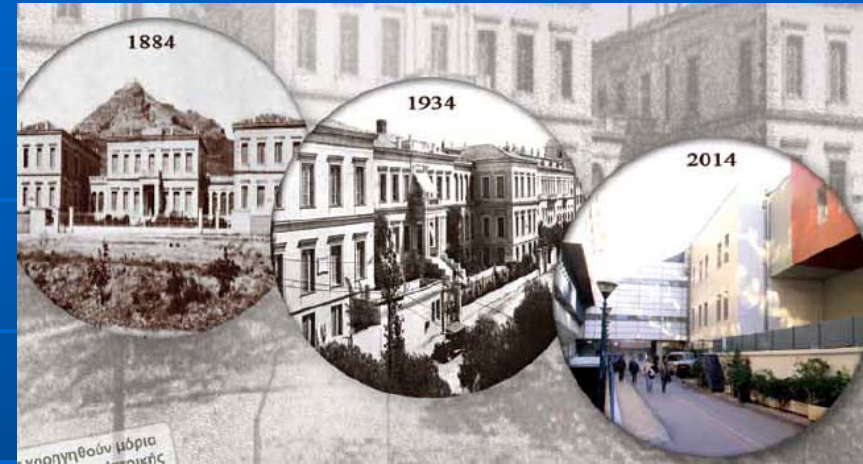
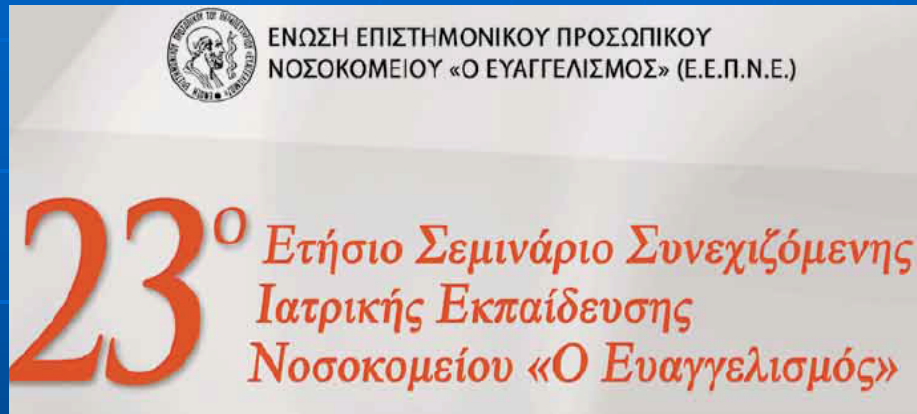


# ΥΒΡΙΔΙΚΗ ΑΝΤΙΜΕΤΩΠΙΣΗ ΤΩΝ ΠΑΘΗΣΕΩΝ ΤΗΣ ΑΟΡΤΗΣ



- Παναγιώτης Δεδεηλίας,  
MD, PhD, FECTS



**23<sup>ο</sup>** Ετήσιο Σεμινάριο Συνεχιζόμενης  
Ιατρικής Εκπαίδευσης  
Νοσοκομείου «Ο Ευαγγελισμός»



Αθήνα, 26 Φεβρουαρίου – 2 Μαρτίου 2018

Δεν υπάρχει σύγκρουση συμφερόντων  
με τις παρακάτω χορηγούς εταιρείες:

NOVARTIS, JANSSEN ONCOLOGY, ABBVIE,  
BRISTOL-MYERS SQUIBB, MEDTRONIC,  
TAKEDA, GENESIS, MSD, PFIZER, AMGEN,  
ASTELLAS, GILEAD, AENORASIS, BAXTER,  
BIANEX, WINMEDICA, ABBOTT, BIOSEP,  
SANOFI, ANGELINI, DEMO, ELPEN,  
EDWARDS, ROCHE, RONTIS, SPECIFAR, UCB,  
ΥΓΕΙΟΔΥΝΑΜΙΚΗ, MAVROGENIS

# Παρουσίαση περίπτωσης

- 72 ετών ασθενής που 2 χρόνια πριν είχε υποβληθεί σε ενδοαυλική θεραπεία της θωρακικής αορτής και στον οποίο ετοποθετήθηκε επιτυχώς ενδοαυλικό μόσχευμα (stent-graft)
- Μετά απο πρόσφατο τροχαίο ατύχημα εμφανίζει θωρακικό άλγος με προοδευτική επιδείνωση.







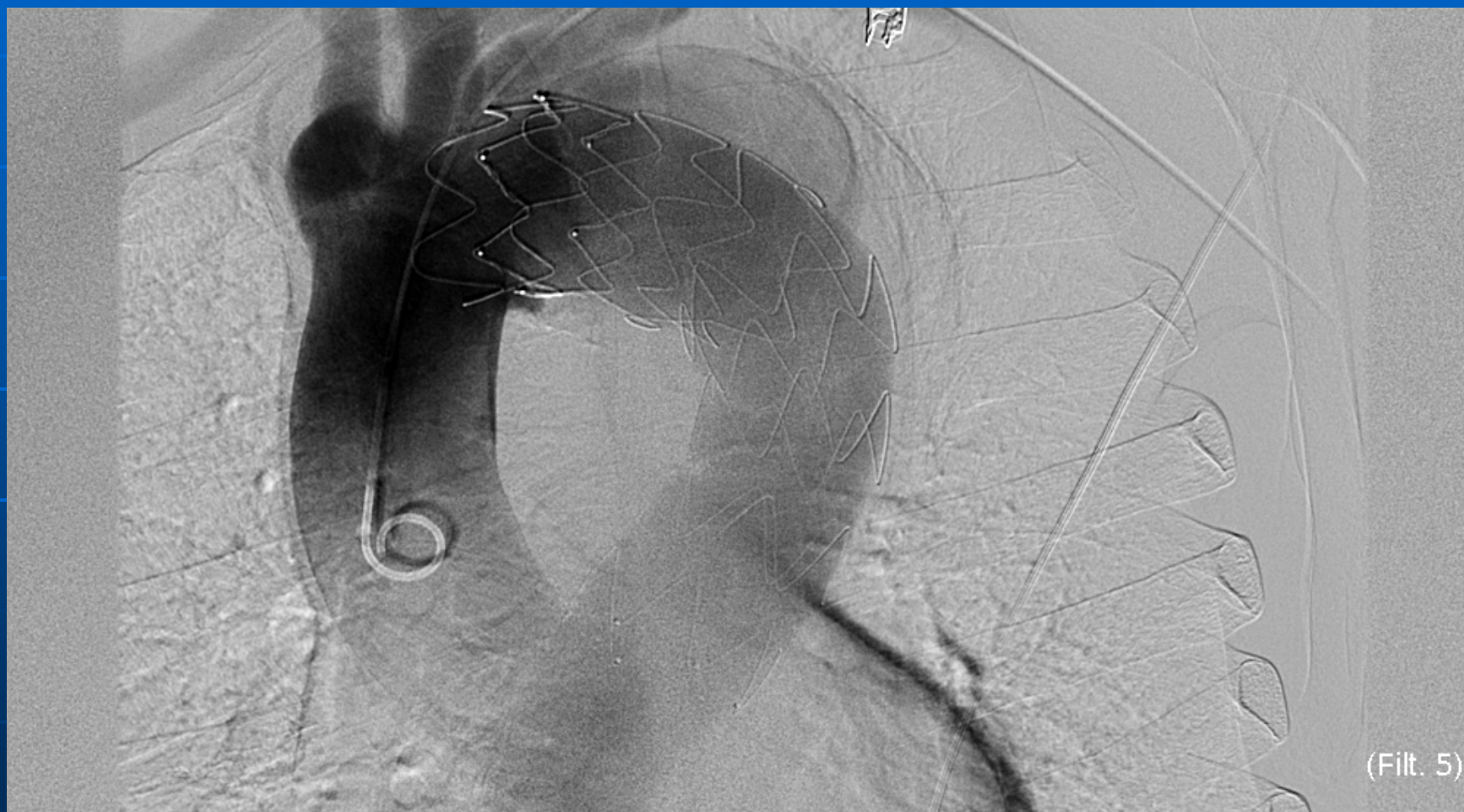
# Αγγειογραφία

Ψευδοανεύρυσμα/ρήξη άνω τόξου

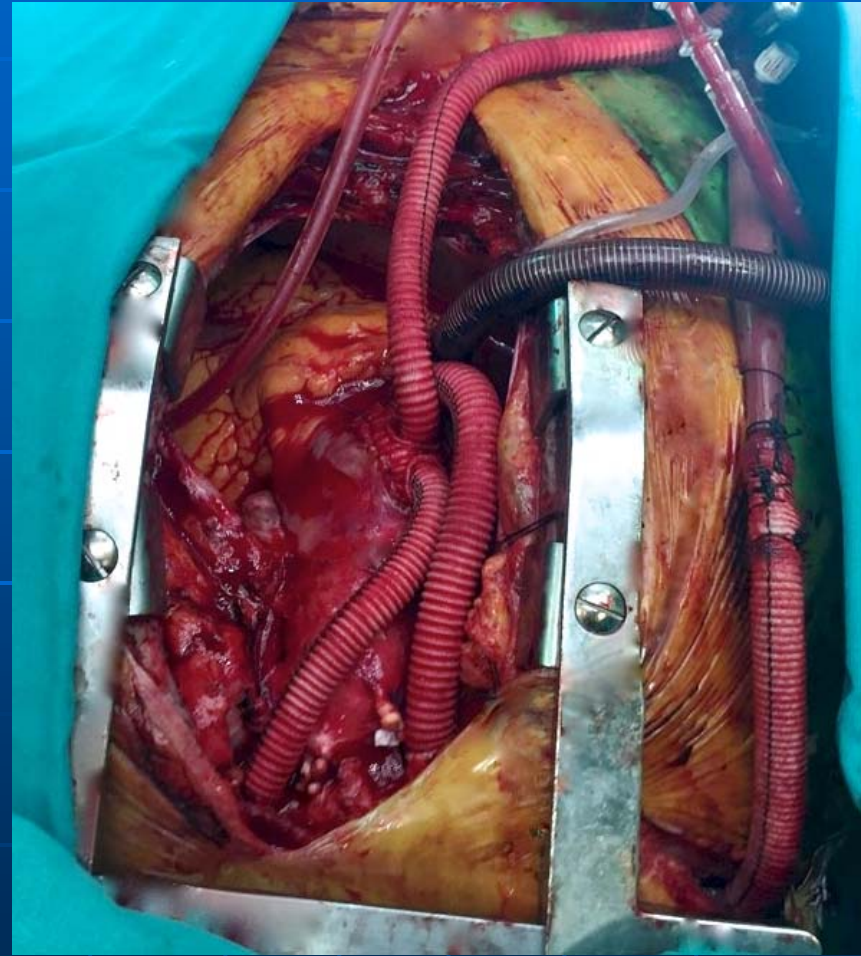
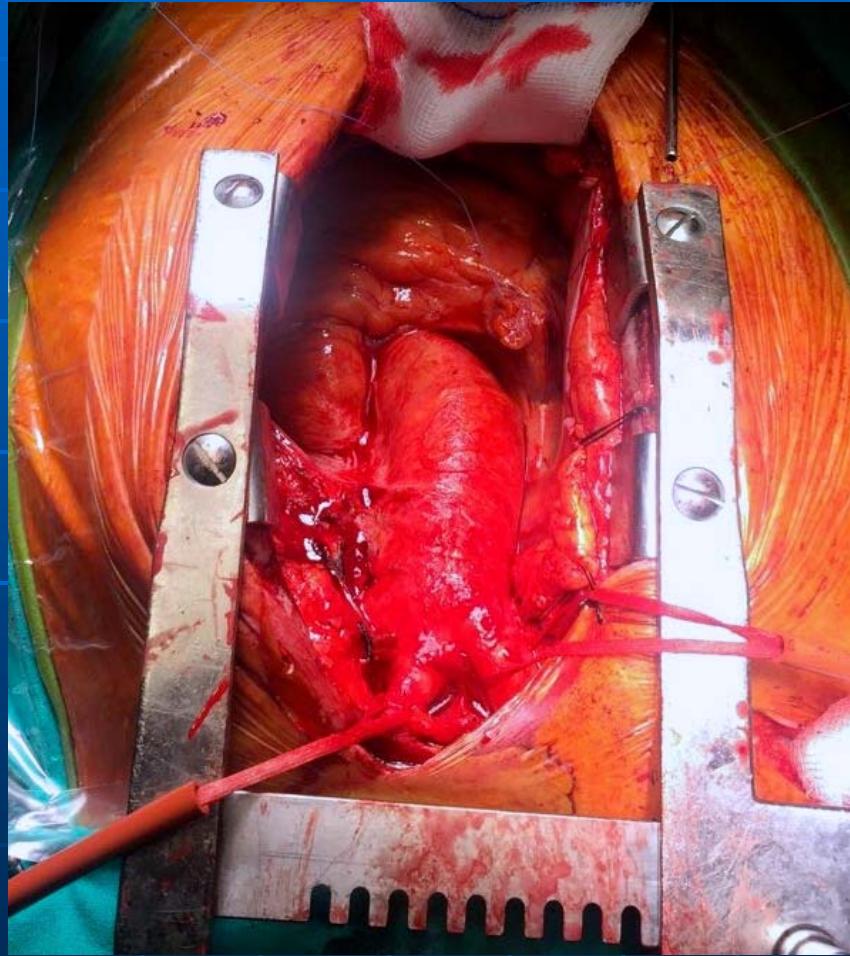


