A Frozen Elephant Trunk Technique to reduce circulatory arrest time in hybrid aortic arch for acute aortic dissection: early and midterm outcomes in a multicentric cohort of 153 patients.

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Background

- Acute aortic dissection type A (AAD) remains a life-threatening condition despite the continuous improvement of operative technique and perioperative care for decades

Khan H, Hussain A, Chaubey S, Sameh M, Salter I, Deshpande R, et al. Acute aortic dissection type A: impact of aortic specialists on short and long term outcomes. J Card Surg.

- Total arch replacement (TAR) has undergone a real boom thanks to Frozen Elephant trunk (FET), which has benefited from numerous modifications and simplifications in parallel with the evolution and improvement of “devices”.

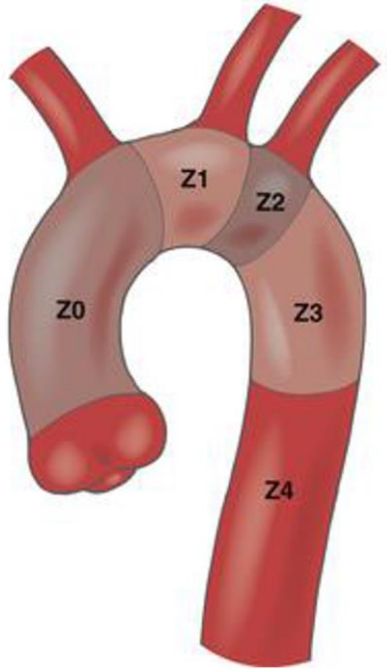
Tian DH, Wan B, Di Eusanio M, et al. A systematic review and metaanalysis on the safety and efficacy of the frozen elephant trunk technique in aortic arch surgery. Cardiothorac Surg. 2013;2:581-591

- Nevertheless postoperative mortality and neurologic/systemic complications remains substantial and mostly related to the imperative use of hypothermic circulatory arrest (HCA).

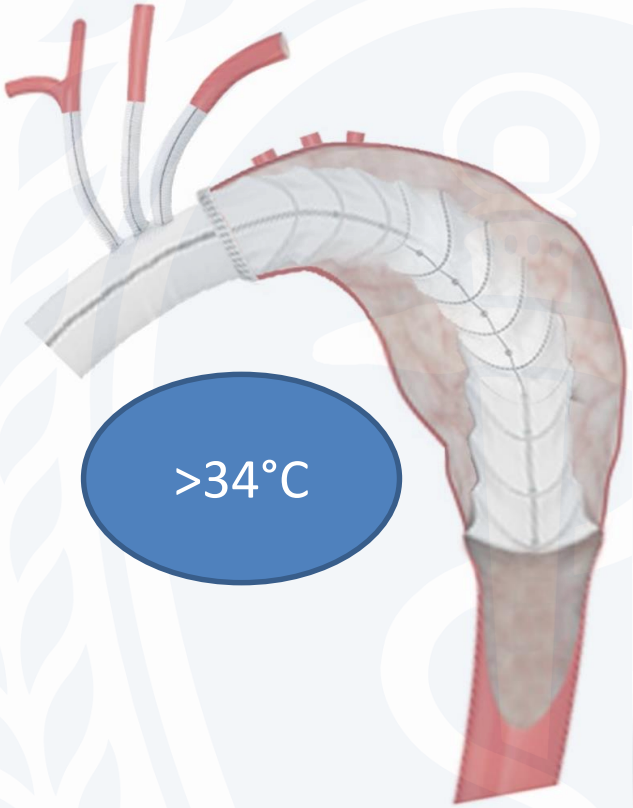
Tsagakis K, Pacini D, Grabenwoger M, et al. Results of frozen elephant trunk from the international E-vita Open registry. Ann Cardiothorac Surg. 2020;9:178-188.

