RelayBranch – early and midterm results

Prof. Dr. med. Martin Czerny MBA, FESC, FEBCTS, FEBVS

Heisenberg Professor for Open and Endovascular Aortic Surgery

UNIVERSITÄTS
FREIBURG · BAD KROZINGEN
HERZZENTRUM

Disclosures

- Consultant: Terumo Aortic, Medtronic

Speaking honoraria: Bentley, Cryolife

Shareholder: TEVAR Ltd.

The aortic programme 2020

Type of surgery	Volume
Root (including David)	121
Ascending/ hemiarch	158
Total arch (including FET)	64
TEVAR (including aortic arch)	59
EVAR (including iliac branches)	71
AAA classical surgery	117
TAAA surgery and f/bEVAR	24
Other	20
Total	**634**

The aortic programme 2020

Type of surgery	Volume
Root (including David)	121
Ascending/ hemiarch	158
Total arch (including FET)	64
TEVAR (including aortic arch)	59
EVAR (including iliac branches)	71
AAA classical surgery	117
TAAA surgery and f/bEVAR	24
Other	20
Total	**634**

Content

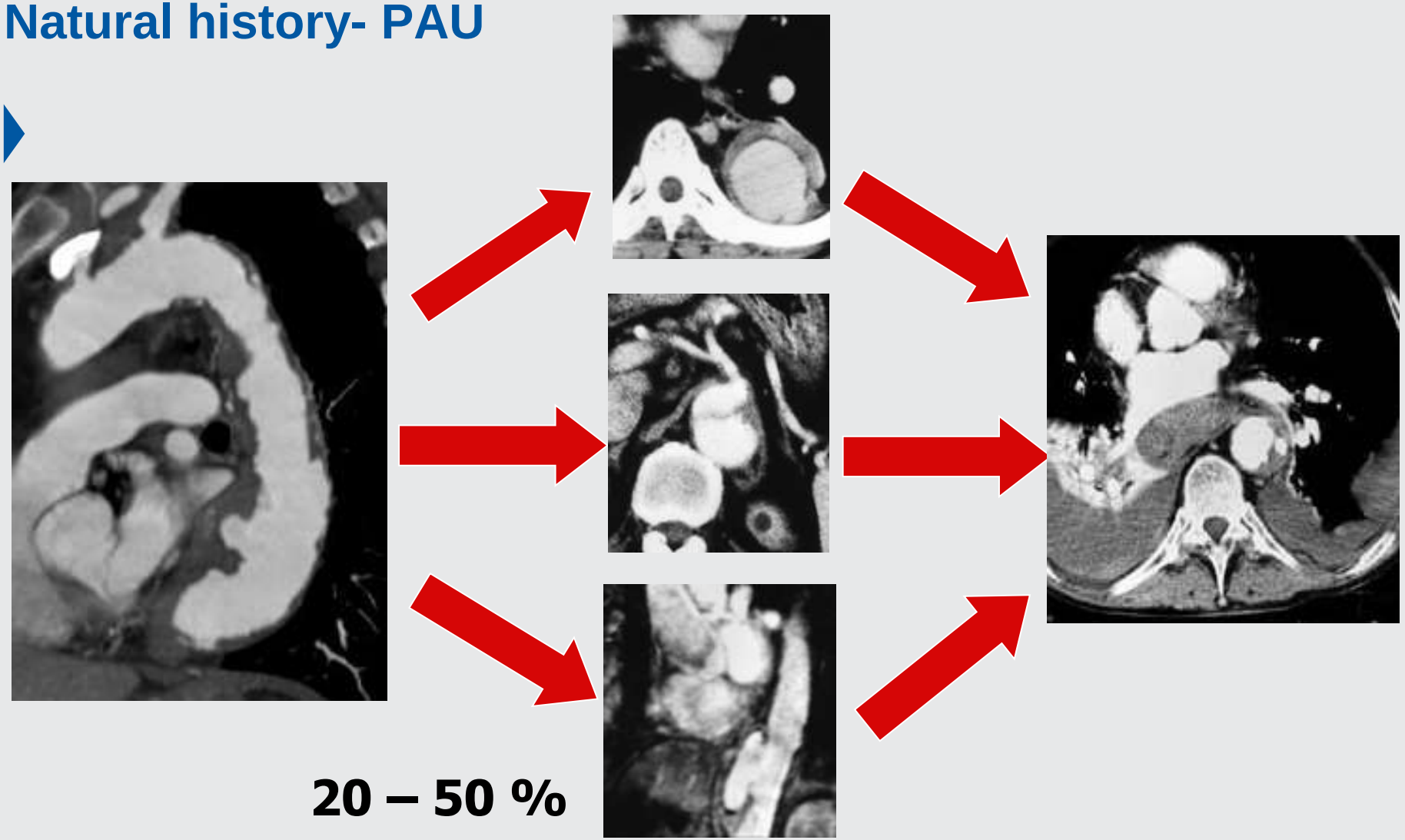
Background

1. Overwhelming spectrum of options
2. Supply exceeds demand
3. New challenge of indicating treatment
4. Results of alternative approaches unclear

