Aortic Remodeling after Frozen Elephant Trunk in Acute Type A and Type B Aortic Dissection

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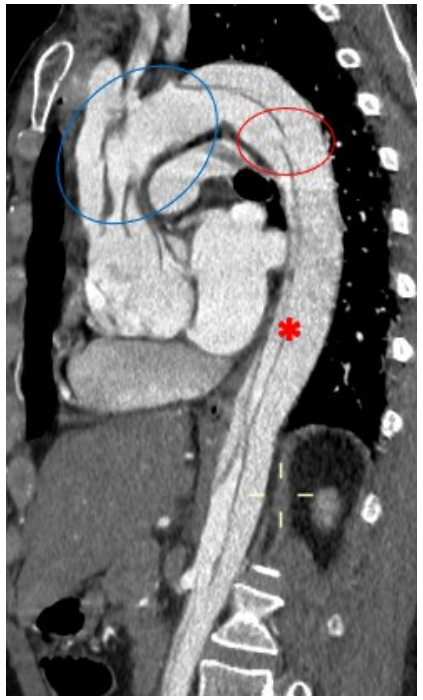
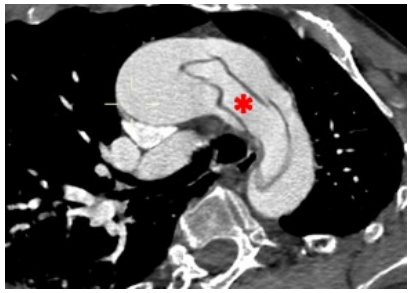
Indications for FET in acute aortic dissection

Type A:

- Entry tear in the arch
- Sign of distal malperfusion (TL collapse)
- Young age

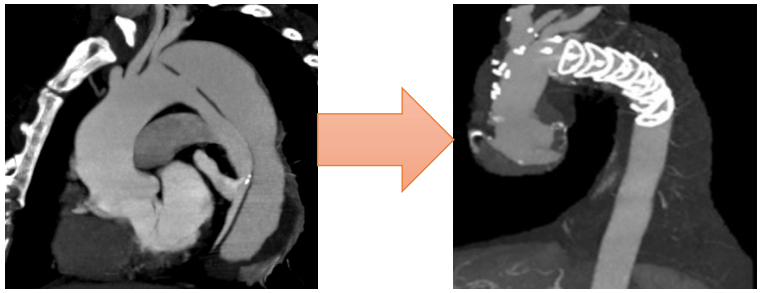


- Facilitate zone 2 distal anastomosis and hemostasis



Type B:

- High risk for endoleak Type 1a:
  - Entry tear in the arch
  - Dilated aortic arch
- Ascending aorta dilatation
- Replacement of the aortic arch in case of additional pathologies (penetrating atherosclerotic ulceration)



Treatment option:
1°choice: TEVAR,
2° choice: FET

Aortic Remodeling

- Progressive changes in aortic morphology

TL dimensions

FL dimensions and thrombosis

Total aortic diameter

- FET achieves remodeling by excluding distal entry tears and restoring antegrade flow in the true lumen and promoting FL thrombosis

- Major effect at stent graft level, progressively reduced in the downstream aorta

True-lumen and false-lumen diameter changes in the downstream aorta after frozen elephant trunk implantation

Tim Berger[a,b,†], Maximilian Kreibich[a,b,†], Julia Morlock[a,b], Stoyan Kondov[a,b], Johannes Scheumann[a,b], Fabian A. Kari[a,b], Bartosz Rylski[a,b], Matthias Siepe[a,b], Friedhelm Beyersdorf[a,b] and Martin Czerny[a,b,*]

Aortic diameter remodelling after the frozen elephant trunk technique in aortic dissection: results from an international multicentre registry†

Mauro Iafrancesco[a,*†], Nora Goebel[b,†], Jorge Mascaro[a], Ulrich F.W. Franke[b], Davide Pacini[c], Roberto Di Bartolomeo[c], Gabriel Weiss[d], Martin Grabenwöger[d], Sergey A. Leontyev[e], Friedrich-Wilhelm Mohr[e], Thanos Sioris[f], Heinz Jakob[g] and Konstantinos Tsagakis[g], on behalf of the International E-vita Open Registry Group

Frozen Elephant Trunk Procedure for Acute Type a Aortic Dissection: Analysis of Distal Aortic Remodeling According to the Society for Vascular Surgery (SVS)/Society of Thoracic Surgeons (STS) Reporting Standard

