



# Surgery of Neoaortic Pseudoaneurysm with Transsternal Penetration in a HLHS Patient

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## Abstract

### Keywords

- ▶ aneurysm
- ▶ reoperation
- ▶ congenital heart disease
- ▶ aorta

**Background** Neoaortic pseudoaneurysm after previous surgery is rare and life-threatening.

**Case Description** We present a case of a 6th redo surgery in a 23-year-old male patient with a history of hypoplastic left heart syndrome presenting with transsternal penetration of aortic pseudoaneurysm. The previously implanted Dacron prosthesis showed semicircular dehiscence. It was exchanged by a Vascutek prosthesis during circulatory arrest and selective antegrade cerebral perfusion.

**Conclusion** Control imaging at 1 year after surgery was unobtrusive. Three years after surgery, the patient is alive and doing well.

## Introduction

Pseudoaneurysm of the thoracic aorta after previous surgery (aortic surgery and aortic valve replacement) is a rare and life-threatening condition.<sup>1</sup>

Herein, we report our surgical management of a neoaortic pseudoaneurysm with transsternal penetration as part of 6th redo in a patient with the history of hypoplastic left heart syndrome (HLHS).

The patient's legal guardian provided written informed consent for this case report.

## Case Description

A 23-year-old male patient was referred to our cardiac surgery department with the suspected diagnosis of mediastinal abscess, after deterioration of general condition, fever, and pressure-dolent parasternal swelling had led to external hospital admission. The patient, born with HLHS, had previously

undergone five cardiac operations at our center: Norwood operation, aortic arch patch plastic as treatment of residual aortic arch stenosis, hemi-Fontan with aorta-pulmonary shunt, Fontan completion, and replacement of the ascending aorta as treatment of false aneurysm. Additionally, the patient had undergone stent implantation at the upper cavopulmonary anastomosis and fenestration of the extracardial conduit. Occlusion of superior vena cava as well as statomotor and psychomotor retardation and condition after perioperative stroke were among his secondary diagnoses.

Positron emission tomography-computed tomography (CT) diagnosis revealed enhancement in the presternal and sternal area, as well as at the aortic prosthesis. An extravasate at the distal anastomosis of the ascending aorta prosthesis with a large pre- and retrosternal hematoma was ultimately revealed in CT angiography (▶ **Fig. 1**) and echocardiography. Therefore, the indication for surgery was given.

Arterial cannulation was established with a 17-Fr cannula through a 7-mm Intergard prosthesis (Getinge, Rastatt,

