MEET 2015

MULTIDISCIPLINARY EUROPEAN ENDOVASCULAR THERAPY

11.20 Thoracic pathology

Moderators: *S. Ronchey, S. Haulon, F. Veith*

How I deal with the aortic arch: from planning to follow-up

11.20 My experience in ascending aorta TEVAR, *I. Loftus*
11.28 Open surgery conventional: discrepancy in results (lights and shadow), *D. Pacini*
11.36 Custom-made solution: how my planning evolved, *S. Haulon*
11.44 Off the shelf solution: selection based on planning, *N. Mangialardi*
11.52 My planning for arch Chimney, *J. Brunkwall*
12.00 Endoleak after arch Chimney, *R. Kolvenbach*
12.08 Hybrid repair: technique for total debranching, *P. Bergeron, A. Petrosyan*
12.16 Stroke rate and mortality in arch procedures, *M. Lachat, F. Pecoraro*
12.24 Endovascular arch repair following ascending aorta open surgery, *S. Haulon*
12.32 Complications of supraaortic debranching, *S. Ronchey*
12.40 Demonstration (crazy arch case), *T. Larzon*
12.48 Discussion

Disclosure

Speaker name:

Mario L. Lachat

I have the following potential conflicts of interest to report:

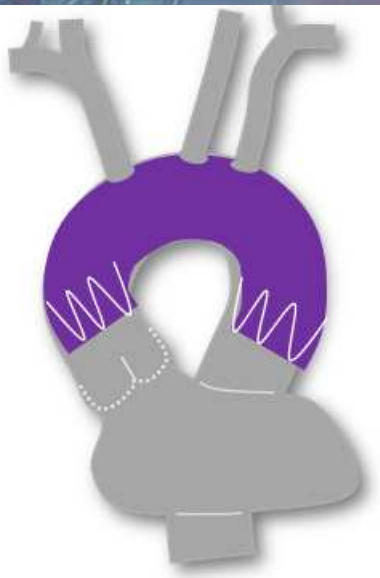
☒ Consulting (Jotec, Gore, Medtronic, Endospan, Philips,)

Great Times

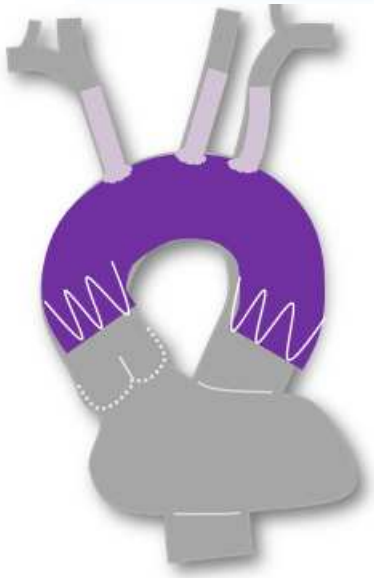
- For patient and for physician
  - Plenty of treatment options
- On the way to “personalized aortic treatment”
- …

- Multiple repair techniques

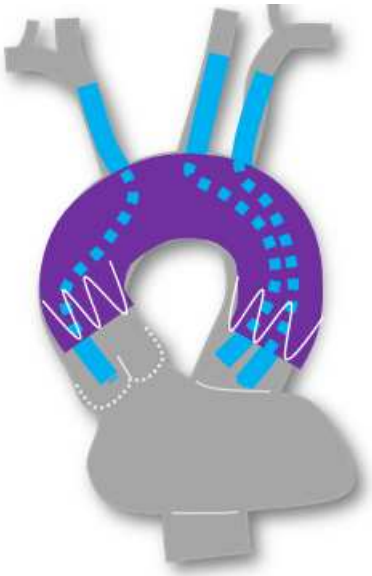
Endovascular



FEVAR

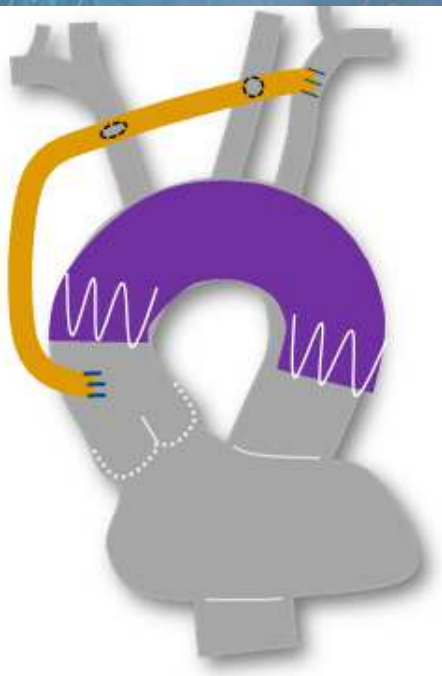


BEVAR

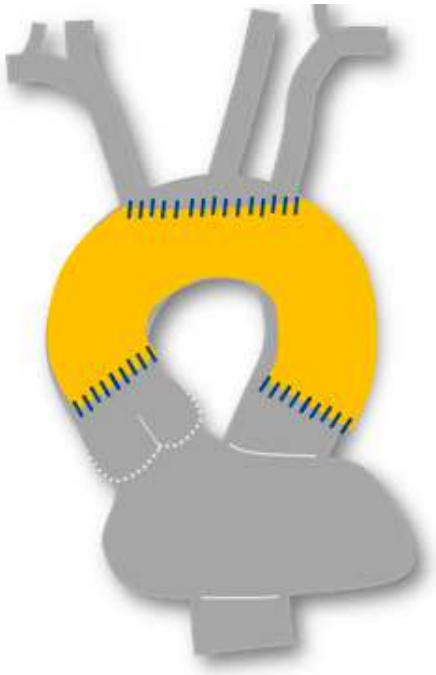


PG-EVAR

Surgery



HR



COS


?
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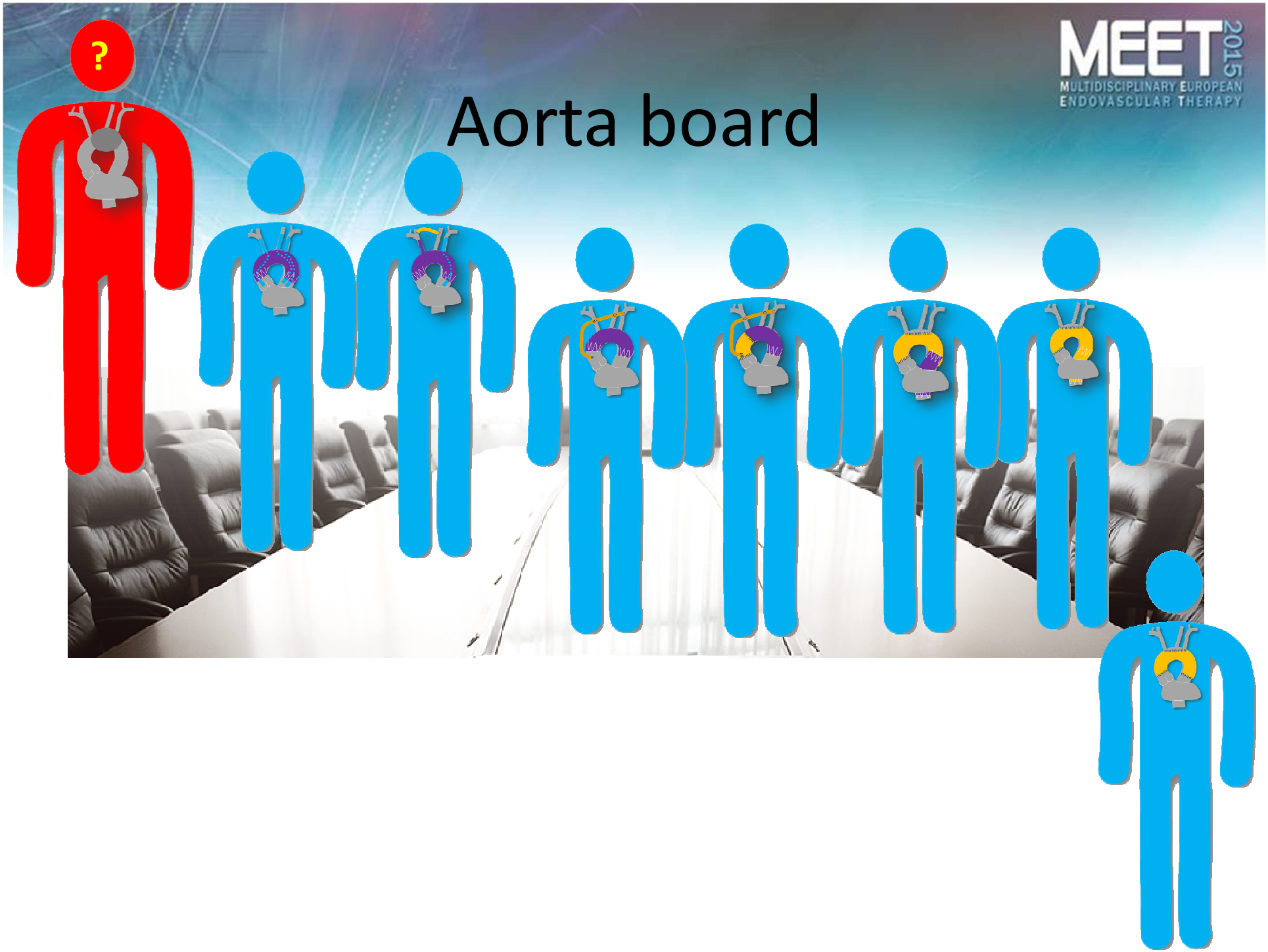
Aorta board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MULTIDISCIPLINARY EUROPEAN ENDOVASCULAR THERAPY
Aorta board
?

- Multiple repair techniques

- What are the results?

