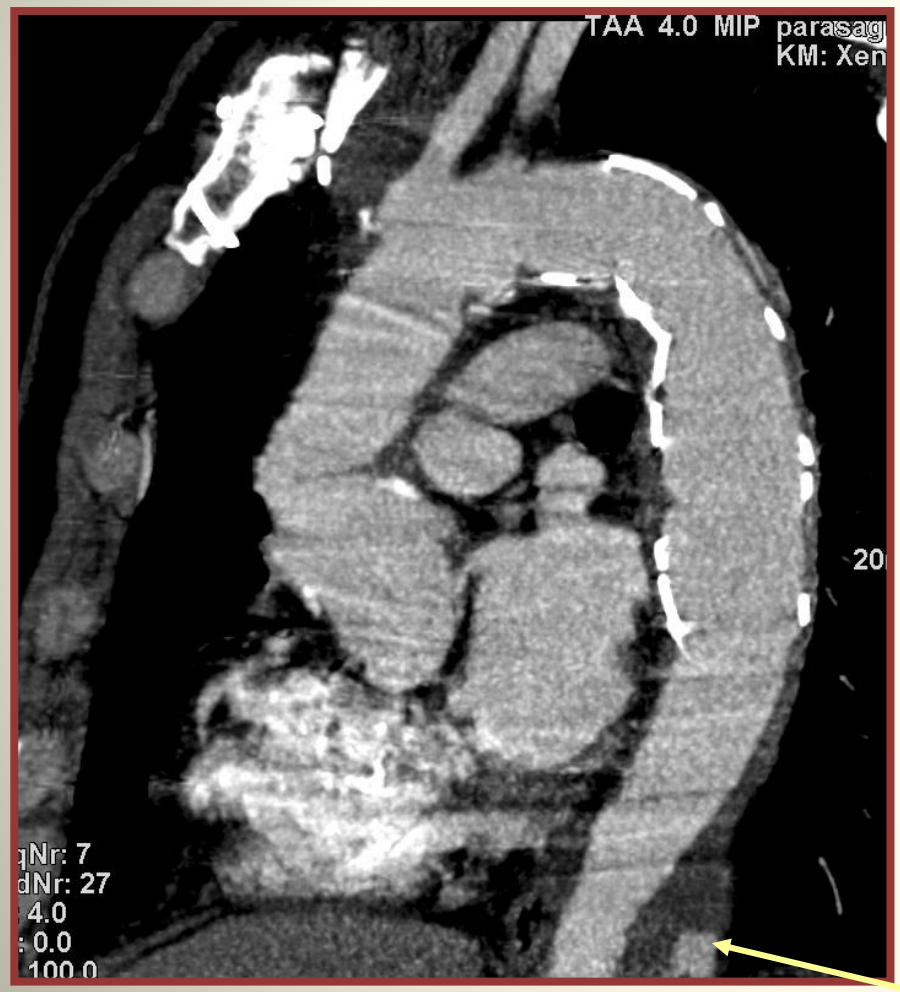
- Hybrid-Stent Grafts: Endovascular Stent grafts combined with a Dacron prosthesis (Jotec^{R})
- Stent grafts were inserted into the descending aorta in the period of circulatory arrest under direct vision via the open aortic arch
  - Landmark: offspring of left subclavian artery for the proximal end of the stent graft
  - Angioscopic guidance for stent graft placement
- Dacron graft is pulled out of the stent gaft and sutured to the aorta distal to the left subclavian artery

