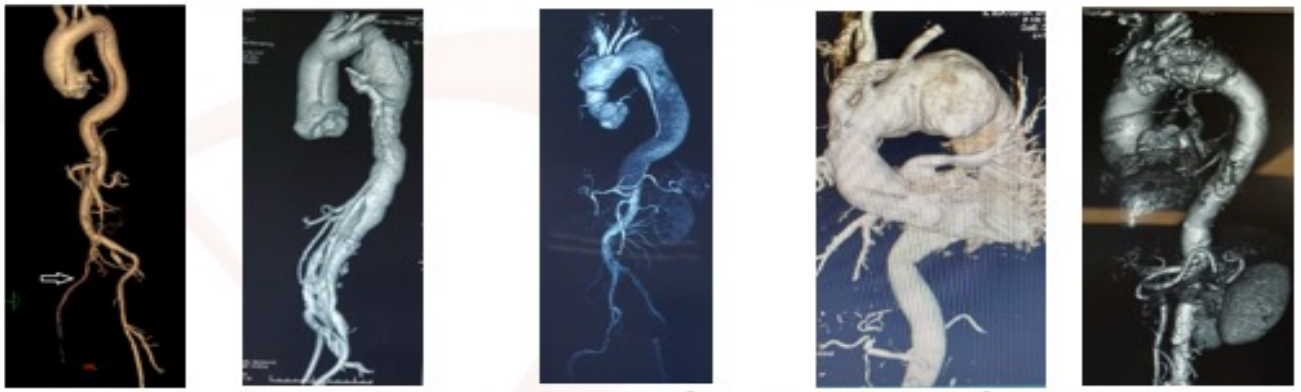
INTERMEDIATE-TERM RESULTS OF THE VIET DUC MODIFICATION OF FROZEN ELEPHANT TRUNK: SINGLE CENTER STUDY

Assoc. Professor Phung Duy Hong Son, MD, PhD
Vice Director of Cardiovascular and Thoracic Center, Viet Duc University Hospital

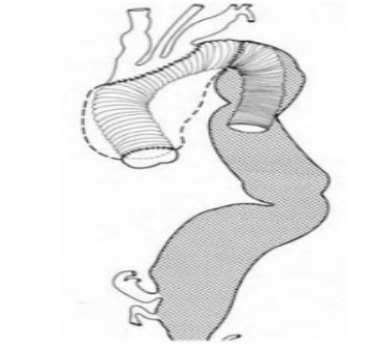
INTRODUCTION



The complex thoracic aorta diseases include a number of diseases that involve the ascending aorta, aortic arch and descending aorta, which is a great challenge to the cardiovascular surgeons.

Ingrund JC, Nasser F, Jesus-Silva SG de, et al. Hybrid procedures for complex thoracic aortic diseases. *Braz J Cardiovasc Surg*. 2010;25(3):303-310. doi:10.1590/S0102-76382010000300005

INTRODUCTION



Birth of ET
H. G. Borst

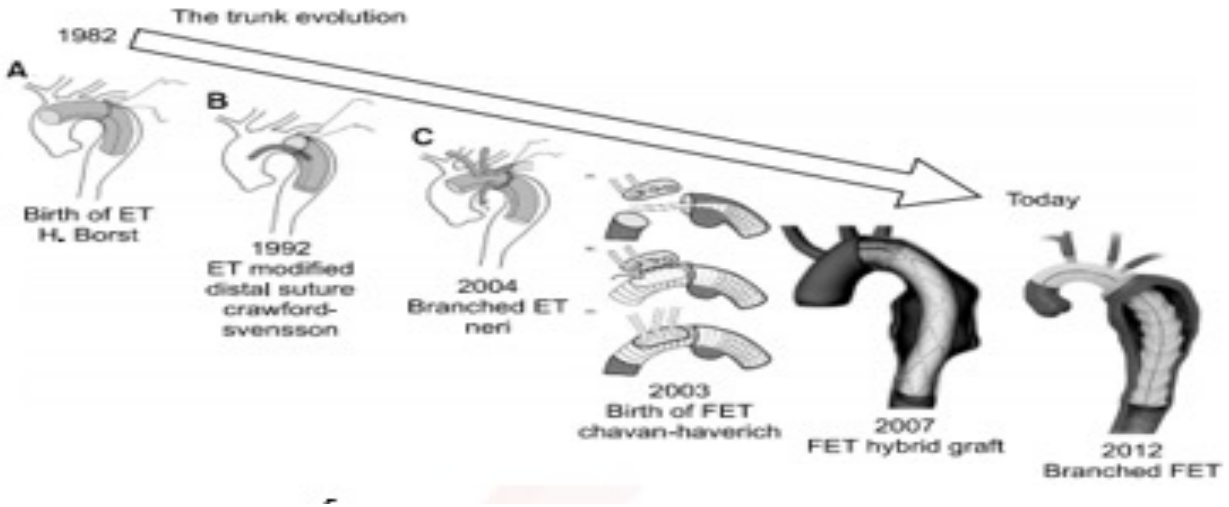
H. G. Borst

The limitations of the birth of elephant trunk technique

- **The distal anastomosis is deep**
- **Bleeding**
- **Long operative time**
- **Recurrent nerve palsy after surgery**
- **Have to need for 2 different major surgeries.**

