



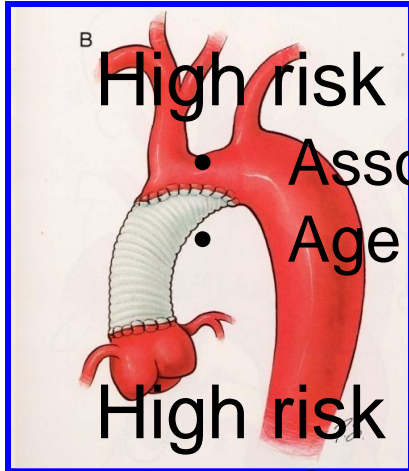
VI CONGRESSO NAZIONALE DI
ECOCARDIOCHIRURGIA
MILANO 15-17 OTTOBRE 2012

Le tecniche ibride di sostituzione
dell'aorta ascendente e dell'arco.
*Come cambia la tecnica associando
le endoprotesi. I risultati.*

Davide Pacini, M.D.

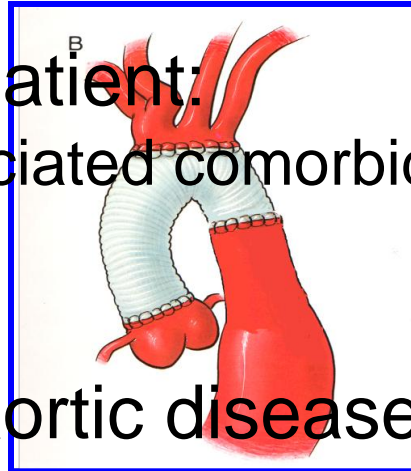


Classic surgery of the thoracic aorta



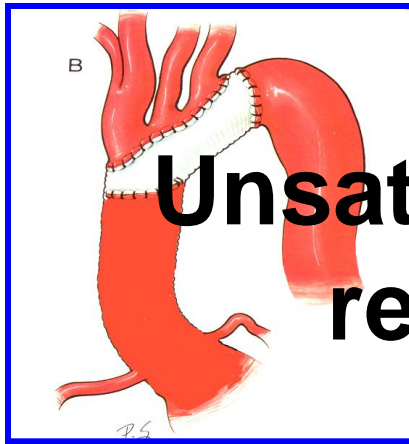
High risk patient:

- Associated comorbidity
- Age

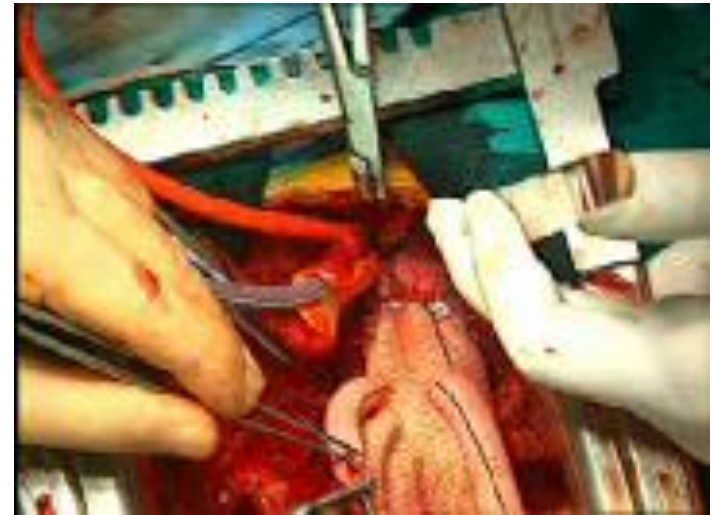
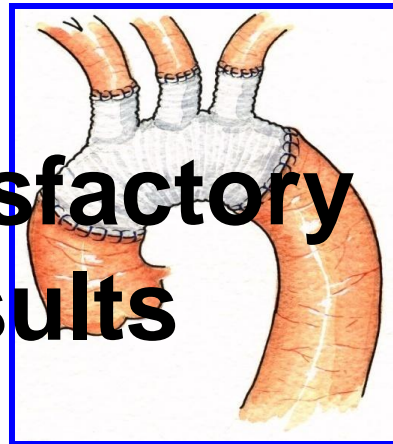


High risk aortic disease:

- Complex aortic disease



Unsatisfactory results



Hybrid surgery

High risk patient:

- **Associated comorbidity**
- **Age**

CPB and HCA



„potential drawbacks“

brain injury
bleeding complications
complement activation
SIRS
infection
long rehabilitation

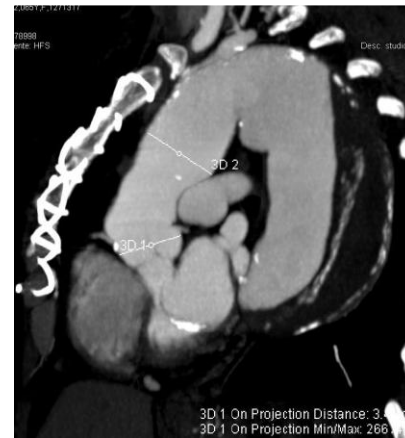
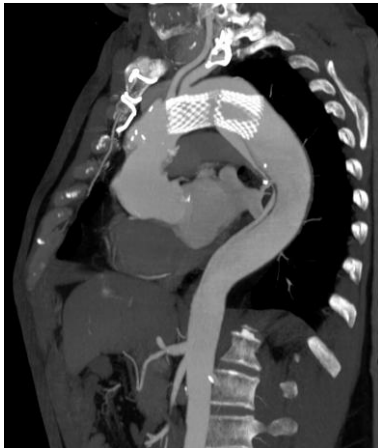
„HCA always needed ?“



Hybrid surgery

High risk aortic disease:

- Complex aortic disease

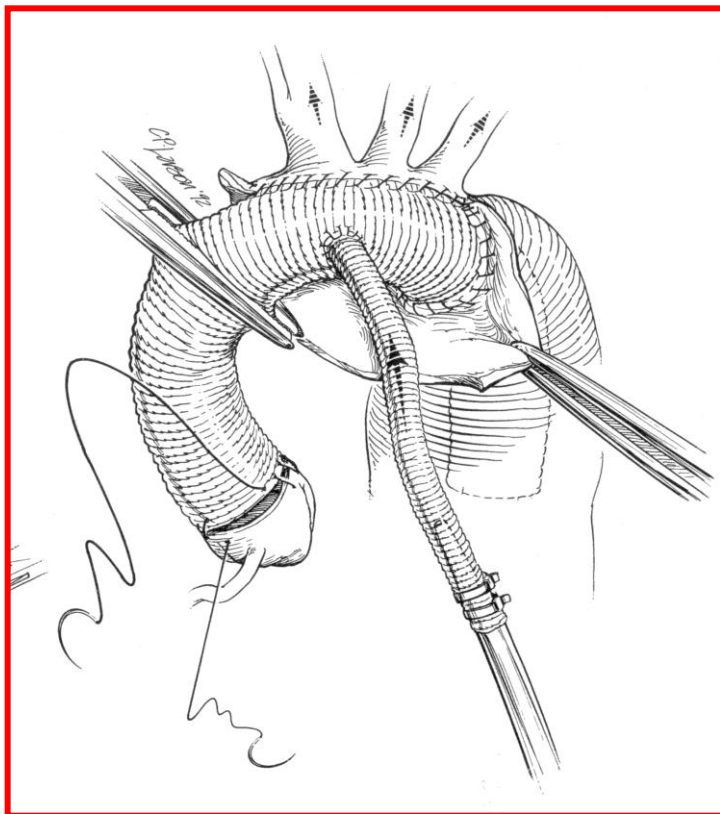


1983 - ELEPHANT TRUNK TECHNIQUE

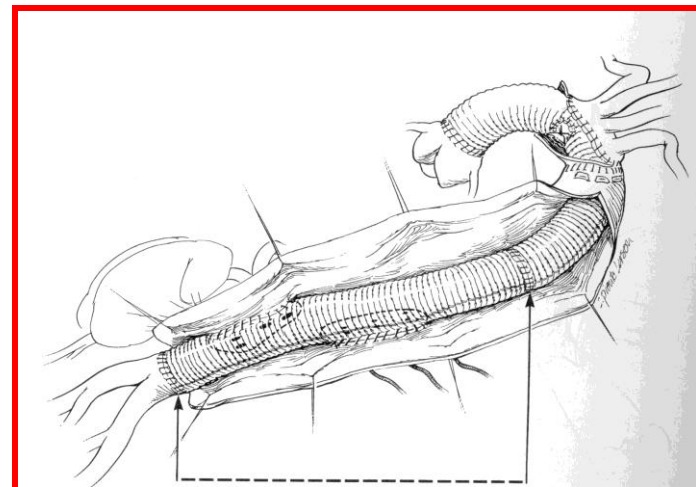
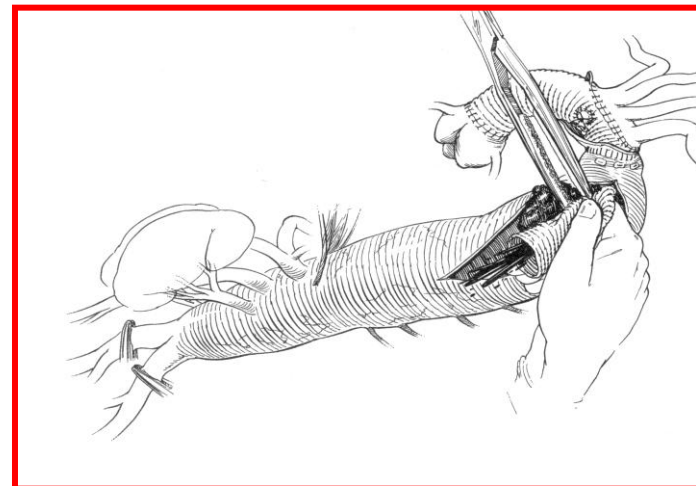