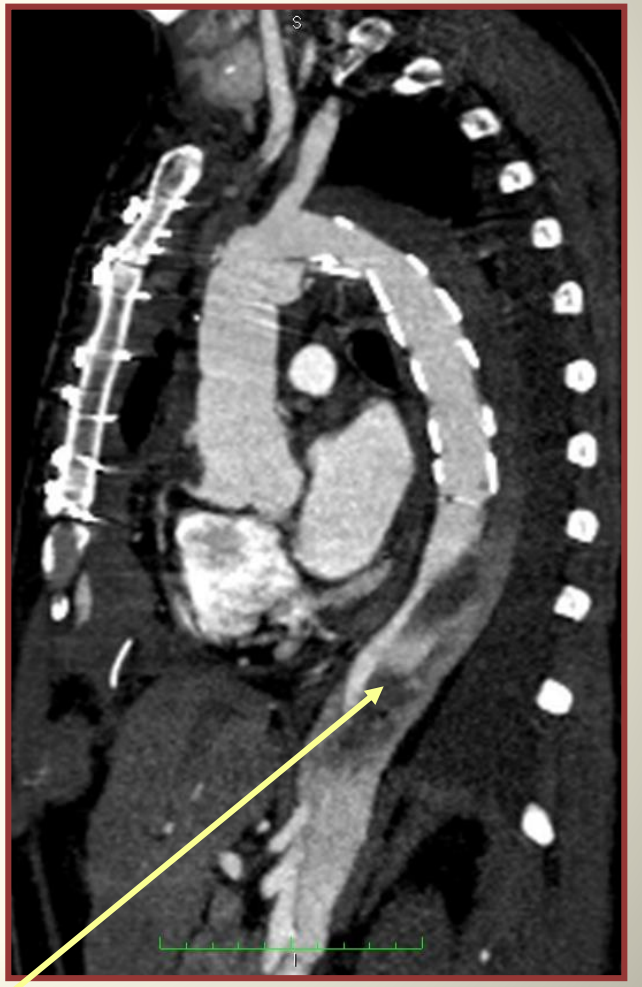
Surgical Technique 2

- Pat. were operated in moderate hypothermia (25^0-28^0C)
- Arterial cannulation: right subclavian artery via 8 mm Dacron graft (no direct cannulation - dissection!)
- Venous line: right atrium
- Bilateral antegrade cerebral perfusion in the period of circulatory arrest (10ml/kg/min)
  - Clamping of the innominate artery
  - Balloon catheter into the left common carotid
- Topical cooling of the brain/1g prednisolon prior to CA

FET for Type A
„Arch light Repair“

CT-scan





False lumen remains patent distal to the end of the stent grafts

A Meta-Analysis of Total Arch Replacement With Frozen Elephant Trunk in Acute Type A Aortic Dissection

Hisato Takagi[1], and Takuya Umemoto[1]; for the ALICE[2] Group

- FET for acute aortic dissection type A
- 15 studies enrolling 1279 patients were identified
- CPB time: 207,1 min.; x-clamp time: 123.3 min.; SACP: 49,3 min.
- Early mortality: 9,2%, ≥ 1 year: 13%, stroke rate 4,8%, Spinal cord injury: 3,5%, re-intervention rate: 9,6%,
  false lumen thrombosis: 96,8%
- Conclusion: FET procedure is a safe alternative with acceptable early mortality and morbidity. The rates of mid- to long-term re-interventions may be lower in the FET population

Vascular and Endovascular Surgery
2016, Vol. 50(1) 33-46

Total aortic arch replacement with the frozen elephant trunk procedure in acute DeBakey type I aortic dissections

Malakh Shrestha*, Axel Haverich and Andreas Martens

Department of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Hannover, Germany

- 2004-2016: 94 patients with acute DeBakey Type I dissection
- Total arch replacement with Frozen Elephant Trunk was performed
- mean age: 58±12 years; malperfusion: 30%;
- Results:
  - Group 1 (2004-2010, non-branched FET prosthesis)
    - Mortality: 21%, Stroke: 11%, spinal cord injury: 7%
  - Group 2 (2010-2016, branched FET prosthesis)
    - Mortality: 9%, Stroke: 17%, spinal cord injury: 5%
- The FET-pocedure improves short-and long-term outcome, especially for DeBakey type I with malperfusion

European Journal of Cardio-Thoracic Surgery 51 (2017) i29–i34

One-stage hybrid aortic repair using the frozen elephant trunk in acute DeBakey type I aortic dissection

Nora Goebel, Ragi Nagib, Schahriar Salehi-Gilani, Samir Ahad, Marc Albert, Adrian Ursulescu, Ulrich F. W. Franke