Background

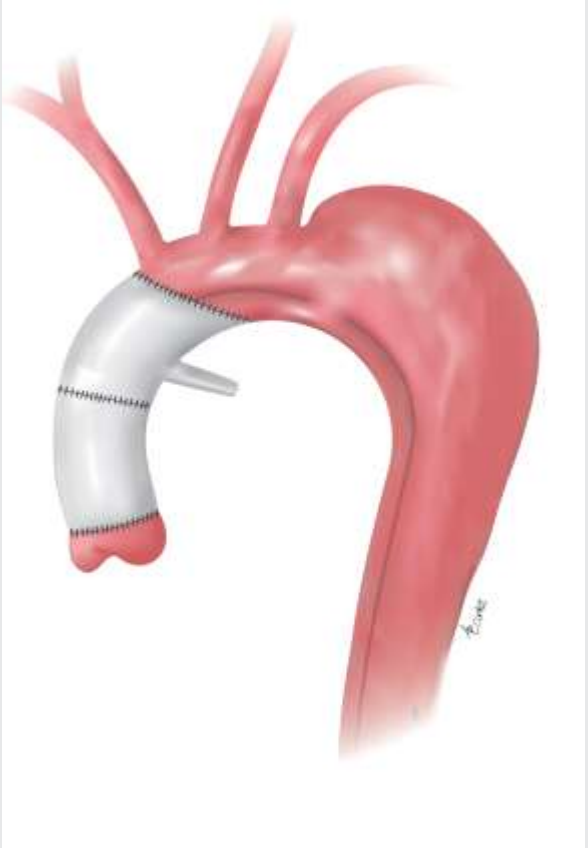
1. Indications still to size criteria- maximum diameter as least common denominator
2. Phenotype versus genotype (obliterative/ dilatative underlying pathology)
3. Summary of details (family history, valve morphology, ST junction, arch variants, CTD components)

Natural history- PAU



20 – 50 %

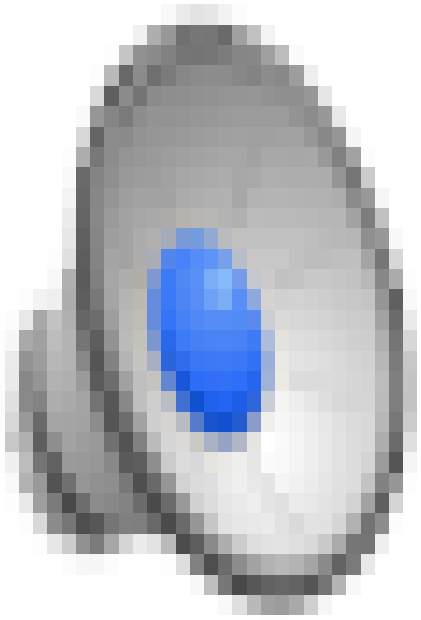
Aneurysm of remaining type B after previous type A repair