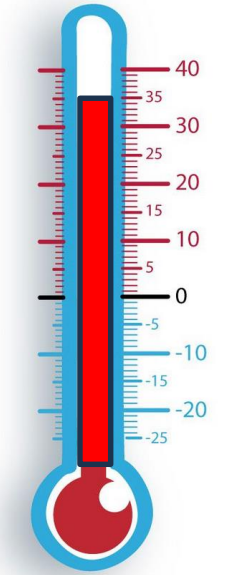
- This has proven to be particularly true in patients with acute aortic dissection

ALTERNATIVE: SIMPLIFIED-DELIVERY FROZEN ELEPHANT TRUNK



SHORT CIRCULATORY ARREST 5 MIN





PROXIMALIZATION ZONE 0 OR 1

MODERATE HYPOTHERMIA OR EVEN NORMOTHERMIA

SD FET technique

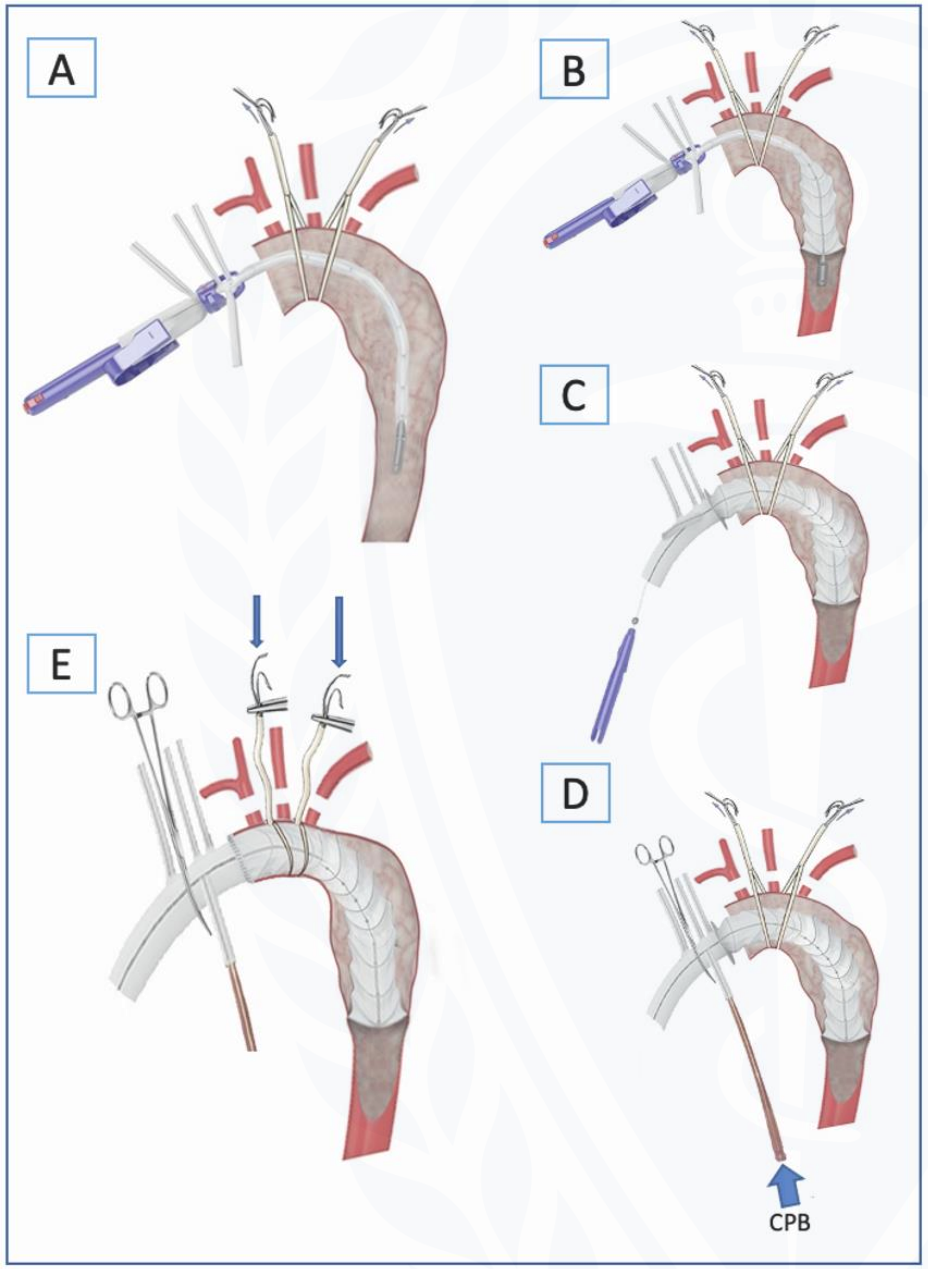
A) The key point of the technique is the placement of two surgical sealing tourniquets around the aortic arch between the brachiocephalic trunk and the left common carotid artery. The compacted stent is inserted into the aorta either by sight or on a guidewire.

