Reply to the Letter to the Editor

Reply to Botta et al.

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Keywords: Aortic aneurysm; Aortic dissection; Hybrid aortic surgery

We appreciate the letter by Dr Botta and colleagues [1] with regard to our article “Treatment of complex disease of the thoracic aorta: The frozen elephant trunk technique with the E-vita open prosthesis” [2].

Our experience with the frozen elephant trunk (FET) technique was initiated in January 2007, and, since then, we have treated more than 50 patients. Based on these very encouraging results, we are widening the scope of indications to even more complex cases. Currently, our indications can be summarised as follows: chronic and acute dissections diffusely involving the thoracic aorta, chronic aneurysms of the ascending arch and descending aorta and aneurysms of the distal part of the aortic arch. In case of acute type A aortic dissection, we use the FET when the arch requires repair because of a rupture or dilatation.

Since our increasing experience with the FET, our use of the classical elephant trunk (ET) technique is on the decline: this technique always requires a second surgical or endovascular step, which can be avoided with FET. We agree with Dr Botta that FET can sometimes be incomplete and some patients could require a further distal aortic repair, but we do not think this operation can be considered unfavourable when compared with the classical ET. However, larger number of patients and longer follow-up are necessary for definitive conclusions.

Regarding the e-vita delivery, we always verify the correct opening of the stent with a Hegar dilator. Fluoroscopy and balloon remodelling could be helpful; however, in these patients who have undergone long periods of visceral ischaemia and extracorporeal circulation, the use of the contrast medium can result in a severe impairment of the renal function.

We find trans-oesophageal echocardiography to be very useful. It provides important information about stent expansion and aneurysm exclusion.

With regard to the myocardial protection, we have good experience with Custodiol cardioplegia: a single dose of 20—25 ml kg⁻¹ guarantees 3 h of myocardial ischaemia. In exceptional cases of myocardial ischaemia longer than 3 h, half dose of Custodiol can be repeated.

Regarding neurological complications, all patients who suffered from spinal cord injury developed early symptoms detectable during awakening from anaesthesia. We totally agree with the comments by Dr Botta and colleagues on the aetiopathogenesis of spinal cord ischaemia (SCI): the mechanism underlying the occurrence of SCI is yet to be completely understood. The patient who suffered from paraplegia had an associated vertebral angioma at the T5 level and a magnetic resonance imaging (MRI) performed during the postoperative period showed some anomalies of the spinal cord vascularisation: Could these anomalies have played a role on the spinal cord injury?

Prior abdominal aortic aneurysm repair was an important risk factor for spinal cord ischaemia in our experience as well; however, none of our patients had undergone previous abdominal aortic repair.

References


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Letter to the Editor

Why Fontan procedure fails in the long term

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Keywords: Fontan procedure; Cardiac contraction

Congratulations to the authors for the studies [1,2]. We have been investigating the inappropriate hypertrophy and decreasing contractility after the Fontan procedure for a long time [3]. We think we could explain why the unwanted conditions after the Fontan procedures occur.

In the studies concerning the Fontan procedure:

1. The patients undergoing right atrium to right ventricle connection were evaluated within the same group of the patients undergoing right atrium to pulmonary artery connection regarding the contractility. This is not compatible with the laws of physics.
2. The contractility of the single ventricular physiology was calculated by only considering the systemic ventricle, excluding the rudimentary ventricle. This is not compatible with the cardiac physiology.
3. Fractional shortening of the single ventricular physiology was derived only from the systemic ventricle, excluding the rudimentary ventricle. This is not acceptable.
4. The diameter and the wall thickness of the rudimentary ventricle were not taken into account while deriving measurements from Laplace’s rule. This is not compatible with the laws of physics.

After correction of the aforementioned measurements incompatible with cardiac physiology, we think that the real cause of the unwanted results of Fontan procedure could be understood.

Our opinion is that this is caused by a lack of volume, which could be corrected by systems that create pulsatile pressures, applicable to human beings.

References


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Reply to the Letter to the Editor

Reply to Kestelli et al.

Long-term ramifications of Fontan circulation

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Keywords: Björk modification; Fontan conversion; Single-ventricle anatomy

We thank Dr Kestelli and associates for their comments and recognise their contributions regarding the Fontan circulation [1–3].

We chose to evaluate ventricular function in patients with functionally single-ventricle hearts by echocardiographic analysis of the main systemic pumping chamber without regard to the contractile effects of the diminutive ventricle in the systemic circulation or the isolated subpulmonary ventricle in the event that it was left in continuity with the systemic venous return (Björk modification).

Of the entire spectrum of hearts lacking two well-developed ventricles, only a very small subset has anatomy suitable for partitioning with incorporation of a hypoplastic ventricle in the subpulmonary position. In that case, it has been estimated that the subpulmonary ventricle must have at least 30% normal volume to begin with, in addition to the good fortune to dilate or enlarge when the systemic and pulmonary ventricles are septated. Then, the patient’s long-term course is dependent on the fate of the right atrium—right ventricle connection—either non-valved, which results in atrial enlargement, arrhythmias or pathway obstruction, or valved, in which case the prosthetic valve always eventually fails due to pathway obstruction, increased venous pressure, atrial enlargement and arrhythmias.

According to the Weipert et al. analysis [4], no better survival outcome was demonstrated for patients with either right atrium—right ventricle or right atrium—pulmonary artery Fontan modification. Although right atrium—right ventricle connection tended to result in more efficient cardiac output compared with right atrium—pulmonary artery patients after an exercise analysis, total work load and ventilatory equivalent was not significantly different between the two Fontan modifications. No additional benefit was observed for the incorporation of a residual subpulmonary ventricular chamber within the Fontan circulation [4].

We are not altogether sure why the Fontan operation fails in the long-term. Certainly, subclinical atrio-pulmonary obstructions, arrhythmias, non-pulsatile pulmonary artery blood flow and long-standing venous hypertension play major roles. Our experience with Fontan conversion in association with arrhythmia surgery and repair of concomitant haemodynamic problems in selected patients has resulted in excellent outcomes at a time when the downward clinical spiral of Fontan failure was taking place.

References


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