Literature search

- Aortic arch
  - Open repair, F/BEVAR, PG-EVAR, Hybrid repair
- 30 day results
  - Stroke, mortality
- Follow-up

Author	Year	Patients	30d Results				FUP	
Conventional Open Repair			death	stroke and/or paraplegia	EL	reintervention	reintervention	survival
Andersen	2012	20	2	1	-	3	0	51@5y
Baraki	2007	39	5	5	-	0	3	87@1.9Y
Chen	2010	28	4	6	-	1	0	88%@5y
Di eusanio	2013	122	21	20	-	15	0	97%@1y
Flores	2006	25	3	8	-	-	-	-
Hofferberth	2012	19	1	3	-	0	4	-
Hoffmann	2012	32	1	1	-	4	0	-
Ius	2013	131	20	15	-	24	0	72%@5y
Jakob	2011	270	41	35	-	38	0	74%@5y
Jim	2011	10	1	1	2	0	1	50%@3Y
Kawaharada	2009	31	2	1	1	0	4	73%@5Y
Lee	2011	21	4	3	2	0	5	-
Leontyev	2013	46	4	11	-	6	0	68%@5y
Lima	2012	50	4	6	1	2	0	87%@2Y
Nishi	2011	61	2	6	-	0	3	-
Pochettino	2009	36	5	1	-	-	-	-
Roselli	2013	17	0	2	-	-	-	-
Shen	2012	38	3	2	-	-	-	91%@5y
Shi	2011	46	1	1	-	2	0	-
Shimamura	2008	126	4	11	-	3	0	63%@5y
Shimamura	2009	69	5	6	6	2	6	89%@3Y
Shrestha	2012	34	3	1	-	6	2	-
Sun	2013	398	31	20	-	28	0	-
Uchida	2011	80	3	7	-	2	0	-
Usui	2002	24	0	4	-	-	-	96%@1year
Xiao	2013	33	6	0	0	-	-	-
Zhao	2012	24	1	1	1	0	1	92%@5Y
Total		**1830**	**176**	**180**	**13**	**135**	**29**	
%			**10**	**10**	**5,5**	**8**	**1,8**	**"79%"@"4years"**

A systematic review and meta-analysis on the safety and efficacy of the frozen elephant trunk technique in aortic arch surgery

David H. Tian[1], Benjamin Wan[1], Marco Di Eusanio[1,2], Deborah Black[3], Tristan D. Yan[1,4]

Table 3 Summary of clinical outcomes

First author	30-day mortality (%)	Stroke (%)	Spinal cord injury (%)	Renal failure (%)	Reoperation for bleeding (%)	Hospital stay (days)	1-year survival (%)	5-year survival (%)
Usui (8)	0	4.2	12.5	NR	NR	36±15	96	NR
Flores (9)	12.0†	16.0	24.0	NR	NR	NR	NR	NR
Shimamura (10)	3.2	5.6	6.3	4.8	2.4	29M	81	63
Pochettino (11)	13.9†	2.8	8.3	16.7	NR	NR	NR	NR
Uchida (12)	3.8	2.6	1.9	5.1	2.6	NR	NR	NR
Chen (13)	0	10.7	NR	7.1	3.6	NR	NR	88
Sun (14)‡	1.4†	2.1	2.8	1.4	7.0	NR	NR	NR
Jakob (15)	12	5.8	8.0	21.9	13.9	19M	NR	74
Shi (16)	2.2	0	0	NR	4.3	19±6	NR	NR
Shen (17)	7.9†	0	5.3	NR	0	21±13	91	NR
Hoffman (6)	0	0	0	NR	12.5	19±8	NR	NR
Leontyev (18)	8.7	13.0	21.7	23.9	13.0	NR	70	68
Xiao (23)	18.2†	0	0	3.0	NR	26±11	NR	NR
Ius (19)	15.3	10.7	0.8	16.0	18.3	18±17	82	72
Sun (20)	7.8†	2.5	2.5	4.3	2.5	NR	NR	NR
Di Eusanio (21)	17.2	7.4	9.0	24.6	12.3	15M	97	NR
Roselli (22)	0	11.8	NR	5.9	NR	20±12	NR	NR
Minimum	0	0	0	0.7	0	15	70	63
Maximum	18.2	16.0	24.0	24.6	18.3	36	97	88
Weighted average	8.3	4.9	5.1	10.9	7.8	NA	84.7	71.5

†in-hospital mortality; ‡only chronic dissection cases; M, median; NA, not statistically available; NR, not reported

Author	Year	Patients	30d Results				FUP	
Hybrid Repair			death	stroke and/or paraplegia	EL	reintervention	reintervention	survival
Andersen	2012	48	10	7	11	3	11	51%@5y
Antoniou	2010	33	7	6	6	-	-	-
Bavaria	2010	23	3	5	-	-	-	-
Bergeron	2006	25	2	3	3	0	3	88%@1.3y
Canaud	2010	34	7	3	7	-	-	70%@2.4Y
Chan	2008	16	5	4	2	3	1	100%@1.2Y
Chiesa	2010	116	5	7	9	0	2	89%@2y
Czerny	2012	66	6	5	9	9	10	96%@5y
Donas	2010	20	2	3	0	0	1	-
Deriu	2012	48	7	2	-	-	-	-
Ferrero	2012	27	3	2	1	0	0	74@1.4Y
Geisbysch	2011	47	9	6	7	0	13	59@3y
Gelpi	2010	15	1	1	0	1	1	93%@5Y
Gottardi	2008	73	5	1	18	0	2	72%@5Y
Holt	2010	78	6	7	8	3	9	-
Hughes	2009	28	5	2	2	4	2	70%@3Y
Ingrund	2010	12	17	1	2	2	0	-
Ishilbashi	2012	12	1	1	0	-	-	-
Lee	2011	37	6	4	3	4	0	-
Lofti	2012	51	5	8	3	6	3	73%@2Y
Lu	2011	49	5	4	0	-	-	-
Ma	2011	24	1	1	-	-	-	-
Murashita	2012	27	1	4	-	-	-	86%@2Y
Saleh	2006	15	1	1	0	0	0	-
Vallejo	2012	38	9	6	5	5	2	50%@4Y
Weigang	2009	26	4	1	1	1	0	-
Total		**988**	**133**	**95**	**97**	**41**	**60**	
%			**13**	**10**	**11**	**6**	**8**	**"76%"@"3years"**

Author	Year	Device	Patients	30d Results				FUP	
F/BEVAR				death	stroke and/or paraplegia	EL	reintervention	reintervention	survival
Inoue K	1999	BEVAR-Inoue	15	0	1	4	1	4	87%@1year
McWilliams	2004	FEVAR	1	0	0	0	0	0	100%@0.5Year
Saito N	2005	BEVAR-Inoue	17	0	1	3	0	2	88%@2.2years
Chuter T	2003	BEVAR	1	0	0	0	0	0	-
Brar R	2008	BEVAR	1	0	0	0	0	0	-
Kawaguchi	2008	FEVAR	288	-	16	-	-	-	62%@5years
Sonesson	2009	FEVAR	1	0	0	0	0	-	100%@0.1Year
Manning	2010	FEVAR	10	0	0	0	0	0	-
Yusa	2011	FEVAR	10	0	0	1	0	0	-
Lioupis	2012	BEVAR	6	0	2	2	1	0	-
Spear	2013	BEVAR	1	0	0	0	0	-	-
Azuma	2013	FEVAR	393	6	10	12	-	-	-
Haulon	2014	BEVAR	38	5	6		4	3	-
Anderson	2015	FEVAR	2	0	0	0	0	0	100%@0.5 years
Matsuyama	2015	FEVAR	37	1	2	1	0	11	65%@5years
Mangialardi	2015	FEAVR-Najuta	1	0	0	0	0	0	-
Tse	2015	FEVAR-insitu	6	0	1	0	0	0	-
Kurimoto	2015	FEVAR	37	0	5	12	0	4	86%@2years
Total			**865**	**12**	**44**	**35**	**6**	**24**	
%				**1,5**	**5**	**4**	**0,7**	**3**	**«86%»@«2y»**

Author	Year	Patients	30d Results				FUP	
Parallel grafts			death	stroke and/or paraplegia	EL	reintervention	reintervention	survival
Mangialardi	2014	26	1	2	6	3	-	80%@3years
Vicente	2014	1	0	0	0	0	0	100%@0.8years
Synoviecz	2013	1	0	0	0	0	0	-
Shahverdyan	2013	6	1	0	3	2	1	83%@0.2years
Samura	2013	2	0	0	2	0	0	100%@0.5years
Zhu	2013	34	0	0	2	4	4	94%@1year
Chang	2013	1	0	0	0	0	0	100%@1year
Zhou	2013	1	0	0	2	0	0	100%@1year
Vallejo	2012	8	1	1	0	3	5	-
Akchurin	2012	10	0	0	1	0	0	100%@0.5years
Cires	2011	9	1	1	0	1	3	100%@0.4years
Yoshida	2011	2	0	0	2	0	1	-
Shu	2011	8	0	0	0	0	0	100%@1year
Feng	2011	1	0	0	0	0	0	100%@1year
Gehringhoff	2011	9	1	0	1	0	1	79%@1year
Sugiura	2009	11	2	1	2	0	1	-
Baldwin	2008	7	0	1	1	0	0	-
Ohrlander	2008	4	0	0	2	1	2	
Criado	2007	8	0	0	0	0	0	-
Hiramoto	2006	1	0	0	0	0	0	-
Larzon	2005	2	0	0	2	0	0	-
Total		**152**	**7**	**6**	**26**	**14**	**18**	
%			**5**	**4**	**17**	**9**	**12**	**"94%"@"1year"**