Borst HG, Walterbusch G, Schaps D. Extensive Aortic Replacement using "Elephant Trunk" Prosthesis. *Thorac Cardiovasc Surg*. 1983; 31(1): 37-40. doi:10.1055/s-2007-1020290

INTRODUCTION

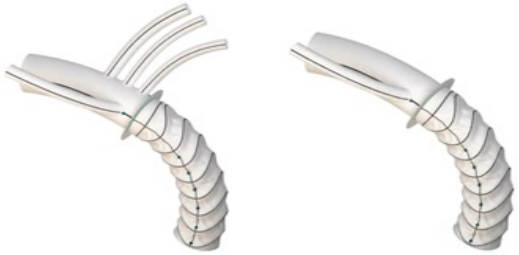


Evolution of the ET technique over time.

Di Marco L, Pantaleo A, Leone A, Murana G, Di Bartolomeo R, Pacini D. The Frozen Elephant Trunk Technique: European Association for Cardio-Thoracic Surgery Position and Bologna Experience. *Korean J Thorac Cardiovasc Surg.* 2017;50(1):1-7. doi:10.5090/kjtcs.2017.50.1.1

INTRODUCTION

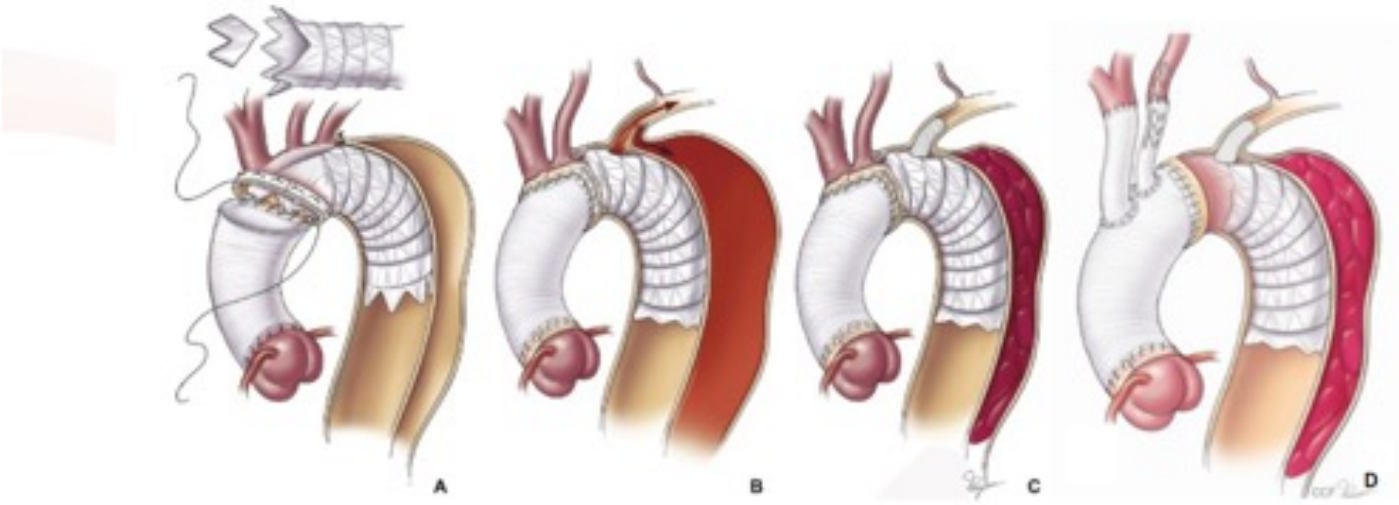
E-vita open Plus ➡ Jotex ⬅ E-vita Neo



The customized devices for FET procedures

Thoraflex –Terumo

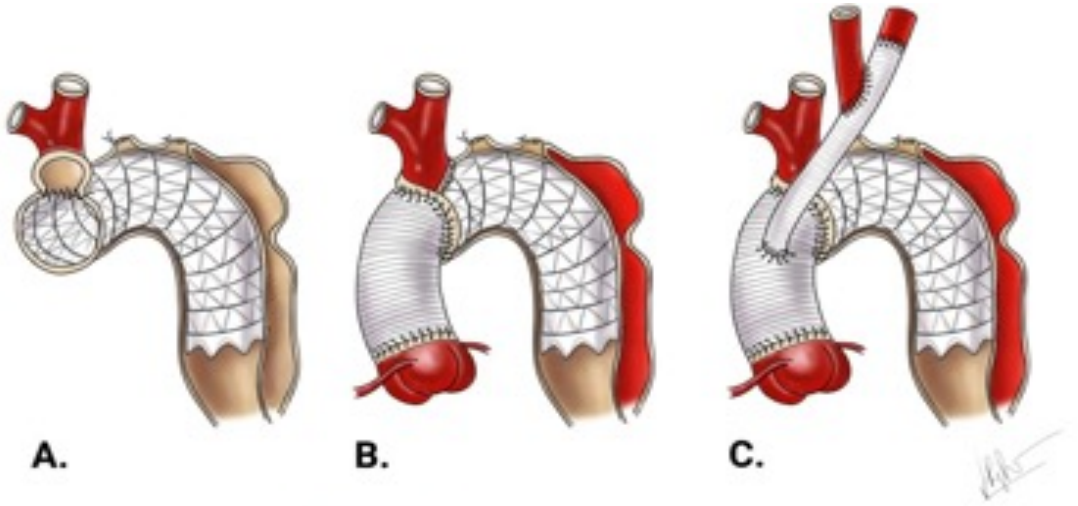
INTRODUCTION



Modified FET of Roselli et al over time