Evolving concept

EJCTS 2015
EJCTS and ESVES 2018

Preoperative CT scan



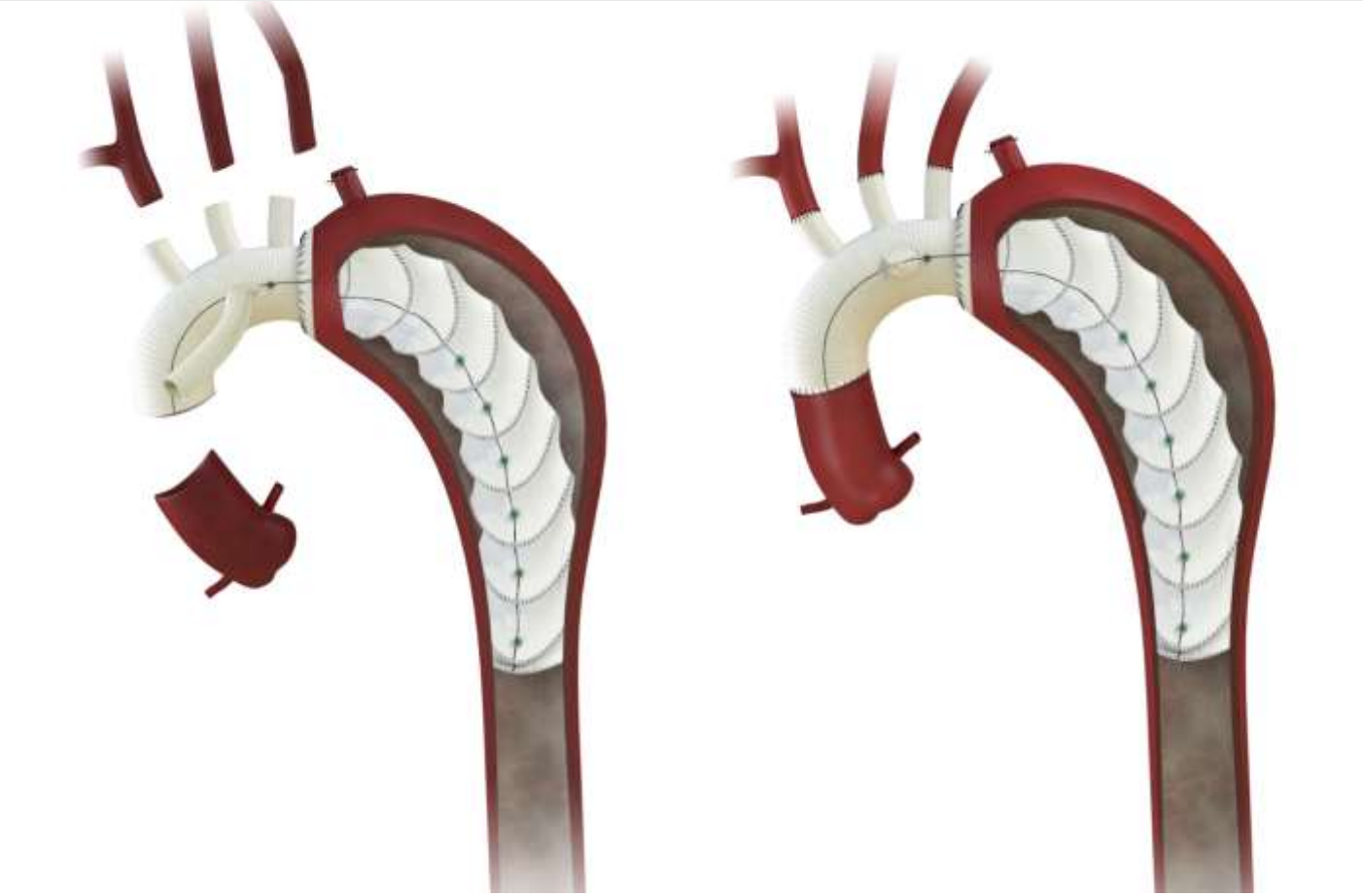
Conceptual approach

1. Technology seeks indication
2. Indications seeks technology
3. Ability or non-ability to provide the entire treatment spectrum
4. Creation of aortic centers

Content

- Underlying pathology
- Branched FET
- Endovascular solutions
- Conclusions

Frozen elephant trunk implantation



Conceptual advantage FET

- Reduce a two step procedure to a one-step procedure
- Facilitate secondary vascular and endovascular procedures
- Less recurring laryngeal nerve injury

Conceptual difference- FET vs. classical arch

- FET is a modification of a distal anastomosis
- Double securement of the suture line by radial force

Underlying diagnoses

- Acute type A aortic dissection
- Acute type B aortic dissection
- Remaining type B after type A repair
- Aneurysmal formation- megaaortic syndrome
- Penetrating atherosclerotic ulcers

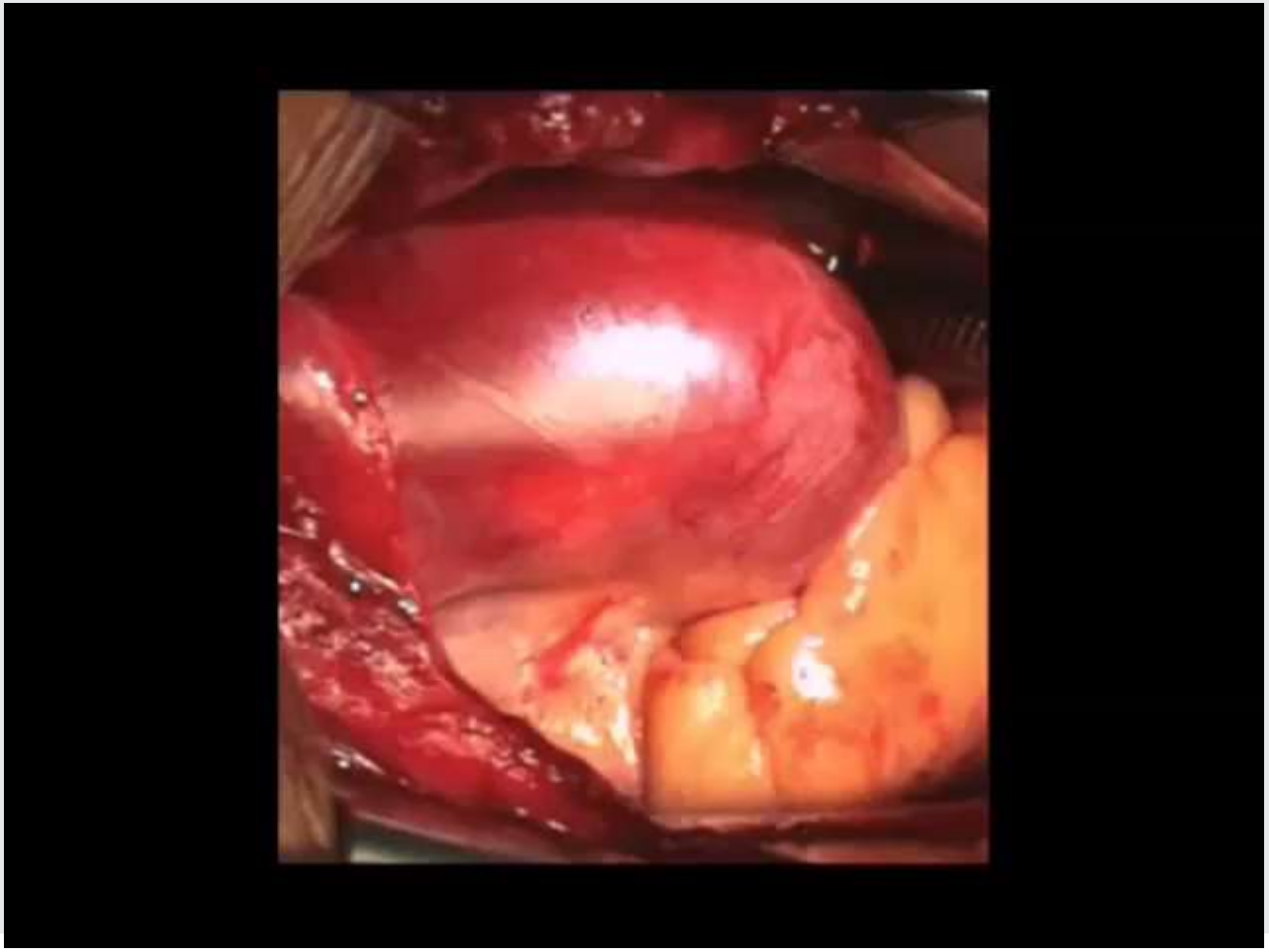
Acute type A aortic dissection- distal entry/malperfusion