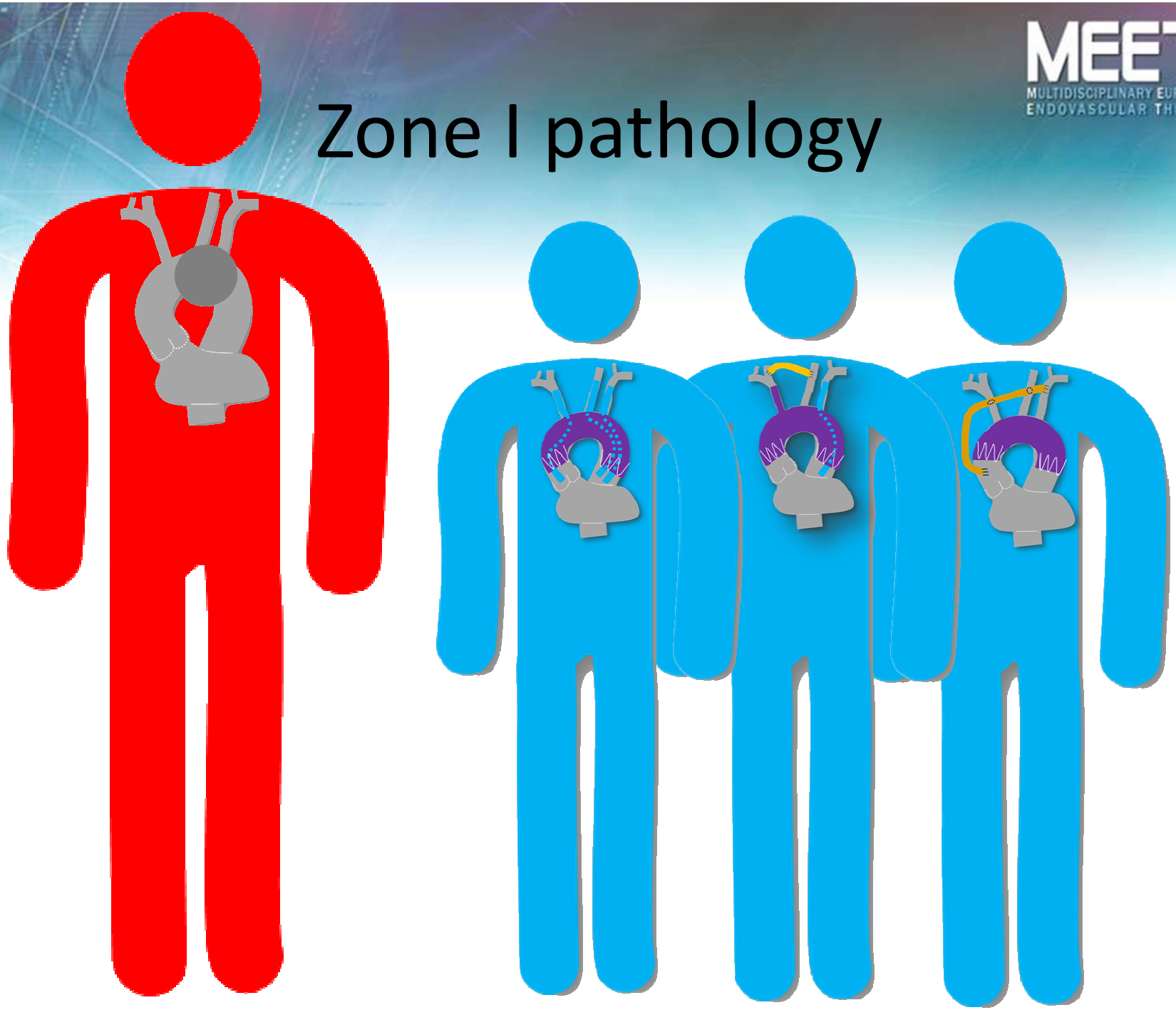
FACTS

- Mortality is significantly higher in surgery groups (COS & HR) when compared to endo repair (F/BEVAR & PG-EVAR)
- Neurological events are significantly less in group PG-EVAR when compared to other repair groups.
  - F/BEVAR had lower incidence of neurological events when compared to surgery groups

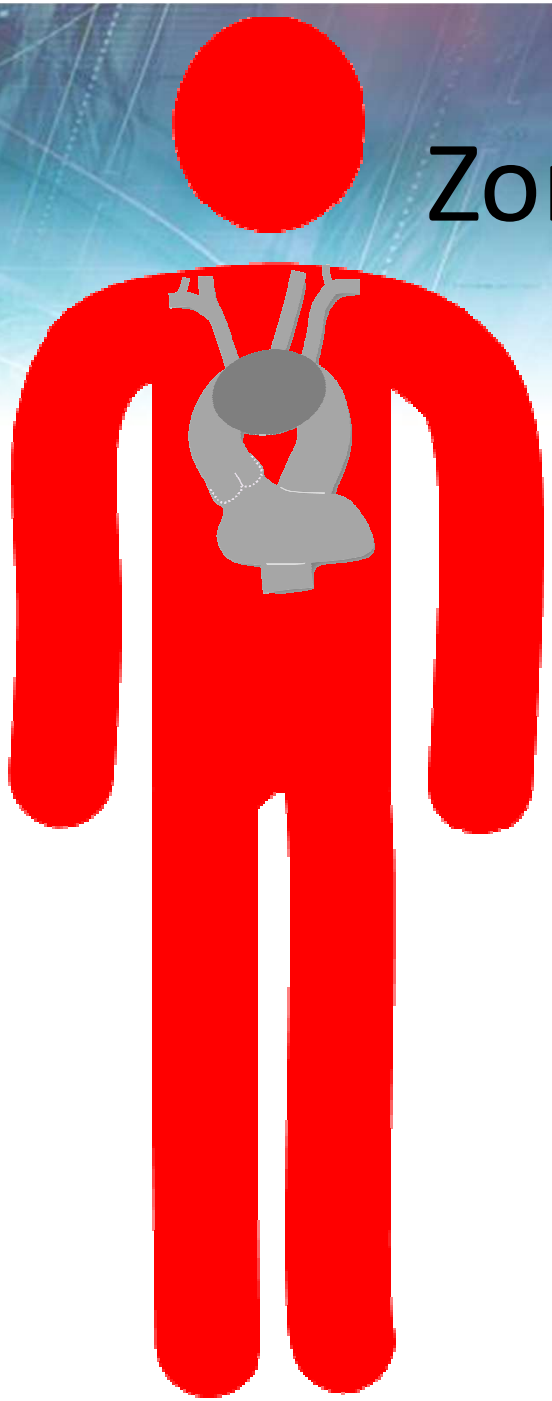
FACTS

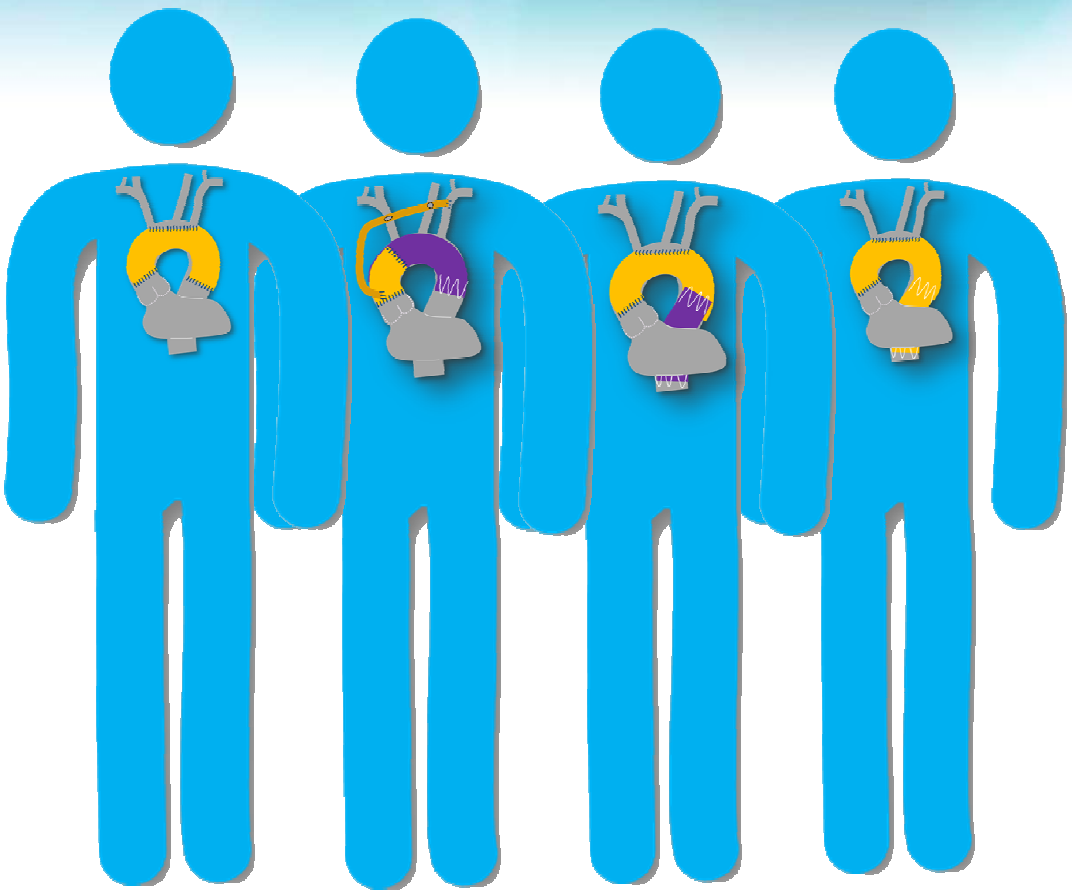
- Endoleaks are significantly less in F/BEVAR when compared PG-EVAR and HR
- Reinterventions are significantly less in F/BEVAR and COS when compared to PG-EVAR and HR

Zone I pathology



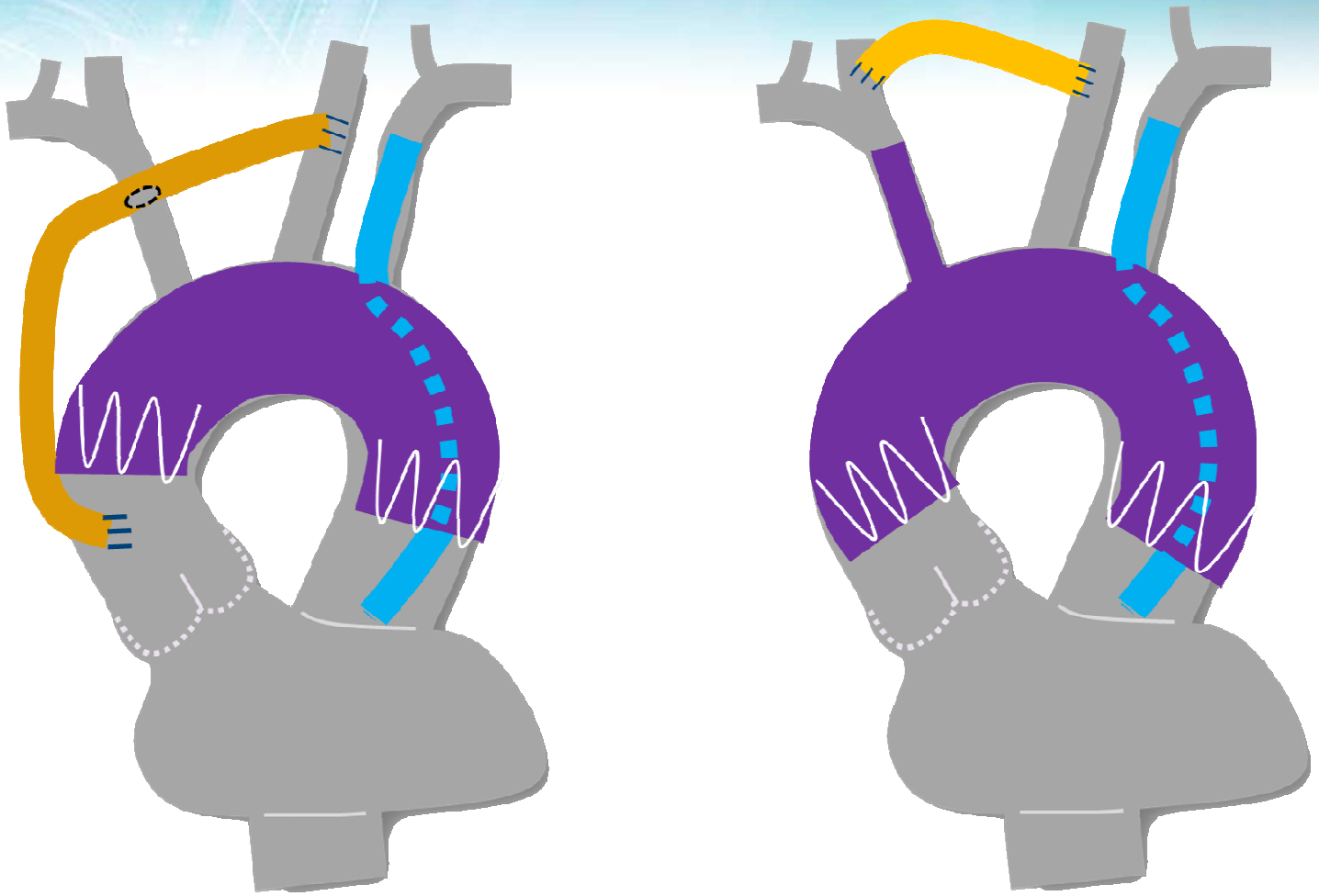
Zone 0 pathology





- Multiple repair techniques
- What are the results?
- What do we not know?