- Roselli EE, Idrees JJ, Bakaeen FG, et al. Evolution of Simplified Frozen Elephant Trunk Repair for Acute DeBakey Type I Dissection: Midterm Outcomes. Ann Thorac Surg. 2018;105(3):749-755. doi:10.1016/ j.athoracsur.2017.08.037
- Fukuhara S, Roselli EE. Modified branched reverse frozen elephant trunk repair for failed TEVAR. Ann Cardiothorac Surg. 2018;7(3):43742-43442. doi:10.3978/16489

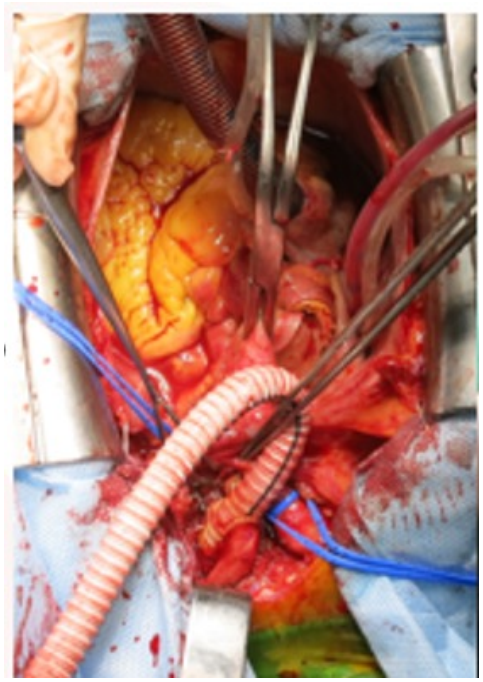
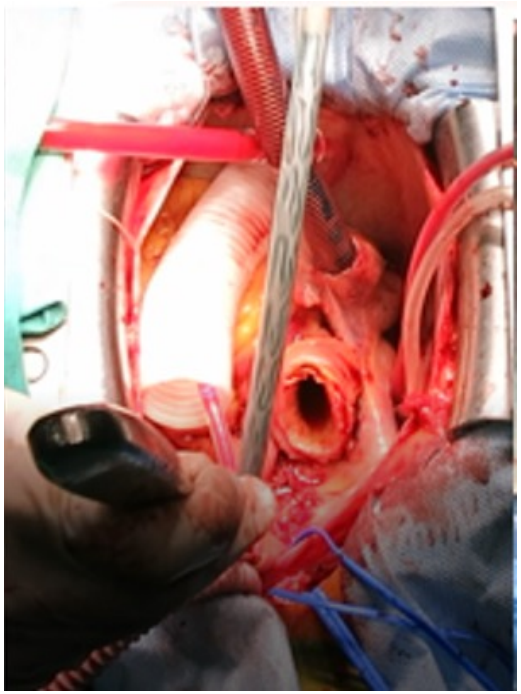
THE FET MODIFICATION IN STAGES AT VIET DUC UNIVERSITY HOSPITAL

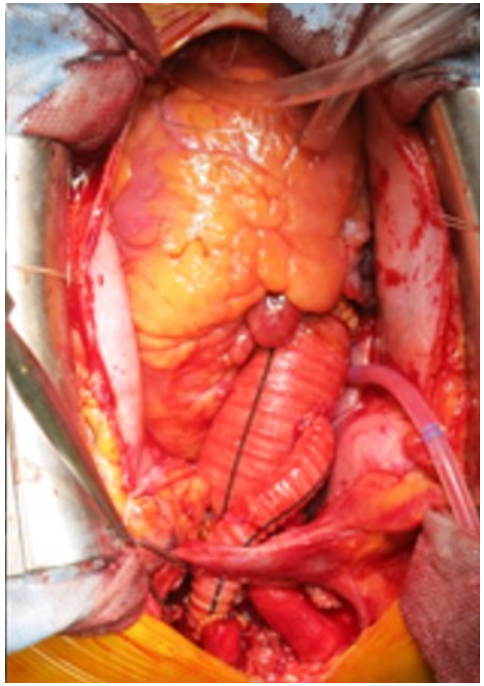


A-Delivery of stent graft.
B- Ascending aorta and hemi-arch replacemen.
C-Aorta-left carotid and subclavian extra-anatomic bypass

Phung, D. H. S., et al. "A novel modification of frozen elephant trunk technique: unique protocol from one institution." *European Review for Medical & Pharmacological Sciences* 25.14 (2021).