Σημείο ρήξης: έκφυση αρ. καρωτίδος



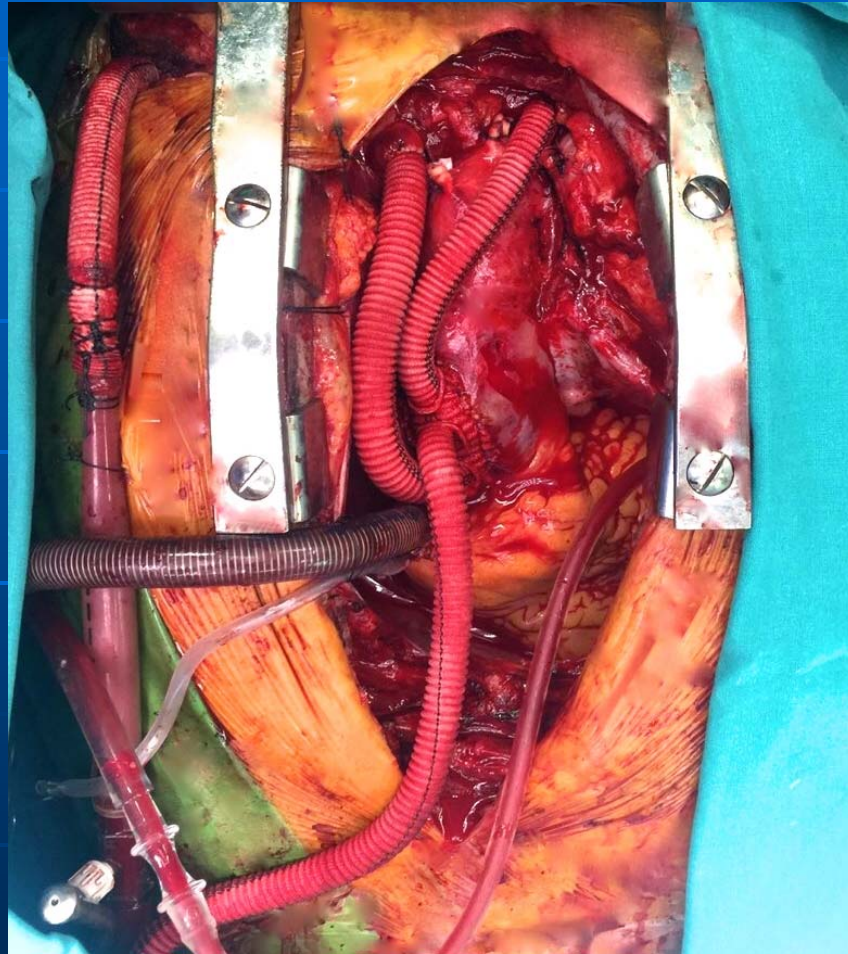








# Κύκλωμα εξωσωματικής κυκλοφορίας και μετεγχειρητική αγγειογραφία

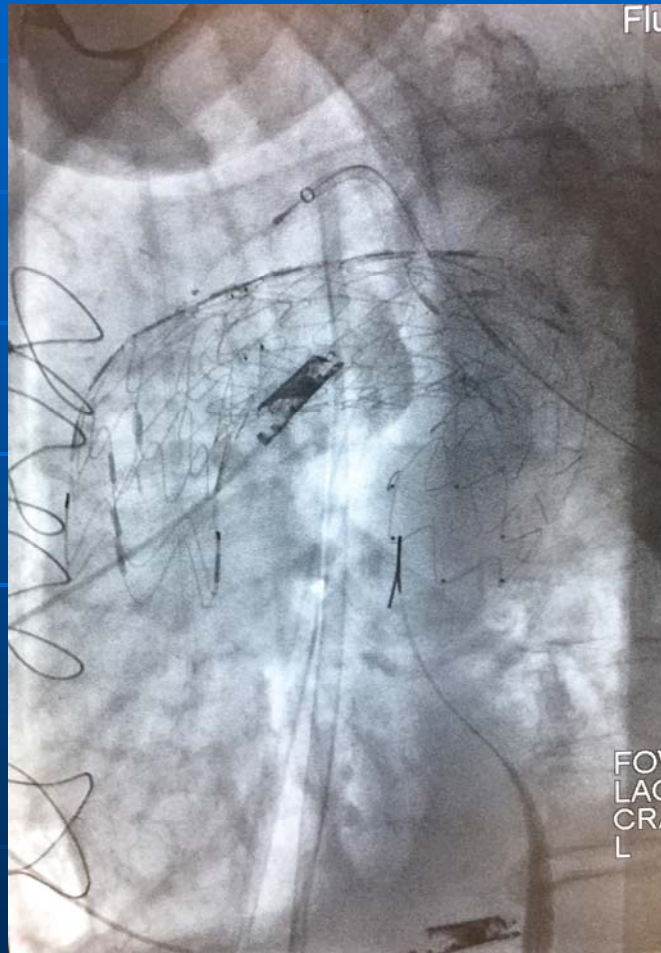


# Μετεγχειρητική αγγειογραφία

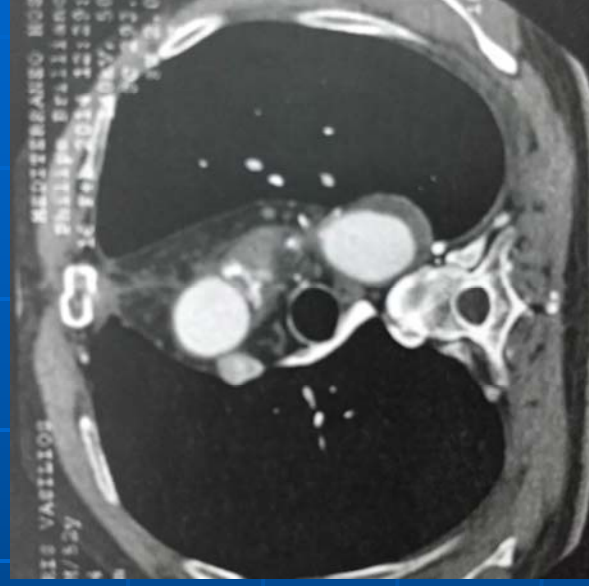




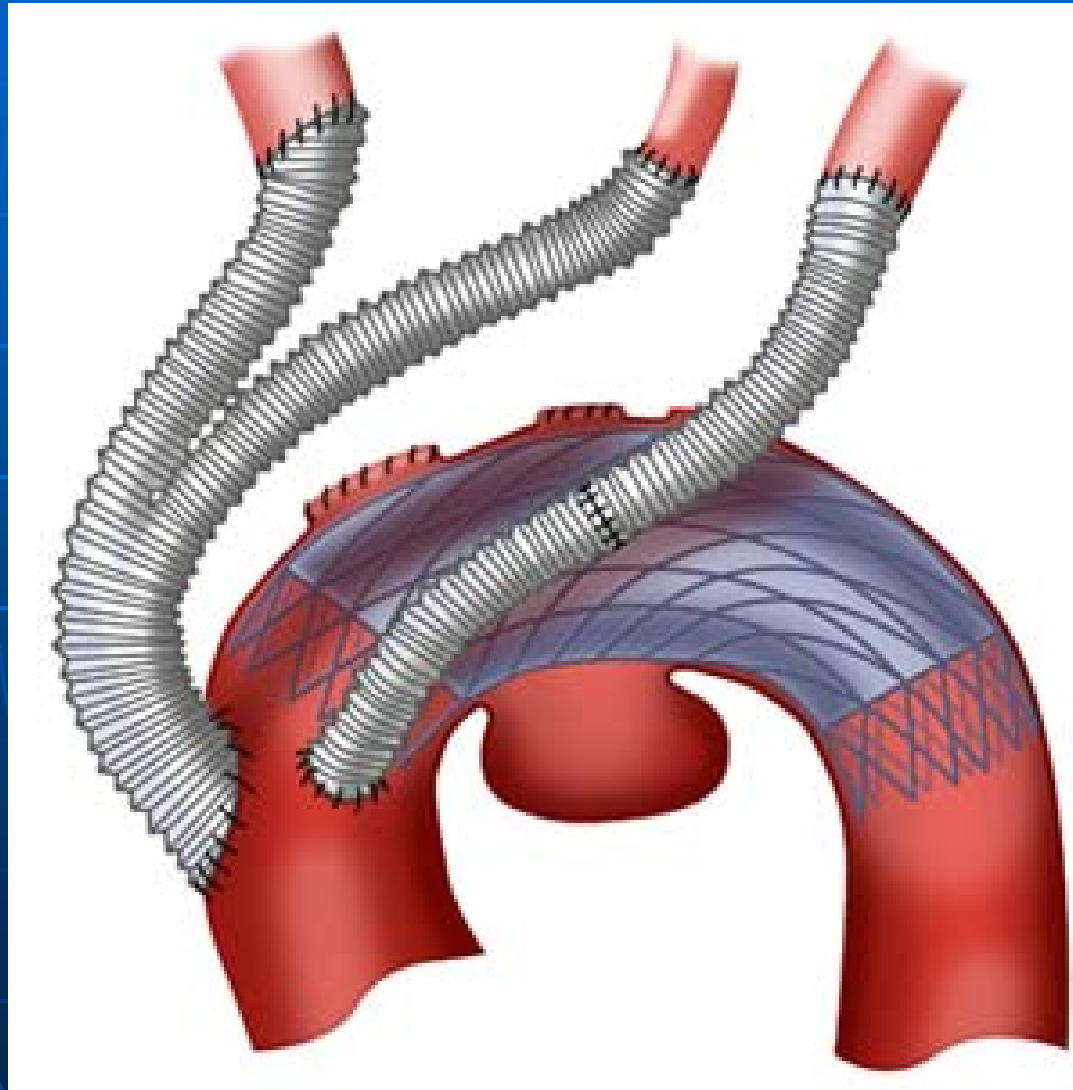
# Αποκλεισμός υποκλειδίου







# Hybrid arch replacement



# Definition

- Hybrid aortic treatment is the combination of open surgical treatment of a part of the aorta with simultaneous preparation for the endovascular completeness of the therapy.
- 265 publications in pubmed regarding the hybrid aortic techniques from 2010-today.
- 7 topics about Hybrid Aortic treatments in EACTS 2015