??MultiTech EVAR??



New complications!!

- **LV perforation**

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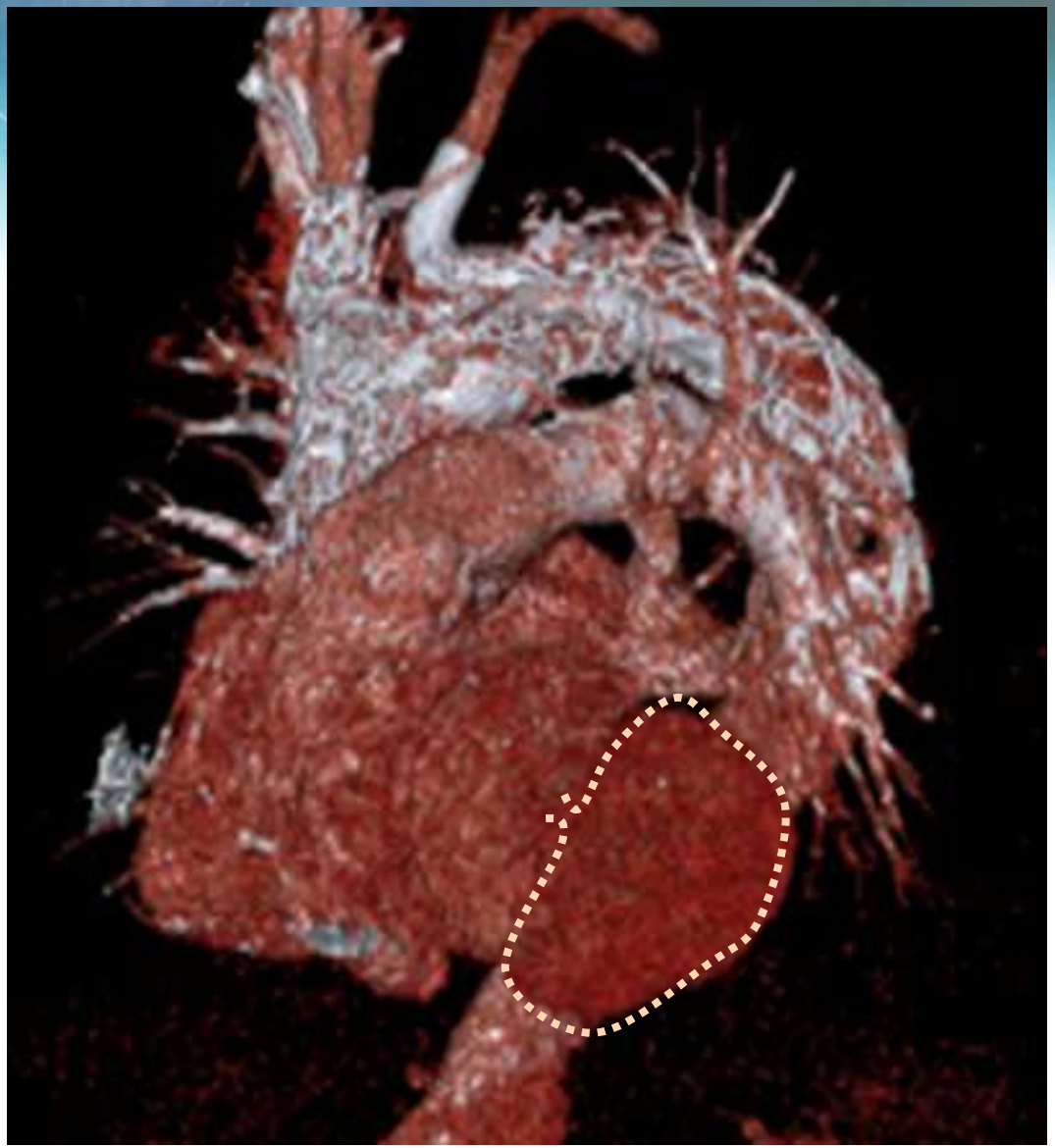
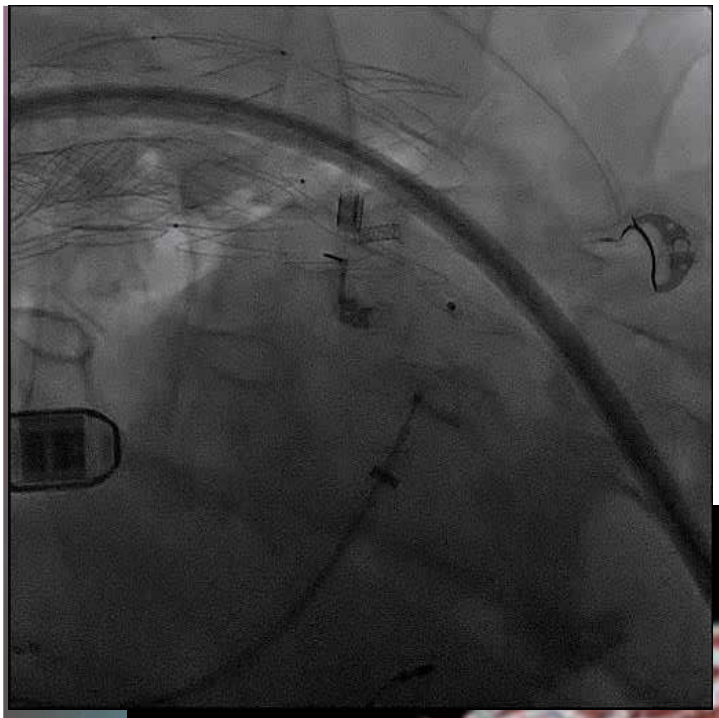
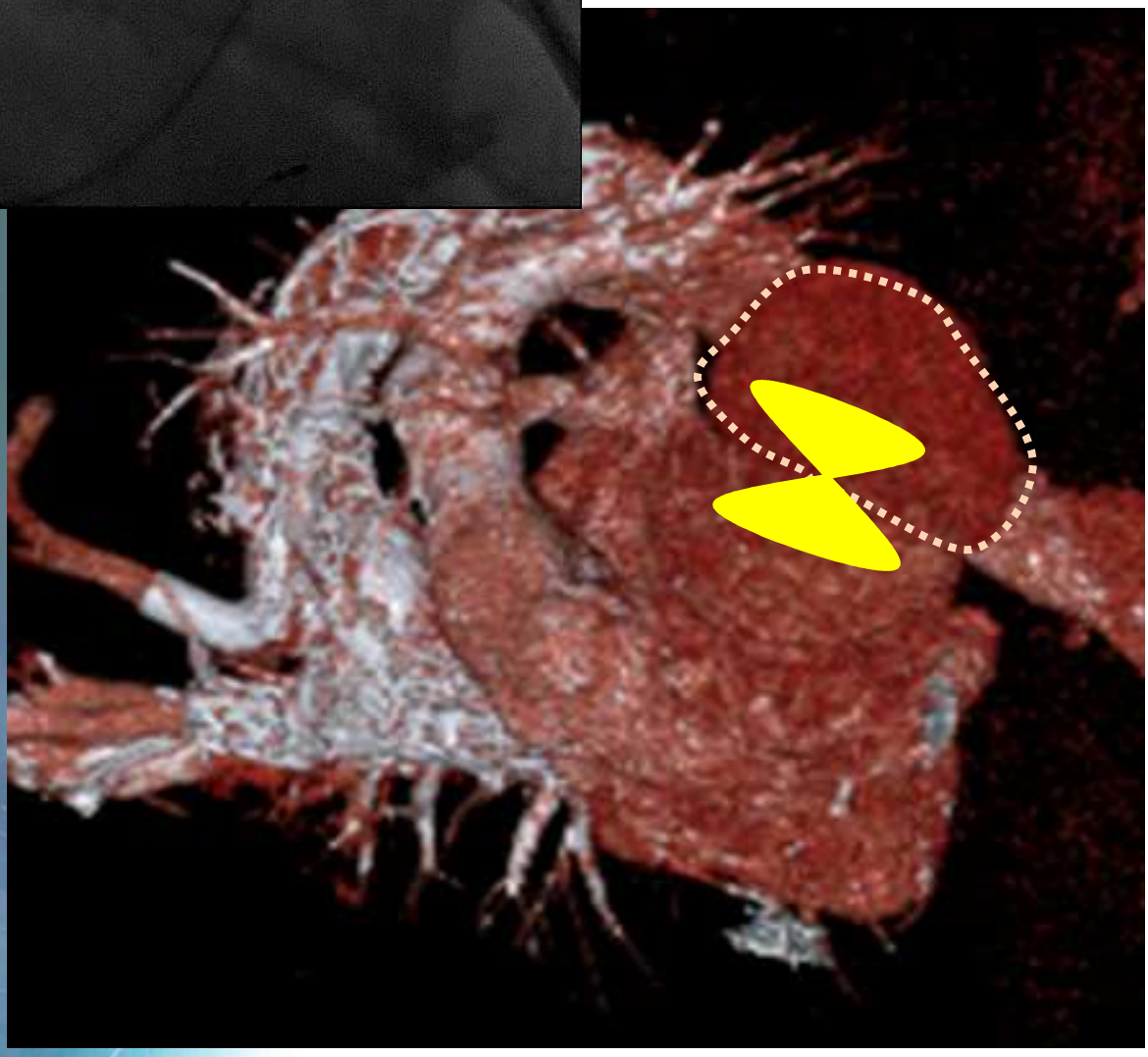






Prevention

- Patient selection

ANATOMIC AND PHYSIOLOGIC CRITERIA FOR ENDOVASCULAR ARCH REPAIR

Anatomic Criteria:

- Arch aneurysms and chronic dissections, no previous mechanical aortic valve replacement
- Ascending aortic length ≥ 50 mm (measured from sinotubular junction to origin of innominate artery)
- Sealing zone in the ascending aorta ≥ 40 mm in length and ≤ 38 mm diameter
- Sealing zone in the innominate artery ≥ 20 mm in length and ≤ 20 mm in diameter
- Access able to accommodate 22- or 24-F sheaths