INTRAOPERATIVE IMAGES



ADVANTAGES OF
THE FET MODIFICATION AT VIET DUC UNIVERSITY HOSPITAL

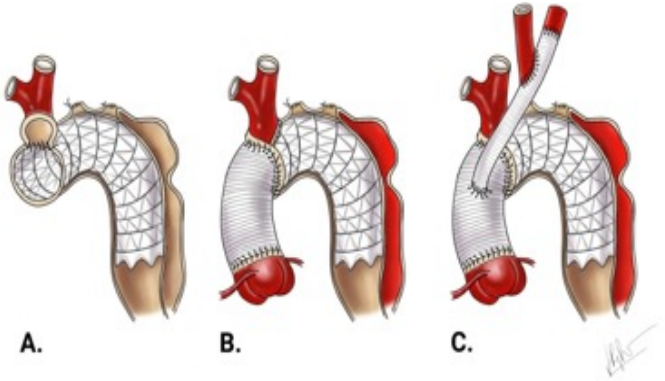
Available, high quality equipments

The distal positioning of frozen elephant trunks deployed from the aortic zone 0, which makes it easier to perform and control bleeding.

Reduce complications: Cerebral shock, Recurrent nerve palsy

Easier to make anastomosis between the subclavian and the 8-mm vascular Dacron graft

Cost-effective



RESULT

Preoperative characteristics of patients (N=47)

Preoperative parameters.		Patients (n)	%
Age Mean ± Standard deviation – yr Range – yr		56,8±9,4 (31-72)	
Sex	Male	34	72,3
	Female	13	27,7
Hypertension		39	83
Type 2 diabetes mellitus		5	10,6
Stage 3 chronic kidney disease		4	8,5
Marphan' syndrome		4	8,5
Previous operation on thoracic aorta		8	17
Recurrent laryngeal nerve compression		2	4,3
Limb malperfusion		4	8,5
Indications for FET	Acute type A aortic dissection	26	55,3
	Acute type A intramural hematoma	2	4,3
	Aortic dissection type B	6	12,8
	Thoracic aortic aneurysm	13	27,7

RESULT

Intraoperative parameters		Patients (n=47)	(%)
Emergency operation		27	57,4
Location of arterial cannula	Brachiocephalic trunk	12	25,5
	Axillary artery	27	57,4
	Femoral artery	6	12,8
	Axillary and femoral artery	2	4,3
Operative time Mean ± Standard deviation – hour Range – min		6,1±1,1 [4,5–9]	
Cardiopulmonary bypass time Mean ± Standard deviation – min Range – min		165,3 ±49,1 [94–330]	
Cross-clamping time Mean ± Standard deviation – min Range – min		100±37 [46-205]	
Body's temperature (°C)		28	
Circulatory arrest time Mean ± Standard deviation – min Range – min		32,6±8,8 [18–58]	

RESULT

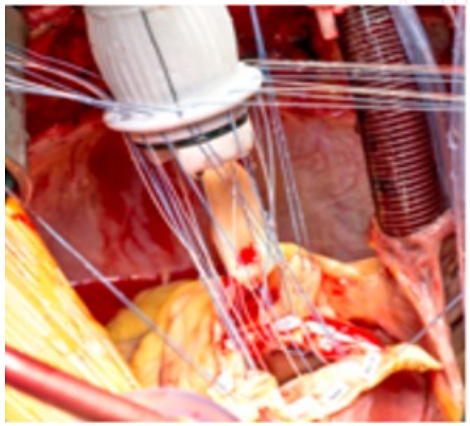
Preoperative parameters.		Patients (n)	%
Indications for FET	Acute type A aortic dissection	26	55,3
	Acute type A intramural hematoma	2	4,3
	Aortic dissection type B	6	12,8
	Thoracic aortic aneurysm	13	27,7

Czerny M, Schmidli J, Adler S, et al. Current options and recommendations for the treatment of thoracic aortic pathologies involving the aortic arch: an expert consensus document of the European Association for Cardio-Thoracic surgery (EACTS) and the European Society for Vascular Surgery (ESVS). *Eur J Cardiothorac Surg*. 2019;55(1):133-162. doi:10.1093/ejcts/ezy313

Recommendation 19: the FET technique or TEVAR 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 DTA to treat associated malperfusion syndrome or to avoid its postoperative development.	**Class IIA**	**Level C**
Recommendation 20: the FET technique may be considered for use in patients undergoing surgery for acute type A aortic dissection to prevent mid-term aneurysmal formation in the downstream aorta [174].	**Class IIB**	**Level C**
Recommendation 21: the FET technique should be considered in patients with complicated acute type B aortic dissection when endovascular interventions are contraindicated [161, 175, 176].	**Class IIA**	**Level C**
Recommendation 22: the FET technique should be considered in patients with concomitant distal thoracic and thoraco-abdominal aortic disease that, in a later stage, will or is likely to require either surgical or endovascular treatment.	**Class IIA**	**Level C**