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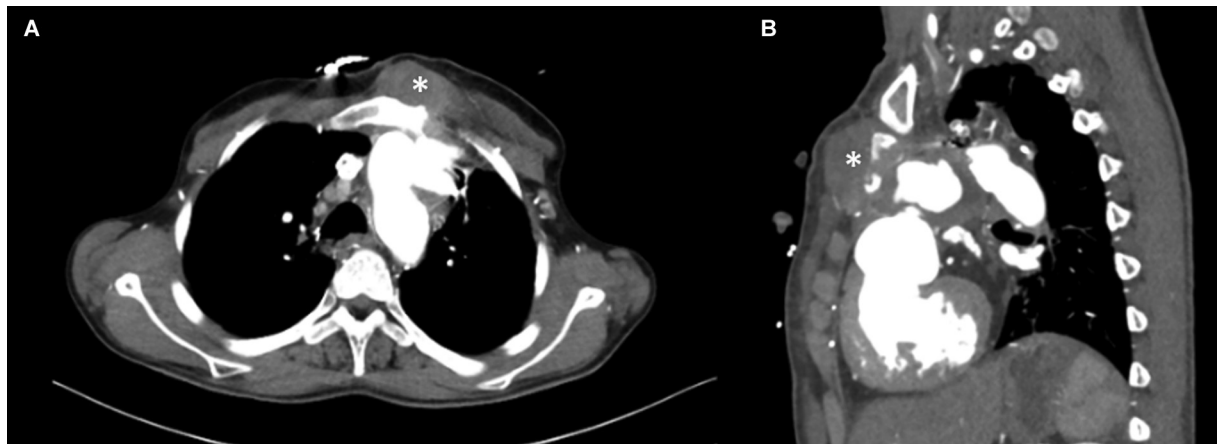
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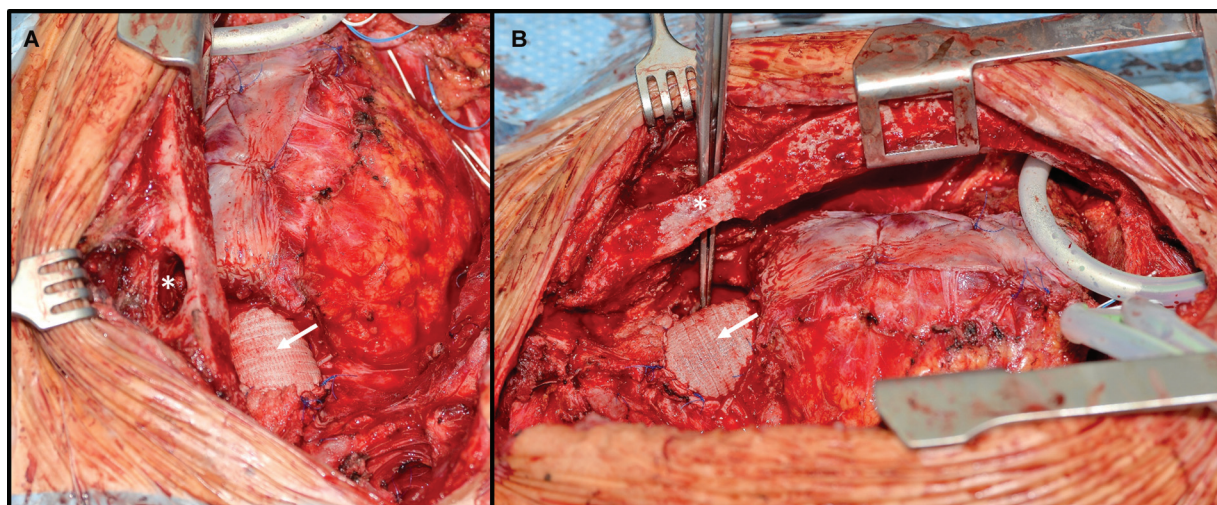


**Fig. 1** Computed tomography (CT) angiography showing an extravasate at the distal anastomosis of the ascending aorta prosthesis with a large hematoma in suspected communication with presternal space (marked with asterisk). (A) Transversal view, (B) sagittal view.

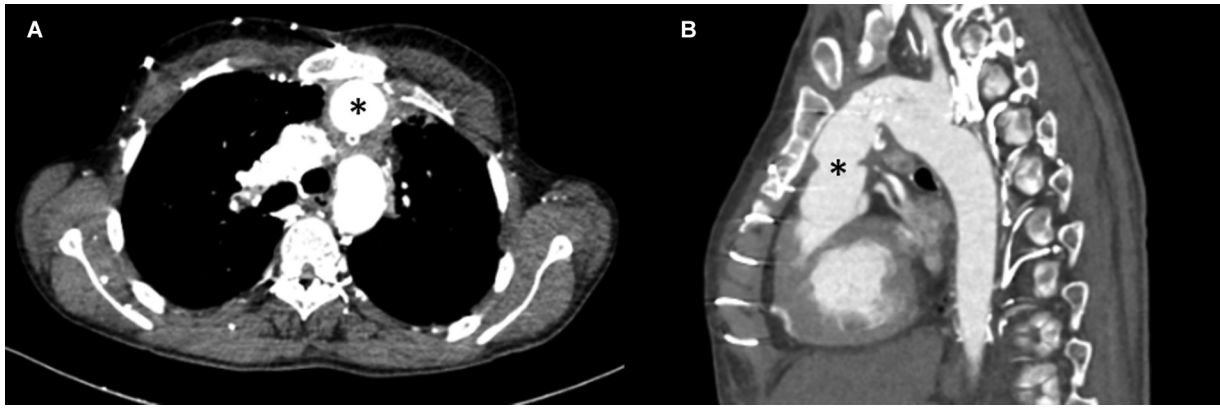
Germany) in the right femoral artery. Venous drainage was achieved through a 21-Fr femoral cannula. Additional arterial cannulation of the right subclavian artery with an 18-Fr cannula through a 7-mm prosthesis was necessary to achieve an adequate flow on extracorporeal circulation (ECC) and selective antegrade cerebral perfusion (SACP). After cooling to 18°C while performing partial inferior sternotomy and careful preparation of the system ventricle, ECC was switched to minimal flow in head-down position and sternotomy was completed using an oscillatory saw. Here, it was noted, that the presternal, 4 × 5 cm large hematoma was connected with the retrosternal left para-aortic space through a 1-cm defect in the sternal corpus (→**Fig. 2A**). After reestablishment of body weight corresponding ECC flow, the brachiocephalic trunk was exposed and snared. A large hematoma in the retrosternal, para-atrial space was evacuated. In the wake of evacuation, an arterial bleeding at the distal aortic prosthesis took place. Retrograde ECC was stopped and antegrade ECC was switched to unilateral SACP under near-infrared spectroscopy control. Exposure of the ascending aortic 22-mm Dacron prosthesis

