


Case Report

Double Aortic Arch of in the Adult Patient Treated by the Frozen Elephant Trunk Technique Using a Thoraflex Hybrid Prosthesis: A Case Report

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Abstract

Aortic arch anomalies encompass a wide range of malformations affecting the arch itself which can lead to the formation of a partial or complete vascular ring around the tracheo-oesophageal axis. Such complications can cause, compressions of the surrounding structures and therefore various symptoms. Most of these cases are reported in pediatric patients. We report the case of an adult patient successfully treated by the frozen elephant trunk technique.

Introduction

Aortic arch anomalies encompass a wide range of malformations affecting the arc itself, its branches or the pulmonary artery which can create partial or complete vascular rings around the tracheo-oesophageal axis. Most of these cases have been reported in pediatric patients with surgical treatments conducted through a lateral thoracotomy. In rare occasions, these conditions can occur in adult patients therefore needing a dedicated surgical strategy such as the Frozen Elephant trunk technique.

Case report

Bronchoscopy revealed an extrinsic compression of the distal part of the trachea. The CT scan showed a double aortic arch compressing the trachea and the oesophagus. A right subclavian and a right primitive carotid arteries rising from the right arch, and left carotid and left subclavian artery rising from the left arch.

The surgery was performed through a median sternotomy, under standard central cardiopulmonary bypass after general heparinization, and a moderate hypothermia with a peripheral temperature of 28°C, corresponding to and a central temperature of 27°C.

During a brief 7-minute circulatory arrest, the right arch was dissected and both the trachea and the oesophagus were isolated on lacs. The right arch was then slid posteriorly of the trachea and placed on its left side. A 26x28x100 Thoraflex prosthesis was deployed in the thoracic descending aorta and was sutured in the isthmic region, or Zone 3, using ten 2/0 Ticron U-stitches reinforced with Teflon pledgets. Selective antegrade cerebral perfusion was conducted via direct cannulation of both common carotid arteries while both subclavian arteries were clamped. Once the stent implanted, distal perfusion was reinstated through a direct cannulation of the prosthesis using an endotracheal intubation tube.

The supra-aortic vessels were then re-implanted on the prosthesis. First both left common carotid and left subclavian arteries were anastomosed as

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Figure 1: Sagittal CT scan of the double aortic cross - red star trachea / white star esophagus

a single palette on one of the prosthetic branches. Then, the right common carotid artery followed by the right subclavian artery were anastomosed separately on two different branches.

Finally, the proximal anastomosis was performed at the native sino-tubular junction using a continuous 5/0 Prolene suture. Clamping and bypass durations were respectively 82 and 117 minutes.

Finally, the prosthesis was isolated from the trachea and esophagus using a patch of bovine pericardium. The patient's pericardium was then closed and a supplementary pericardial patch was applied to isolate the prosthesis from the sternal wall.

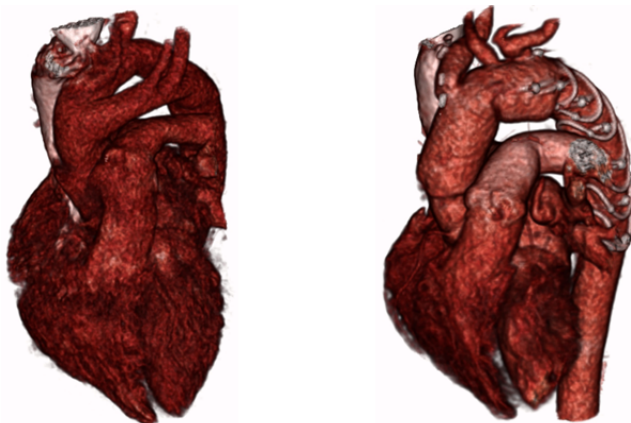


Figure 2: To the left, the original vessels with the double arch, to the right, the ThoraFlex. Images coming from 3D modelisation of pre and post-operative CT scan.

Discussion

First of all, adult cases of double aortic arch are scarce.

This condition affects pediatric patients as with symptoms appearing in early ages and therefore patients requiring the surgery during the first months of life.

In pediatric population, surgical treatment can not include bypass prosthetic replacement surgery as these patients have not fully grown. Most of the literature describe a different surgical approach for both children and adults in the management of double aortic arches. They report debranching and ligating the most agenic arch, via a lateral thoracotomy and respecting the remaining anatomy.

Other cases of double aortic arch treated with a ThoraFlex prosthesis have been described but these cases were conducted in the setting of type B aortic dissections. The decision to treat this patient with ThoraFlex was based on several arguments.

Firstly, the ratio between the diameter of the ascending aorta, measured at 27 mm, and that of the right dominant arch, measured at 16 mm (the left one measuring 12mm), raised the question of a risk of aortic coarctation as the left arch was still very developed. We took care to place the prosthesis after the abnormal arches for a good diameter. This is one of the main dangers, and covering the distal suture with the endovascular covered portion of the prosthesis secures the surgery.

Conclusions

Frozen Elephant Trunk is a valuable tool in the management of such complex aortic malformation

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