RESULTS

Size of vascular prothesis (mm)	Patients (n=47)	%
22	1	2,1
24	2	4,3
26	15	31,9
28	16	34
30	13	27,7
Size of stent graft (mm)		
22	1	2,1
24	1	2,1
26	1	2,1
28	7	14,9
30	21	44,7
32	12	25,5
34	4	8,5



Length of stent graft (mm)	Patients (n=47)	%
150	14	29,8
185	8	17
200	21	44,7
205	2	4,3
280	1	2,1
Concomitant surgery		
Bentall procedure	3	6,4
Right coronary artery bypass grafting	1	2,1
Aortic valve replacement and mitral valve repair surgery	1	2,1
The sinus of Valsalva (noncornary) repair surgery	1	2,1

INITIALS RESULT

Postoperative parameters and complications (N=47)

Postoperative parameters	Patients (n=47)	(%)
In-hospital mortality	5	10.6
Cerebral shock	4	8.5
Spinal cord ischemia	0	0
Recurrent nerve palsy	1	2.1
Bleeding required reoperation	0	0
Red blood cell transfusion above 5 units	3	6.4
Malperfusion required intervention or surgery	0	0
Hemodialysis	6	12.8
Tracheostomy	3	6.4
Mechanical ventilation time Mean ± Standard deviation – day Range – day	7.5±10.2 (1-59)	
Intensive care unit time Mean ± Standard deviation – day Range – day	15.9±15.4 (2-90)	
Length of hospital stay Mean ± Standard deviation – day Range – day	26.7±14.3 (2-91)	

Reop bleeding	Stroke	SCI (paraplegia + paraparesis)	AKI (aggregate transient + permanent dialysis)	Laryngeal nerve palsy	In-hospital mortality (30 days—no discharge)
2.5–30%	2.5–20%	0–21%	4–34.8%	0–12.8%	1.8–17.2%

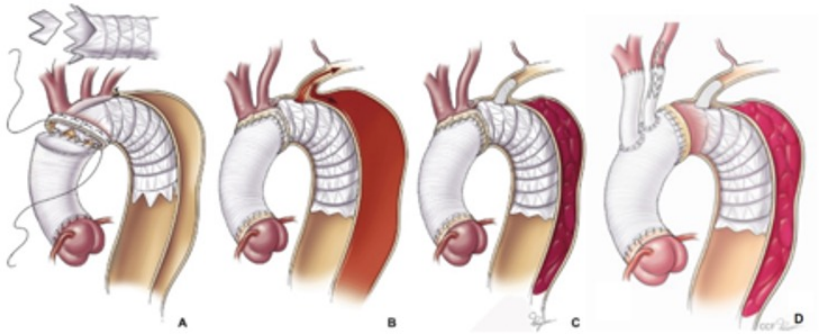
SCI: spinal cord injury; AKI: acute kidney injury.

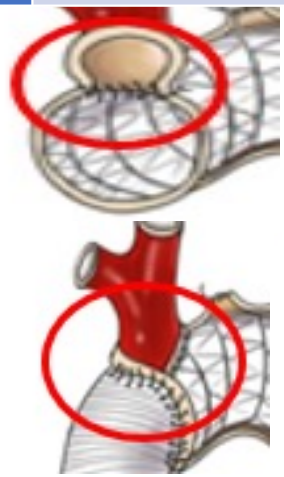
Shrestha M, Bachet J, Bavaria J, et al. Current status and recommendations for use of the frozen elephant trunk technique: a position paper by the Vascular Domain of EACTS. *Eur J Cardiothorac Surg*. 2015;47(5):759-769. doi:10.1093/ejcts/ezv085