showed a semicircular dehiscence at the distal anastomosis with the aortic arch. The prosthesis was removed with proximal and distal postresection. Histidine-tryptophan-ketoglutarate cardioplegia was applied to the heart already arrested by deep hypothermia through the coronary ostia. The valve of the system ventricle appeared tricuspid and showed no signs of degeneration or endocarditis. A 24-mm Vascutek prosthesis (Terumo, Inchinnan, United Kingdom) was implanted (→**Fig. 2B**). After 44 minutes, whole body perfusion was recommenced. After warming of the patient and defibrillation of the system ventricle, ECC was successfully weaned under low catecholamine dosage after 248 minutes of ECC time. Pericardial closure was performed with a Gore-Tex patch and primary chest closure could be performed.

Intensive care unit stay was prolonged due to impaired gas exchange in need of continuous positive airway pressure therapy as a result of a preknown plastic bronchitis and due to statomotor and psychomotor retardation of the patient. A paralytic ileus was successfully treated with propulsive measures. In the aortic explant, *Bacillus cereus* was identified.



**Fig. 2** Surgical result after Vascutek prosthesis implantation in neo-aorta (prosthesis marked with arrow), note the 1-cm defect in the sternal corpus after evacuation of hematoma (marked with asterisk), (A) cranial view; (B) surgical view.



**Fig. 3** Unobtrusive control computed tomography (CT) scan 1 year after surgery (ascending neo-aorta marked with asterisk), (A) transversal view, (B) sagittal view.

Hence, an antibiotic therapy with vancomycin for 4 weeks, followed by clindamycin treatment for 2 weeks was performed as recommended by the antibiotic stewardship team of our center.

CT and echocardiography control imaging 1 year after surgery was unobtrusive (► **Fig. 3**).

Three years from surgery, the patient is still alive and doing well.

## Discussion

Mediastinal aortic pseudoaneurysms represent an uncommon complication after surgery of the thoracic aorta or aortic valve.<sup>1</sup> A transsternal penetration of such aneurysms is extremely rare. To our knowledge, such condition has only been reported sporadically in adult patients.<sup>2,3</sup> We describe such a condition in a grown-up congenital heart (GUCH) patient with a history of HLHS.

In such cases, there is no single standard scheme of perfusion management. Due to complex anatomical condition in GUCH patients, we recommend a combination of antegrade and retrograde perfusion with deep hypothermia. Antegrade perfusion is used for SACP within distal cardiovascular arrest. Deep hypothermia protects myocardium from ischemia before the possibility of cardioplegia application. This approach is similar to safety level 4, described by

Mohammadi et al for the treatment of false aneurysm of the ascending aorta after its prosthetic replacement.<sup>4</sup>

As in all complex cardiac redo surgical procedures, a careful stepwise planning is needed beforehand to provide for all contingencies.<sup>5</sup>

## Funding

None.

## Conflict of Interest

None declared.

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