H. BORST

1 st stage



2 nd stage



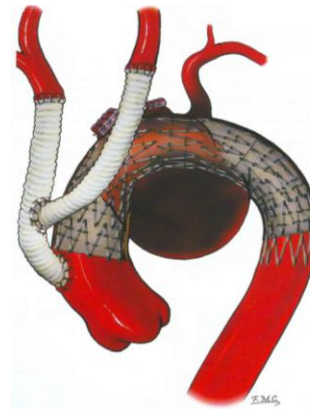
ELEPHANT TRUNK - RESULTS

Author	Year	Mortality at first-stage ET	Patients underwent second-stage operation	Mortality at second-stage operation
Safi et al.	2007	16/254 (6.3%)	115/254 (45.3%)	11/115 (9.6%)
Coselli et al.	2006	18/148 (12.2%)	76/148 (51.4%)	3/76 (3.9%)
Svensson et al.	2005	2/94 (2.1%)	47/94 (50%)	4/47 (8.5%) including 7 pts. with stenting
Hanafusa et al. ^a	2002	1/12 (8.3)	0	
Kuki et al.	2002	0/17 (0%)	9/17 (52.9%)	0/9 (0%)
Takahara et al.	2002	3/37 (8.1%)	0	
Schepens et al.	2002	8/100 (8%)	44/100 (44%)	NA
Kirali et al. ^b	2002	9/28 (32.1%)	0	
Naka et al.	1999	1/9 (11.1%)	6/9 (66.7%)	2/6 (33.3%)
Ando et al.	1998	2/15 (13.3%)	0	
Heinemann, Borst et al.	1995	10/72 (13.9%)	24/72 (33.3)	NA
		70/786 (8.9%)	321/694 (46.3%)	20/268 (7.7%)

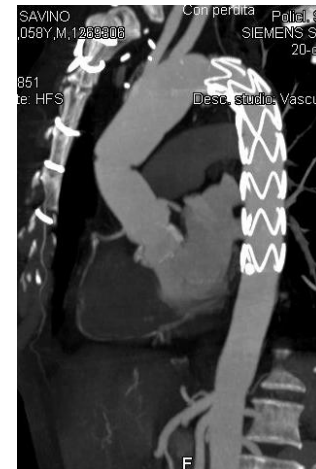


Hybrid surgery

- Debranching

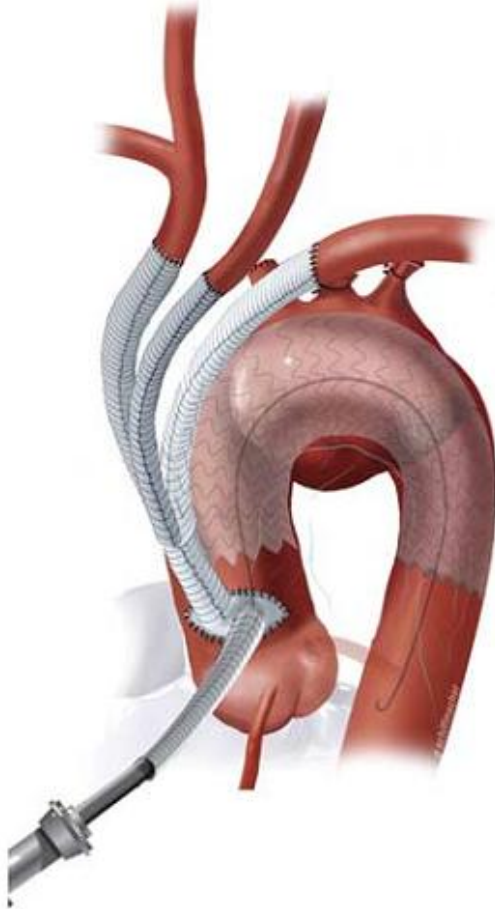


- Frozen elephant trunk



DEBRANCHING

Type I



Type II





Meta Review of Zone 0 LZ Hybrids

Study	Year	N	Periop Mortality	Periop Stroke	Paraplegia/Sp. Ischemia	Zone 0 Hybrids only?
Milewski et al	2010	27	10%	5%	10%	No- only 19
Wiegang et al	2009	16	15%	4%	0%	Yes
Chan et al	2008	7	0%	0%	0%	No- only 5
Hughes et al	2008	7	14%	0%	0%	Yes
Chen et al	2008	6	0%	0%	0%	Yes
Melissano et al	2007	26	14.3%	14.3%	0%	No- only 14
Czerny et al	2007	27	4-7%*	0%	0%	No- only 14
Bergeron et al	2006	25	8-13%*	12-20%*	4-6%*	No- only 15
Saleh et al	2006	15	0%	0%	0%	Yes
Carrel et al	2006	6	0%	0%	0%	No- only 5

* Percentages inaccurate, as outcomes in zone 0 are not addressed separately in original paper!



Targeting Landing Zone 0 by Total Arch Rerouting and TEVAR: Midterm Results of a Transcontinental Registry

Martin Czerny, MD,* Ernst Weigang, MD,* Gottfried Sodeck, MD, Juerg Schmidli, MD, Carlo Antona, MD, Guido Gelpi, MD, Tanja Friess, MD, Josef Klocker, MD, Wilson Y. Szeto, MD, Patrick Moeller, MS, Alberto Pochettino, MD, and Joseph E. Bavaria, MD

Table 3. Complications Characteristic of the Cohort

Complication	N = 66
Early	
In-hospital death, n (%)	6 (9)
Major stroke, n (%)	3 (5)
TIA, n (%)	1 (1)
Permanent paraplegia, n (%)	2 (3)
Retrograde aortic dissection, n (%)	2 (3)
Early endoleaks	
Type Ia, n (%)	7 (11)
Type Ib, n (%)	0 (0)
Type II, n (%)	1 (1)
Type III, n (%)	1 (1)
Endoleak requiring reintervention, n (%)	9 (14)

Table 3. Complications Characteristic of the Cohort

Complication	N = 66
Late	
Follow-up in months, median (IQR)	25 (8–41)
Aorta-related death, n (%)	2 (3)
All-cause death, n (%)	14 (21)
Late retrograde aortic dissection, n (%)	3 (5)
Need for open conversion, n (%)	3 (5)
Late endoleaks	
Type Ia, n (%)	2 (3)
Type Ib, n (%)	1 (1)
Type II, n (%)	2 (3)
Type III, n (%)	1 (1)
Endoleak requiring reintervention, n (%)	4 (6)

IQR = interquartile range; TIA = transient ischemic attack.



COMPLEX LESIONS OF THE THORACIC AORTA

“Pathology of the aorta starting from the ascending aorta or aortic arch and extending downward into the descending thoracic or thoracoabdominal aorta”

ACUTE

Type A aortic dissection

Type B aortic dissection

PAU – Ao Haematoma

CHRONIC

Chronic aneurysms

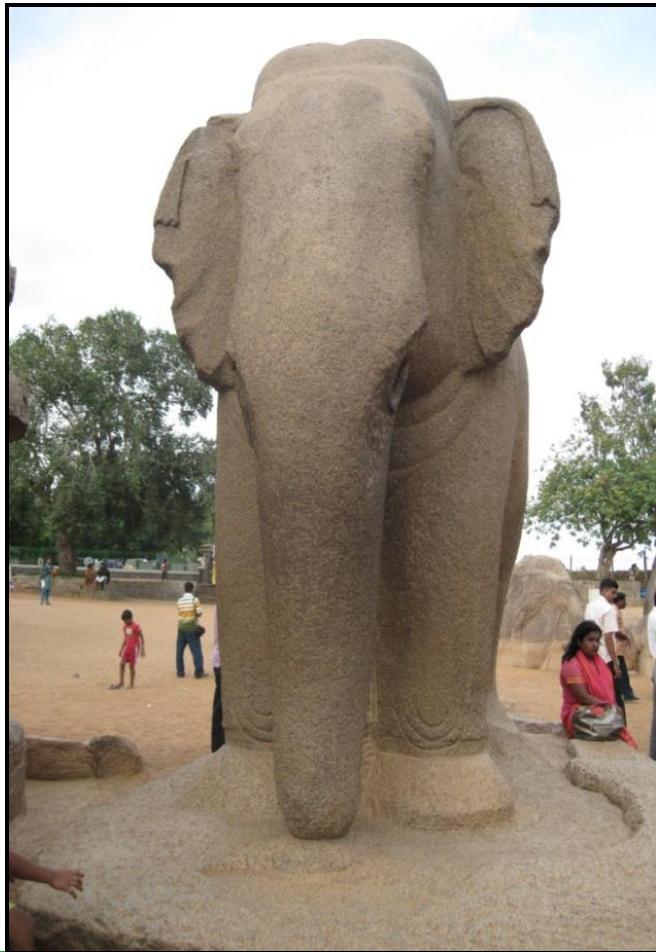
Type A aortic dissection

Type B aortic dissection

PAU – Ao Haematoma



FROZEN ELEPHANT TRUNK



The most recent development of the classic elephant trunk technique is the combination of an endovascular stent graft with a conventional surgical graft for hybrid procedures of the entire thoracic aorta.