# Skepticism

- Stend grafting : Purpose or means  
*Willem Ranschaert and Marc A.A.M. Schepens*  
*Eur J Cardiothorac Surg (2015) 47 (1): 134*
- Total aortic arch replacement with frozen elephant trunk in acute type A aortic dissection: are we pushing the limits too far?  
*Malakh Shrestha, Felix Fleissner, Fabio Ius, Nurbol Koigeldiyev, Tim Kaufeld, Erik Beckmann, Andreas Martens, and Axel Haverich*  
*Eur J Cardiothorac Surg (2015) 47 (2): 361-366*

# Indications of Hybrid treatment

- Acute aortic syndrome: Acute aortic dissection, Atherosclerotic ulcer, Endovascular haematoma , Iatrogenic dissection.
- Degenerative aortic aneurysms
- Mega-aorta syndrome

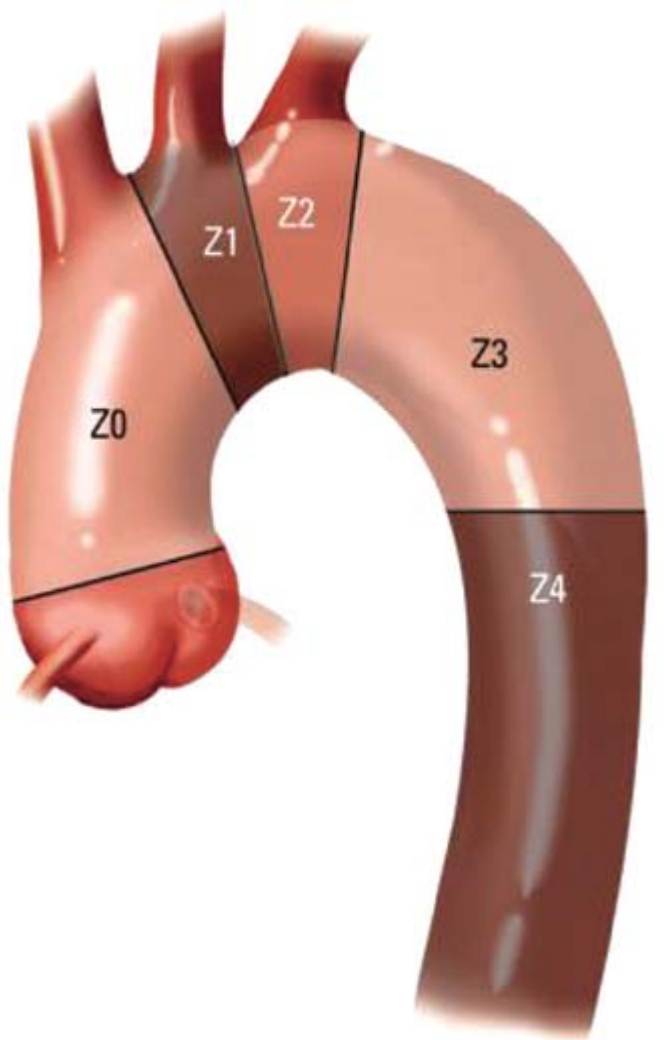
# Hybrid arch procedures

- Although replacement of the arch and anastomoses of the brachiocephalic branches remains the gold standard for the treatment of arch pathology in patients with comorbidities the open method is related with high morbidity and mortality.
- Hybrid treatment offering fewer ischemia and bypass time comprises an attractive alternative option for such a patient cohort.

Vallabhajosyula P, et al. Type II arch hybrid debranching procedure.  
Ann Cardiothorac Surg 2013;2(3):378-386

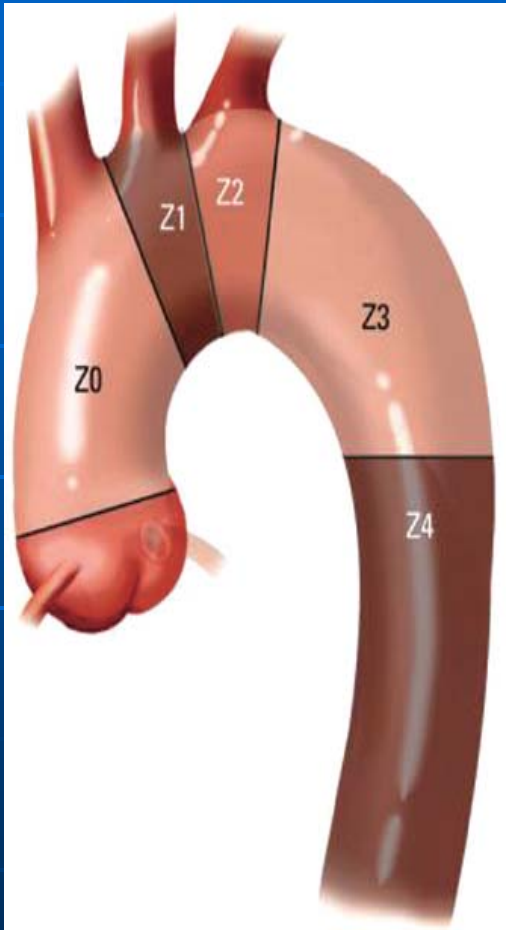


## Hybrid arch procedures



- Surgical transposition of the brachiocephalic branches so that there will be enough space for a good landing zone of the stent-graft in ascending aorta ( zone 0 )

# Hybrid arch procedures

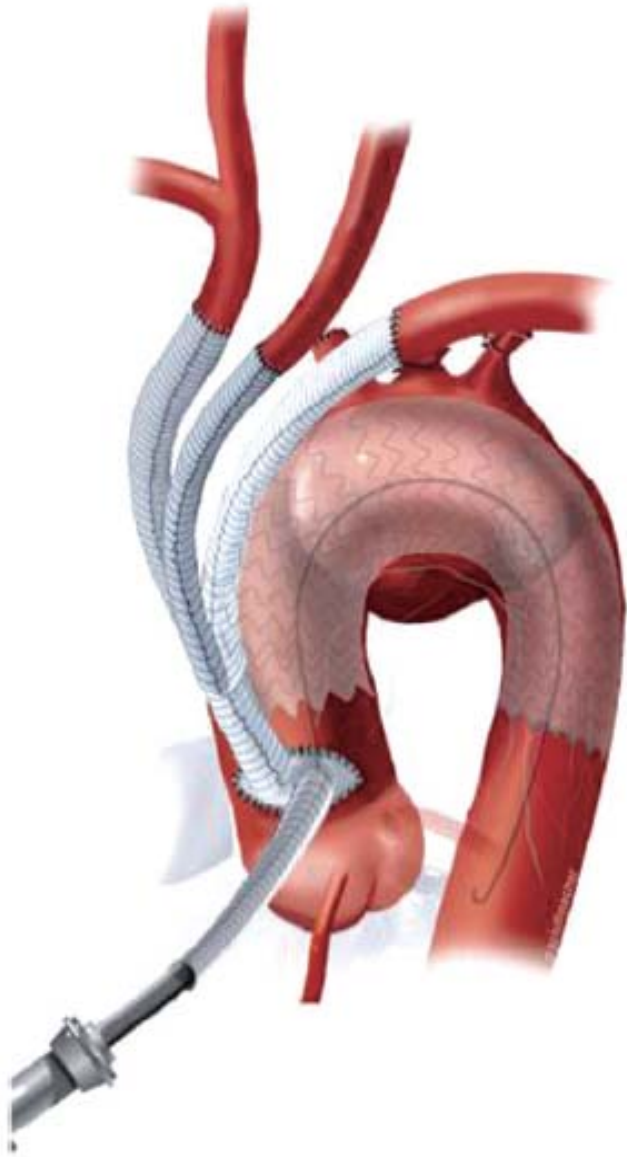


- This plan is based upon three principles:
  - (I) «Open surgical trasposition of vessels»
  - (II) Creation of safe proximal and distal landing zones for the graft .
  - (III) Simultaneous or in 2<sup>nd</sup> phase stent-graft insertion.

Ann Cardiothorac Surg 2013;2(3):378-386

A

Type I



## Hybrid arch procedures

### Type I arch hybrid

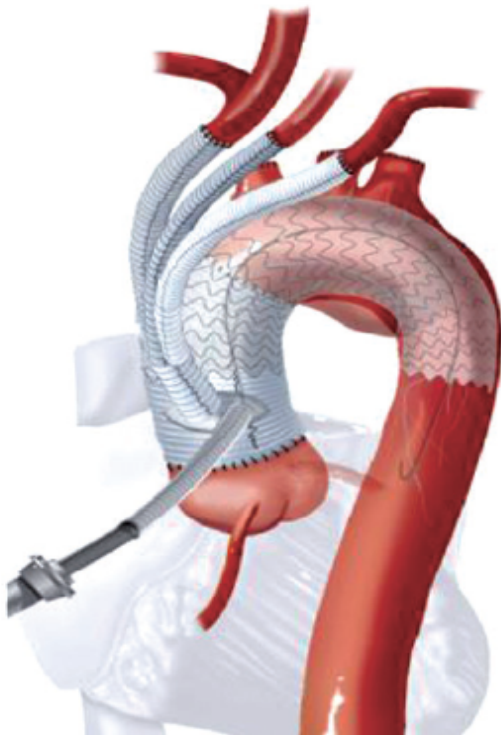
Transposition of branches so that landing zone on Z0 of the aorta is available.