The FET technique or an alternative method to close the primary entry tear should be considered in patients with acute type A aortic dissection with a primary entry in the distal aortic arch or in the proximal half of the descending aorta to treat associated malperfusion syndrome or to avoid its postoperative development.

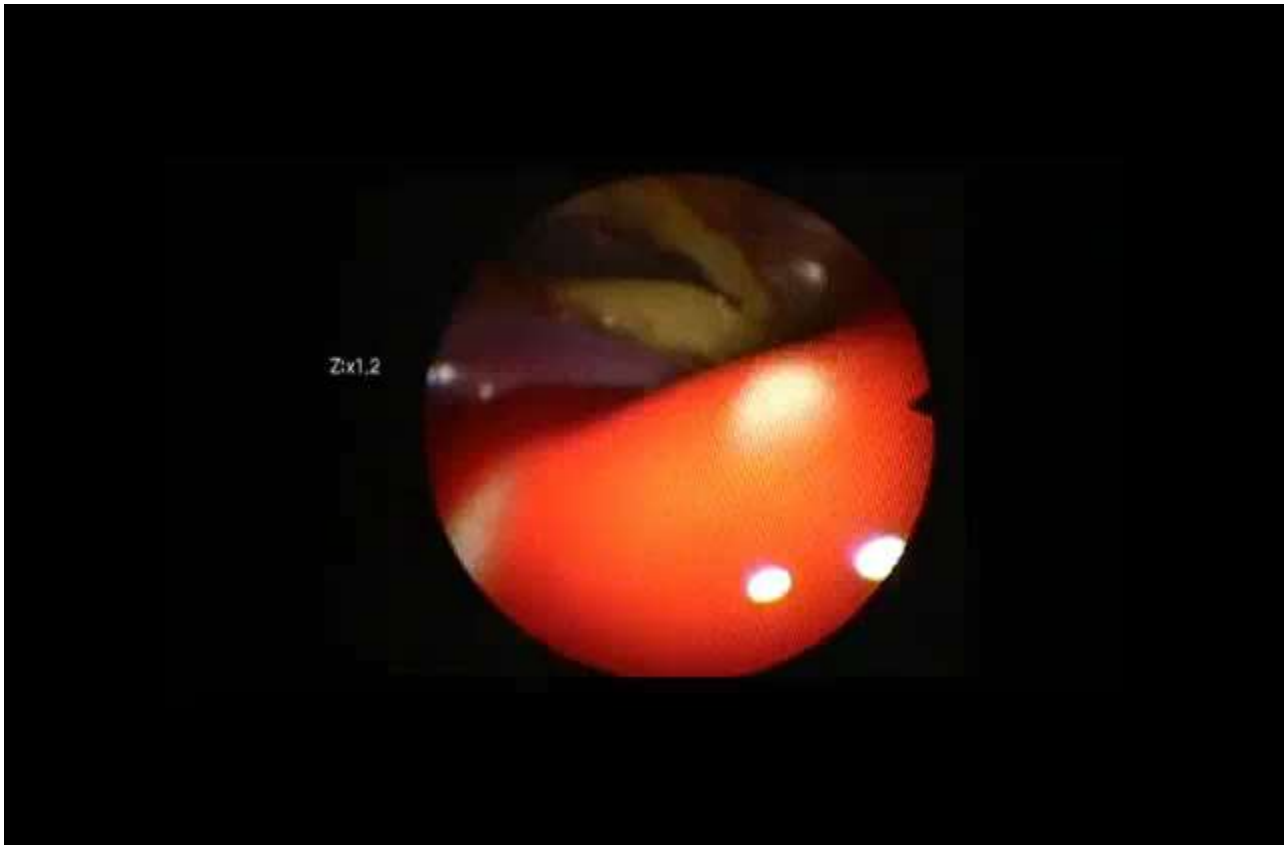
Class of recommendation IIa- Level of evidence C