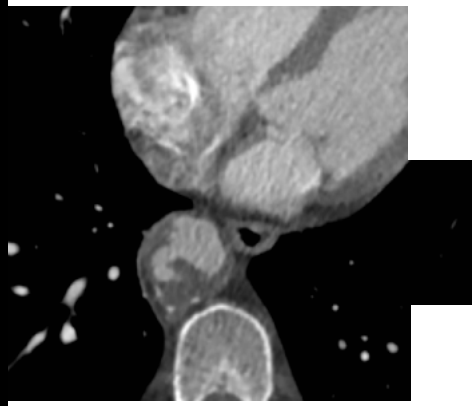
Physiologic Criteria:

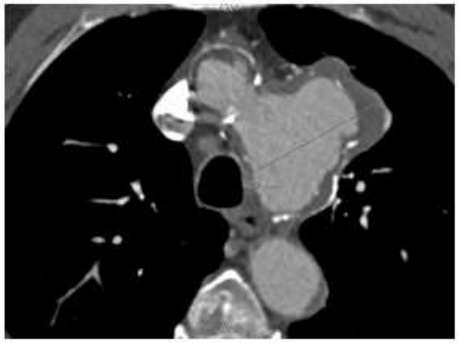
- Minimum of 2-year life expectancy
- Negative stress test (cardiology clearance required in the setting of positive stress test)
- No class III or IV congestive heart failure
- No stroke or myocardial infarction in the last year
- No significant carotid bifurcation disease (≥ 75% stenosis by North American Symptomatic Carotid Endarterectomy Trial criteria)
- Estimated glomerular filtration rate by modification of diet in renal disease method ≥ 45 mL/min/1.73 m^2

No dissection of SAT
No endoluminal plaques

Stépan Haulon. EVT Nov. 2014

DB Aneurysm





lesion

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Hybrid repair

- Aortic arch
- Visceral aorta
- Pelvine arteries

Prevention

- Assess supraaortic anatomy
- Protection devices

Prevention

- Assess supraaortic anatomy
- Protection devices
- High-dose heparinisation

Anticoagulation

	Intraoperative	Postoperative
F/BEVAR	Heparin	Aspirin and/or Plavix LMWH Coumadin
PG-EVAR	Heparin	Aspirin and/or Plavix LMWH Coumadin
HR	Heparin	Aspirin and/or Plavix LMWH Coumadin
COS	Heparin	Aspirin and/or Plavix Coumadin

ACT?

Prevention

- Assess supraaortic anatomy
- Protection devices
- High-dose heparinisation
- Reduce manipulations in arch
- Avoid time consuming deployment devices

NEXUS (Endospan)

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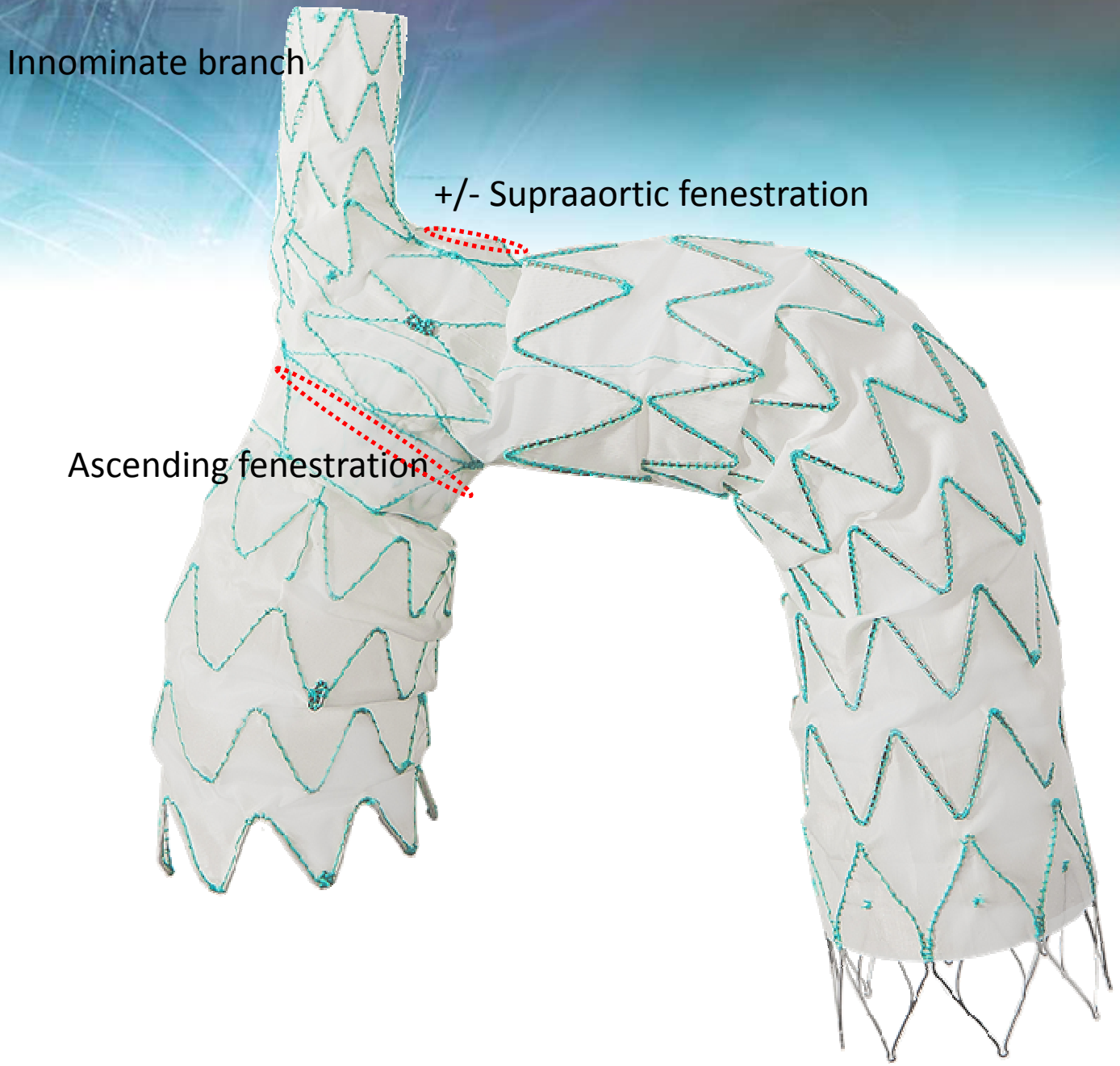
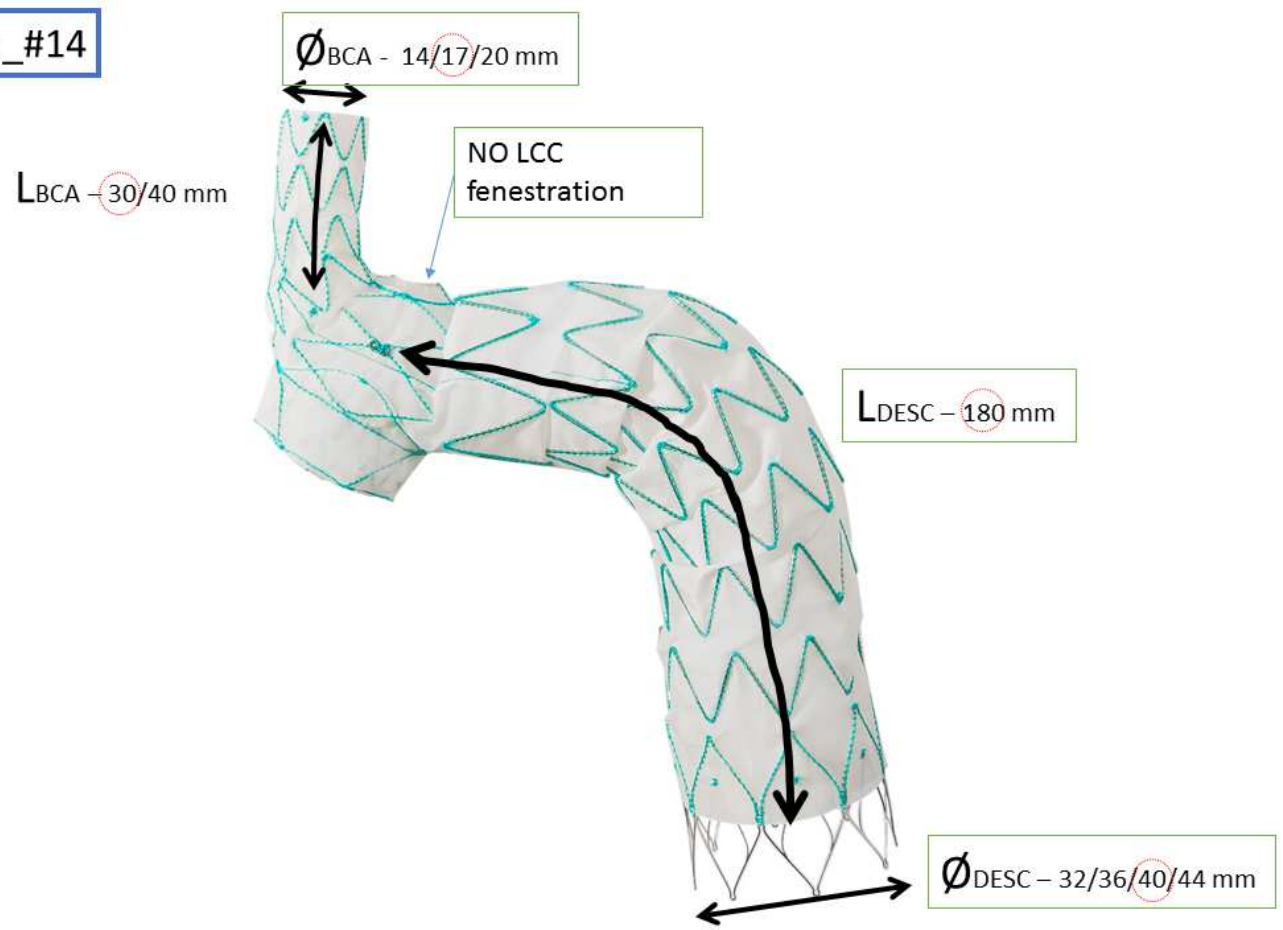
Nexus™ Delivery System

Nexus' low-profile, 20Fr delivery system makes this EVAR option available for a wide range of patients


Innominate branch
+/- Supraaortic fenestration
Ascending fenestration

Module 1 (OTS)