B) The stent is deployed as usual.

C) Ancillary instrument is removed.

D) Systemic cardiopulmonary bypass is restarted via the fourth branch at full output to expand the stent.

E) The two sealing tourniquets are gradually tightened on a loaded aorta until sealing is totally achieved, this point is very important to avoid a kink of an under-deployed stent. The operative field is perfectly bloodless and manoeuvrable.



MATERIAL AND METHODS

Centre Cardiologique du Nord

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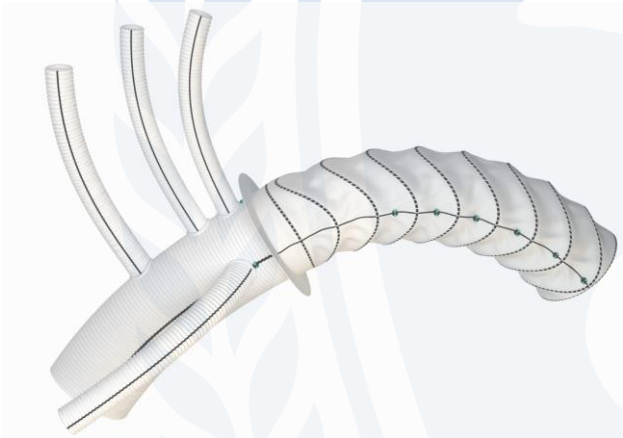
CHU ANGERS CENTRE HOSPITALIER UNIVERSITAIRE