EJCTS 2015

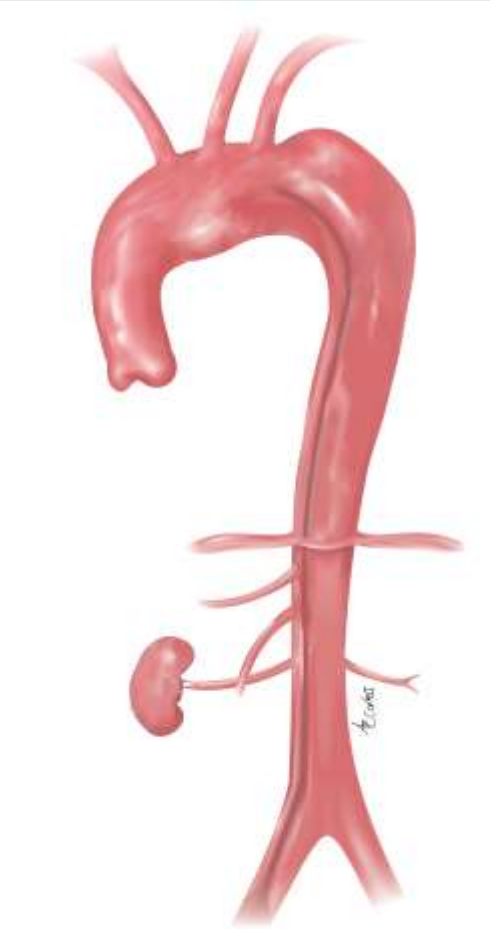
Intraoperative view



Angioscopy Aortic dissection



Acute type B aortic dissection



The FET technique should be considered in patients with complicated acute type B aortic dissection when primary TEVAR is not feasible or the risk of retrograde type A aortic dissection is high.

Class of recommendation IIa- Level of evidence C

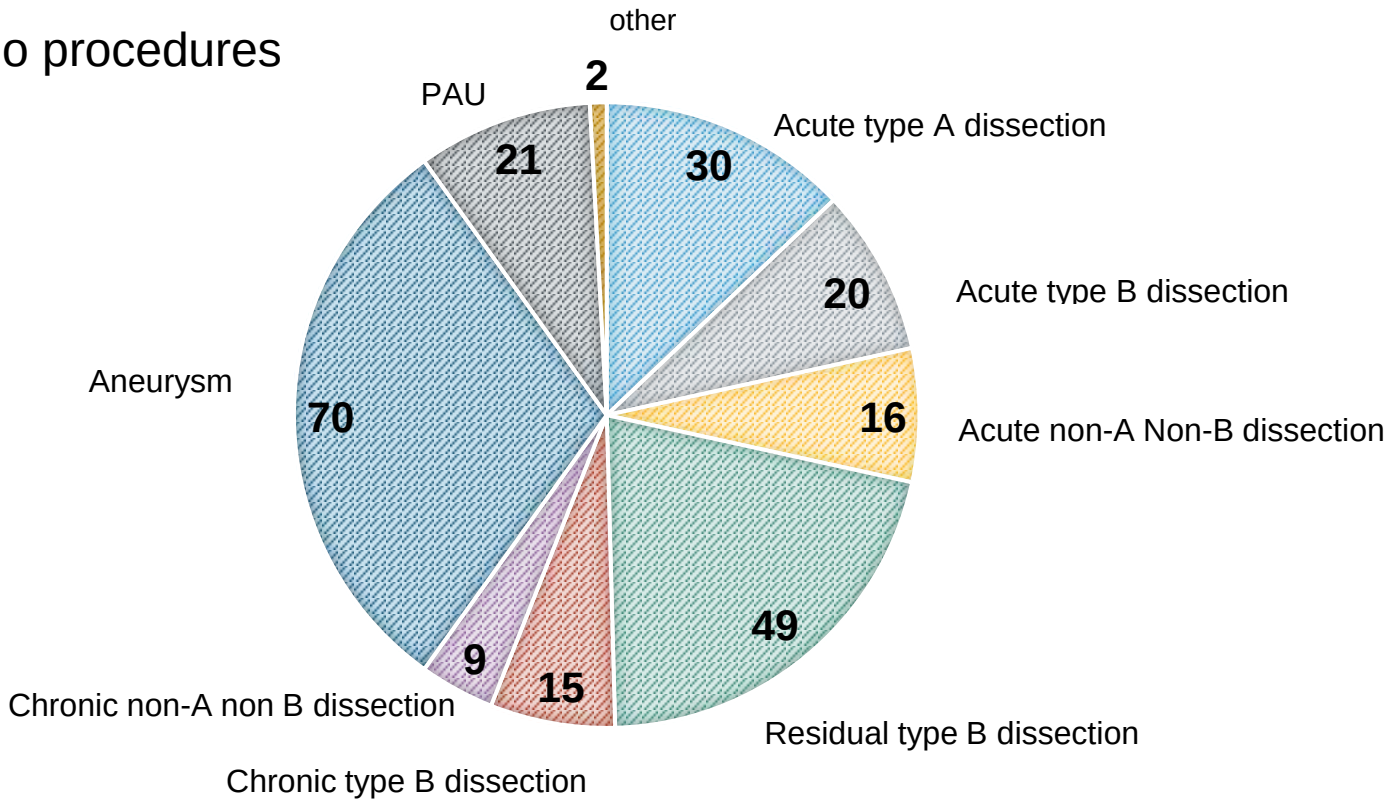
EJCTS and EJVES 2018


Bild-Größe: 512 x 512
Ansichts-Größe: 911 x 819
WL: 7 WW: 632
A
00114233358
66 y , 66 y
TA XL-Thorax
0
8
R
L
Zoom: 178% Winkel 0
B: 30/614 S (S -> I)
Schichtdicke: 2.00 mm Position: -94.50 mm
P
06.02.13 13:55:46
Made In Osirix PRO