H.B.S – Nx_can_#14

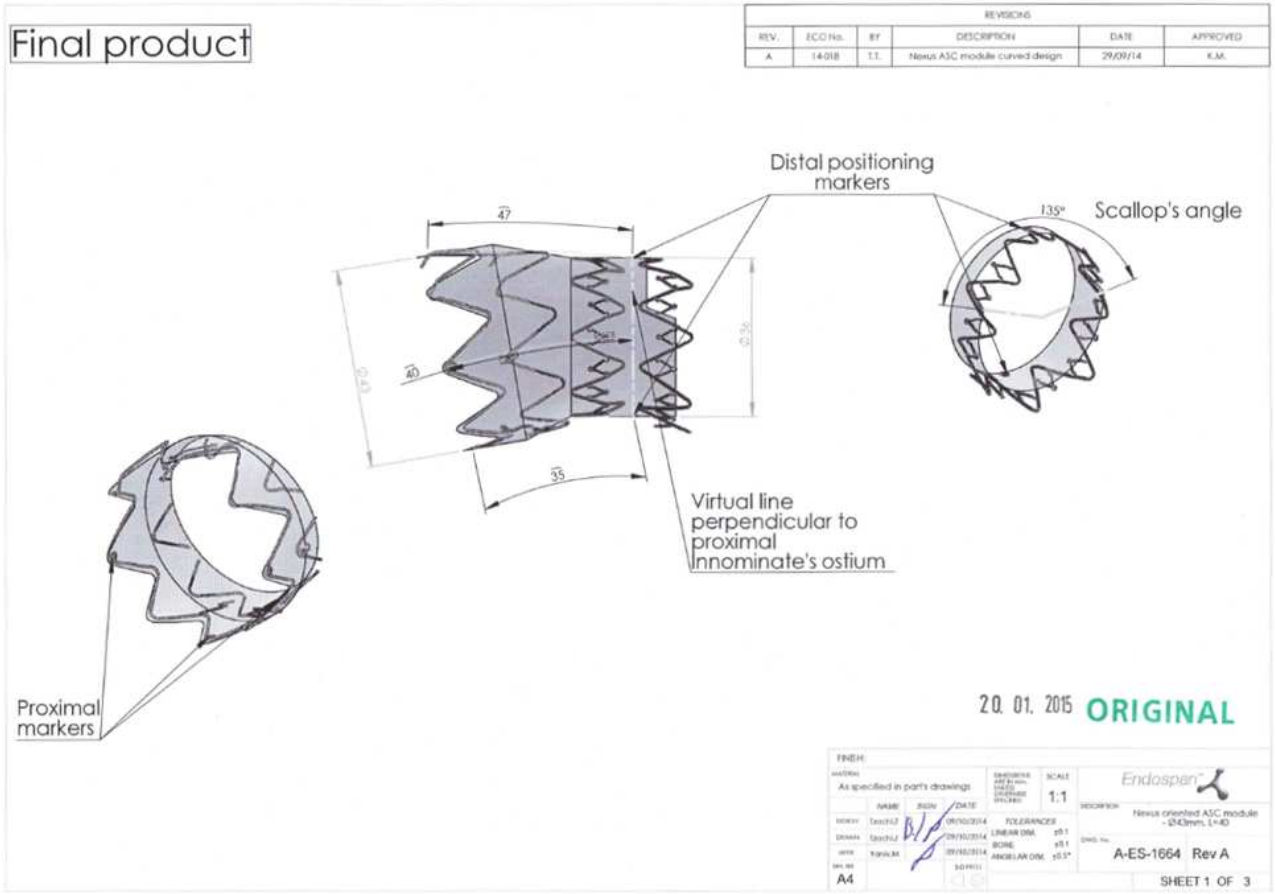


Module 2 (OTS)

straight

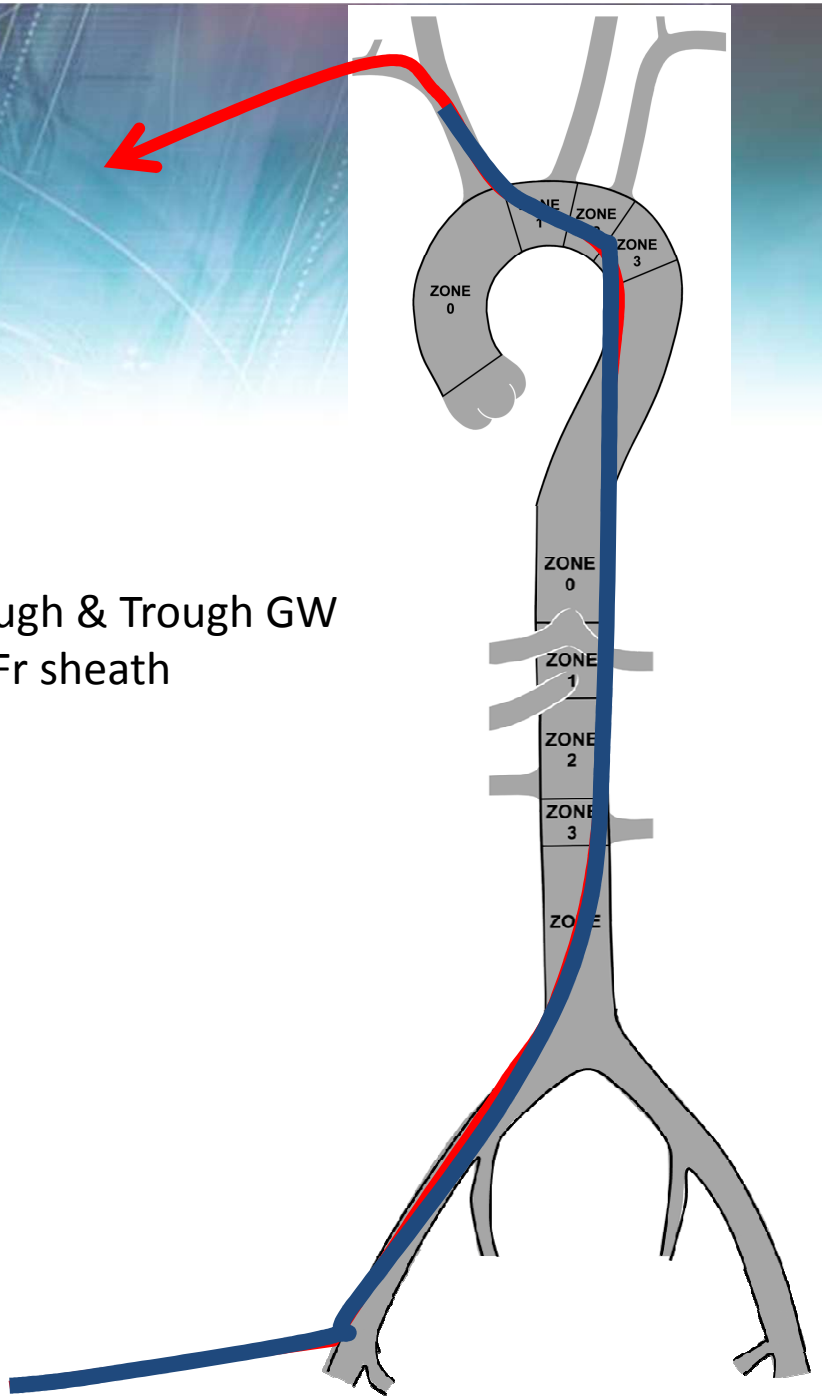
Pre-curved

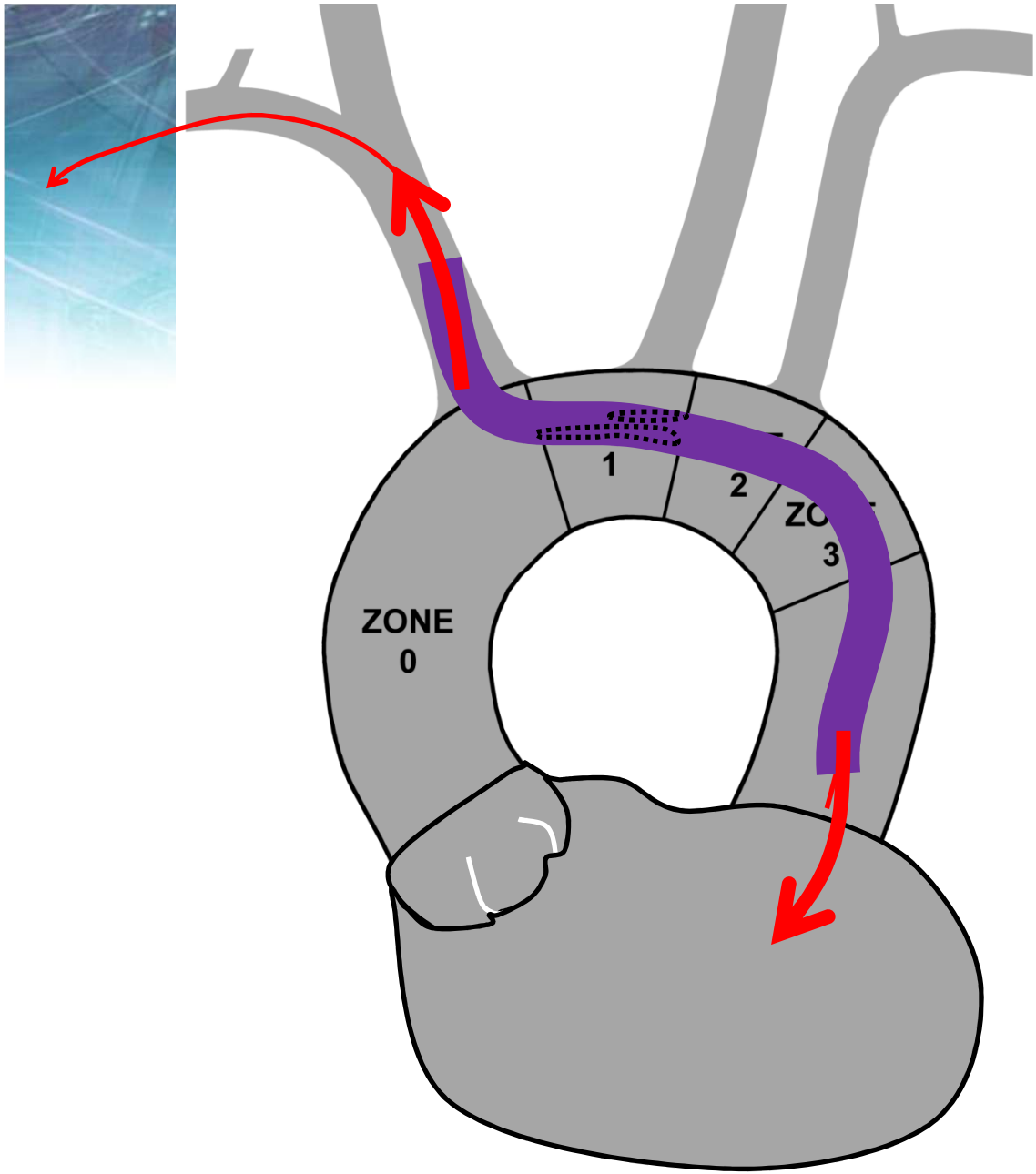
CM Module 2


Final product
REVISIONS
REV. | ECO No. | BY | DESCRIPTION | DATE | APPROVED
A | 14-018 | T.T. | Nexus ASC module curved design | 29/09/14 | K.M.
Distal positioning markers
135°
Scallop's angle
47
40
35
Virtual line perpendicular to proximal Innominate's ostium
Proximal markers
20. 01. 2015 ORIGINAL
Endospan
Nexus oriented ASC module - Ø43mm, L=40
A-ES-1664 Rev A
A4
SHEET 1 OF 3