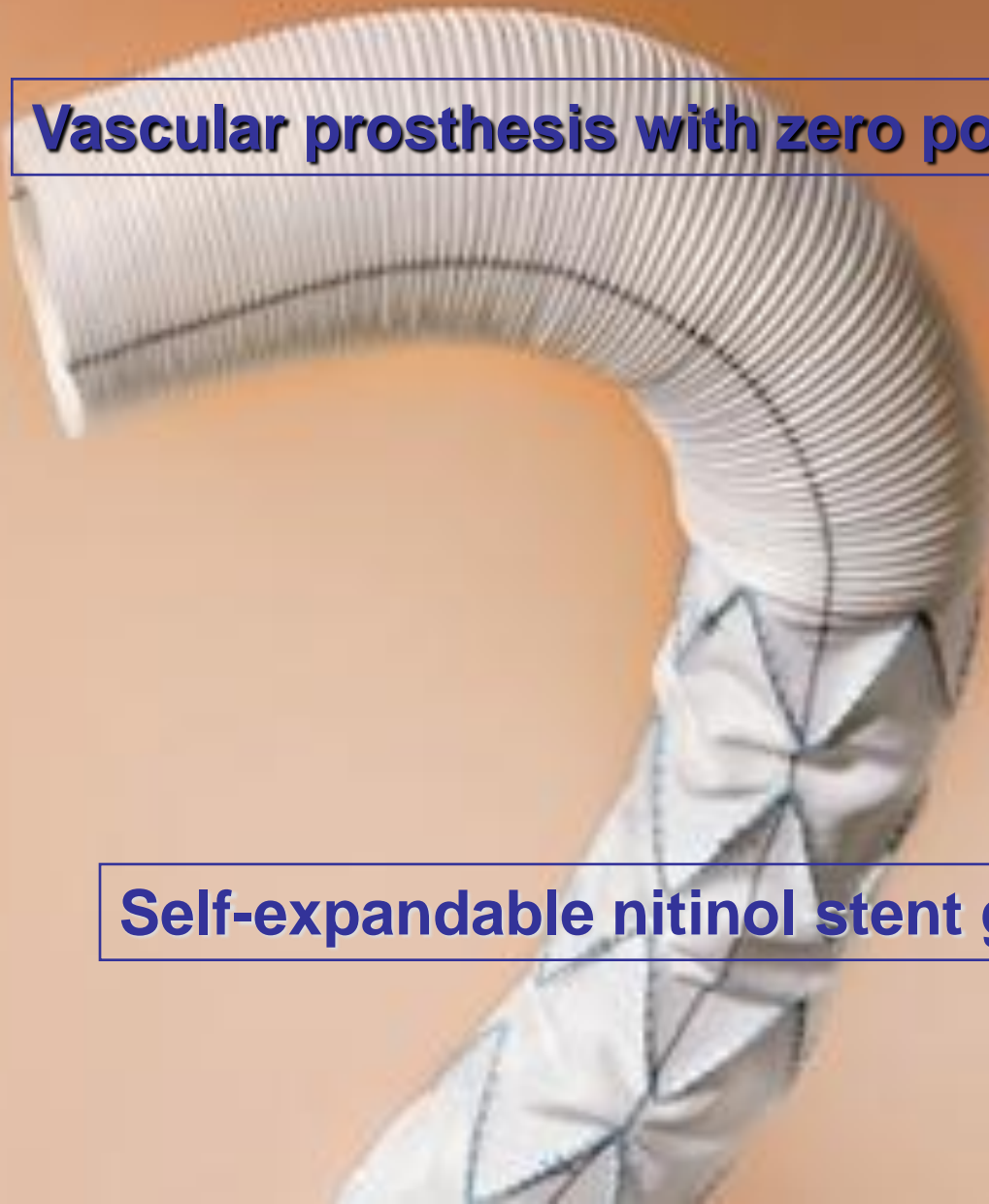
Kark M, Haverich A, et al. *The frozen elephant trunk technique: a new treatment for thoracic aortic aneurysms.* J Thorac Cardiovasc Surg 2003; 125:1550-3



E-vita open plus

Vascular prosthesis with zero porosity

Self-expandable nitinol stent graft



Key-points

Aortic anatomy assessment

Organ protection

Myocardial

Cerebral

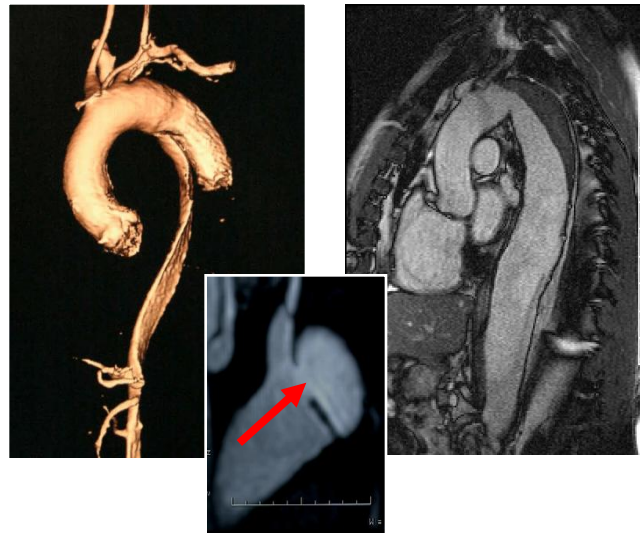
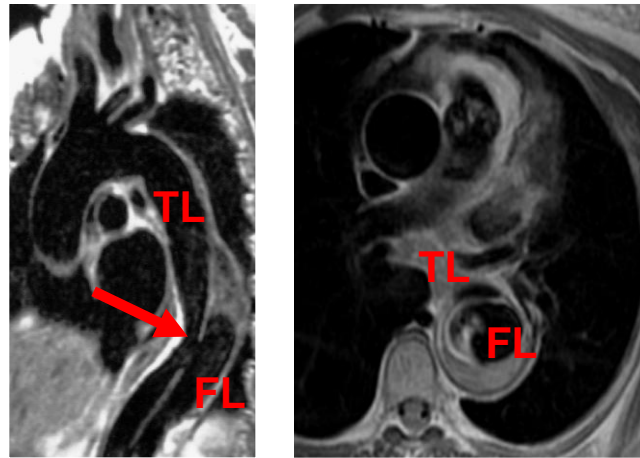
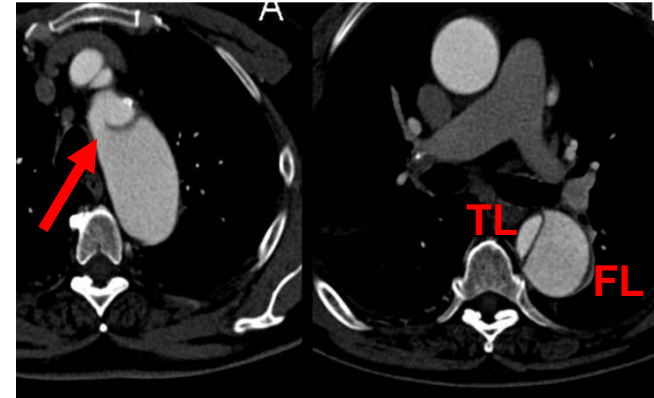
Visceral

Surgical technique/strategy



Aortic Dissection

- Intimal flap extension
- Entry site
- Relation true/false lumen
- Visceral vessels origin
- Reentry
- **No oversizing**



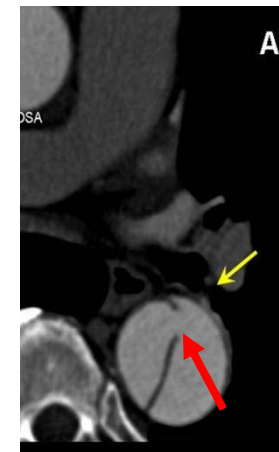
Entry site



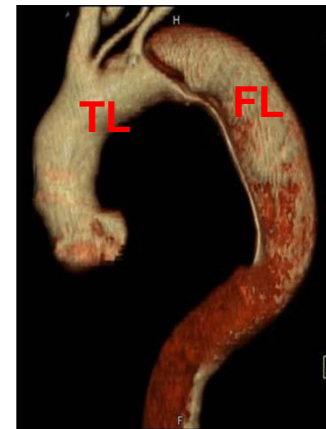
Reentry



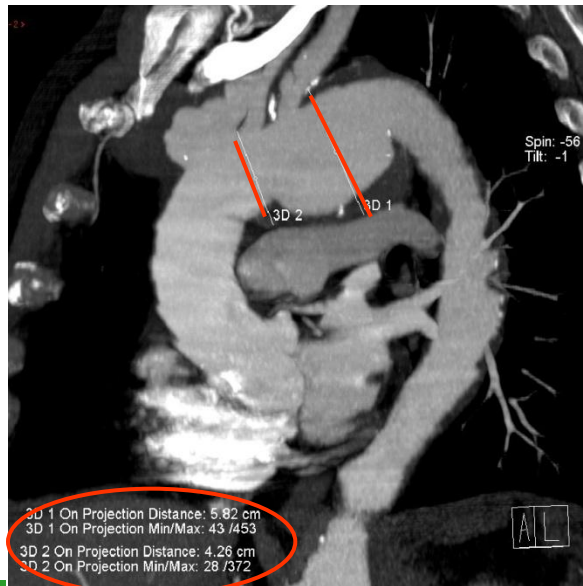
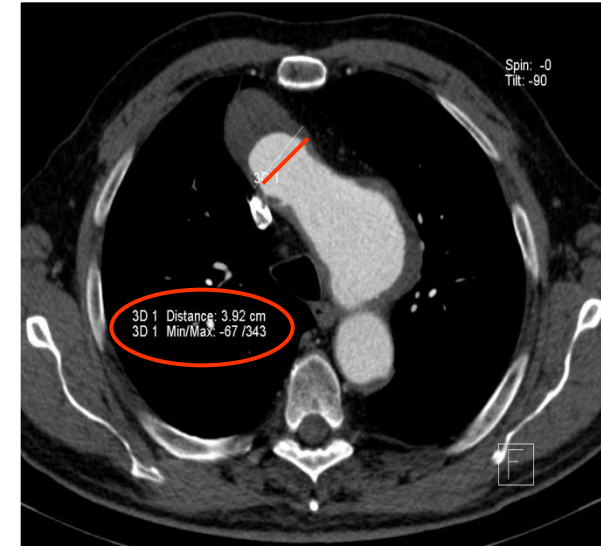
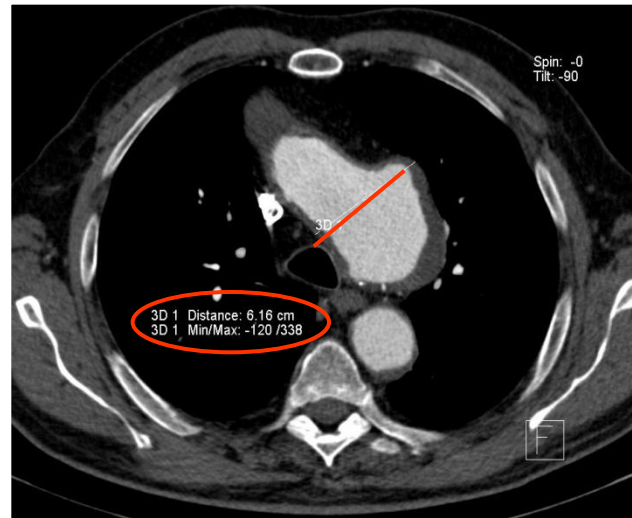
Reentries