CHU Rennes

Marie Lannelongue

2016 → 2022

All patients who underwent aortic arch surgery for type A dissection



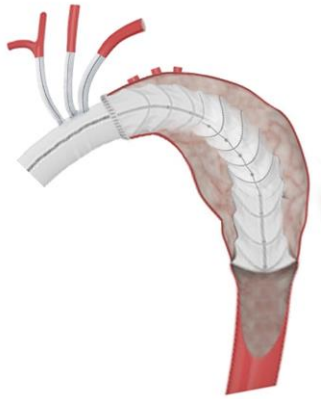
THORAFLEX HYBRID PROSTHESIS

Retrospective and prospective data collection

Preoperative, perioperative and in-hospital outcomes

AAD and THP

n=153 AAD



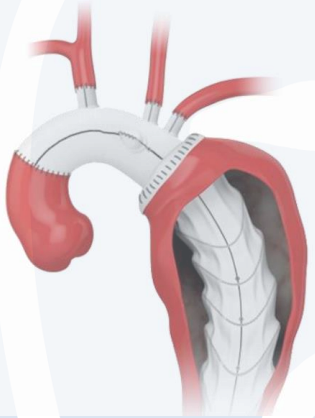
2 GROUPS

Primary endpoints

- ✓ IN-HOSPITAL MORTALITY
- ✓ STROKE
- ✓ SPINAL CORD INJURY

SD-FET GROUPE
SHORT CIRCULATORY ARREST
>32°C

n=90



FET GROUP
CONVENTIONNAL TECHNIQUE
HYPOTHERMIC CIRCULATORY ARREST

n=63

INTRAOPERATIVE RESULTS

	SD-FET GROUP SHORT CA		FET GROUP CONVENTIONAL TECHNIQUE
CIRCULATORY ARREST, MIN	5 ± 3	p<0.001	40 ± 16
CROSS-CLAMP TIME, MIN	83 ± 45	p<0.001	166 ± 57
CPB TIME, MIN	186 ± 73	p<0.001	280 ± 65
CORE BODY TEMPERATURE, °C	34.6 ± 1.4	p<0.001	25.2 ± 3.1
CONCOMITANT DAVID PROCEDURE	22 (24.4%)	p<0.001	3 (4.8%)

ENDPOINTS

	SD-FET GROUP SHORT CA 		FET GROUP CONVENTIONAL TECHNIQUE 
OVERALL			
IN-HOSPITAL MORTALITY 	**n=9 (10.3%)**	**p=0.206**	**n=11 (27.5%)**
SPINAL CORD INJURY 	**n=2 (2.2%)**	**p=0.100**	**n=3 (4.8%)**
STROKE 	**N=11 (12.4%)**	**p=0.065**	**n=15 (23.8%)**
LONG INOTROPIC SUPPORT 	**19 (21.3%)**	**p=0.055**	**23 (35.5%)**
LACTATES IN THE FIRST 24h 	**3.7 ± 1.8**	**p=0.010**	**5.0 ± 3.9**

Results

- In univariate analysis of secondary endpoints, the main significant differences between the 2 groups were in favour of the SD-FET group

  - ✓ On peak lactates in the first 24 hours (5.0±3.9 vs 3.7±1.8; *P = 0.010*)
  - ✓ The need for postoperative ECLS (8.1% vs 1.1%; *P = 0.032)*
  - ✓ For the postoperative multiorgan failure (15.9% vs 4.4%; *P = 0.016*)

- In multivariable analysis, **SD-FET appeared to be protective for combined outcome (death and/or neurological event)** with an odds ratio of *0.22 (95% confidence interval 0.06–0.65; P = 0.008)* with a corresponding population-average percentage of events of 17.8% (5.3–27.7) in the SD-FET group versus 30.7% (16.5–52.8) in the FET group [significant difference of -12.9% (-0.3 to -26)].