Followed by simultaneous or in second stage TEVAR



B

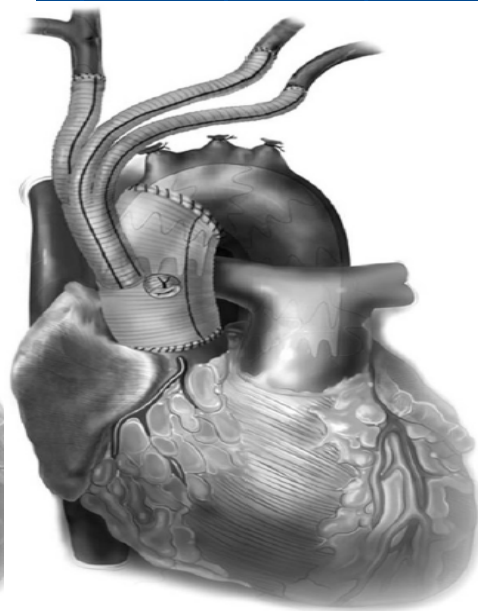
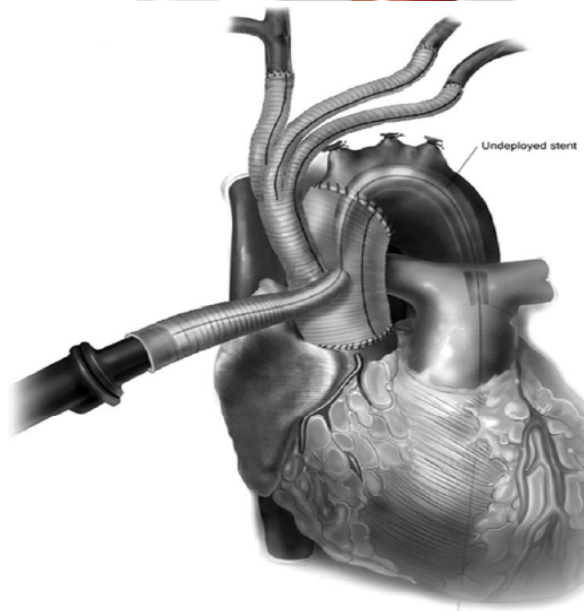
## Type II



## Hybrid arch procedures

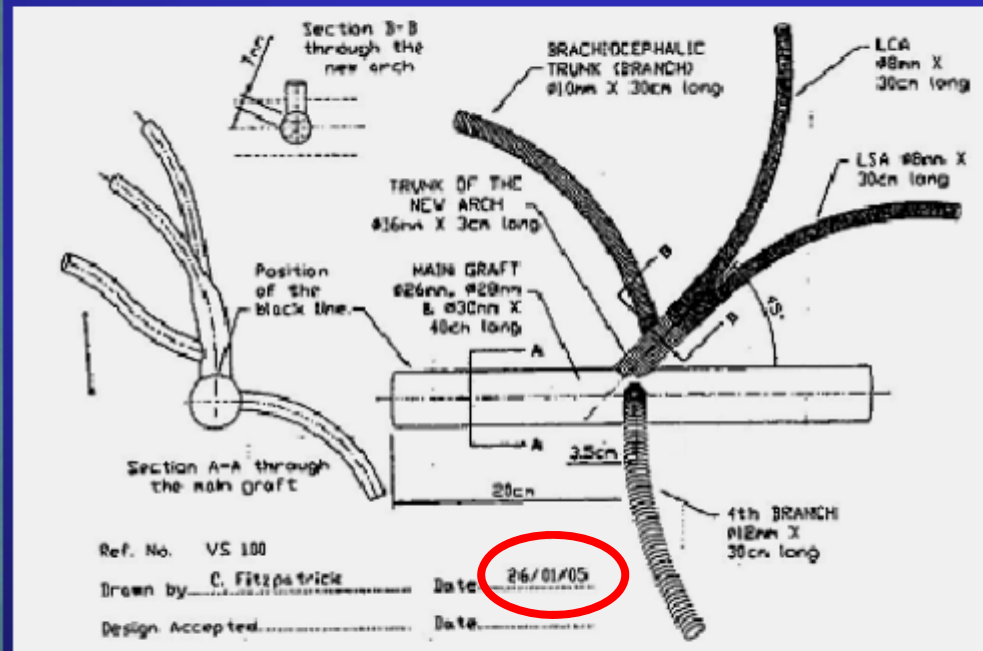
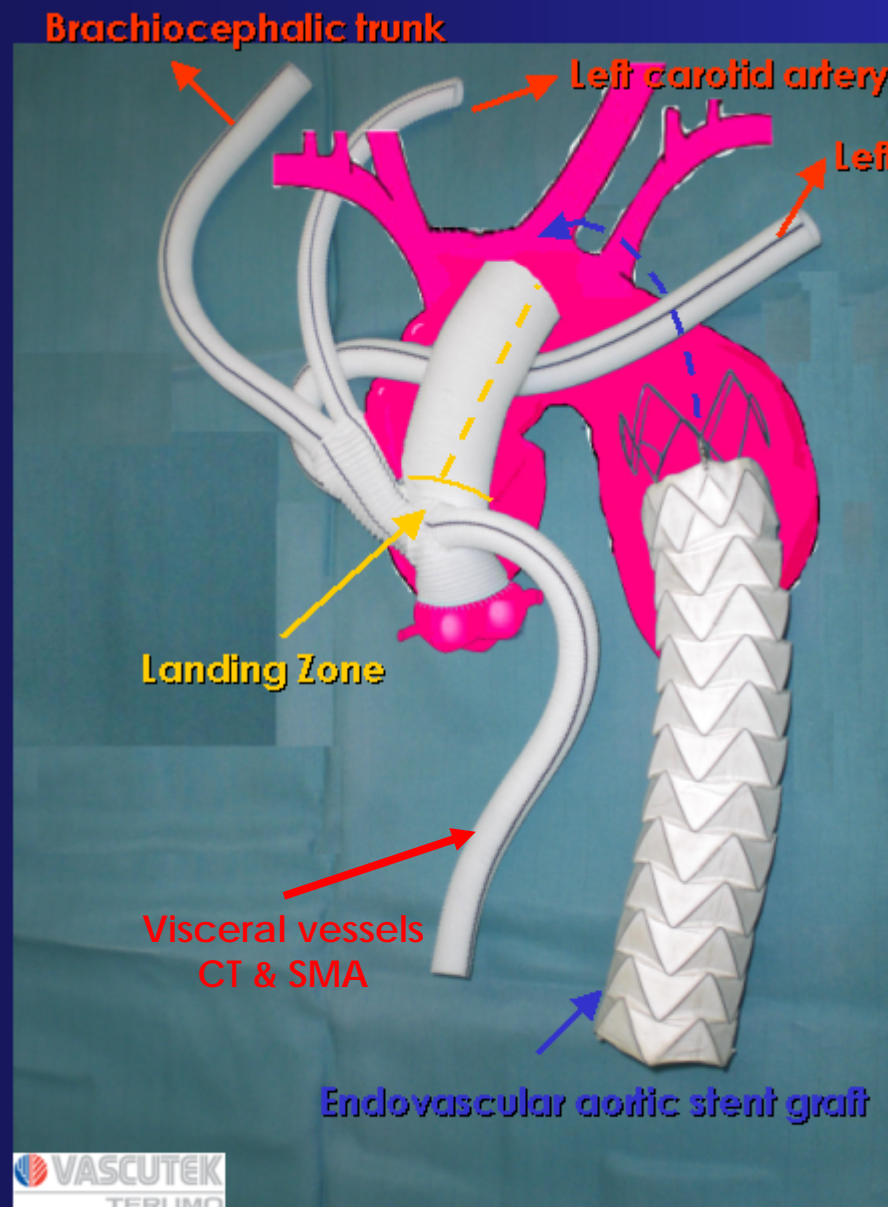
### Type II arch hybrid repair

1. The type II is recommended in Aortic aneurysms of ascending aorta and arch with acceptable Z3/Z4 and good peripheral LZ .
2. In this type replacement of ascending aorta in addition to transposition of the branches is required .
3. A short time of extracorporeal circulation is needed.



4. The fourth branch of the graft is used for the insertion of the stent-graft and is transfixed afterwards.

# HYBRID TWO-STAGE "LUIPIAE TECHNIQUE"



C

Type III



## Hybrid arch procedures

### Type III arch hybrid repair

More complex cases such as mega aorta syndrome or dissections with a lot of communications between true and false lumen require hybrid type III replacement .

In cases like this there is no acceptable proximal or distal LZ.

A total ascending aorta and arch replacement is needed : Elephant trunk or Frozen elephant trunk.

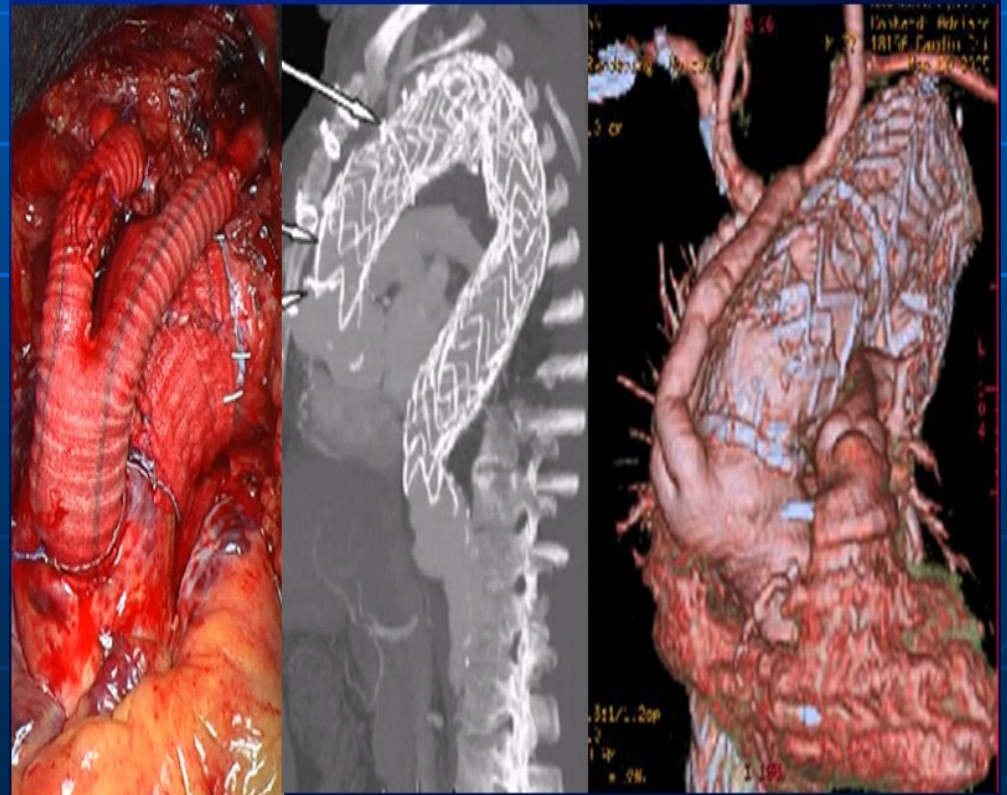
When extensive coverage of the descending aorta is to be performed CSF drainage should be provided.



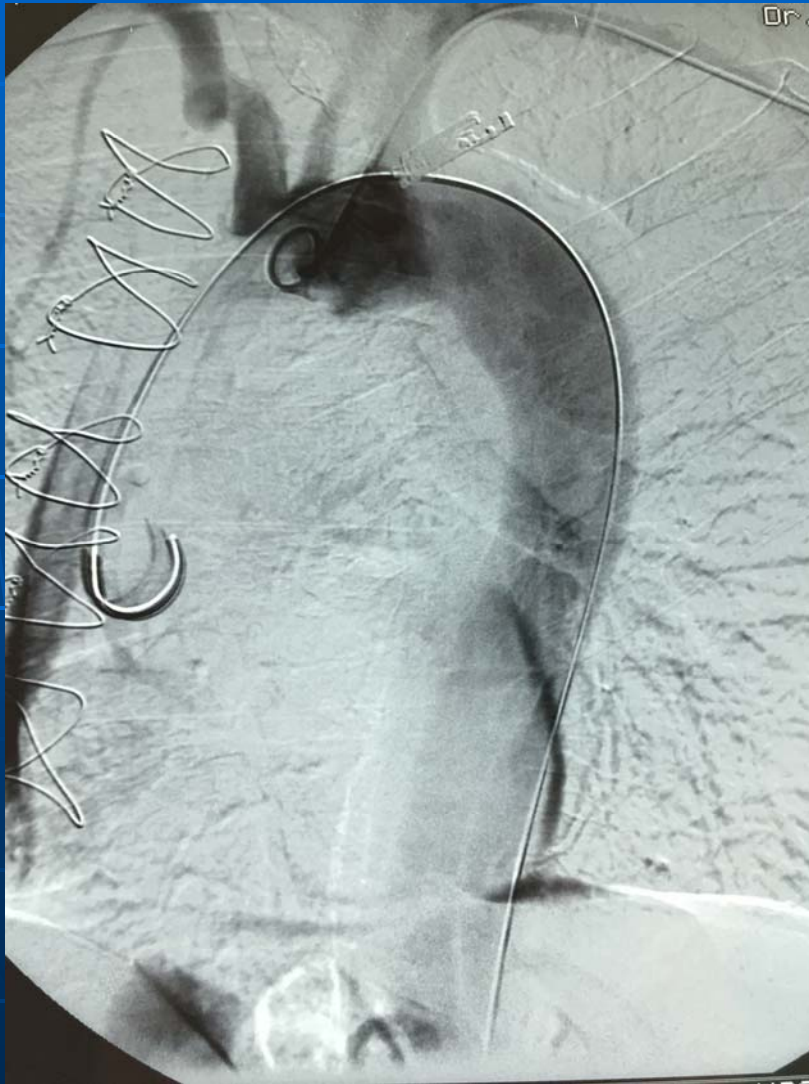
# Hybrid type II repair



Debranching with reinforcement of landing zone with graft material to enhance seal and prevent future dilatation of landing zone