Entry



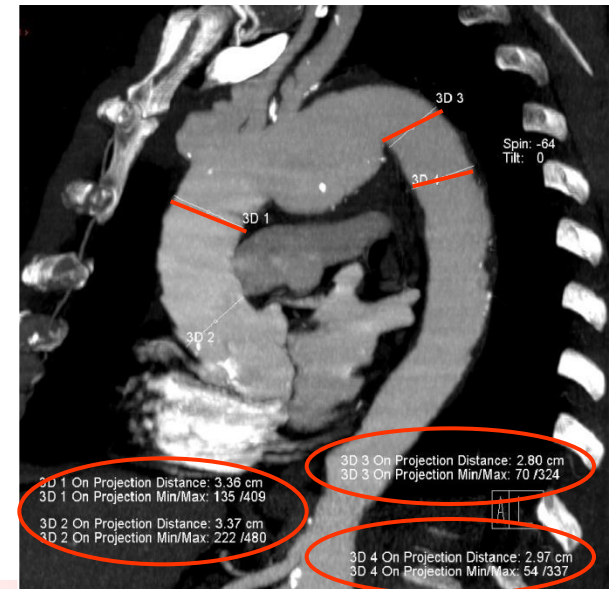
Aortic anatomy assessment



CHRONIC ANEURYSMS

Evaluation of aortic diameters

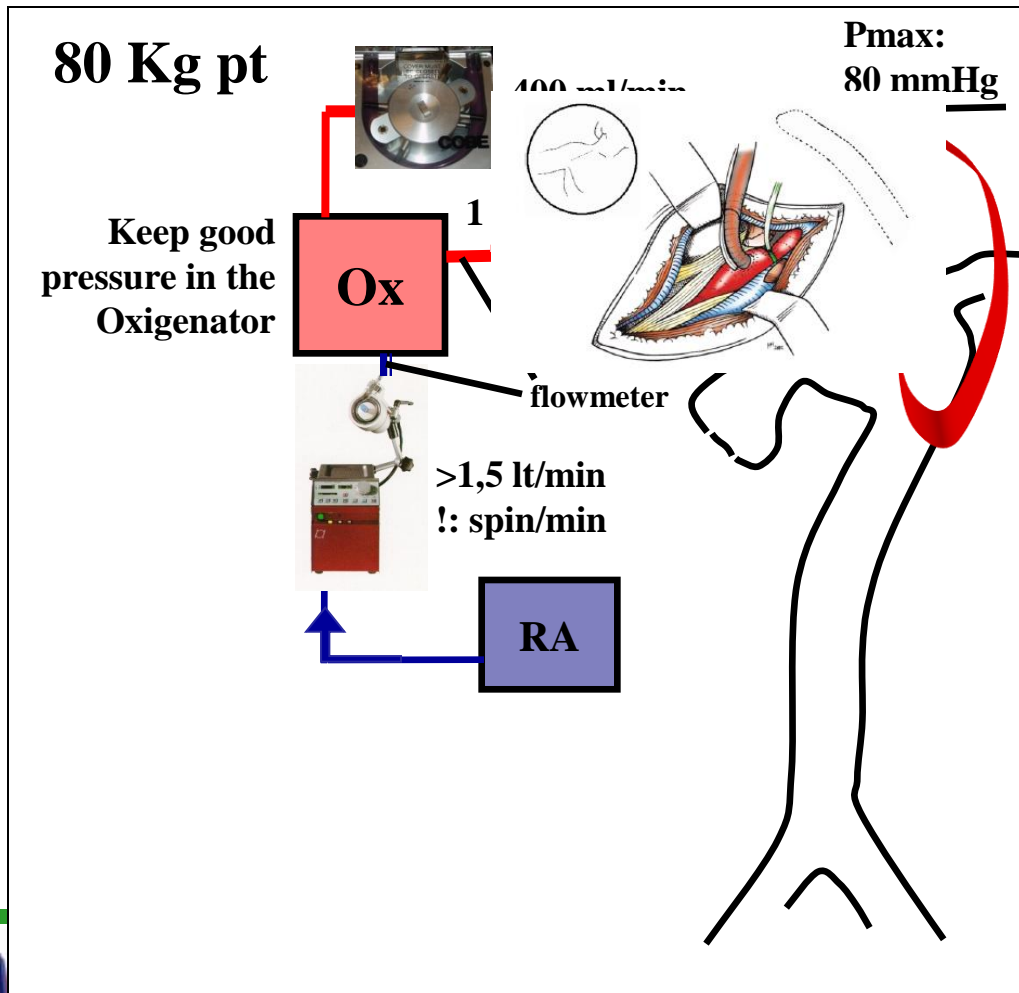
OVERSIZING: 10-20%



Cerebral Protection:

Antegrade Selective Cerebral Perfusion

Axillary/Innominate artery cannulation



Moderate systemic hypothermia:

26° C of nasoph. T

Advantages:

- Antegrade flow
- Left carotid and left subclavian art. selective cannulation

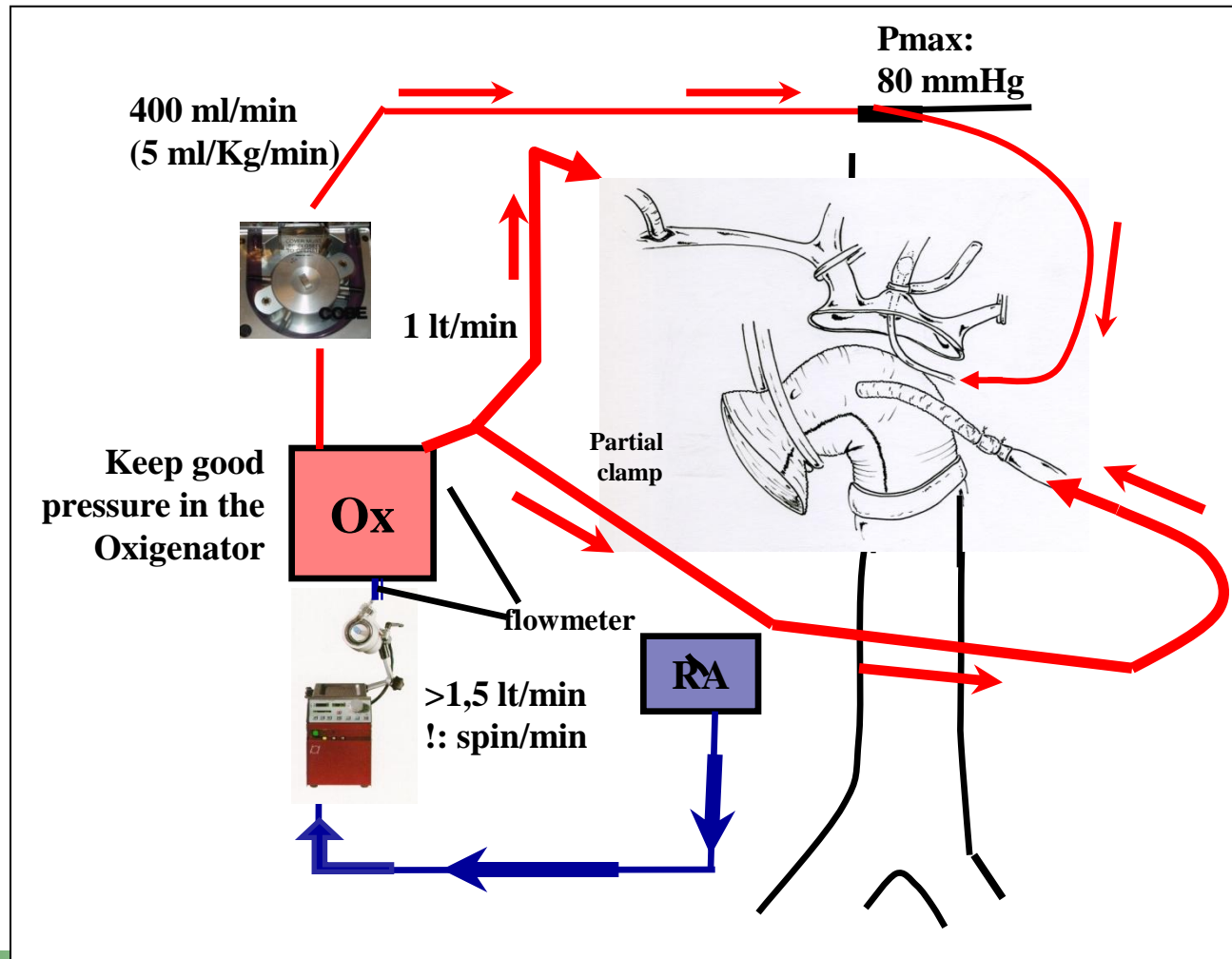
Drawbacks:

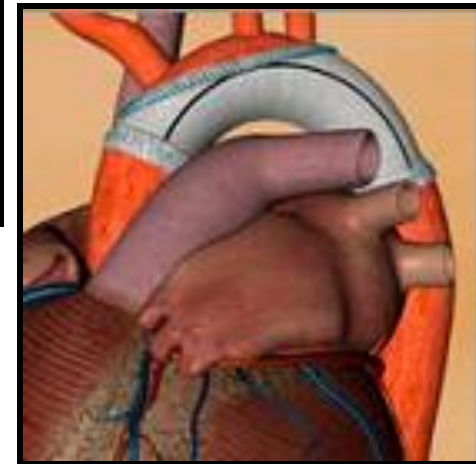
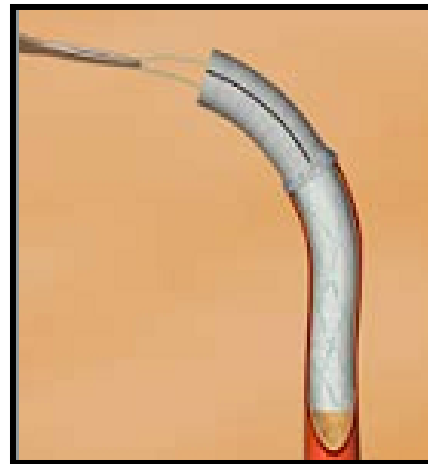
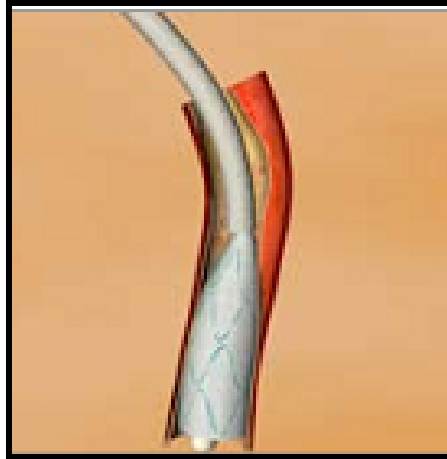
- Two system cerebral perfusion
- No right radial artery pressure