Ottavia Borghese,[1,2] Saravananthan Sajiram,[1] Michelle Lee,[1] Adeyemi Olayiwola,[1] Benjamin Adams,[1] Aung Ye Oo,[1,3] Tara Mastracci,[1,4] and Ana Lopez-Marco,[1,3] London, UK, and Rome, Italy

Clinical study

Materials and Methods

- **Study design and population**

  Retrospective study including 88 patients treated with FET for Acute Type A and B aortic dissection from December 2007 to December 2025

- **Data collection**

  Clinical characteristics, operative reports, imaging analysis and outpatient follow-up collected retrospectively from istitutional database

- **Imaging analysis**

  MPR analysis of Preoperative, pre-discharge and one year (± 6 months) Angio-CT scan

Aim of the study

Primary objective

Evaluate aortic remodeling after FET by assessing morphometric changes of the aorta over time

Secondary objectives

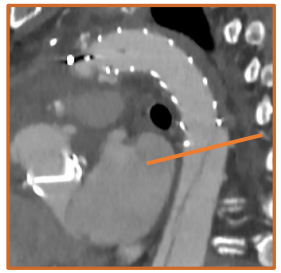
- Survival after FET
- Occurrence of major complications
- Freedom from reintervention

Angio-CT scan analysis

1. Different diameters at 3 different levels : Total diameter, True lumen diameter, False lumen diameter

L1

Distal landing zone of the stent graft

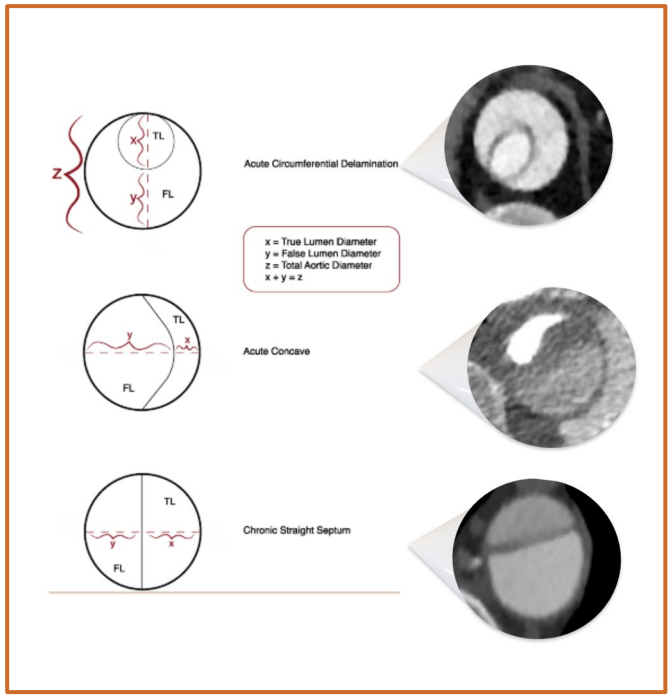


L2

Thoracoabdominal transition

L3

Before the origin of celiac trunk



2. Presence of dSINE
2. Residual dissection
2. Complete or partial thrombosis among the stent graft

Results

Preoperative characteristics

Variable	N=88
Age	58.6 ± 11.1
Male sex	75 (85.2%)
Body Mass Index (BMI)	26.9 (IQR 6.1)
Acute Type A Aortic Dissection	65 (72.7%)
Chronic Kidney Disease (CKD)	24 (27.3%)
Chronic Obstructive Pulmonary Disease (COPD)	4 (4.5%)
Coronary Artery Disease (CAD)	3 (3.4%)
Hypertension	3 (3.4%)
Diabetes	33 (37.5%)
Smoke	64 (72.7%)
Cerebral Vasculopathy	4 (4.5%)
Connective tissue disorders	4 (4.5%)
Left Ventricular Ejection Fraction (LVEF)	60 (IQR 6.3)
Reinterventions	3 (3.4%)

Variable	N=88
Malperfusion	30 (34.1%)
Cerebral	12 (13.6%)
Spinal	7 (8%)
Renal	114 (15.9%)
Bowel	7 (8%)
Lower Limbs	7 (8%)