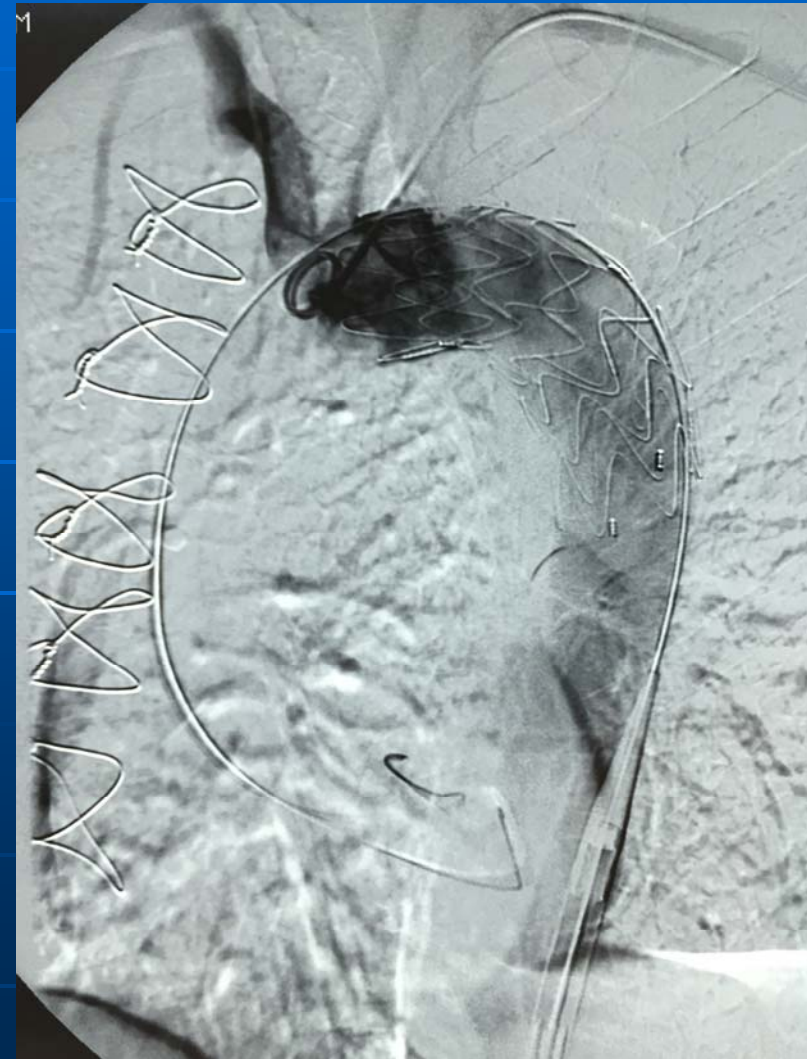


# Two stage hybrid replacement of ascending aorta and arch



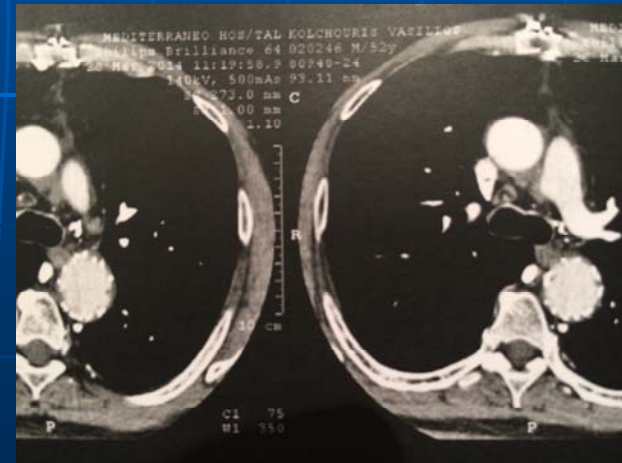
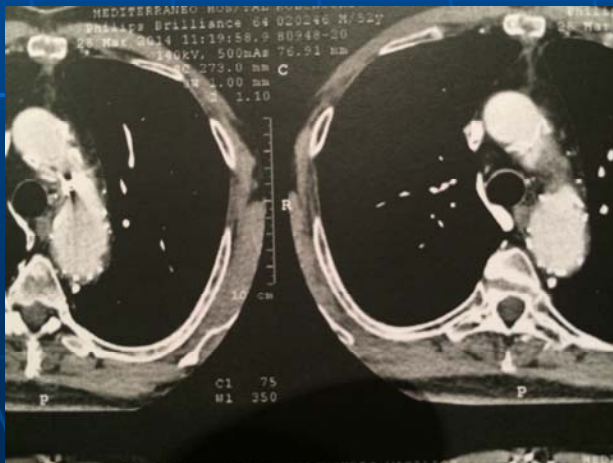
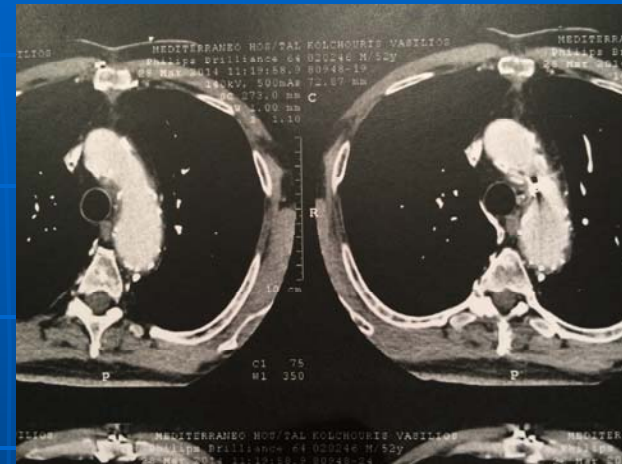
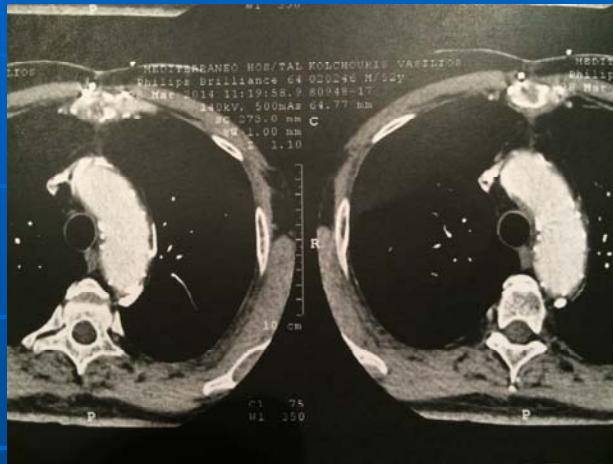


# Two stage hybrid replacement of ascending aorta and arch

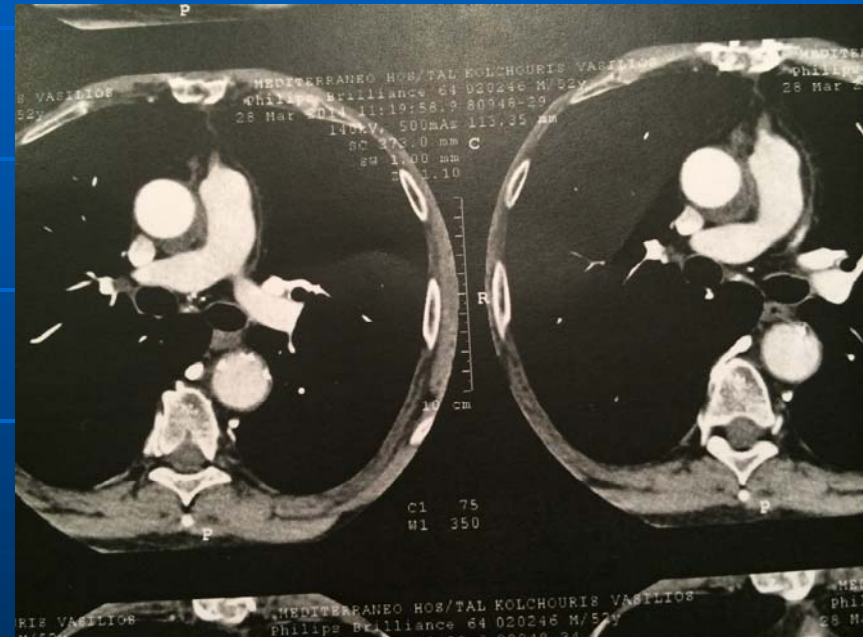
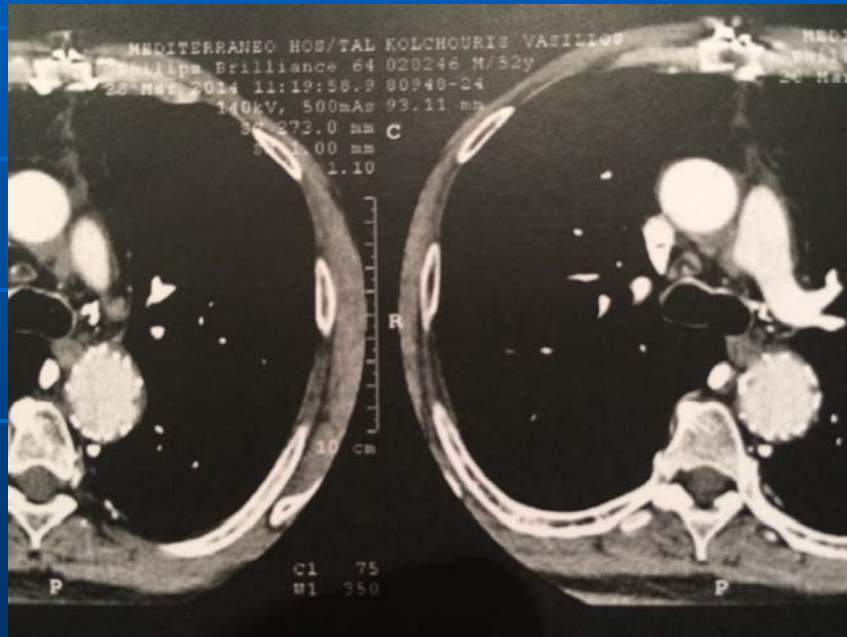