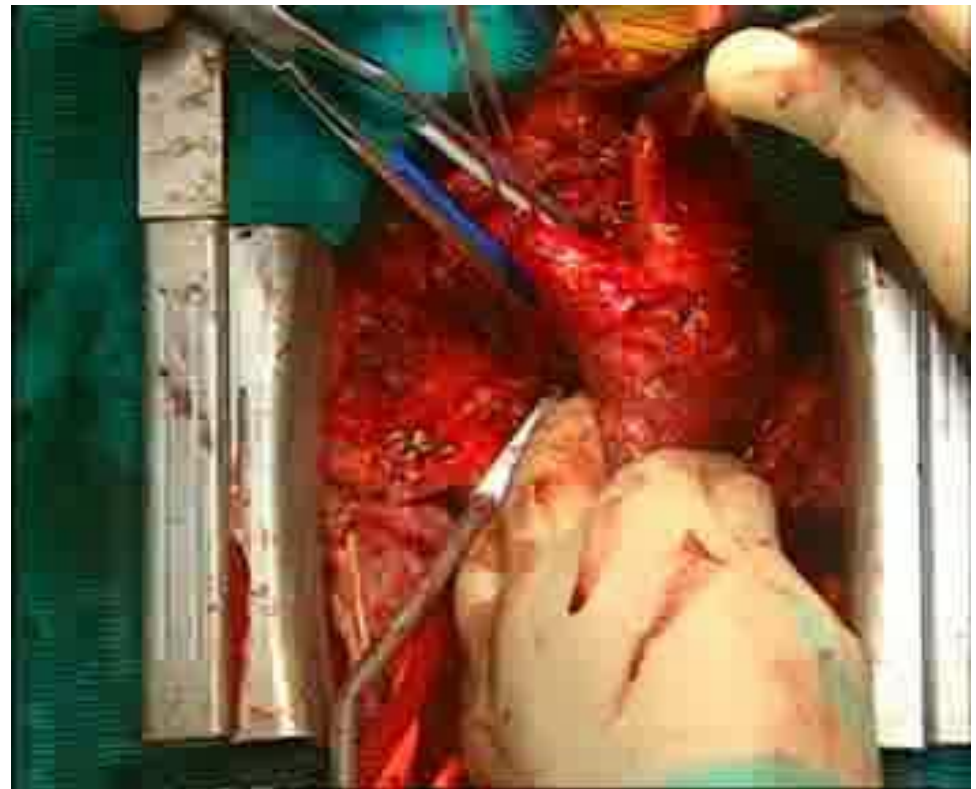
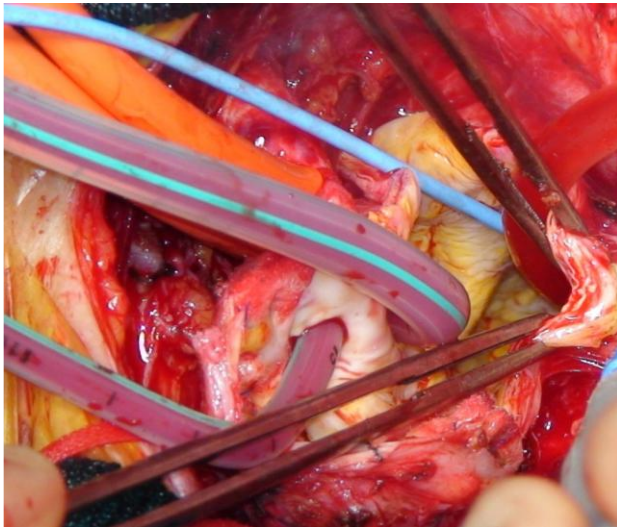
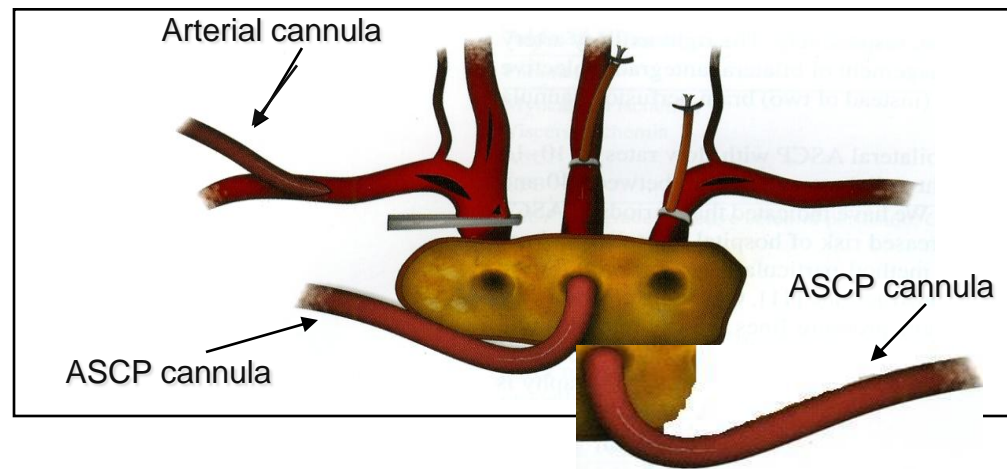
Visceral and Spinal Cord Protection

After Distal Anastomosis



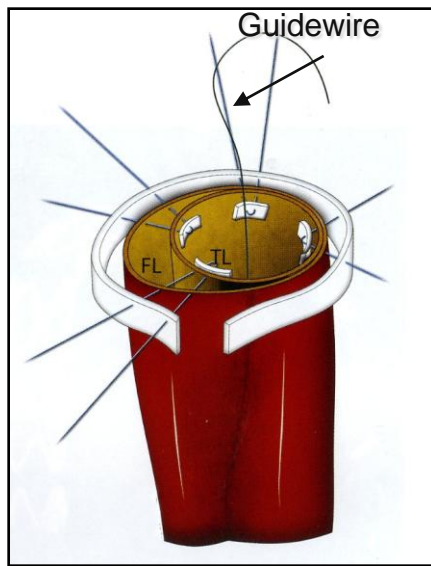
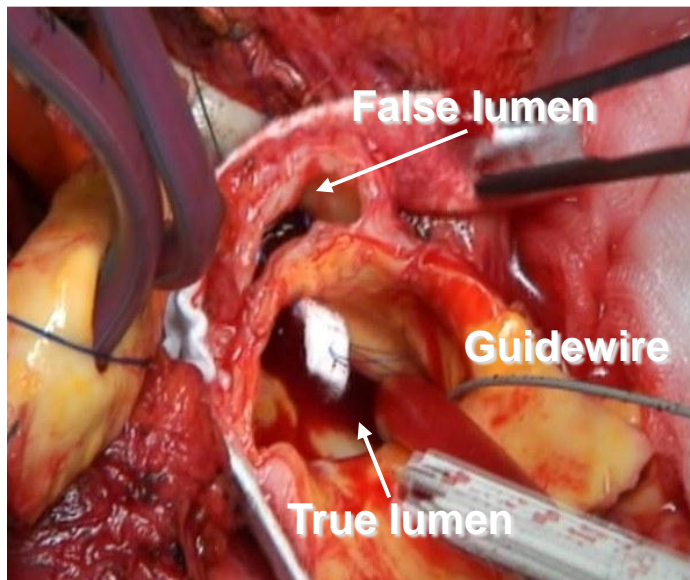