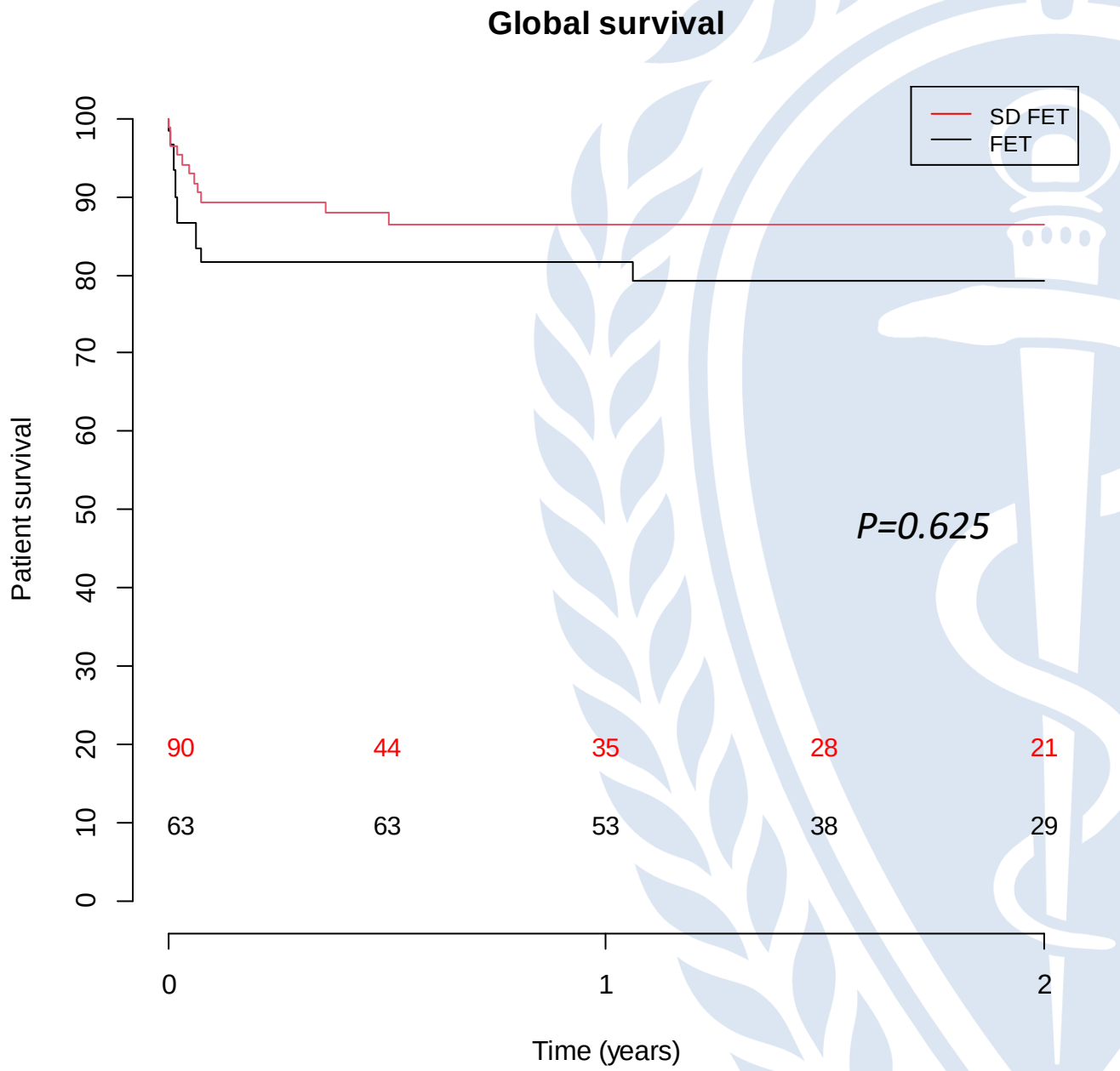
Results

- Median follow-up of 21.4 months (range 0-81).
- 7 patients died during follow-up, with no difference between groups (4(4.5%) in the SD-FET group versus 3(5%) in the FET group; *P* =0.886).
- Of these deaths, 3 were due to the aorta (*P* =0.376).
- The incidence of early distal reinterventions during the first hospitalisation was not significant (7(7.8%) in the SD-FET group versus 7(11.1%) in the FET group; *P* =0.482), but this incidence was significantly higher in the conventional group during follow-up (3(3.3%) in the SD-FET group versus 7(14.5%) in the FET group; *P* =0.012).
- The Kaplan-Meier showed a survival rate at 12 and 24 months of 87% in the SD-FET group versus 83% in the FET group and 86% in the SD-FET group versus 80% FET (*P* = 0.625).

Results

- Kaplan Meier curves showing the overall survival following Simplified Delivery FET and conventional FET.

- Survival is similar between SD-FET versus FET during the first 2 years (*P =0.625*).



Conclusion

- SD-FET can significantly reduce circulatory arrest time and allow the FET procedure to be carried out in moderate hypothermia—and even without cooling with experience and mastery of the technique.

- This technique is feasible, reproducible with a morbidity comparable to the reference technique .

- This approach was associated with a lower occurrence of the primary outcome (combined criteria of death and/or neurological event).

- Survival is similar between SD FET versus FET during the first 2 years.