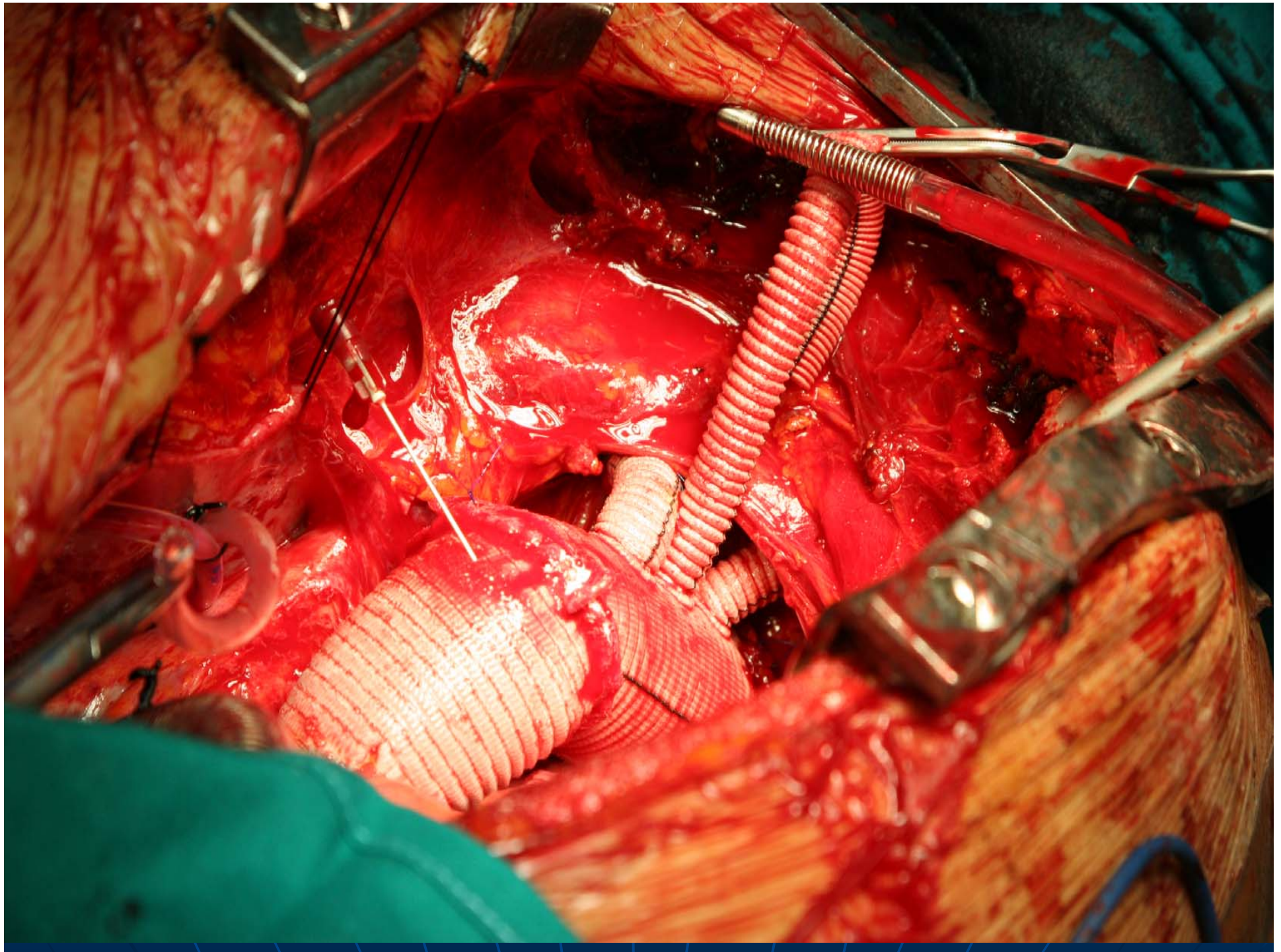
# Two stage hybrid replacement of ascending aorta and arch



# Two stage hybrid replacement of ascending aorta and arch

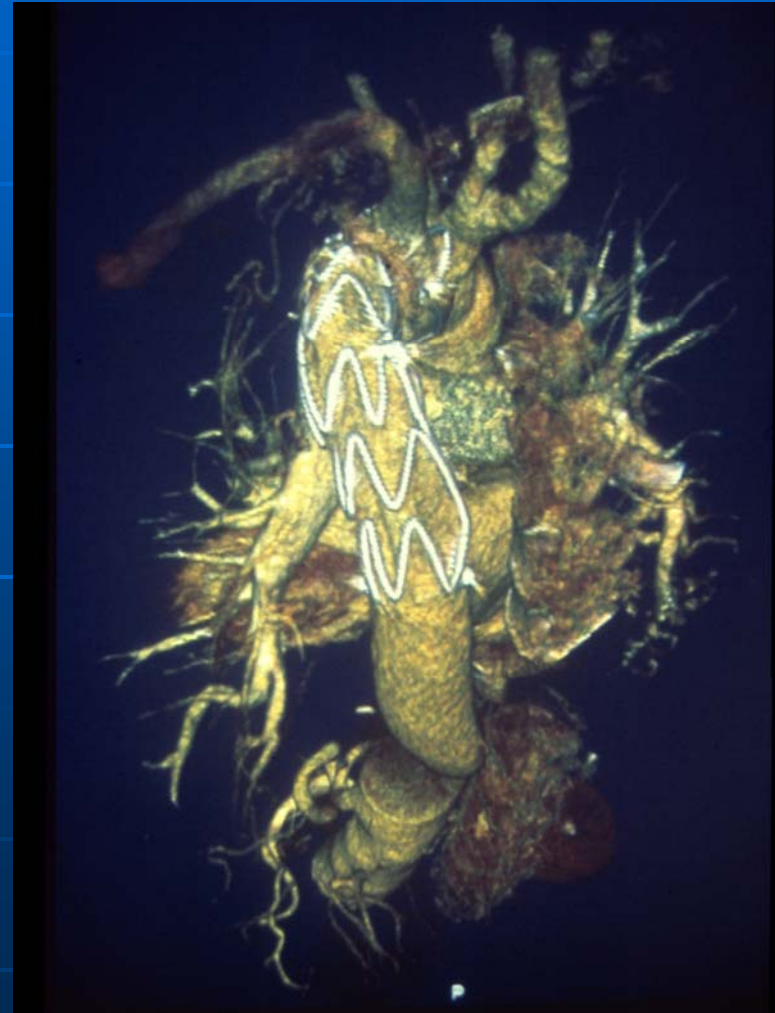
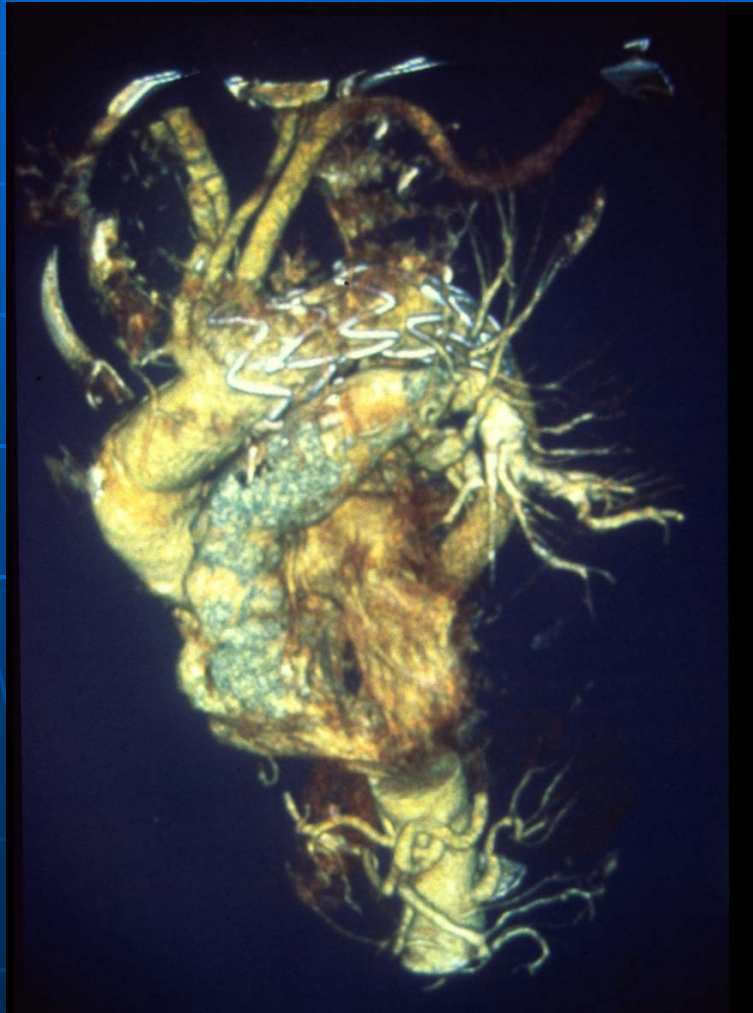