Department of Cardiovascular Surgery, Robert-Bosch-Hospital, Stuttgart, Germany

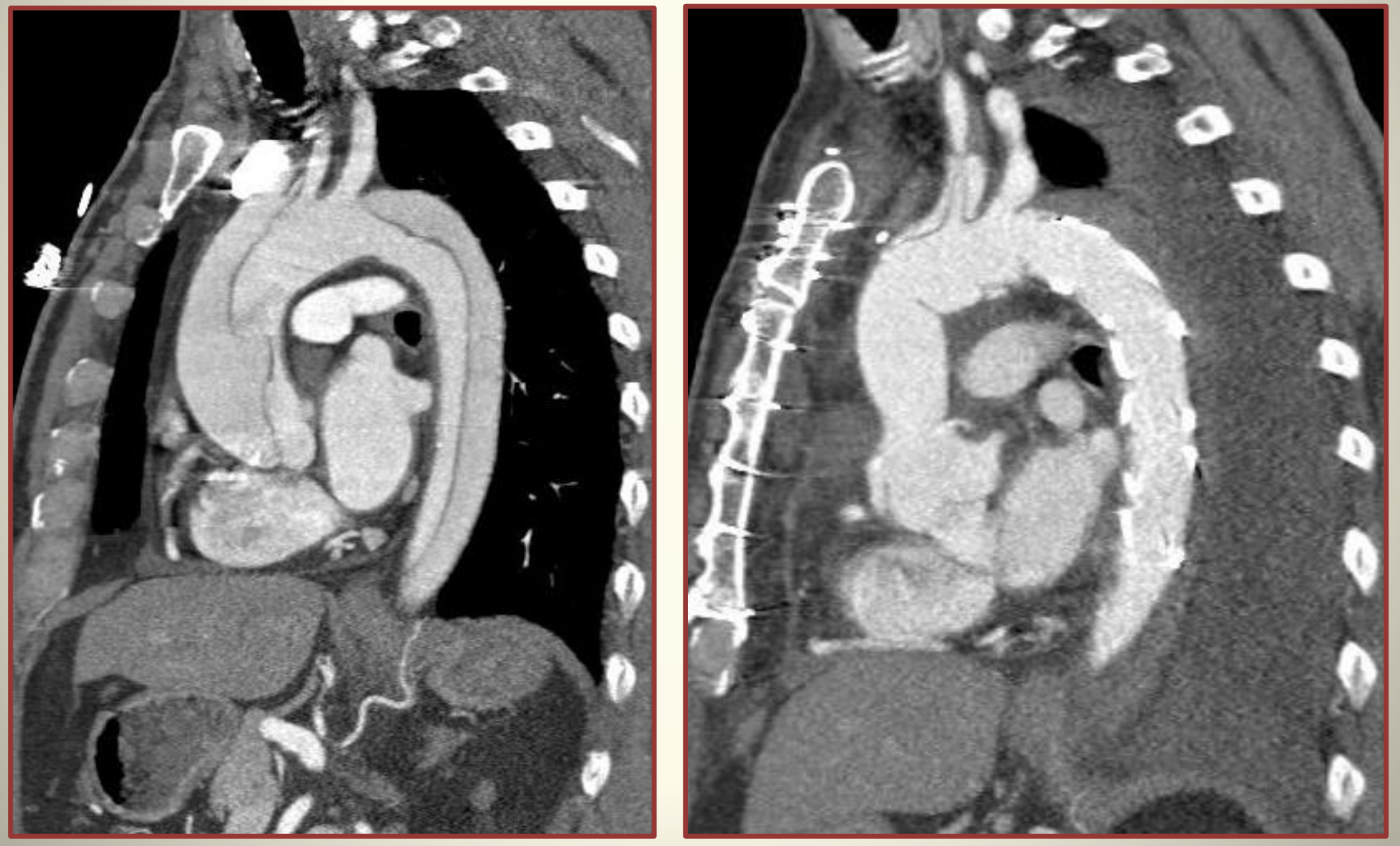
- 2009-2016: 72 patients with DeBakey Type I aortic dissection;
- Emergent aortic repair with FET-prosthesis
- 30-day mortality: 15,3%; Stroke: 2,8%; Spinal cord injury: 4,2%
  Freedom from distal re-intervention: 96,7% (at 4 years)
- Conclusion: Hybrid aortic repair does not elevate perioperative risk of mortality and provides excellent aortic remodelling

J Thorac Dis 2018;10(7):4195-4203

Results Hospital Hietzing

- 37 FET procedures in pat. with acute dissections
  - type A: 26 pat.
  - retrograde A after B: 7 pat.
  - NonA nonB: 4 pat.
- 31 male and 6 female pat.
- mean age: 57,2 years
- SACP-time: 57,2 min.
- ICU stay: mean 6 days (1-22 days)
- In-hospital mortality: 8,1% (3/37)
- permanent stroke: 16% (6/37) (most of them nonA nonB dissections)

FET for Type A



Conclusions

- Frozen elephant trunk technique enables treatment of the ascending aorta, the aortic arch and the proximal descending aorta in a one-stage procedure resulting in
  - Enhanced thrombosis of the false lumen
  - Less re-interventions in the follow-up period
- Can be performed with excellent results!
- Aggressive approach is strongly recommended for patients:
  - < 70 years (reasonable long-term prognosis)
  - entry-tear in the arch or proximal descending aorta
  - lower body malperfusion