FET- Patient characteristics Freiburg Bad Krozingen

229 patients, aged 65 ± 12 years

91 Aortic redo procedures



Conclusions

- Aortic arch replacement using branched FET can be performed safely in the majority of patients with a dissected thoracic aorta

FET induces immediate thrombosis of the false lumen at the level of the stent-graft

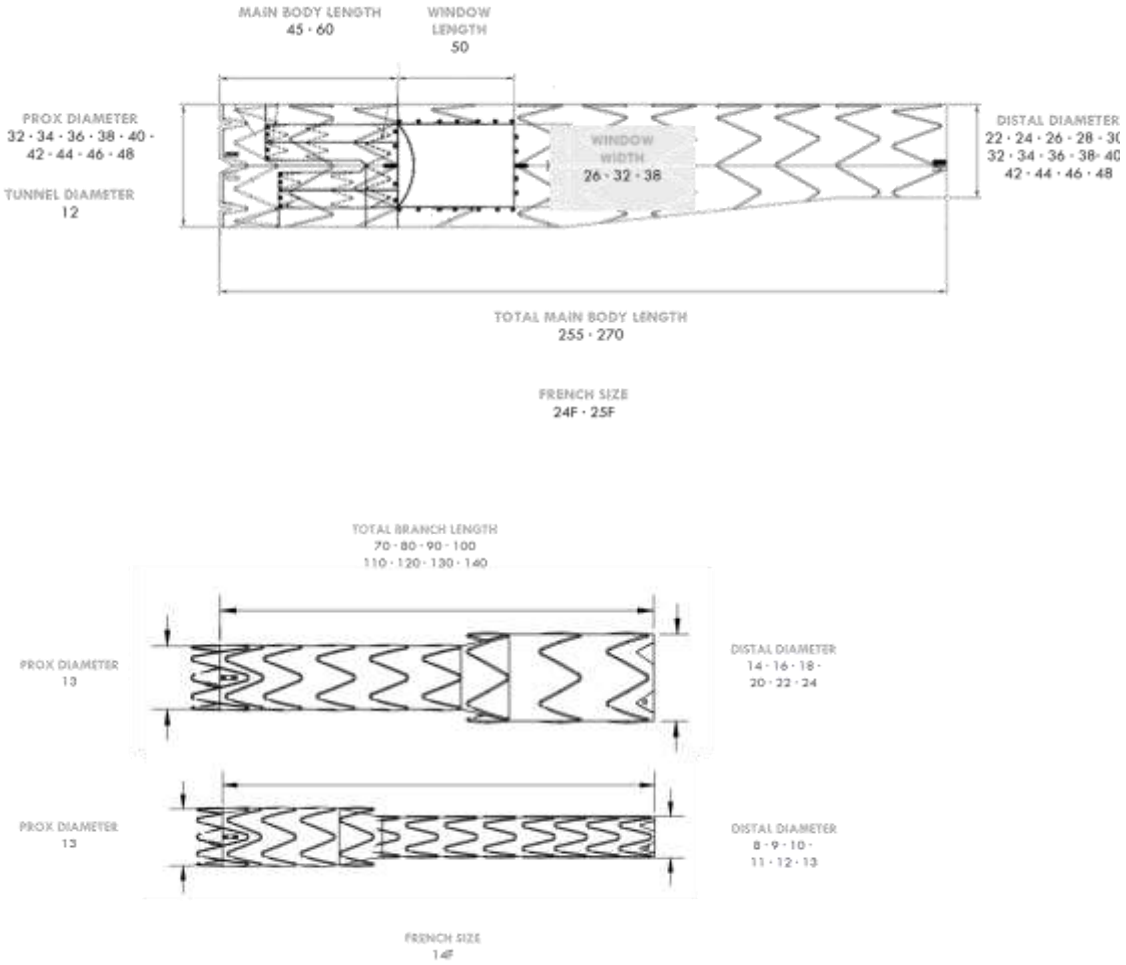
FET provides a stable proximal landing zone for later TEVAR procedures and eliminates the risk of endoleak type Ia

