

Longer stent graft in frozen elephant trunk procedure: A fear or truth?

Mohammed Idhrees¹ and Mohamad Bashir¹

¹SRM Institutes for Medical Science Vadapalani

June 14, 2021

Longer stent graft in frozen elephant trunk procedure: A fear or truth?

Mohammed Idhrees¹, Mohamad Bashir²

1. Consultant, *Institute of Cardiac and Aortic Disorders, SRM Institutes for Medical Science (SIMS Hospital), Chennai, India*

2. *Clinical Research Professor of Cardiovascular Surgery, SRM Institutes for Medical Science (SIMS Hospital), Chennai, India*

Corresponding Author:

Dr. A. Mohammed Idhrees MBBS, MS MCh, FAIS

Cardiovascular Surgeon

Institute for Cardiac and Aortic Disorders

SRM Institutes for Medical Science (SIMS Hospitals)

Chennai, India – 600 026

Phone: +919962268787

E-Mail: a.m.idhrees@gmail.com

Key Words: Aortic dissection, Frozen Elephant Trunk, Size of hybrid prosthesis, Spinal cord ischemia, paraplegia

No. of words: 1124 (including references, abstract, title page)

No. of reference: 8

Conflict of Interest: Nil

Ethic committee clearance: N/A

The management of Acute Type A aortic Dissection (ATAAD) has evolved over the years. Resection of the primary tear in the ascending aorta with/without addressing the aortic root has remained the gold standard. The major concerns of these patients during follow-up are the expanding distal false lumen which can cause compression of the true lumen or rupture. Frozen elephant trunk (FET) has been suggested to attenuate the negative phenomena of distal false lumen. Experts from Europe have recommended FET for clinically stable ATAAD patients (1). Spinal cord deficit (SCD; postoperative paraplegia or paraparesis) has been considered the ‘Achilles heel’ of FET. A recent metanalysis showed that the pooled prevalence of paraplegia was 3.5 %(2). Wang et al (3) reported an incidence of SCD of 4.4% in 158 ATAAD patients. They have

implanted longer (150mm) Cronus hybrid prosthesis (HP) in patients who are taller than 160cm and they found there was no statistical difference between the long and short (100mm) HP in regards to SCD. Further the longer HP helps in positive remodelling of the distal thoracic aorta

In the recent times there are several papers in literature favouring FET in multiple aortic pathologies, but there are no general consensuses in regards to the size (diameter and length) of the stent graft to be used. A short HP may not be adequate enough to cover the entry tear in the descending thoracic aorta (DTA), while a longer HP may invoke a risk of paraplegia. So the aortic team have to balance between the risk of reintervention (endoleak or partial thrombus) with shorter HP, and risk of paraplegia with longer HP (4). Most of the centers/surgeons opt for the former strategy.

No authors have studied the application of the longer versus shorter HP in regards to height of the patient. The average height of the Asian male (166-174cm) is approximately 7 to 8 cm shorter than the European population (179-182cm) (5). Wang et al (3) have used 150mm Cronus HP in 45 patients with height great than 160cm tall and reported SCD in 1 patient (2.2%). Theoretically, this is equivalent to using 150mm HP in average European men who are 180cm tall. In similar context, earlier in 2017 (6), a team from India has presented their experience with FET. The authors performed antegrade Thoracic endovascular **aortic** repair (**TEVAR**) in the DTA and anastomosed a four branch graft to the zone 2/3. The authors reported zero incidence of SCD in their cohort. Figure 3 of the article (6), shows the extend of the endograft – a few inches from the origin of coeliac artery.

It is very intriguing to know the difference between the European and Asian population. So when someone is asked, “*Does the anatomy of spinal circulation differ in Asian population as compared to Europeans?*” The answer is ‘May be yes’. The incidence of SCD in an average Asian (166-174cm) with longer HP is almost equal to an average European (179-182cm) with a shorter HP. A larger study to understand the difference in spinal circulation between different Ethnic is needed.

It is very intriguing to ask, “*Is the length of HP the sole culprit of SCD? Or it is one of the culprit*”. In our experience, length of the HP is just one of the culprits of SCD. The overall results depends on several other factors which includes

- (i) Lower body protection during circulatory arrest: Adequate cooling of the patient and maintain a short circulatory arrest period. If need intermittent perfusion of lower body with a Foley’s catheter
- (ii) Continuous perfusion of left subclavian artery: Continuous perfusion through the left subclavian artery would encourage collateral circulation to the spinal cord during the circulatory arrest period (7,8)
- (iii) Minimal Handling of the atherosclerotic plaques on the aorta
- (iv) Through deairing of the descending thoracic aorta, prior to restarting lower body circulation.

A decade ago, when FET was evolving, surgeons used long HP at zone 3, resulting in a high incidence of SCD. Over the years the surgical techniques of FET have tremendously evolved, graft deployment takes place in zone 2 and surgeons prefer shorter HP. This resulted in a reduction of SCD in the recent reports. With evolved techniques in FET and zone 2 implantation, is longer HP still an apprehension among surgeons? The answer is probably ‘May not be’. Zone 3 to Zone 2 proximalization has helped us gain 2-3cm, and a deployment of 150mm HP, is effective 2cm more than 100mm HP implanted in zone3. A randomized trial is definitely necessary to ascertain the fact.

Longer HP helps in better positive remodelling of DTA, but the apprehension of SCD still looms around us. A randomised trail to study the incidence of paraplegia in regards to height of the patient and length of HP is needed.

Reference

1. Shrestha MB, Bachet JB, Bavaria J, Carrel TP, De Paulis R, Di Bartolomeo R 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;47:759–69

2. Rezaei Y, Bashir M, Mousavizadeh M, Daliri M, Aljadayel HA, Mohammed I, Hosseini S. Frozen elephant trunk in total arch replacement: A systematic review and meta-analysis of outcomes and aortic proximalization. *J Card Surg*. 2021 Jun;36(6):1922-1934. doi: 10.1111/jocs.15452

3. Wang Chaojie et al. Outcomes of Long vs Short Stent Cronus Hybrid Prosthesis

in Type A Aortic Dissection. *Jouranal of cardiac surgery*. Manuscript ID: JOCS-2021-OA-582.R1

4. Idhrees M, Bashir M, Jakob H. Right size matters! The ideal size of hybrid prosthesis in frozen elephant trunk. *Asian Cardiovasc Thorac Ann*. 2020 Aug 20;218492320953338. doi: 10.1177/0218492320953338.

5. <https://www.worlddata.info/average-bodyheight.php>. Site accessed on June 13, 2021

6. Idhrees M, Krishnaswami M, Jacob A, Velayudhan B. Hybrid aortic arch repair: 10-year experience from India. *Indian J Thorac Cardiovasc Surg*. 2019 Jun;35(Suppl 2):156-163. doi: 10.1007/s12055-018-0689-0.

7. Yamashiro S, Kuniyoshi Y, Arakaki K, Inafuku H, Morishima Y, Kise Y. Aortic replacement via median sternotomy with left anterolateral thoracotomy. *Asian Cardiovasc Thorac Ann*. 2009;17(4):373-377. doi:10.1177/0218492309343260

8. Jakob H, Moughal S, Bashir M. Frozen elephant trunk with straight vascular prosthesis: single-center experience with a review of current trends. *J Cardiovasc Surg (Torino)*. 2020;61(3):301-307. doi:10.23736/S0021-9509.20.11401-0