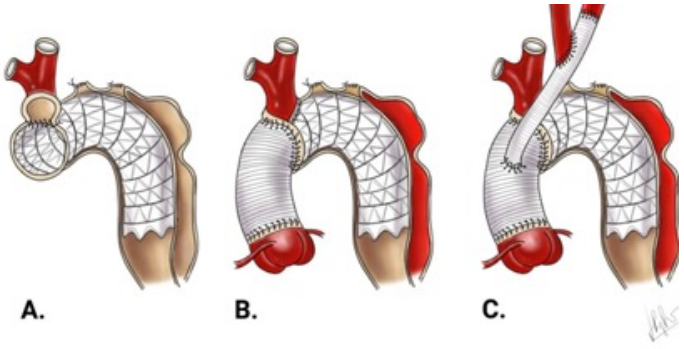
ATCSA2023
Ho Chi Minh city, Vietnam

RESULT

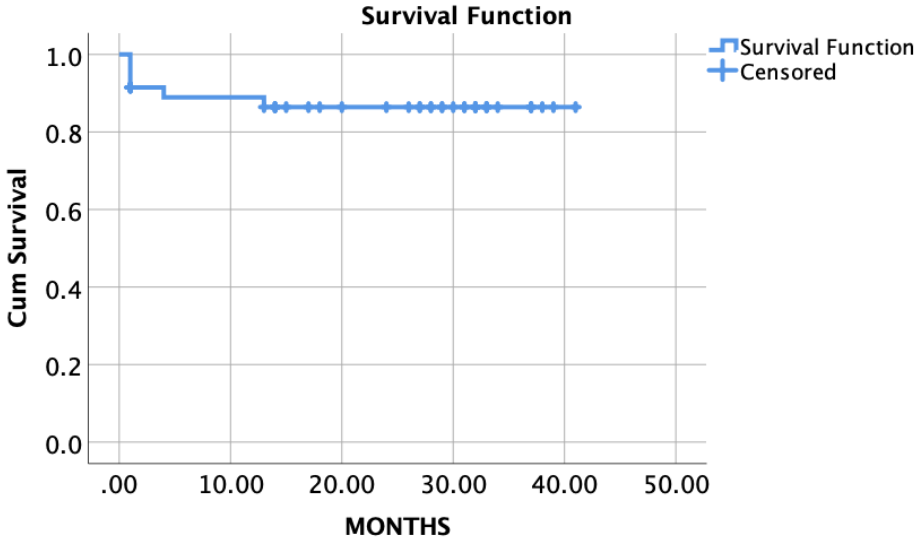
Parameters	n	%
The postoperative follow-up times (months)	25.8±11.7 [3-43]	
Second-stage TEVAR	4	9.5
Second-stage TEVAR + surgery	1	2.4
Late reoperation	3	7.1
Late dead	1	2.4







RESULT

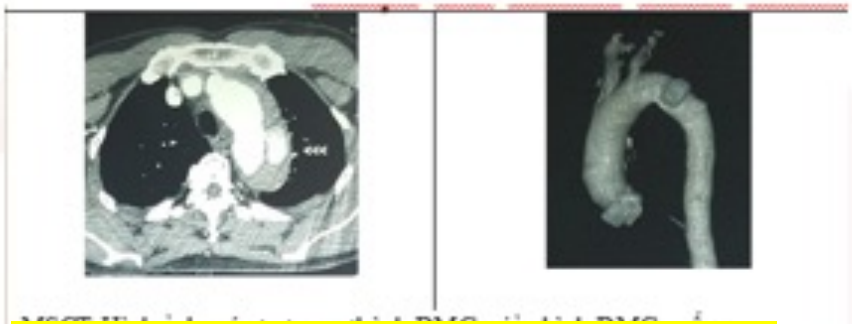


The Kaplan–Meier survival curve for the overall surgical patients

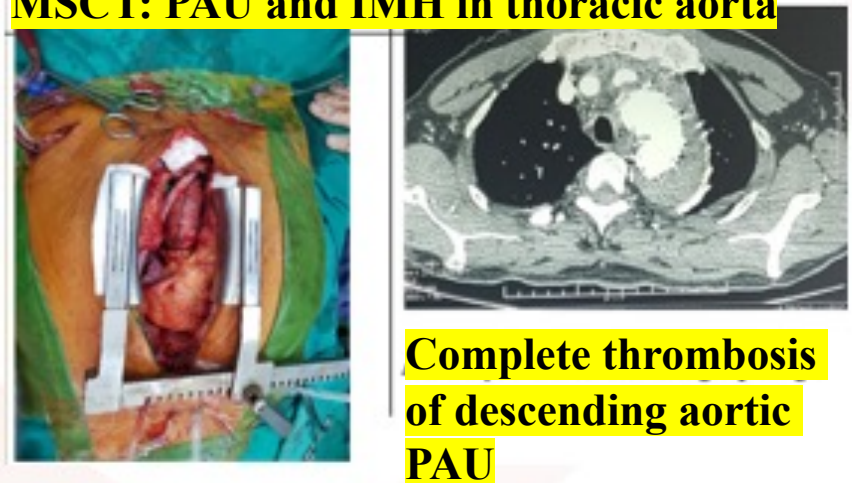
Results: Thirty-seven studies with 4,178 patients were identified. The majority of the studies focused solely on acute dissections. Average follow-up was 3.2 years. Overall survival at 1-, 3-, and 5-year was 89.6%, 85.2%, and 82.0%, respectively. Freedom from reintervention at the same timepoints were 93.9%, 89.3%, and 86.8%, respectively. Mortality, permanent neurological deficit and spinal cord injury were 10.2%, 7.7%, and 6.5%, respectively.

Tian DH, Ha H, Joshi Y, Yan TD. Long-term outcomes of the frozen elephant trunk procedure: a systematic review. *Ann Cardiothorac Surg*. 2020;9(3):144-151. doi:10.21037/acs.2020.03.08

