

# Who Develops Early Thrombosis in Frozen Elephant Trunk Prostheses and How to Prevent it

Ravi J De Silva, Katharine Tweed, Morgan Quinn, Ismail Vokshi, Rushmi Purmessur, Shakil Farid, Florian Falter.

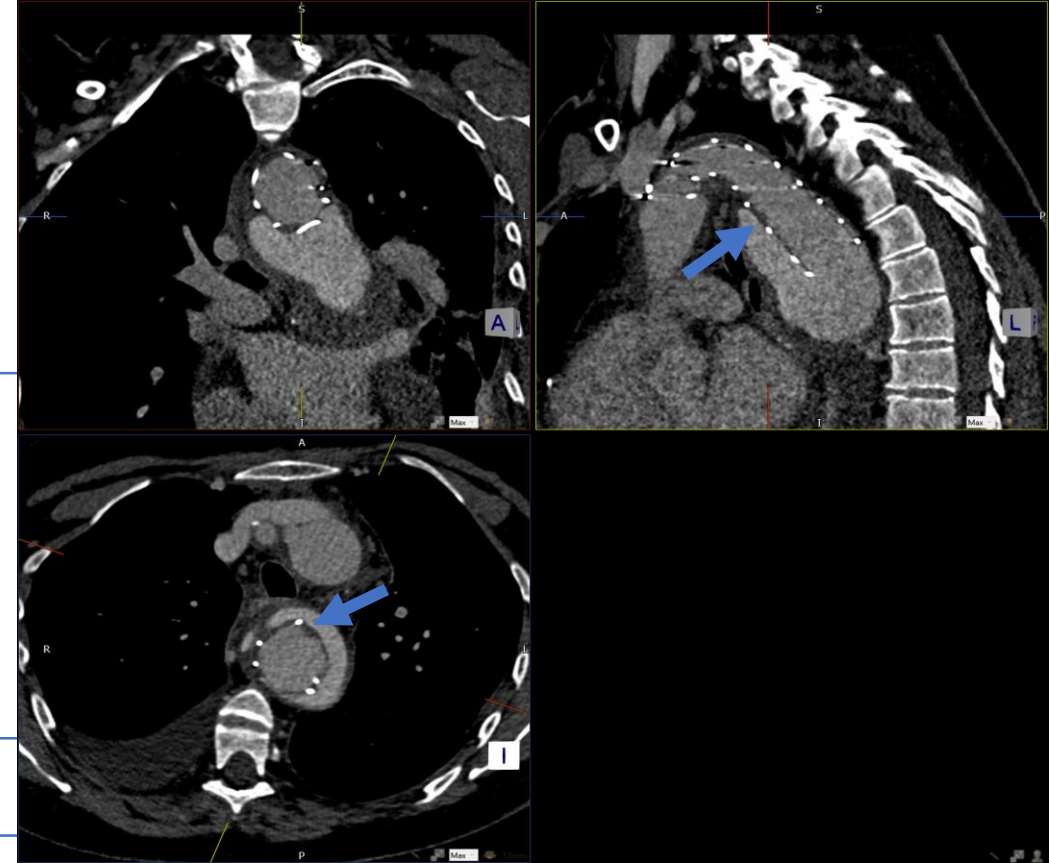
# Is there a problem?

In-stent thrombus incidence 5 – 17%

- Mortality up to 30%
- Embolic complications up to 27%
- Longer ICU and hospital stay

Small number of publications

Mostly single centre



Walter T et al. Postoperative In-Stent Thrombus Formation Following Frozen Elephant Trunk Total Arch Repair. *Front. Cardiovasc. Med.* (2022) 9:921479

Ibrahim M et al In-hospital thromboembolic complications after frozen elephant trunk aortic arch repair. *J Thorac Cardiovasc Surg.* 2022 Aug 17:S0022-5223(22)00851-0.

Misfeld M et al Early Intraluminal Frozen Elephant Trunk Stent Graft Thrombosis After Aortic Arch Surgery. *Ann Thorac Surg.* 2023 Sep;116(3):450-457.

# Who is at risk?

- Patient factors
  - Female sex
  - Age
  - Degenerative aneurysm
  - Bleeding / conservative coagulation management
  - Need for TEVAR
  
- Operative factors
  - Smaller stent / graft diameter index
  - Longer graft
  - Central graft position



Martens A et al Features and risk factors of early intraluminal thrombus formation within the frozen elephant trunk stent graft. J Thorac Cardiovasc Surg. 2023 Jan 23:S0022-5223(23)00082-X.

# Papworth experience

- 185 FET 2014 – 2023
- 40 excluded from analysis
  - 24 RIP before CT
  - 16 incomplete data

## Demographic, intra- and postoperative variables

	Thrombus no (n=129)	Thrombus yes (n=16)	p
<b>Age</b>	68 (67 – 70)	72 (63 – 75)	0.2
<b>Male Sex</b>	83 (64%)	8 (50%)	0.26
<b>Height</b>	171 (170 – 175)	171.5 (159 – 176)	0.27
<b>Weight</b>	83 (80 – 85.3)	81.5 (62 – 90)	0.38
<b>EuroSCORE</b>	17.2 (15.1 – 20.1)	19.6 (12.6 – 32.7)	0.35
<b>Redo aortic operation</b>	30 (23%)	3 (19%)	0.68
<b>Emergency</b>	61 (47%)	7 (44%)	0.79
<b>CPB (min)</b>	248 (238 – 253)	230 (201 – 290)	0.63
<b>X-clamp (min)</b>	95 (76 – 119)	104 (54 – 150)	0.77
<b>12 hour blood loss (ml)</b>	315 (275 – 361)	290 (231 – 514)	0.91
<b>Anticoagulant started post-OP day</b>	2 (1.8 – 2.8)	1.8 (1.7 – 2.0)	0.18
<b>ICU LOS (days)</b>	5 (4 – 7)	5 (2.6 – 14.1)	0.87
<b>Hospital LOS (days)</b>	16 (14 – 18.8)	21 (14.3 – 26.8)	0.2