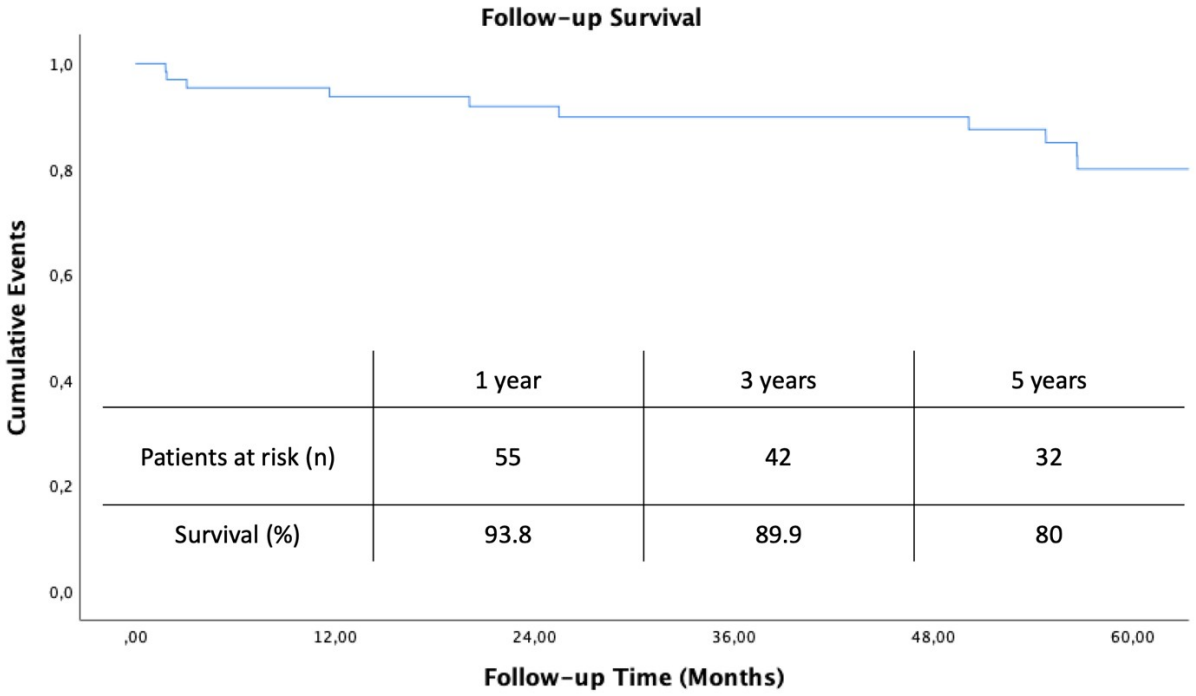
Early results

Variable	n =88
Paraplegia	3 (3.4%)
Paraparesis	2 (2.3%)
Stroke	10 (8.8%)
Dialysis	28 (31.8%)
TEVAR during hospitalization	1 (1.1%)
Tracheostomy	11 (12.5%)
Low Output	12 (13.6%)
Bleeding	18 (20.5%)
Hospital-stay	18 (IQR 18)
30-day mortality	20 (22.7%)

