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Frozen Elephant Trunk Technique in a Patient with Multiple Previous Cardiac Procedures: A Case Report

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Background: We present the case of a 69-year-old female patient with giant aortic aneurysm who underwent previously multiple cardiac surgeries or interventions.

Case Report: Ross procedure was performed in 2006 due to aortic valve regurgitation and aneurysm of the ascending aorta. In 2010 the patient was re-admitted for pulmonary valve insufficiency and a transcatheter pulmonary valve was implanted. Recently, the patient presented with an aortic arch aneurysm, maximum diameter 78 mm, which was treated by a hybrid approach, implanting a frozen elephant trunk and a covered stent graft.

Conclusions: The current case report demonstrates a suitable hybrid option for an extremely demanding procedure by multiple previous cardiac procedures.

MeSH Keywords: **Aortic Aneurysm • Chimera • Reoperation**

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Background

Aneurysms of the entire thoracic aorta are severe diseases due to high risk of dissection, rupture, and death [1]. Necessary surgery can be extensive and challenging, especially if the patient underwent previously multiple cardiac surgeries [2].

Case Report

A 69-year-old female patient presented with a newly found aneurysm of the thoracic aorta, maximum 78 mm diameter, in the zone of the aortic arch (Figure 1A). The patient underwent Ross procedure and replacement of the ascending aorta in 2006. In 2010 pulmonary valve replacement was performed due to pulmonary insufficiency. In 2015 the patient was re-admitted with the above findings and, after clarifying therapeutic options, a hybrid approach was planned to replace the aortic arch and the descending aorta. Hypothermic cardiopulmonary bypass was implemented by cannulation of the right axillary artery and the femoral vein to open the chest because the aneurysm was directly behind the sternum. After exposing the aneurysm, circulatory arrest with cerebral perfusion was started. In the course of the procedure, due to heavy adhesions of the lung to the

heart, the aneurysm and the chest wall had to be loosened. The aortic arch was excised and a Thoraflex™ Hybrid (Vascutek, Hamburg, Germany) prosthesis was inserted distal of the left subclavian artery. After reconnection of the detached arteries, circulation was re-induced after 89 minutes. Cardiopulmonary bypass was stopped after 326 minutes. Due to respiratory failure, extracorporeal membrane oxygenation was necessary to support lung function for the following 5 days. At 12 days after the operation, a Valiant™ thoracic stent graft (Medtronic, Berlin, Germany) was implanted interventionally in the descending aorta (Figure 1B). The postoperative course was complicated, including temporary renal failure (requiring dialysis), pneumonia, long-term ventilation (including tracheotomy), peripheral embolization due to heparin-induced thrombocytopenia, and critical-illness polyneuropathy/myopathy. However, due to optimal interdisciplinary teamwork, the patient was discharged to a rehabilitation facility on the 40th postoperative day and went home 2 months later completely recovered.

Discussion

The replacement of the aortic is an extensive operation with operative mortality between 2.5% and 10% and stroke rates

Figure 1. (A) 3D and 2D reconstruction of the aneurysm preoperatively. (B) 3D and 2D reconstruction after the completed procedure.

between 5.0% and 11.8% [1]. Secondary procedures are usually more complex due to aging and adhesions involving the whole operative area [2]. Therefore, in these patients the perioperative risk rises [2]. The established method is either the 1-stage treatment using the clamshell incision, or the 2-stage treatment by a secondary lateral thoracotomy. The combined open surgical and endovascular approach for the treatment of aortic arch aneurysms has emerged as a safe treatment with good midterm results [3]. This so-called frozen elephant trunk technique reduces surgical trauma, as well as reducing the duration of cardiopulmonary bypass, circulatory arrest, and the whole procedure [4]. Additionally, a survival advantage of this hybrid technique compared to the surgical method has already been shown [5]. In the presented case, the 2-stage hybrid procedure was performed despite the high-risk profile of the patient, leading to a satisfactory operative result. Alternative treatment options like the 1-stage and 2-stage approach cause a

higher operative risk and would, in retrospect, not have been an option in this patient due to the heavy adhesions of the aneurysm and the complete operative situs. Nonetheless, this case demonstrates that the postoperative course can still be complicated and demanding.

Conclusions

In conclusion, hybrid surgery can be an appropriate option to reduce surgical trauma in high-risk patients with aortic aneurysms and multiple previous cardiac procedures.

Conflicts of interest

The authors declare no conflicts of interest.

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