Cannulation of epiaortic vessels for antegrade cerebral perfusion

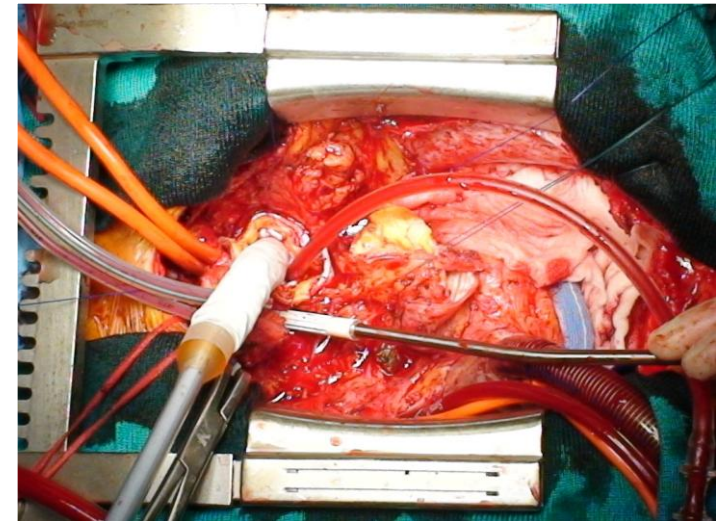


Acute/Chronic Ao dissection

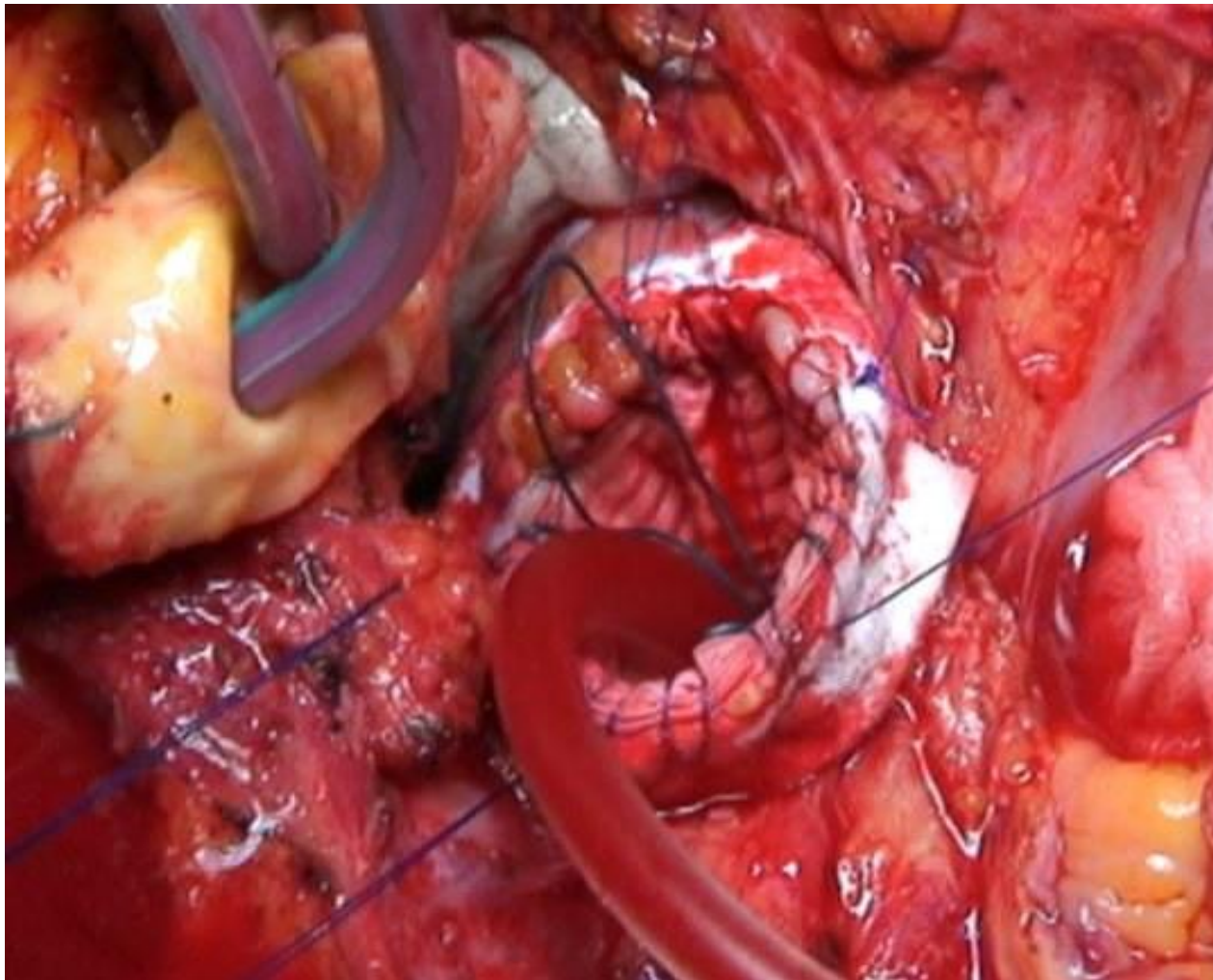
Reapproximation of the TL and FL



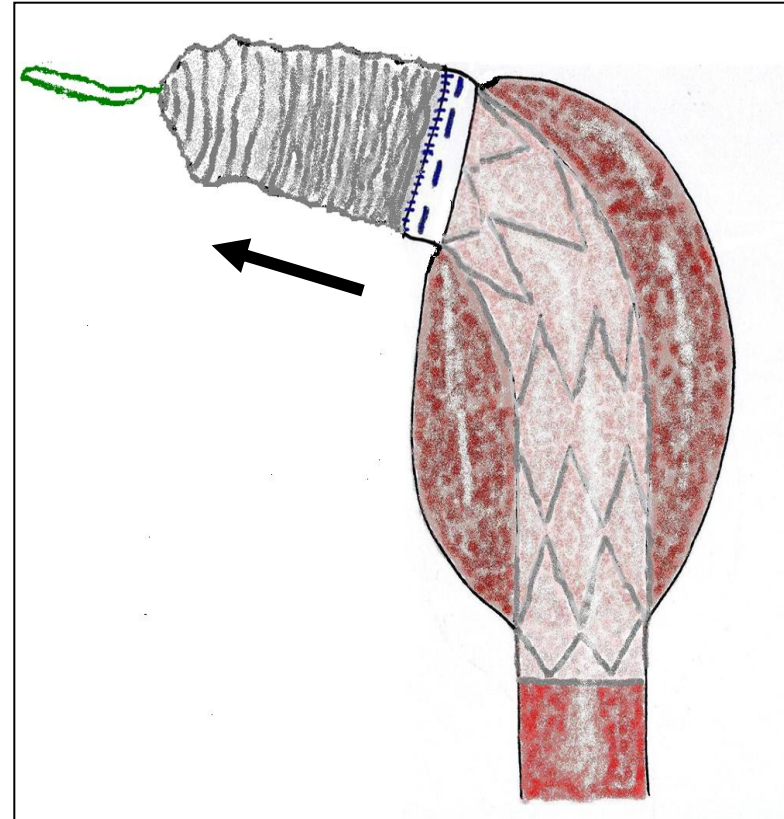
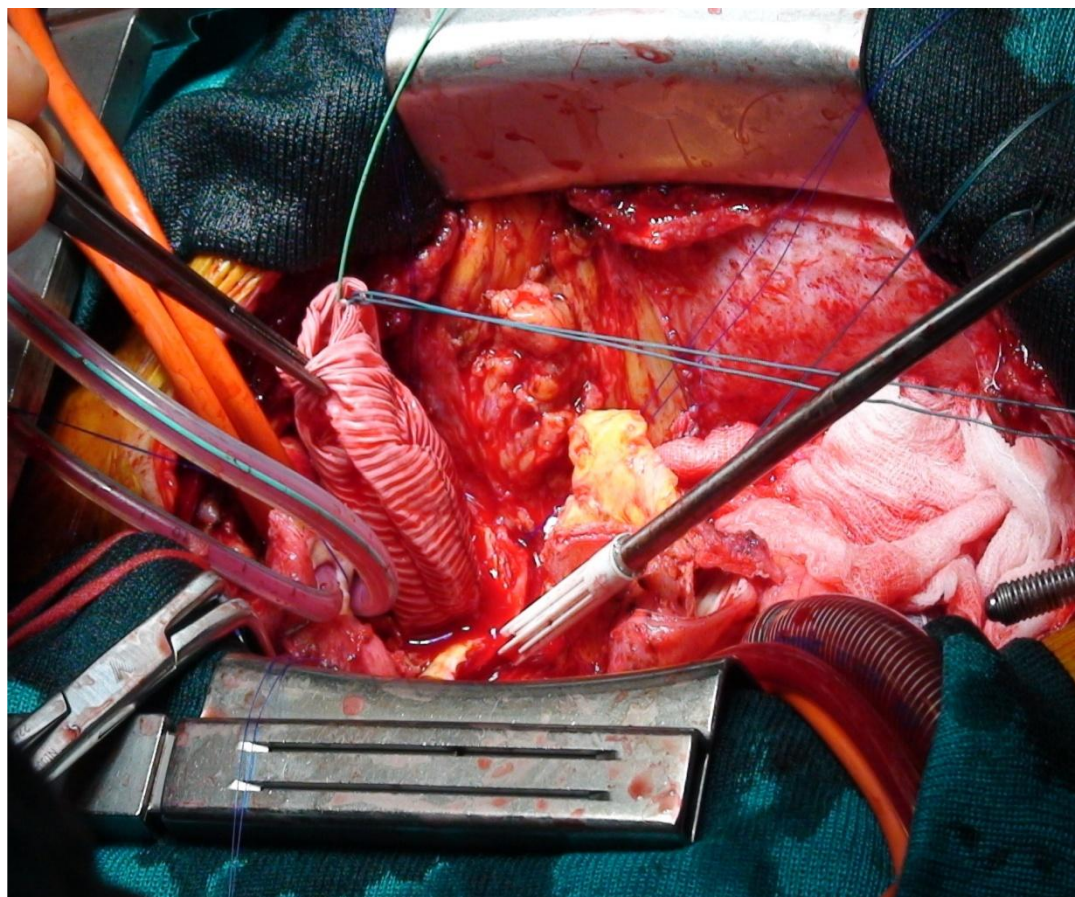
Introduction of E-vita open stent-graft in antegrade fashion