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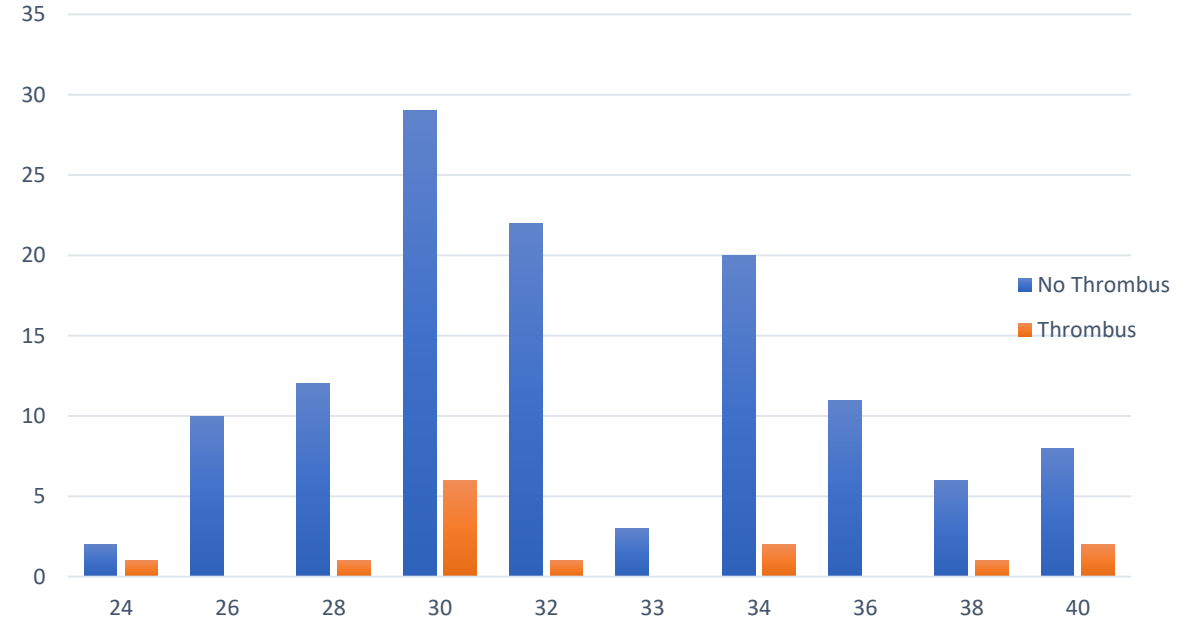
	Thrombus no (n=129)	Thrombus yes (n=16)	p
<b>Aortic Arch Aneurysm</b>	<b>54 (86%)</b>	<b>9 (14%)</b>	0.89
Dilated Aortic Arch	31 (91%)	3 (9%)	
Non A non B Dissection	4 (100%)	0	
Type A Dissection	27 (90%)	3 (10%)	
Type B Dissection	12 (91%)	1 (8%)	
Other	1 (100%)	0	
<b>FET Position</b>	Thrombus no (n=129)	Thrombus yes (n=16)	0.08
Eccentric FET	85 (66%)	7 (44%)	
<b>Central FET</b>	<b>44 (34%)</b>	<b>9 (56%)</b>	

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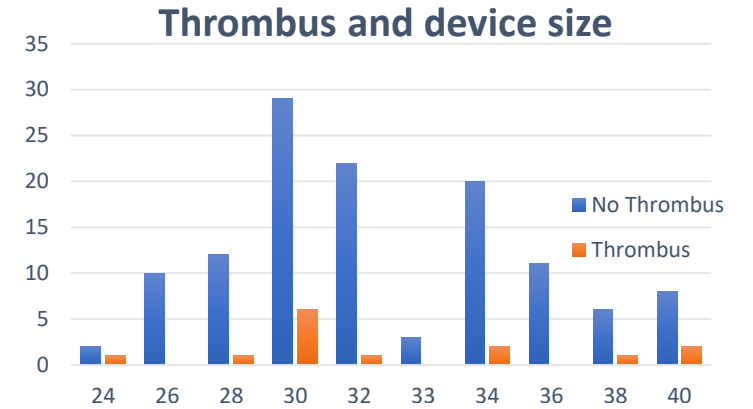
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Thrombus and device size



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Anticoagulation		
	Thrombus no (n=129)	Thrombus yes (n=16)
<b>Enoxaparin</b>	67	10
<b>Tinzaparin</b>	48	2
<b>Warfarin</b>	9	0
<b>Aspirin</b>	3	1
<b>Aspirin + Clopidogrel</b>	0	2
<b>Argatroban</b>	1	0
<b>None</b>	1	1

# What to do?

- Aneurysmal disease and central position are risk factors
- Early imaging
- Anticoagulation management
  - Early warfarin
  - Transition to ?? and when?
- More data, bigger studies with more centres required
- Standardise reporting?
- Registry?