Content

- Underlying pathology
- Branched FET
- Endovascular solutions
- Conclusions

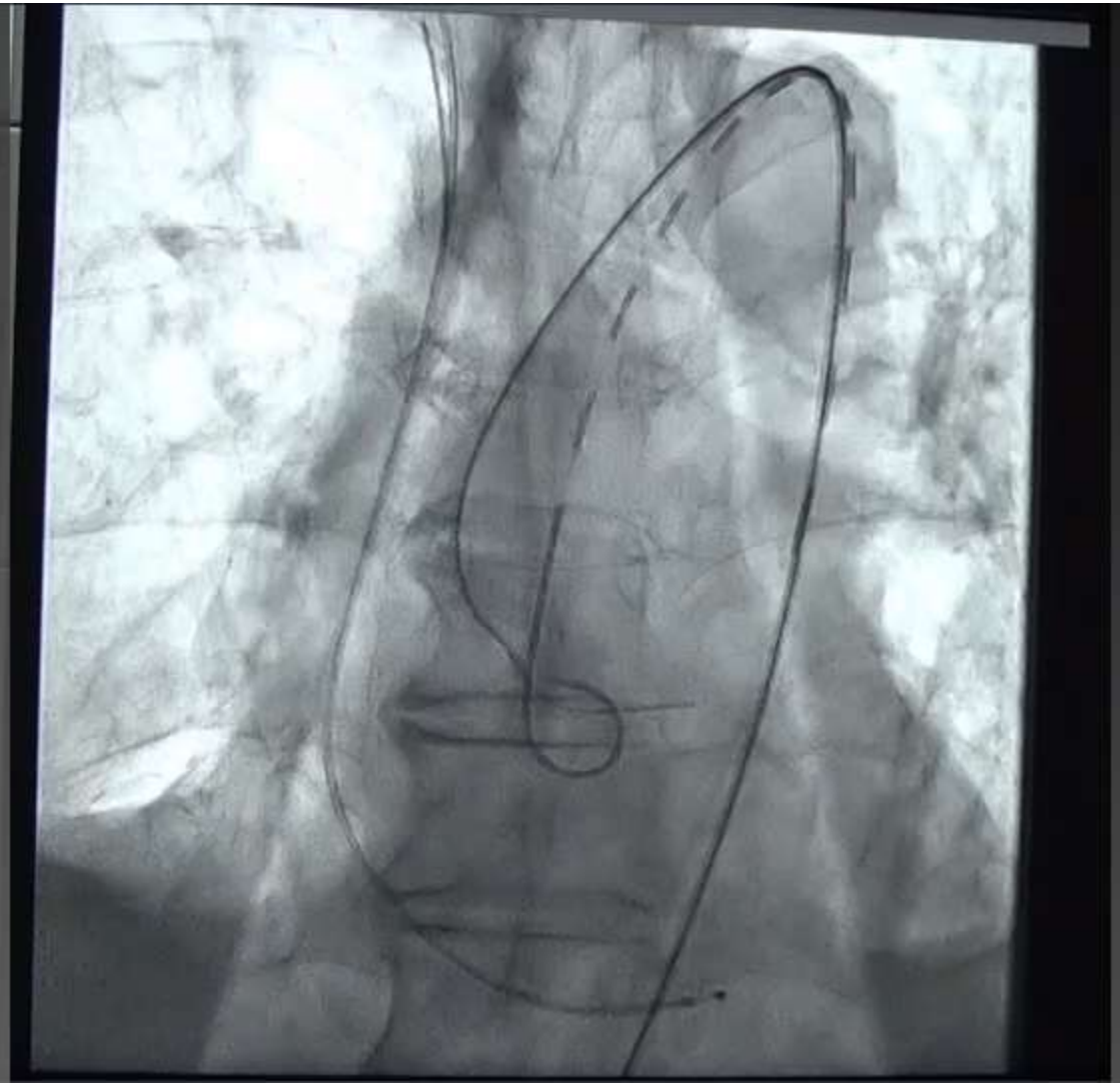
Branched endografts

Planning- CAD



EJCTS under review

Positioning of guidewire in the Left Ventricle



Anatomical requirements

Anatomical requirements	
Ascending aorta landing zone diamteter (mm)	29-43
Distal landing zone diameter (mm)	19-43
BCT and LCCA diameter (mm)	7-20
ST junction to BCT length (mm)	>65 or >85
Distal landing zone length (mm)	25-30
BCT landing zone length (mm)	25
LCCA landing zone length (mm)	30
Proximal BCT to distal LCCA (mm)	<45

EJCTS under review

Baseline characteristics

Patients	43
Male	33 (77)
Age	73 ± 9
EuroScore II	3.3 ± 1.5
NYHA	
I	25 (58)
II	8 (19)
III	5 (12)
unknown	5 (12)
CCS	
0	1 (2)
1	31 (72)
2	5 (12)
3	1 (2)
unknown	5 (12)
LVEF (%)	56 ± 9
Coronary artery disease	16 (37)
Previous coronary artery bypass grafting	0 (0)
Recent myocardial infarction	0 (0)
Valvular heart disease	2 (5)
Tricuspid aortic valve	34 (79)
Atrial fibrillation	10 (23)
PAH	2 (5)
Renal impairment	14 (33)
Extracardiac arteriopathy	18 (42)
Poor mobility	9 (21)
COPD	11 (26)
IDDM	2 (5)
Previous stroke	8 (19)