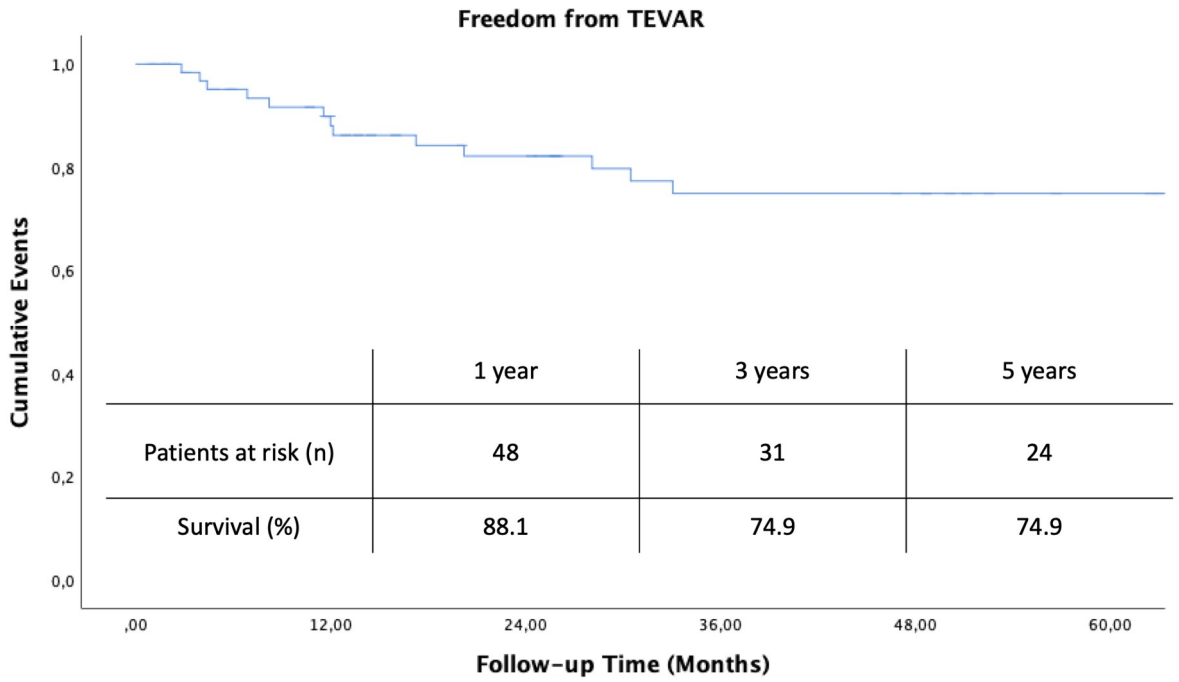
Angio-CT scan Analysis

Variables	A. Preoperative (n= 52)	B. Pre-discharge (n=72)	C. 1-Year (n = 48)
Total L1 (mm)	34 (IQR 6)	35 (IQR 6)	35 (IQR 9.5)
TL L1 (mm)	14 (IQR 7)	20 (IQR 8)	27.5 (IQR 9.8)
FL L1 (mm)	19 (IQR 10)	14.5 (IQR 9.8)	8 (IQR 13.8)
Total L2 (mm)	32 (IQR 5)	32 (IQR 4.8)	34.5 (IQR 7)
TL L2 (mm)	13 (IQR 10)	16 (IQR 8)	17.5 (IQR 15)
FL L2 (mm)	20 (IQR 10)	17 (IQR 8.8)	20 (IQR 17.8)
Total L3 (mm)	30 (IQR 5)	31 (IQR 5)	34 (IQR 5.8)
TL L3 (mm)	12 (IQR 10)	16 (IQR 7)	14.5 (IQR 10.8)
FL L3 (mm)	20 (IQR 13)	16 (IQR 7.5)	19 (IQR 11.8)
dSINE/distal end degeneration		3 (4.2%)	11(22.9%)
Residual dissection		62 (86.15%)	43 (89.6%)
FL Thrombosis		72 (100%)	48 (100%)
Partial Thrombosis		25 (34.7%)	6 (12.5%)
Complete Thrombosis		47 (66.2%)	42 (87.5%)

Follow-up outcomes



	1 year	3 years	5 years
Patients at risk (n)	55	42	32
Survival (%)	93.8	89.9	80



	1 year	3 years	5 years
Patients at risk (n)	48	31	24
Survival (%)	88.1	74.9	74.9

Remodeling

	Preoperative	Pre-discharge	1-Year
Total diameter L1 (mm)	34.3 ± 5.2	35.7 ± 5.5 (p=0.012)	36.6 ± 6.2 (p=0.066) ↑
TL L1 (mm)	14.4 ± 6.3	21.2 ± 5.8 (p<0.001)	26.4 ± 6.2 (p<0.001) ↑
FL L1 (mm)	19.9 ±7.7	14.5 ±7.7 (p<0.001)	10.0 ± 9.6 (p<0.001) ↓
Total diameter L2 (mm)	32.1 ± 4.9	32.9 ±4.9 (p=0.057)	34.9 ± 5.4 (p<0.001) ↑
TL L2 (mm)	13.2 ± 6.9	16.4 ±7.4 (p=0.016)	18.3 ± 7.5 (p<0.001) ↑
FL L2 (mm)	18.9 ± 8.4	16.5 ± 8.8 (p=0.120)	15.9 ± 11.0 (p=0.107) ↓
Total diameter L3 (mm)	30.7 ± 4.3	31.2 ± 4.1 (p=0.983)	33.3 ± 5.1 (p<0.001) ↑
TL L3 (mm)	12.9 ± 9.5	16.1 ± 6.7 (p=0.004)	16.4 ± 6.7 (p=0.004) ↑
FL L3 (mm)	18.2 ± 9.2	15.1 ± 7.7 (p=0.006)	16.6 ± 9.2 (p=0.471) ↓

Conclusions

FET is an **effective hybrid strategy** for selective patients in both Type A and Type B acute aortic dissection involving the arch and descending aorta, especially in patients with **severe malperfusion**

In this cohort, FET **promoted early TL expansion**, **partial or complete FL thrombosis**, and **favourable aortic remodeling** at stented levels

Distal, unstented segments show less remodeling due to secondary entry tears and residual dissection, underscoring the need for **long-term imaging follow-up**

Distal Aortic **reinterventions are common**, however they can be treated with distal **TEVAR** extension

Thank You