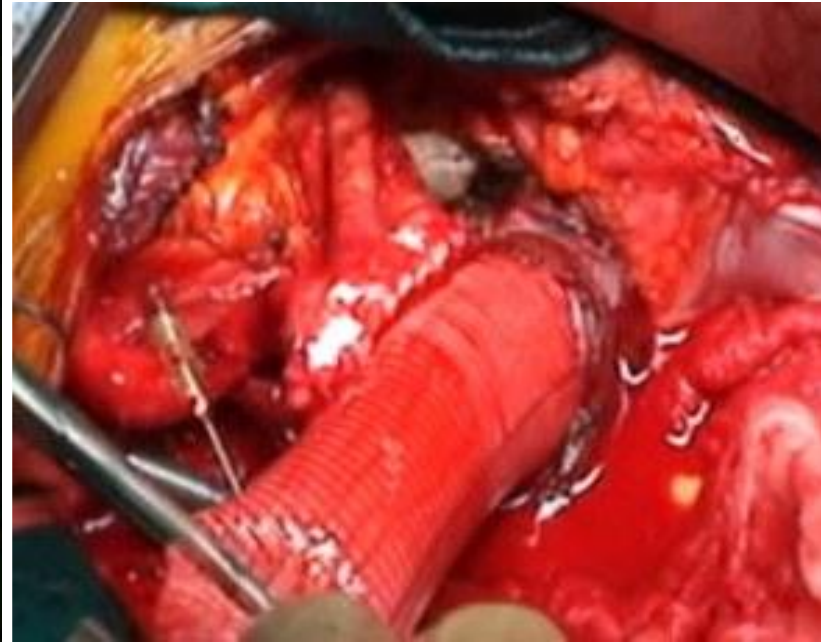
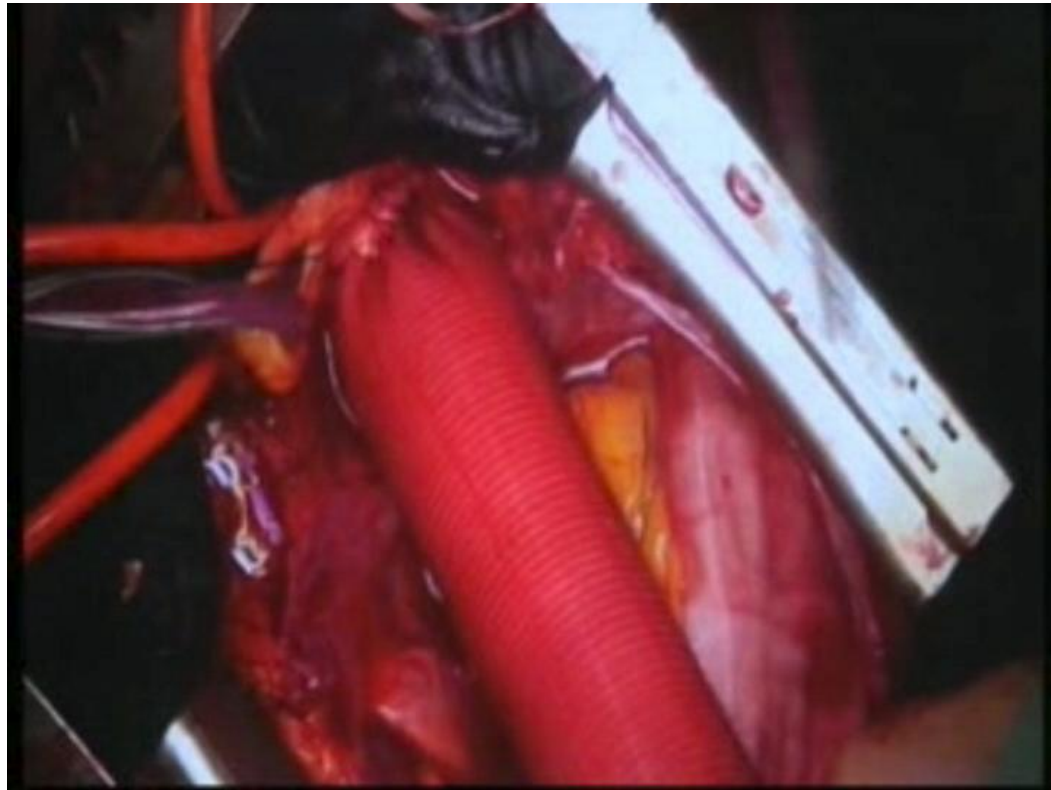
Fixation of the graft



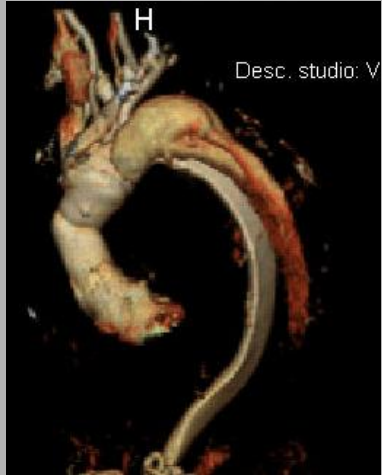
The incorporated dacron graft is pulled back



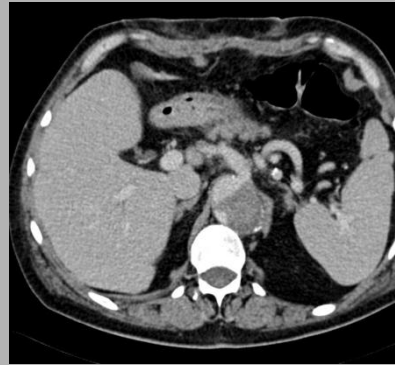
Epiaortic vessels reimplantation



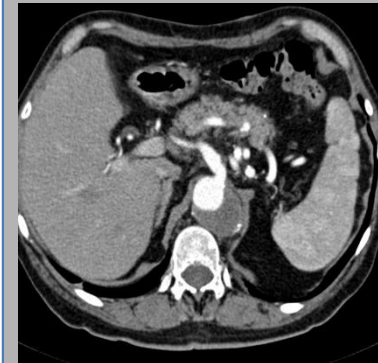
Post-operative result



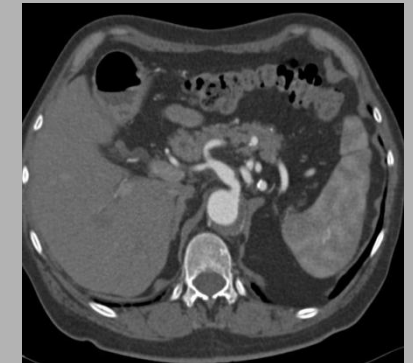
Pre-operative



1 week after surgery



After 3 months



After 2 years



Bologna Experience

January 2007 – August 2012

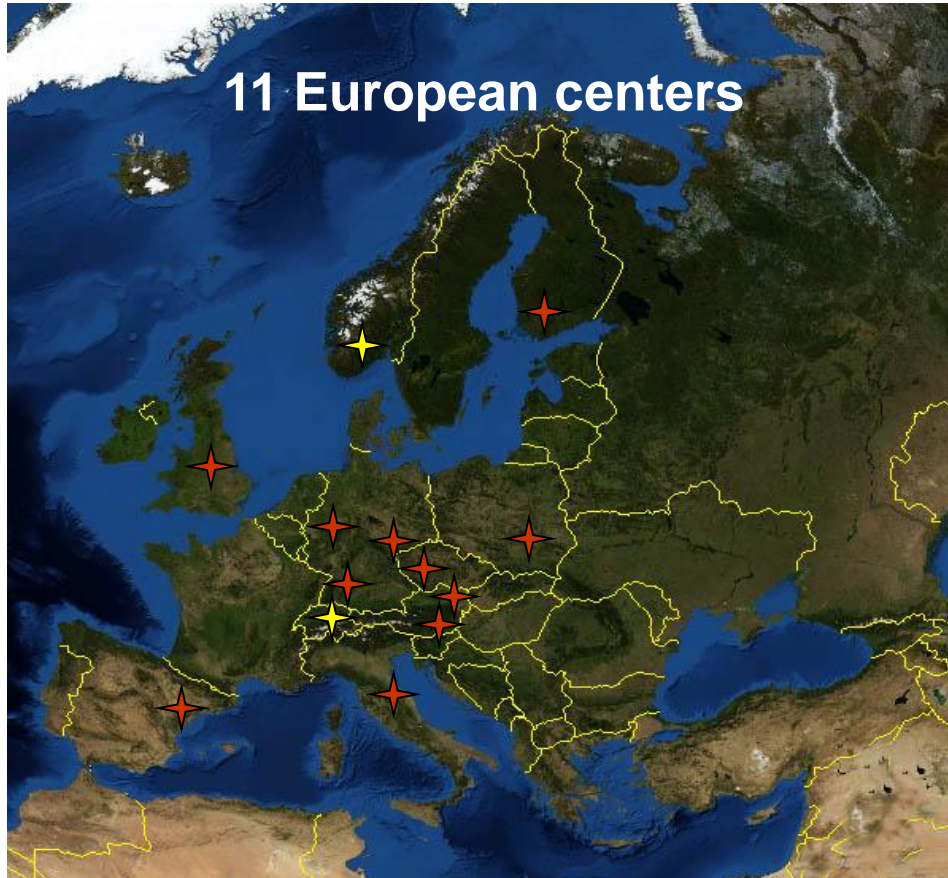
N° 125 Patients



	N°	%
Male	107	85
Age	61.3±10.1	
Hyperthension	110	82
Preop-renal insuff.	9	7



International E-vita Open Registry



Online data submission
since 09.2008

- Barcelona (C. Mestres)
- Birmingham (R. Bonser)
- Bologna (R. Di Bartolomeo)
- Essen (H. Jakob)
- Graz (P. Oberwalder)
- Leipzig (F. Mohr)
- Prague (S. Czerny)
- Rzeszow (K. Widenka)
- Stuttgart (Franke)
- Tampere (T. Sioris)
- Vienna / Hietzing (M. Grabenwöger)

★ **New candidates (Bern, Oslo)**



International E-vita Open Registry DATA

From 01.2005 – 06.2012

Registered patients
N = 363



International E-vita Open Registry Aortic Disease

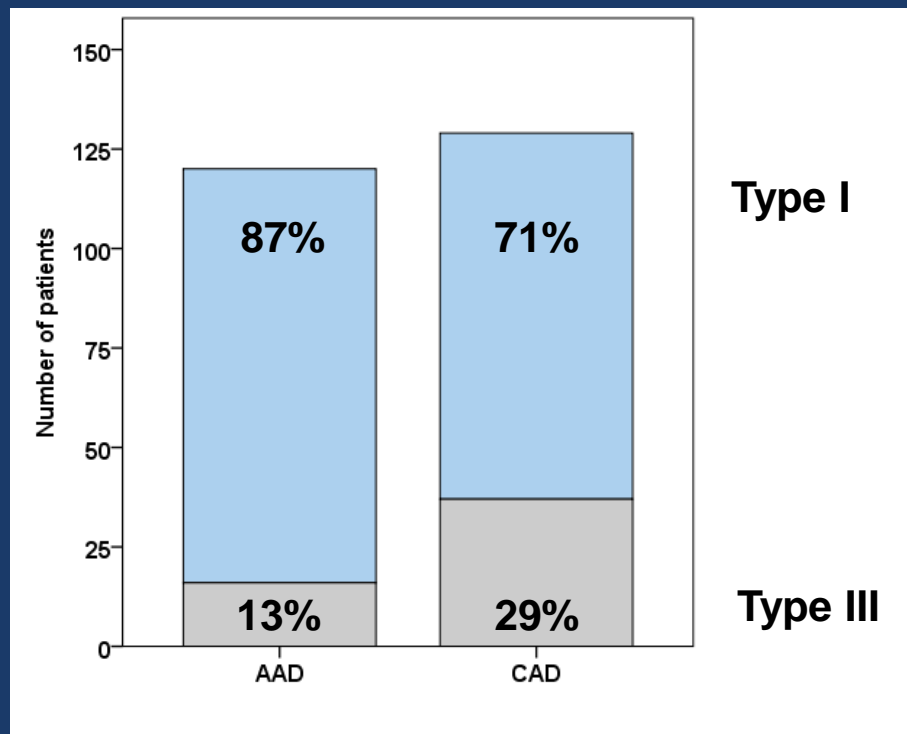
N = 363

Aortic dissection 249

Acute (AAD) 120

Chronic (CAD) 129

Aneurysm (TAA) 114



International E-vita Open Registry

Co-morbidities

N (%)	Total	AAD	CAD	TAA
	N = 363	N = 120	N = 129	N = 114
AV insufficiency >2	127 (35)	63 (53)	44 (34)	20 (18)
CAD	62 (17)	17 (14)	11 (9)	34 (30)
EF < 40 %	9 (2)	2 (2)	3 (2)	4 (4)
Creatinin > 2mg/dl	34 (9)	16 (13)	9 (7)	9 (8)
COPD	59 (16)	24 (20)	16 (12)	19 (17)