Implantation technique

Trough & Trough GW
20 Fr sheath

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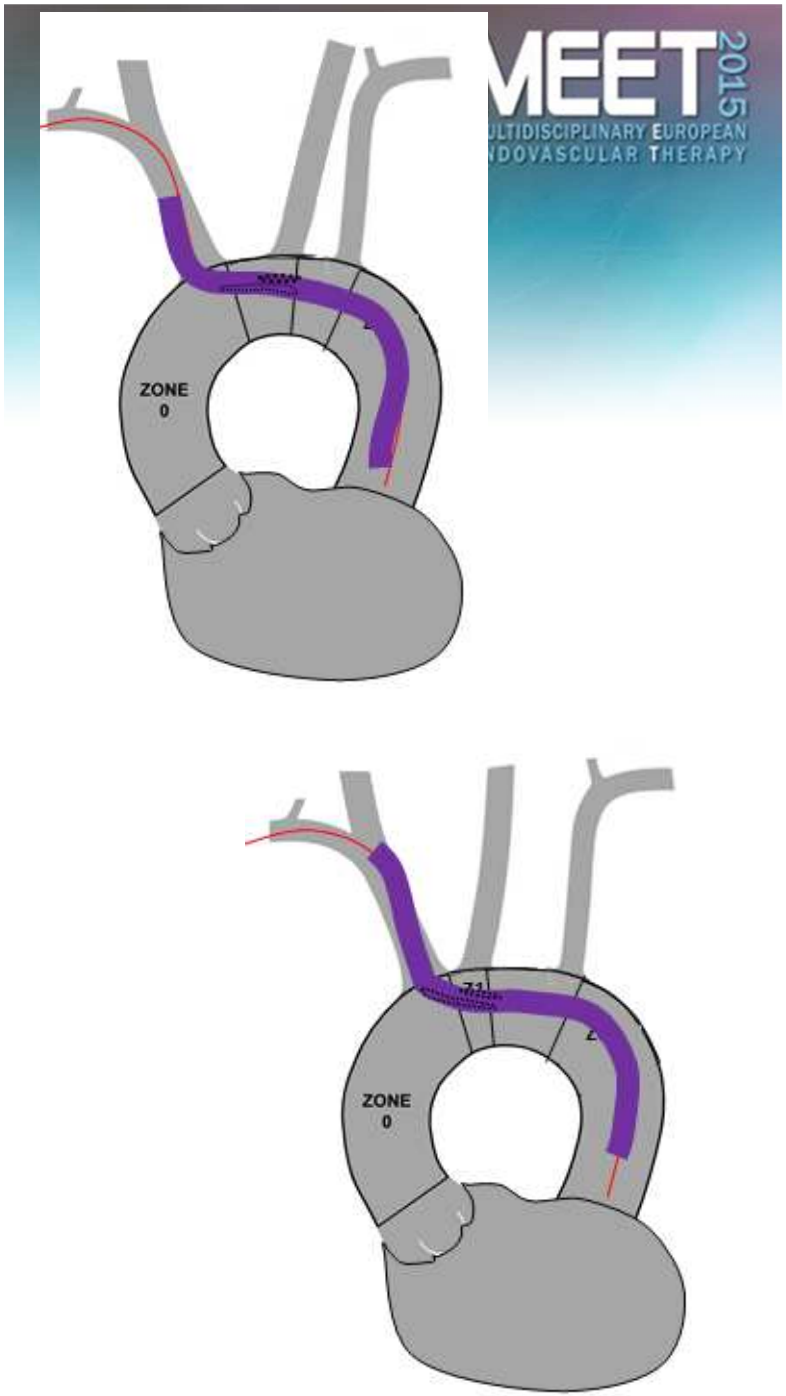
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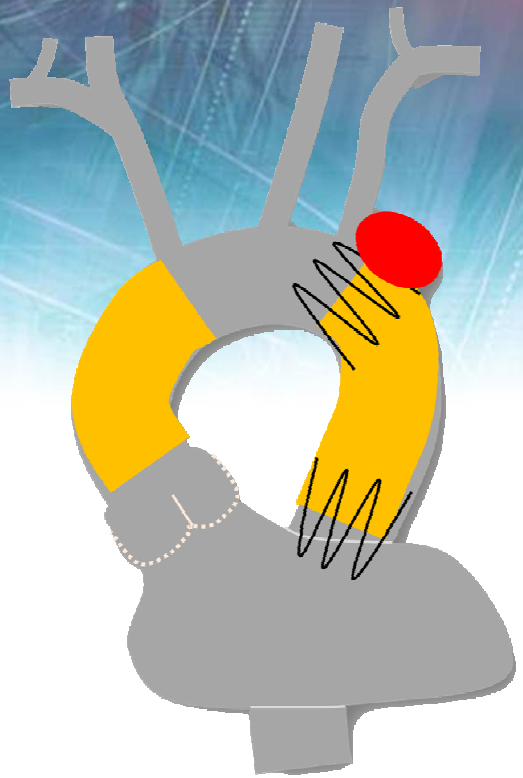