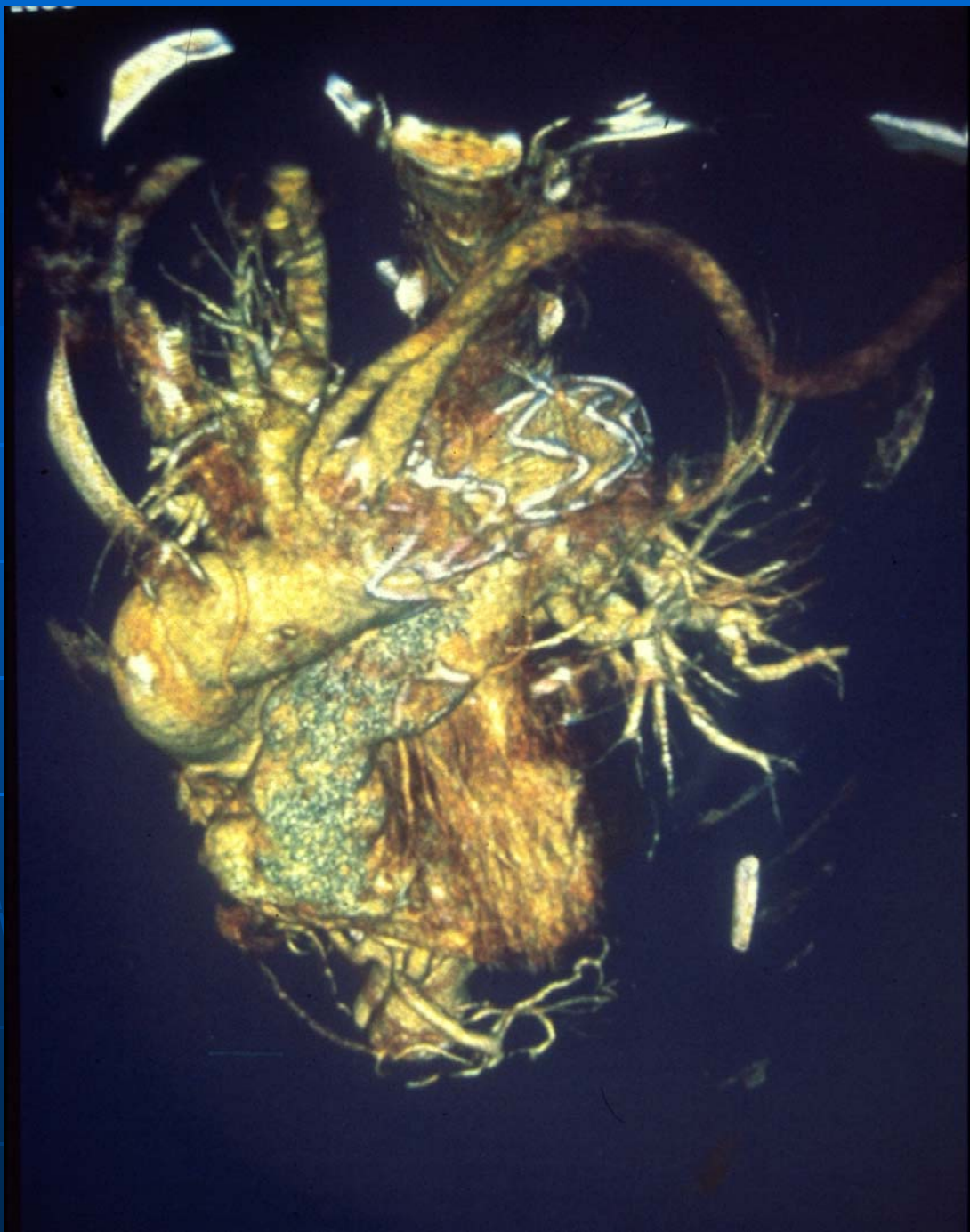




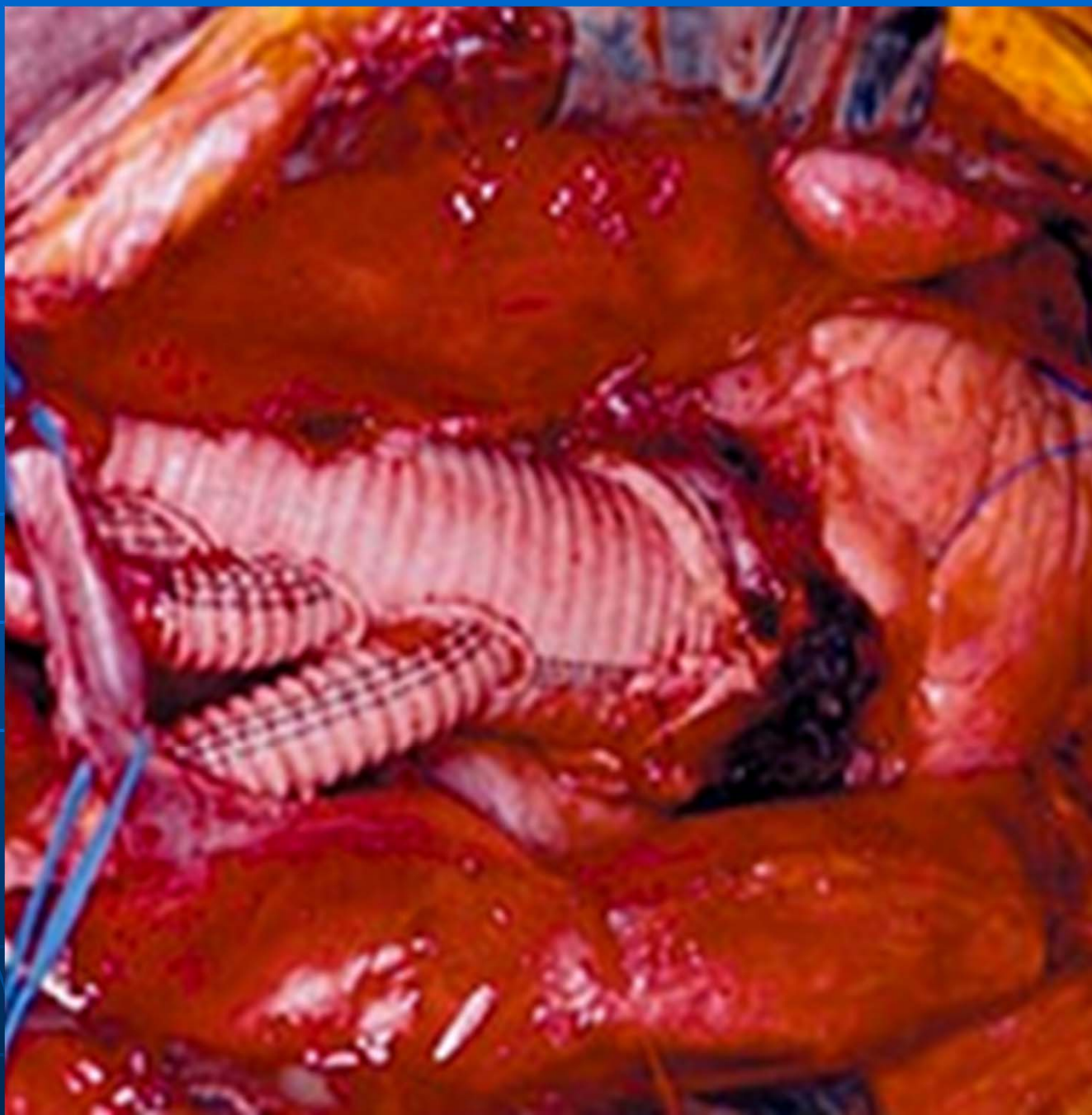


# Two stage hybrid replacement of ascending aorta and arch









# POSTOPERATIVE CARE

- This is based on two principles :
  - (I) **Haemodynamic stability** that allows good blood supply to the organs.
  - (II) **Spinal cord protection** (CSF drainage).
- Maintenance of mean blood pressure of 80 – 90 mm Hg and in some cases 90-110 mm Hg ( cases with long aortic coverage) .
- Preoperative Lumbar drain especially if the stent-graft is to cover thoracic aorta below T6 or in cases when part of abdominal aorta has been replaced.



## "Hybrid" Repair of Aneurysms of the Transverse Aortic Arch: Midterm Results

G. Chad Hughes, MD,\* Mani A. Daneshmand, MD, Keki R. Balsara, MD, Hardean A. Achneck, MD, Bantayehu Sileshi, MD, Sean M. Lee, MD, and Richard L. McCann, MD

Department of Surgery, Duke University Medical Center, Durham, North Carolina

**Background.** Aneurysms of the transverse aortic arch, especially those involving the mid to distal arch, are technically challenging to repair with conventional open techniques. We present our results with a combined open/endovascular approach ("hybrid repair") in such patients.

**Methods.** From August 11, 2005, to September 18, 2008, 28 patients underwent hybrid arch repair. For patients (n = 9) with distal arch aneurysms but 2 cm or more of proximal landing zone (PLZ) distal to the innominate artery, right to left carotid-carotid bypass was performed to create a PLZ by covering the left carotid origin. For patients (n = 12) with mid arch aneurysms but 2 cm or more of PLZ in the ascending aorta, proximal ascending aorta-based arch debranching was performed. For patients (n = 7) with arch aneurysms with no adequate PLZ ("mega aorta") but adequate distal landing zone, a stage 1 elephant trunk procedure was performed to create a PLZ. For the first two groups, endovascular aneurysm exclusion and debranching

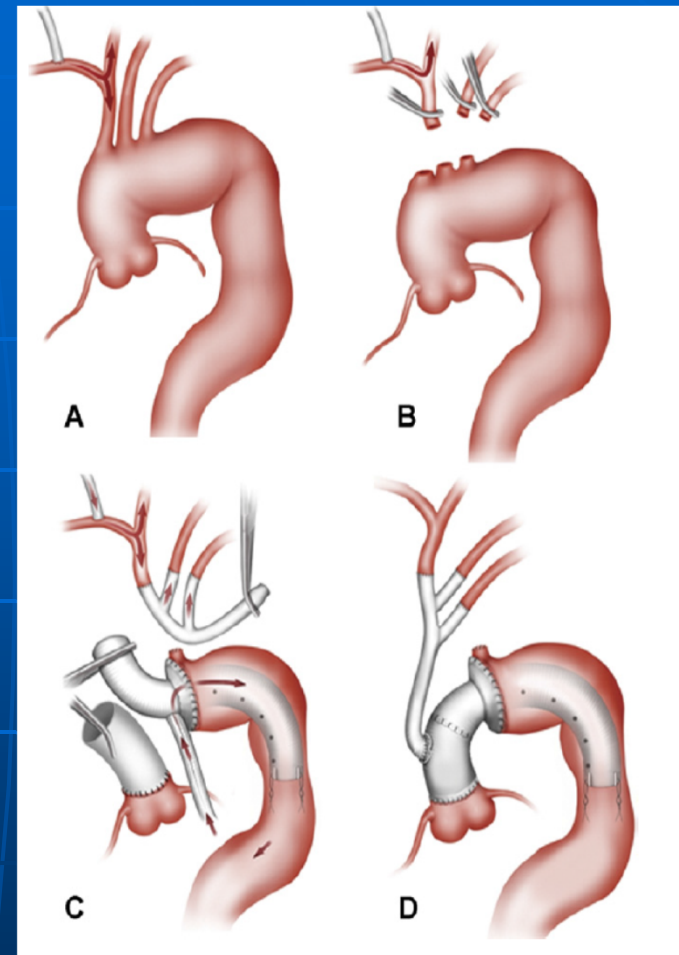
were performed concomitantly, whereas the procedures were staged for the group undergoing an initial elephant trunk procedure.

**Results.** Mean patient age was  $64 \pm 13$  years. Primary technical success rate was 100%. Thirty-day/in-hospital rates of death, stroke, and permanent paraplegia/paresis were 0%, 0%, and 3.6% (n = 1), respectively. At a mean follow-up of  $14 \pm 11$  months, there have been no late aortic-related events. Two patients (7%) required secondary endovascular reintervention for a type 1 endovascular leak. No patient has a type 1 or 3 endovascular leak at latest follow-up.

**Conclusions.** Hybrid repair of transverse aortic arch aneurysms appears safe and effective at midterm follow-up and may represent a technical advance in the treatment of this pathology.

(Ann Thorac Surg 2009;88:1882-8)

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## Results with an Algorithmic Approach to Hybrid Repair of the Aortic Arch

Nicholas D. Andersen, MD<sup>1</sup>, Judson B. Williams, MD, MHS<sup>1</sup>, Jennifer M. Hanna, MD, MBA<sup>1</sup>, Asad A. Shah, MD<sup>1</sup>, Richard L. McCann, MD<sup>2</sup>, and G. Chad Hughes, MD<sup>1</sup>