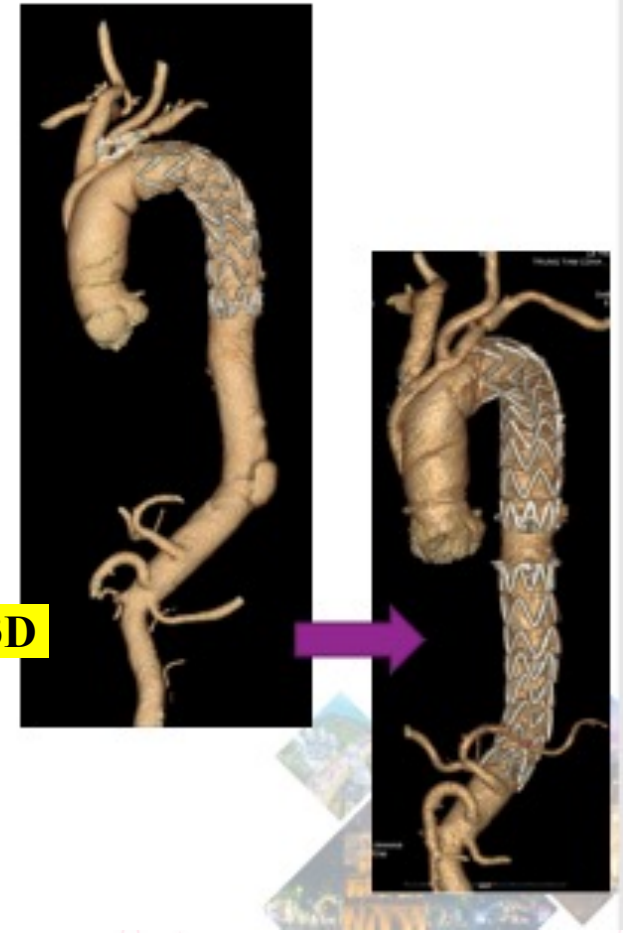
RESULT



MSCT: PAU and IMH in thoracic aorta



Complete thrombosis of descending aortic PAU



Images of MSCT with 3D reconstruction.