Under review

Aortic characteristics

Patients	N = 43
Underlying aortic disease	
Aneurysm	31 (72)
other	12 (28)
Presumed etiology	
Degenerative	26 (61)
Post-dissection	7 (16)
PAU	8 (19)
unknown	2 (5)
Beginning of lesion	
0	4 (9)
1	7 (16)
2	24 (56)
3	8 (19)
End of lesion	
2	2 (5)
3	15 (35)
4	26 (61)
Morphology	
Regular arch morphology	39 (91)
Bicarotid trunk	4 (9)
Isolated vertebral artery offspring	1 (2)
Measurements	
Maximum aortic arch diameter (mm)	62 ± 15
Length Ascending (mm)	78 ± 15
Diameter Ascending (mm)	37 ± 3
Length BCT (mm)	34 ± 8
Landing zone BCT (mm)	26 ± 11
Diameter BCT (mm)	15 ± 2
Length LCCA (mm)	56 ± 33
Diameter LCCA (mm)	8 ± 1

EJCTS under review

Procedural details

Patients	N = 43
Intended oversizing (%)	17 ± 6
Blood pressure lowering	
Rapid-pacing	34 (79)
Adenosine	3 (7)
IVC occlusion	5 (12)
unknown	1 (2)
CSF drainage	16 (37)
Heparin (IU)	9674 ± 5896
LCCA-LSA bypass	34 (79)
during TEVAR	22 (51)
before TEVAR	12 (28)
no	9 (21)
LCCA access	
Open	37 (86)
Seldinger	4 (9)
unknown	2 (5)
Access for BCT extension	2 (5)
Brachial artery	3 (7)
Right subclavian artery	37 (86)
Right common carotid artery	1 (2)
unknown	
Common carotid artery clamping during deployment	18 (42)
Operation time (min)	289 ± 142
Fluroscopy time (min)	49 ± 29
Packed red blood cells	1.2 ± 2.8
Distal extension (TEVAR)	9 (21)

EJCTS under review

Outcome all patients

Patients	N = 43
Mortality	4 (9)
Stroke	11 (26)
Disabling stroke	3 (7)
Non-disabling	8 (19)
Transient SCI	1 (2)
Renal failure	2 (5)
Pneumonia	4 (9)
Neck hematoma/Bleeding	3 (7)
ICU stay (days)	3 ± 3
Hospital stay (days)	14 ± 11
Endoleak	7 (16)
Ia	1 (2)
Ib	1 (2)

EJCTS under review

Outcome remaining aortic dissection

Patients	n=8
Mortality	0 (0)
Stroke	1 (13)
Disabling stroke	0 (0)
Non-disabling	1 (13)
Transient SCI	0 (0)
Renal failure	0 (0)
Pneumonia	1 (13)
Neck hematoma/Bleeding	0 (0)
ICU stay (days)	3 ± 3
Hospital stay (days)	19 ± 17
Follow-up time (months)	15 ± 15
Follow-up mortality	1 (13)
Type A dissection	1 (13)

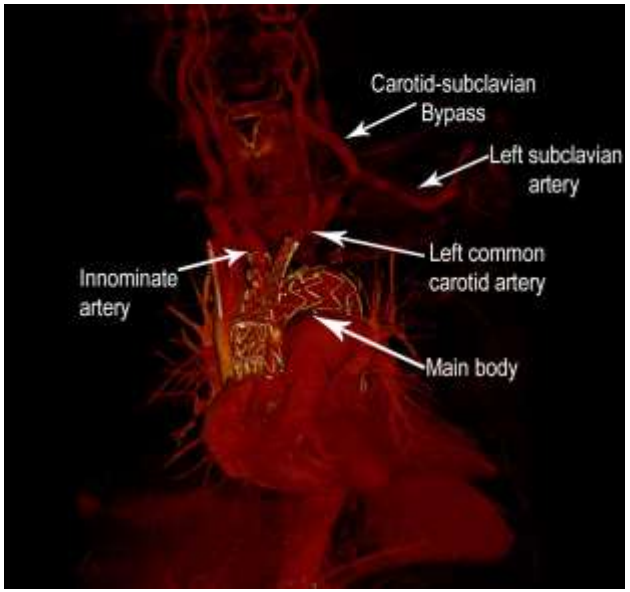
EJCTS under review

Details- neurologic injury

Stroke				
Patients	previous stroke	disabling	mRS	description
1	no	no	3	bilateral
2	yes	no	-	left hemisphere and cerebellar
3	no	yes	6	hemorrhage
4	yes	no	1	right hemisphere
5	no	yes	6	left hemisphere
6	no	no	1	left hemisphere
7	yes	no	1	-
8	yes	no	1	bilateral
9	no	no	1	-
10	no	no	2	-
11	no	yes	5	-

EJCTS under review

CTA- pre- and post implantation



EJCTS under review

Summary

- Outcome after branched endovascular aortic arch repair is good

Disabling stroke is low- success rate is high

Non disabling stroke is too high- measures for reduction

Best outcome in patients with remaining aortic dissections

More data are needed

Content

- Underlying pathology
- Branched FET
- Endovascular solutions
- Conclusions

Conclusions

- Pathology determines the mode of treatment

The FET technique has excellent results- TEVAR extension frequent

Results of total endovascular aortic arch repair are promising

Life-long follow-up is mandatory- progression of disease in other segments

Creation of aortic centers with the entire armentarium will aid in doing the right things in the right patients