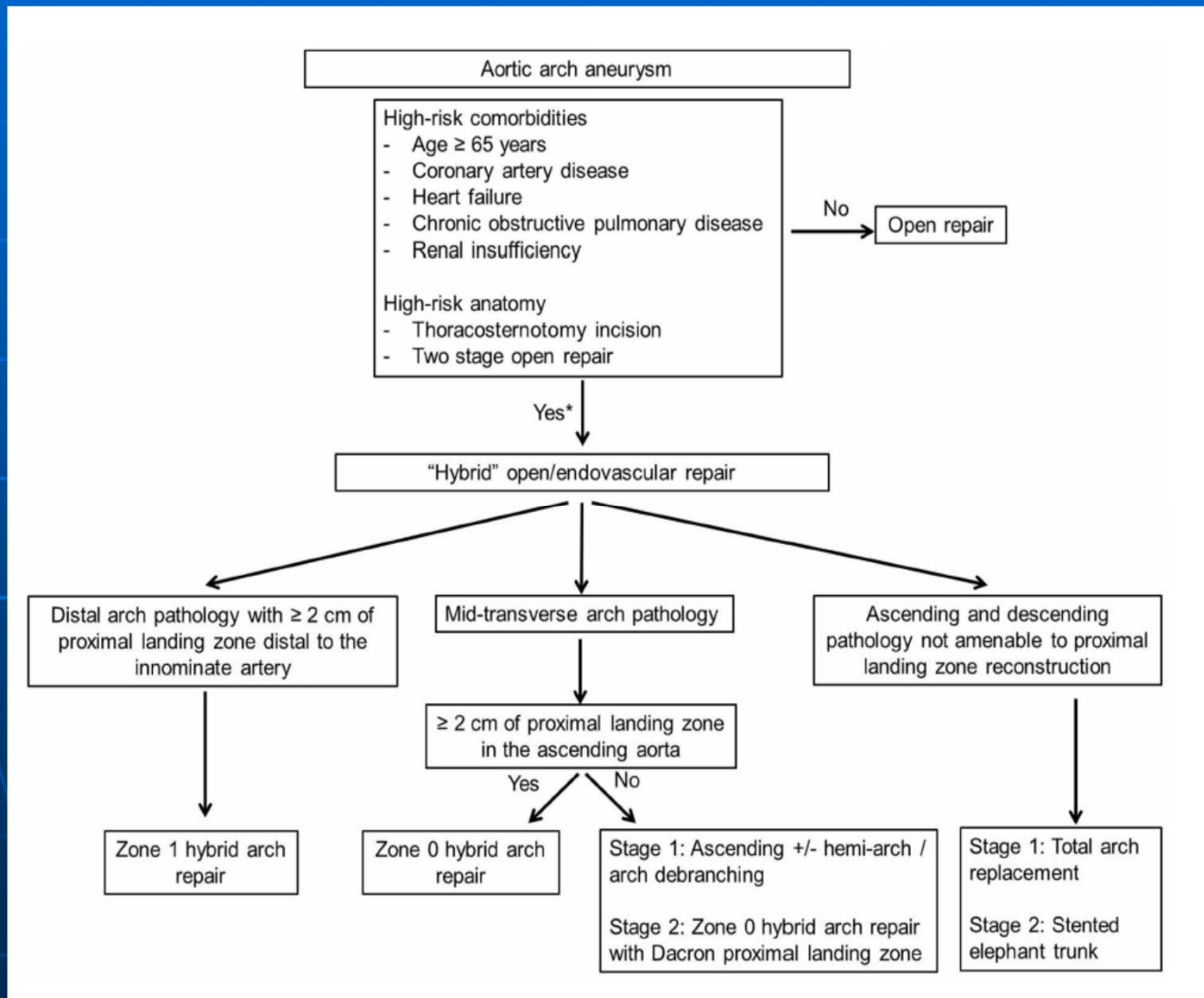
<sup>1</sup>Division of Cardiovascular and Thoracic Surgery, Department of Surgery, Duke University Medical Center, Durham, North Carolina

**Objective**—Hybrid repair of the transverse aortic arch may allow for aortic arch repair with reduced morbidity in patients who are suboptimal candidates for conventional open surgery. Here, we present our results with an algorithmic approach to hybrid arch repair, based upon the extent of aortic disease and patient comorbidities.

**Methods**—Between August 2005 and January 2012, 87 patients underwent hybrid arch repair by three principal procedures: zone 1 endograft coverage with extra-anatomic left carotid revascularization (zone 1, n=19), zone 0 endograft coverage with aortic arch debranching (zone 0, n=48), or total arch replacement with staged stented elephant trunk completion (stented elephant trunk, n=20).

**Results**—The mean patient age was 64 years and the mean expected in-hospital mortality rate was 16.3% as calculated by the EuroSCORE II. 22% (n=19) of operations were non-elective. Sternotomy, cardiopulmonary bypass, and deep hypothermic circulatory arrest were required in 78% (n=68), 45% (n=39), and 31% (n=27) of patients, respectively, to allow for total arch replacement, arch debranching, or other concomitant cardiac procedures, including ascending ± hemi-arch replacement in 17% (n=8) of patients undergoing zone 0 repair. All stented elephant trunk procedures (n=20) and 19% (n=9) of zone 0 procedures were staged, with 41% (n=12) of patients undergoing staged repair during a single hospitalization. The 30-day/in-hospital rates of stroke and permanent paraplegia/paraparesis were 4.6% (n=4) and 1.2% (n=1), respectively. Three of 27 (11.1%) patients with native ascending aorta zone 0 proximal landing zone experienced retrograde type A dissection following endograft placement. The overall in-hospital mortality rate was 5.7% (n=5), however, 30-day/in-hospital mortality increased to 14.9% (n=13) due to eight 30-day out-of-hospital deaths. Native ascending aorta zone 0 endograft placement was found to be the only univariate predictor of 30-day/in-hospital mortality (odds ratio, 4.63; 95% confidence interval, 1.35-15.89; P=0.02). Over a mean follow-up of 28.5 ± 22.2 months, 13% (n=11) of patients required reintervention for type 1A (n=4), type 2 (n=6), or type 3 (n=1) endoleak. Kaplan-Meier estimates of survival at 1, 3, and 5 years were 73%, 60%, and 51%, respectively.

# Algorithm of treatment





# State-of-the-Art of Hybrid Procedures for the Aortic Arch: A Meta-Analysis

George J. Koullias, MD, and Grayson H. Wheatley III, MD

Illinois Cardiac Surgery Associates, Peoria, Illinois; and Department of Cardiovascular Surgery, Arizona Heart Institute, Phoenix, Arizona

Questions have risen regarding procedural indications, techniques, and outcomes for hybrid arch procedures. We performed a meta-analysis to benchmark this innovative approach. Studies and case reports involving hybrid aortic arch procedures listed through May 2008 were reviewed (n = 718). End points were 30-day mortality, stroke, paraplegia, and endoleak rates. A total of 15 studies with 463 patients were included in the meta-

analysis. Overall 30-day mortality was 8.3%. Endoleak rate was 9.2%, stroke was 4.4%, and paraplegia was 3.9%. Treated on-pump or off-pump did not affect any of the endpoints. Results compare favorably with standard operative repair. Long-term follow-up is needed.

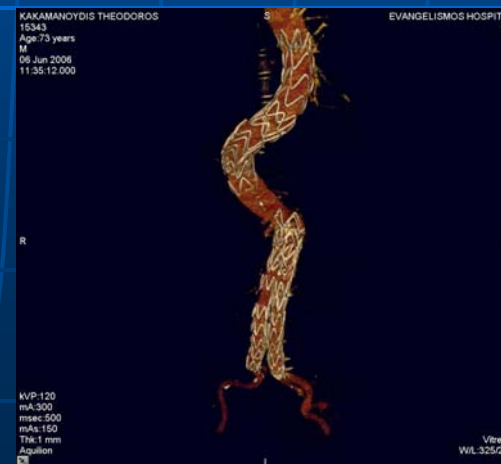
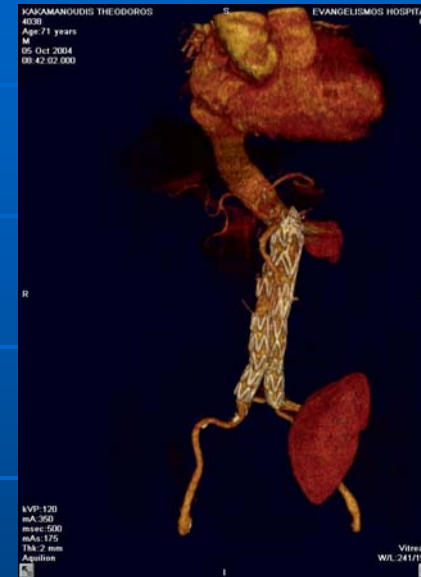
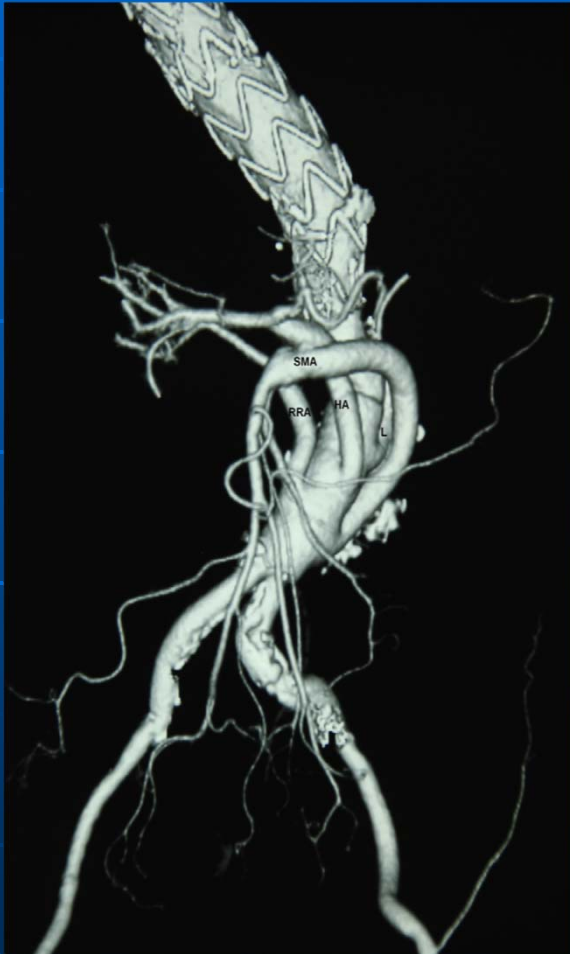
(Ann Thorac Surg 2010;90:689–97)

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# Hybrid treatment of thoracoabdominal aneurysms



# Hybrid treatment of thoracoabdominal aneurysms

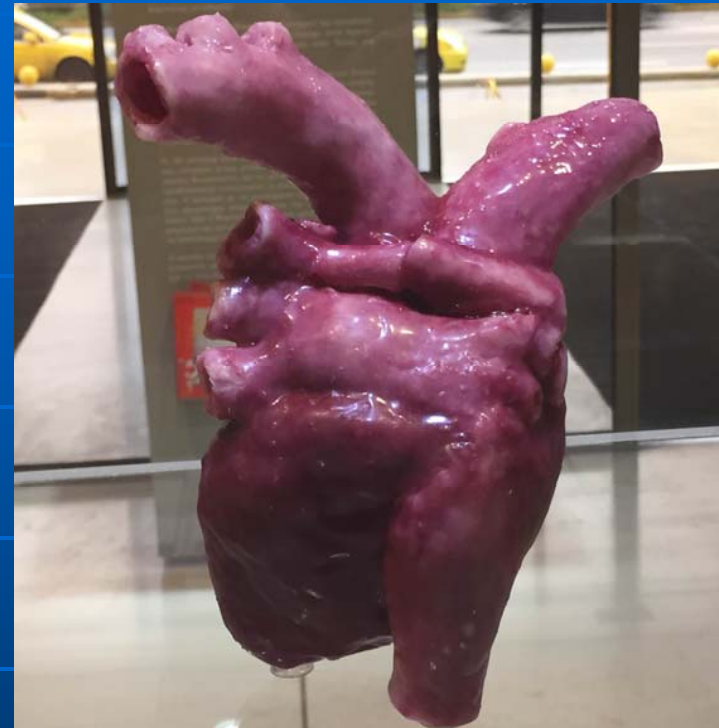




# Evaggelismos hospital experience

- 125 patients with a acute type A dissection have been treated over the last 5 years. In hospital mortality:12%
- >300 TEVAR . Cases include traumatic aortic rupture selective cases of type B aortic dissection, rupture atherosclerotic ulcer of the descending aorta or as supplementary therapy of arch replacement over the last 10 years with excellent results. (Interventional radiology department)
- 18 cases of arch replacement + TEVAR (no death)
- 5 cases of arch debranching+TEVAR (Type I hybrid-1 death)
- 14 Frozen elephant trunk ( Type III – 4 deaths )
- 4 debranching+EVAR for thoracoabdominal aorta...
- Necessary : TEAM WORK

# PICTURES FROM THE FUTURE:HYBRID ROOMS AND 3D PRINTING





# THANK YOU