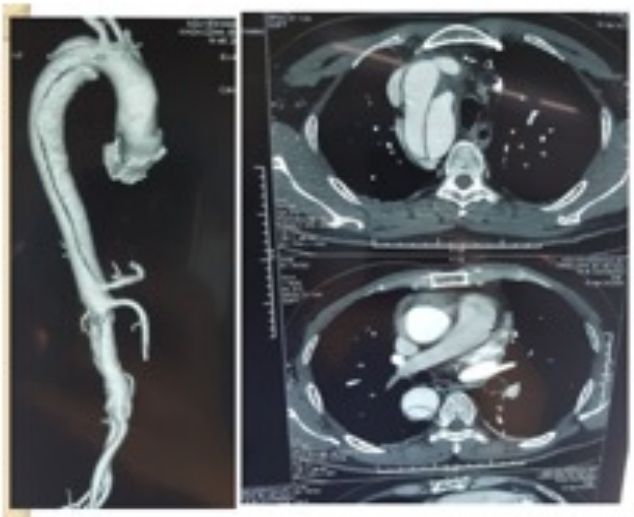
RESULT

Preoperative CT-A

1-month after surgery

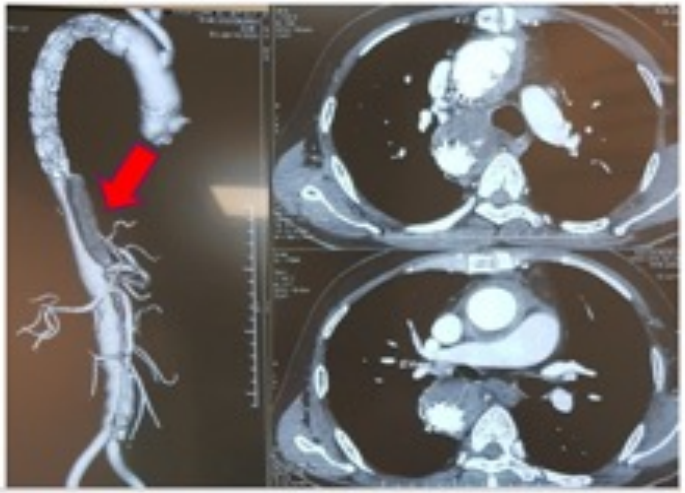
2-month after surgery

RESULT



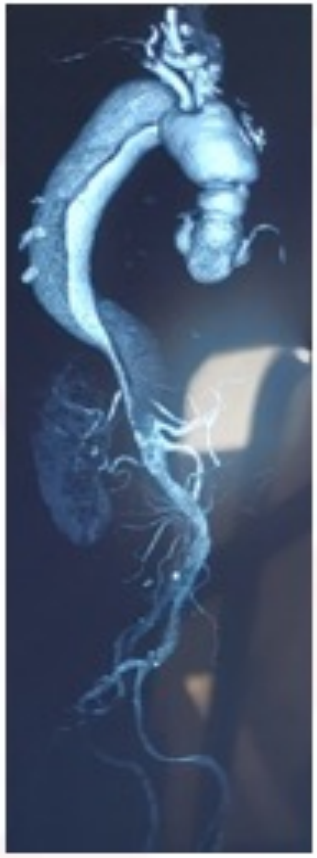
Before surgery

1-month after surgery



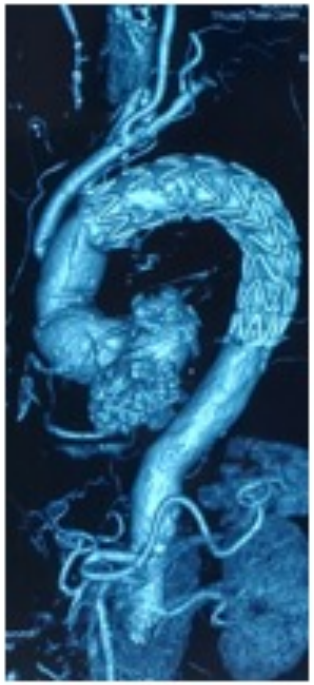
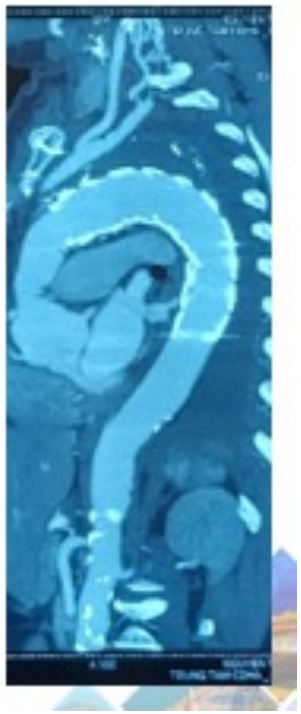
1-year after surgery

RESULT

RESULT

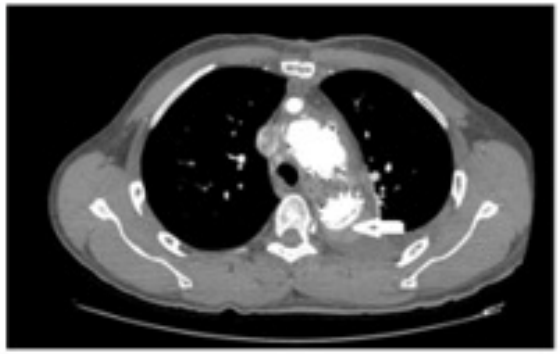


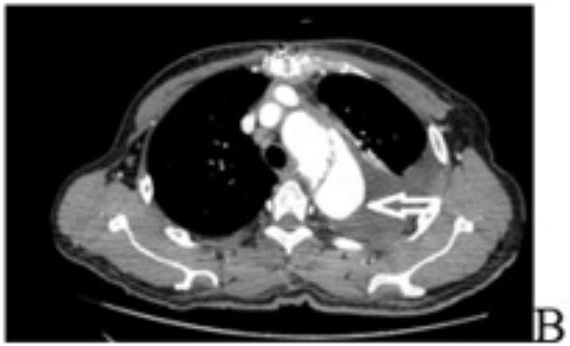




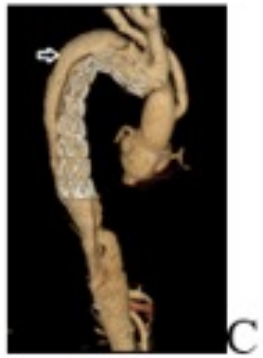
RESULT

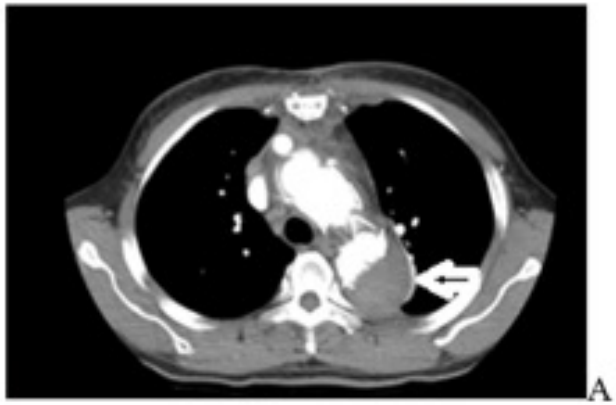
RESULT

Case of the postoperative type 1A endoleak


A

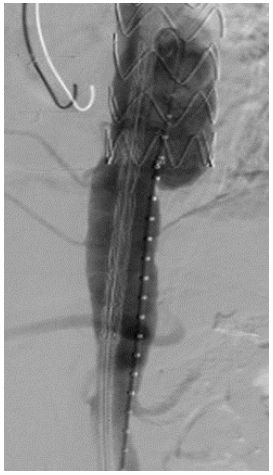

B

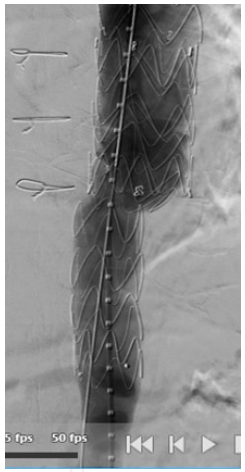

C


A


B

TREATMENT OF dSINE - BY ENDOVASCULAR THERAPY





Second-stage TEVAR + Abdominal aortic-iliac artery replacement surgery

CONCLUSIONS

THE VIET DUC MODIFICATION OF FROZEN ELEPHANT TRUNK:

- Easy to implement
- Cost-effective
- The initial and intermediate-term results are equivalent to other studies
- Advantages for Second-stage TEVAR


Thank You
Thank You
Thank You!!!!