Is Release and Perfuse Technique Essential Along with Frozen Elephant Trunk Procedure?

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May 9, 2022

Abstract

Frozen Elephant Trunk (FET) has revolutionized management of aortic arch and proximal descending aorta pathologies. Despite significant advancement in FET prosthesis design in recent years, adverse outcomes related with neurologic and visceral ischemic events remained unsolved. To address this issue, several publications evaluated protection strategies to reduce body lower ischemic time. In the present commentary we put the technique promoted as "Release and Perfuse Technique" on scale that is for achievement of less lower body circulatory arrest time.

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Running title : Commentary on Release and Perfuse Technique

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Funding: None

Disclosure : None

Keywords : Frozen Elephant Trunk, FET, Hybrid Arch Replacement, Circulatory Arrest, Commentary

The advent of Frozen elephant trunk (FET) has revolutionized aortic arch repair and also further approaches to pathologies involving descending aorta, providing a single-stage treatment of both arch and descending aorta. A large body of evidence published previously reported short- and long-term outcomes of FET[1]. However, a potential shortcoming of this technique is the necessity of a complex arch replacement which is accompanied by adverse events mainly neurologic and renal failure due to circulatory arrest.

Although moderate hypothermic circulatory arrest (MHCA) with selective cerebral perfusion (SCP) offers an equivalent visceral and cerebral protection during arch procedures compared with deep hypothermic circulatory arrest (DHCA), an immense attempt has been made to reduce MHCA time achieving a lower incidence of visceral ischemic complications as well as renal impairment after FET.[2]

At the same time with the introduction of the newer generations of FET[3], other series published results of modifications in FET procedure to address the unsolved problem of circulatory arrest time. With newer FET generations, approaching distal anastomosis has been targeted along with well-established, safer surgical technique adjustment (i.e. proximalization of distal anastomosis from zone 3 to zone 2 or even to zone 1 or 0) [45]. Aortic occlusion balloons, also an adjunct, is being utilized to achieve lower circulatory arrest time with earlier restoration of lower body perfusion before completing distal anastomosis[6].Nevertheless, newer generations of FET devices coupled with increasingly FET experiences prevent popularity of aortic balloon occlusion as it anticipated.

We read with great interest Piperata et al. article on (Evaluation of the "release and perfuse technique" for aortic arch surgery)[7]. They reported their result using a modified technique named "release and perfuse Technique (RPT)". The primary rationale behind their proposed approach was to minimize lower body circulatory arrest time.[7] The authors described their technique during aortic arch replacement under MHCA plus SACP. They also cited previous attempts published to reduce lower body circulatory arrest time as mentioned above. This adjunct procedures seems to be more valuable in stringent and particular situations with minimum exposure of zone 2 or zone 3 which the surgeon finds hardship with such as re-do operations or huge aneurysmal sac repair, as well as aortic dissections in emergency settings.

A recent meta-analysis conducted by Cao et al[8] observed a lower incidence of renal failure and need for renal replacement therapy in MHCA comparing to DHCA when the lower body circulatory arrest time was less than 30 minutes but a similar pooled incidence this complication in both groups for longer than 30 minutes. This 30 minutes period for an aortic surgeon adequately allows insertion of FET conduit along with safe and hemostatic anastomosis of its collar, generally. Hence, reducing the lower body circulatory arrest time by performing RPT in expense of potential backflow bleeding around a stented portion of FET and as the result, some difficulty in suturing of the FET‘s collar, is not the optimal choice. Visceral organ protection is also well achieved by lowering core body temperature because of reduced metabolism rate and oxygen demand along with catching of more safe circulatory arrest time. However, it prolongs operative time needless to say that due to more time needed for cooling and rewarming.

Accordingly, Wang and colleagues studied on over a thousand patients who underwent aortic arch surgery requiring hypothermic circulatory arrest[9]. The authors reported a mean of 24 minutes for lower body circulatory arrest. When compared with 14 minutes of lower body circulatory arrest time described by Piperata in their technique, a reduction of 10 minutes in time of performing distal anastomosis is a potential benefit. Although this 10-minutes period should be justified against risk of troublesome intra-operative bleeding in the prospective clinical trials.

In addition, their approach which entailed release of the stented graft and restoring distal blood flow through the fourth branch of FET for restoring lower body perfusion would be potentially beneficial in selected patient cohort with proper sizing to have good sealing. As the authors did this RPT method in 18 patients from the total 44 cases of FET in their cases. Except for patients with a proper sealing zone in the thoracic aorta, surgeons will encounter troublesome back bleeding around the stented portion into the suturing area.

Altogether, it is appropriate that we add this approach to the armamentarium of aortic arch repair using FET for optimal outcomes for patients and surgeons equally.

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