International E-vita Open Registry CAD / TAA Preop. Characteristics

N (%)	Total	AAD	CAD	TAA
	N=363	N = 120	N = 129	N = 114
Previous CV- surgery	112 (31)	5 (4)	84 (65)	23 (20)
Previous EVAR	21 (6)	4 (3)	7 (5)	10 (9)



International E-vita Open Registry

Additional procedures

N (%)	Total	AAD	CAD	TAA
	N = 363	N = 120	N = 129	N = 114
Bentall	44 (12)	17 (14)	20 (16)	7 (6)
Valve sparing	19 (5)	15 (13)	1 (1)	3 (3)
Isolated valve replacement	27 (7)	5 (4)	14 (11)	8 (7)
CABG	54 (15)	22 (18)	9 (7)	23 (20)



International E-vita Open Registry

Operative Time

mean \pm SD, minutes	Total	AAD	CAD	TAA
	N = 363	N = 120	N = 129	N = 114
CPB	240 \pm 70	247 \pm 76	246 \pm 69	226 \pm 65
Cardiac arrest	137 \pm 52	142 \pm 49	146 \pm 51	122 \pm 53
Selective cerebral perfusion	74 \pm 28	68 \pm 30	82 \pm 27	70 \pm 28
Visceral ischemia	68 \pm 27	68 \pm 32	69 \pm 23	67 \pm 25



International E-vita Open Registry In-Hospital Mortality

N (%)	Total	AAD	CAD	TAA
	N = 363	N = 120	N = 129	N = 114
In-hospital mortality	57 (16)	22 (18)	19 (15)	16 (14)



International E-vita Open Registry

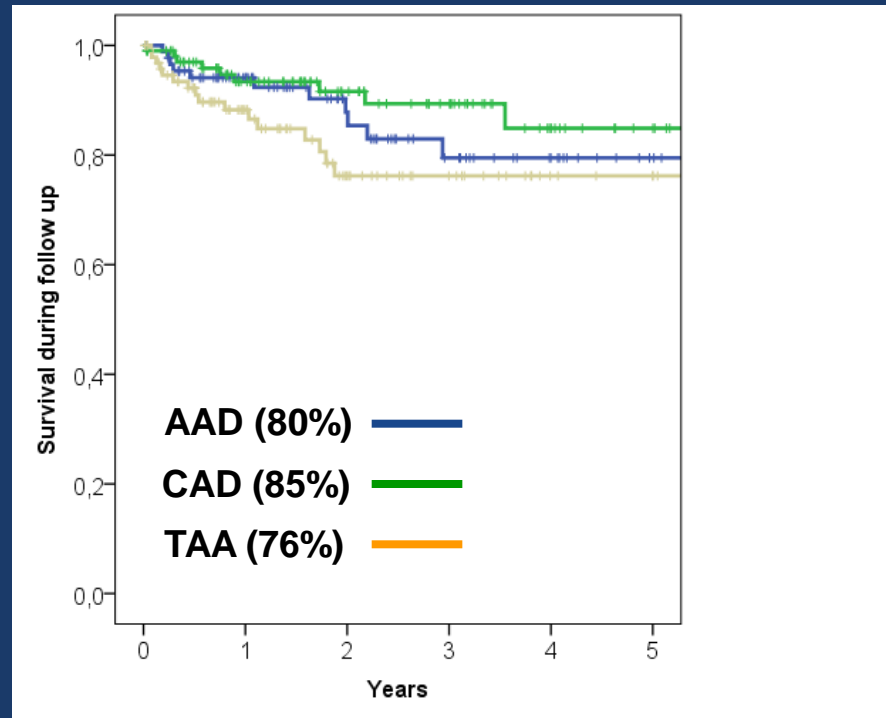
Postoperative Neurological Events

N (%)	Total	AAD	CAD	TAA
	N = 363	N = 120	N = 129	N = 114
Stroke	18 (6)	9 (8)	6 (5)	8 (7)
Spinal injury	25 (7)	7 (6)	9 (7)	9 (8)
Paraplegia	14 (4)	4 (4)	6 (5)	4 (4)



International E-vita Open Registry Survival

Survival / Aortic Disease



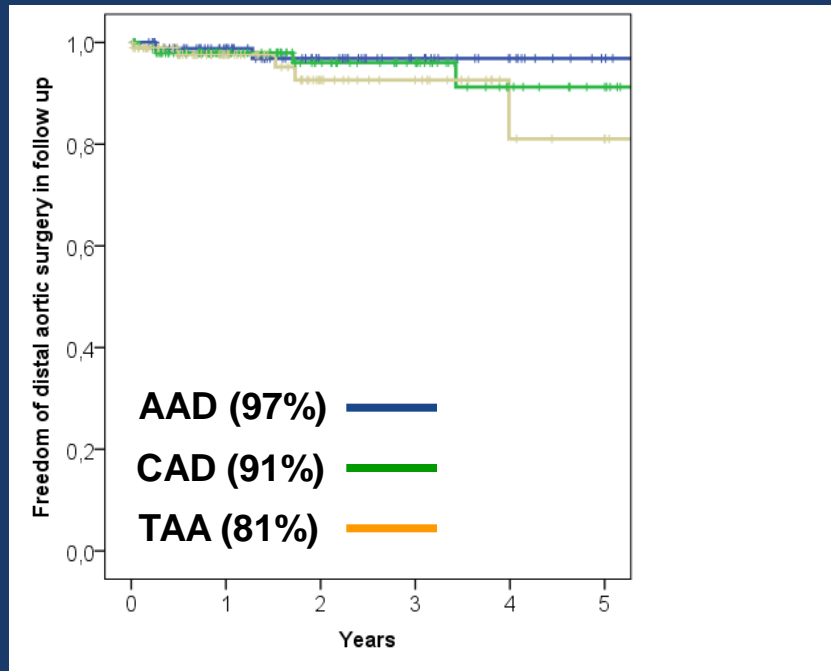
Years	0	1	2	3	4	5
Pts	288	184	111	72	34	15



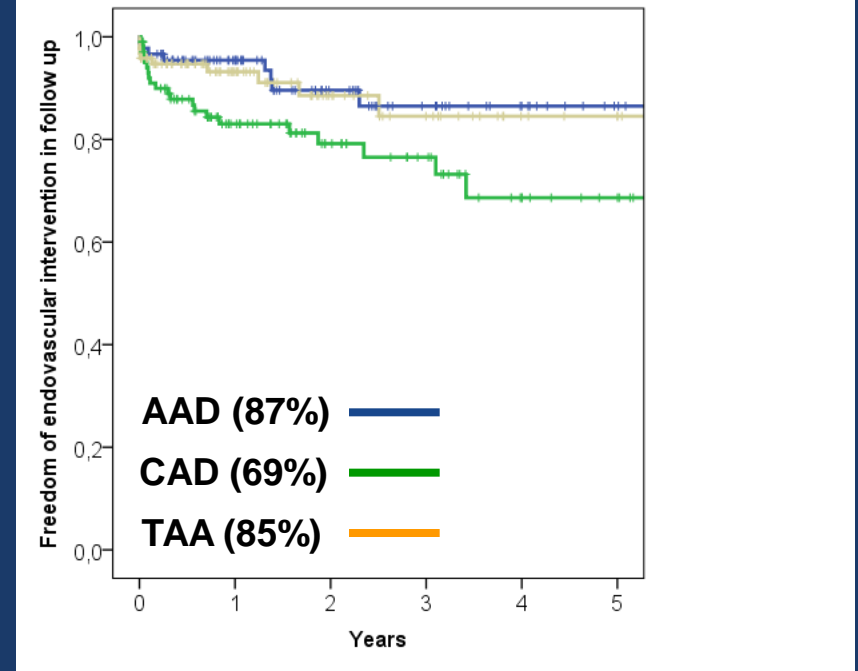
International E-vita Open Registry

Freedom of Distal Re-Interventions

Freedom of sec. ao. surgery



Freedom of sec. EVAR



Years	0	1	2	3	4	5
Pts	288	180	106	71	34	16

Years	0	1	2	3	4	5
Pts	288	167	96	63	31	14



CONCLUSIONS

- **Classic open surgery in high risk patients (old, severe comorbidity, complex aortic disease) has unsatisfactory results**
- **Hybrid treatment has been introduced to improve outcomes**
- **Aortic arch debranching can be used in high risk patients but it's associated with not negligible mortality and morbidity**



CONCLUSIONS

- **Various techniques are available for the treatment of complex diseases of the thoracic aorta**
- **FET represents a feasible and efficient option**
- **Satisfactory rate of mid-term survival, freedom of sec. Ao surgery, freedom of sec. EVAR**
- **Longer term follow-up is warranted**



University of Bologna

1088-1988



THANK
YOU

M-CM-LXXXVIII

Alma Mater Studiorum

University of Bologna - Italy
Cardiac Surg. Dept. dav.pacini@gmail.com