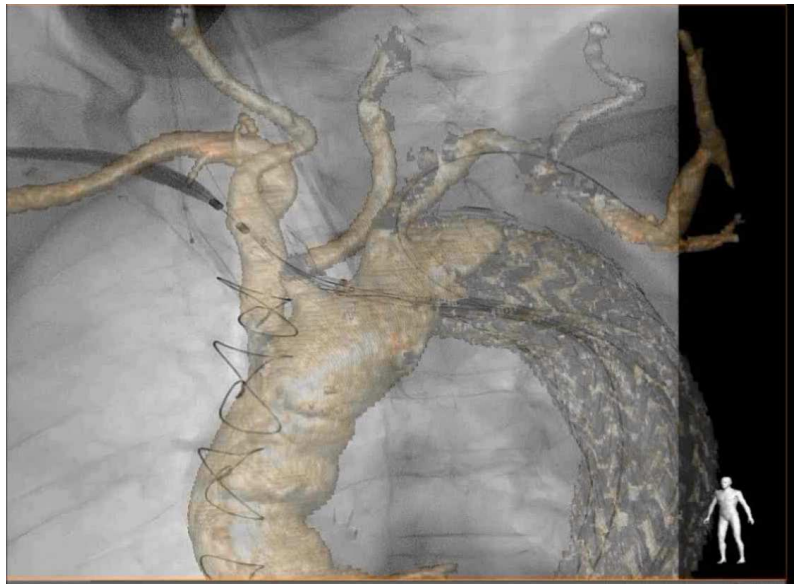

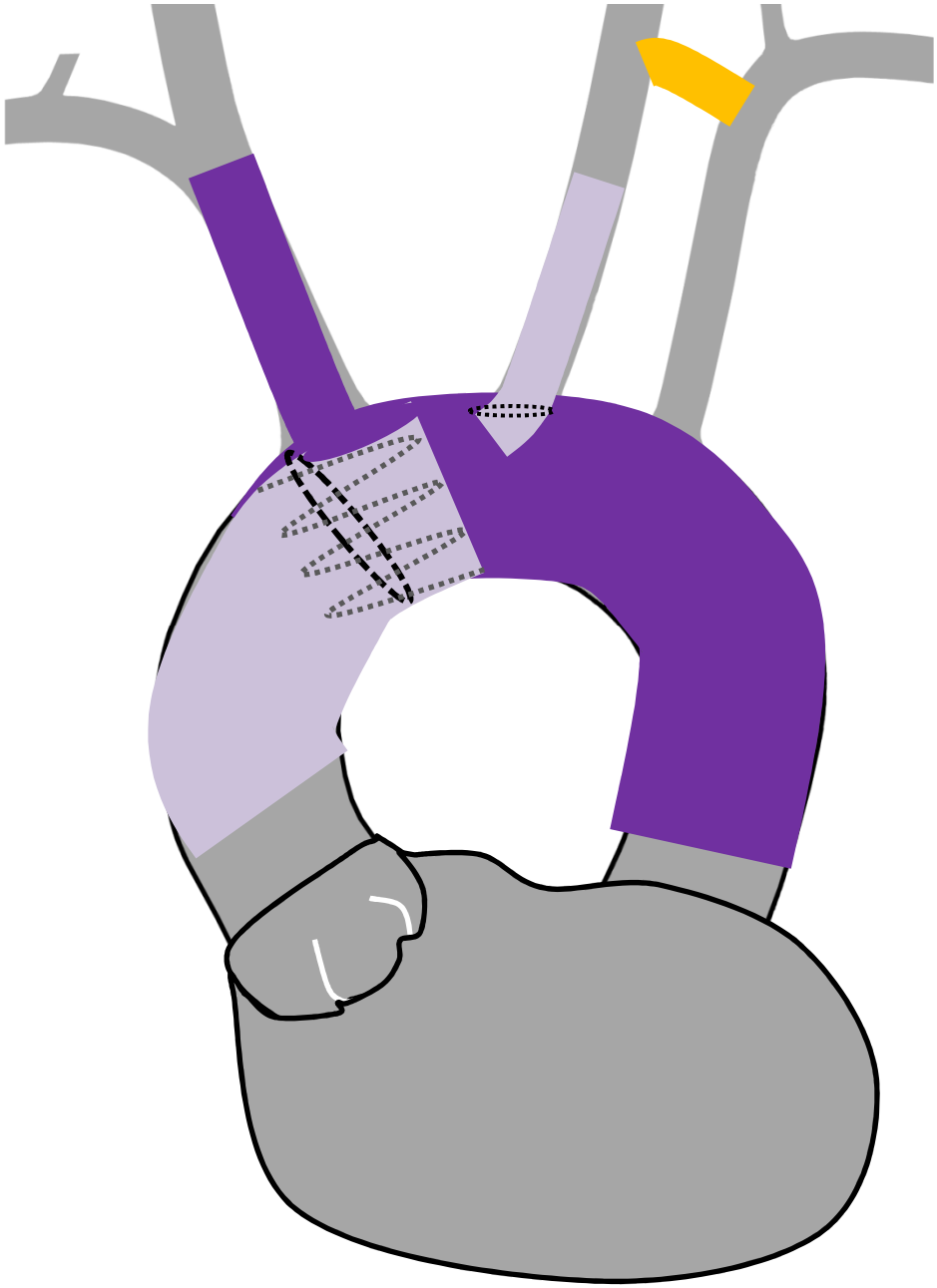

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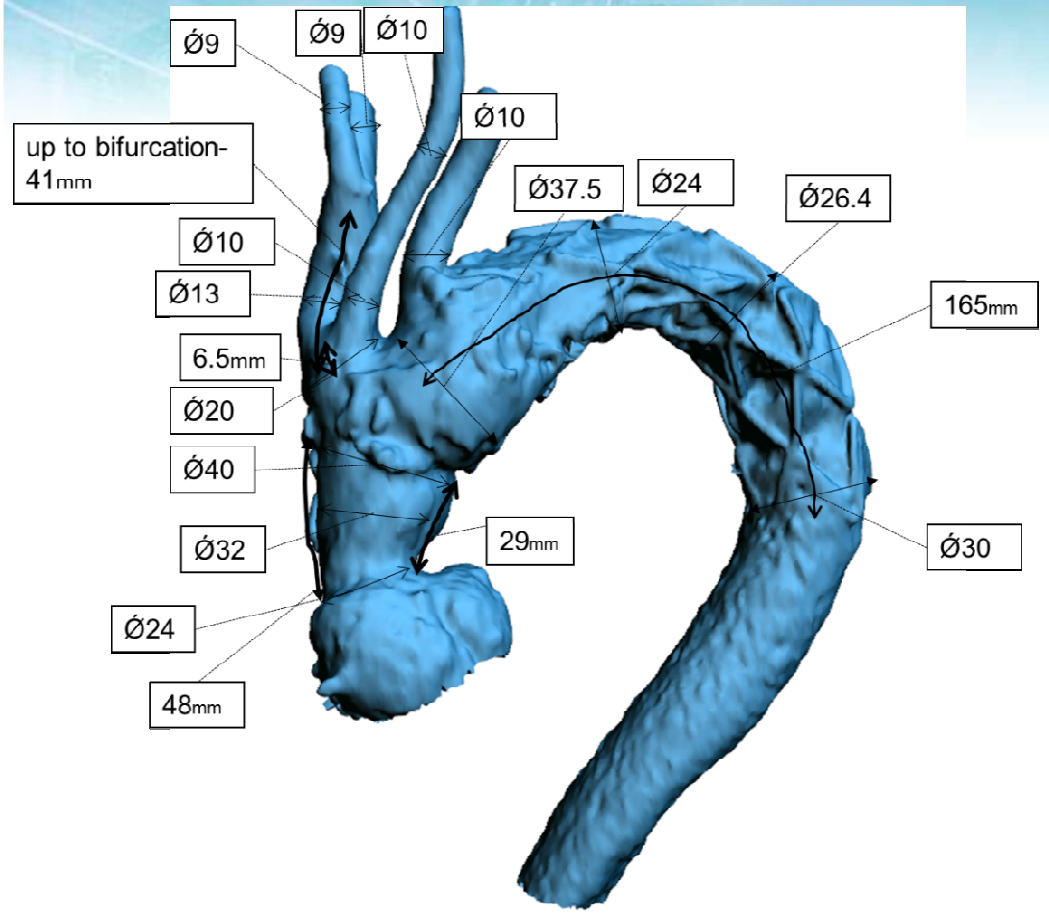
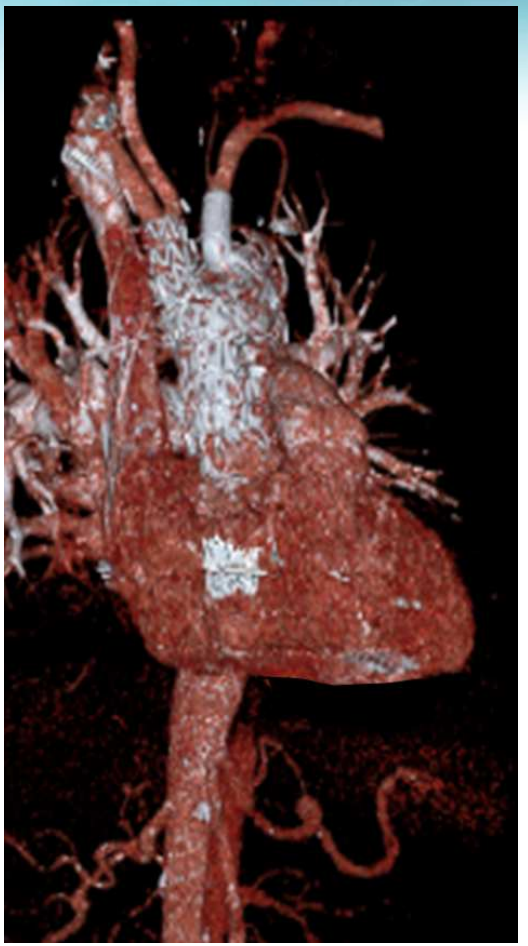
Carotid to LSA bypass optional

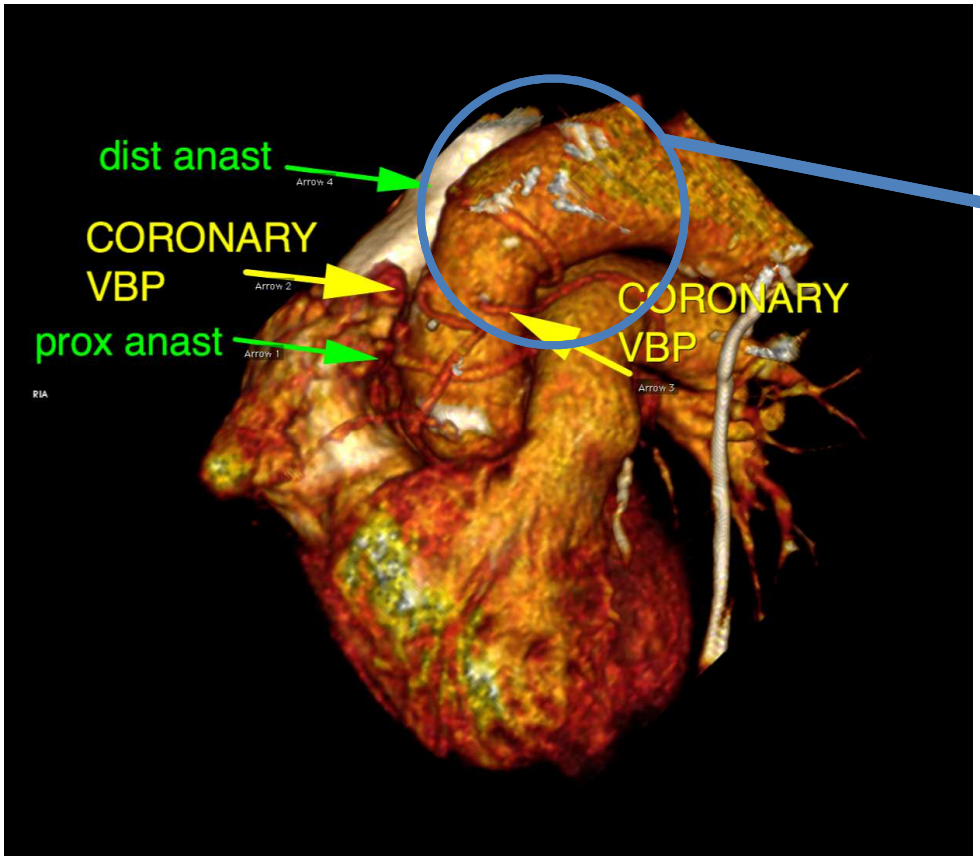
Challenging Zone 0

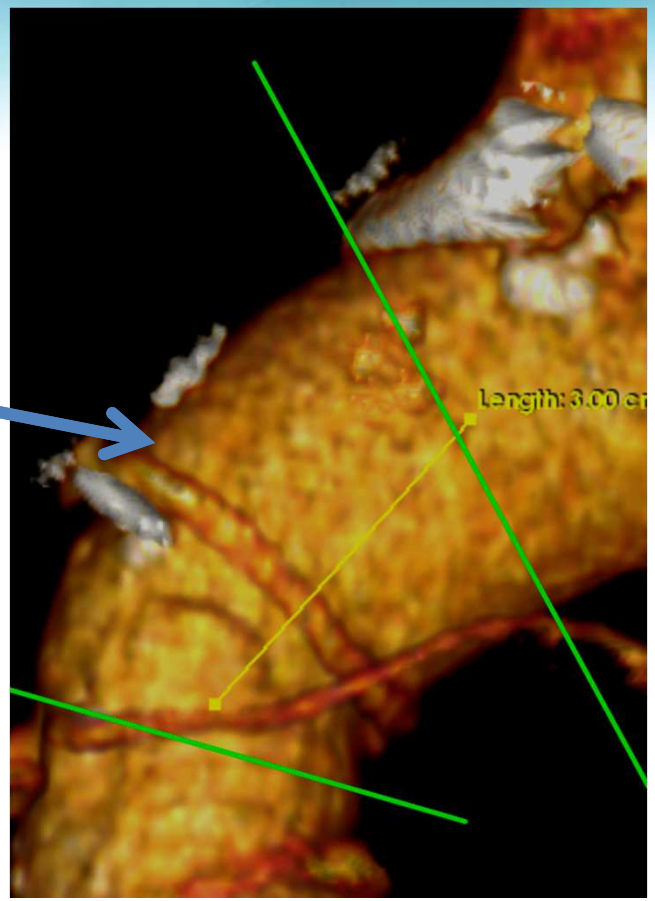




- Patient from Zurich

Challenging Zone 0





Patient from N. Mangialardi

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Clinical experience

- **8 patients** (5m)
- **76 +/- 7 years**
- 3 FIM, **5 CC**

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30-day results

- 2 deaths (pneumonia, myocardial infarction)
- 3 strokes (one with paraplegia)
  - 1 stroke 4 weeks before Nexus (after debranching)
  - All recovered clinically
- 4 EL (1 EL I/III, 3 EL II)
  - Patients w. therapeutic heparinisation/anticoagulation
  - @ 6 +/-5 months mFUP: 1EL I/III or II??

Conclusions

- No randomized trial!
- Endovascular and open repair do not address same pathologies (and not same patients)
  - 100% Endo does not fit for aneurysm extending to Z0
- Stroke and mortality rates of endovascular repair techniques compare favorably to conventional open repair
  - Still in learning curve
  - Promising new devices


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Thank You!