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## Surgery of neo-aortic pseudoaneurysm with trans-sternal penetration in a HLHS patient

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**Conflict of Interest:** The authors declare that they have no conflict of interest.

### Abstract:

Neo-aortic pseudo aneurysm after previous surgery is rare and life-threatening. We present a case of a 6th re-do surgery in a 23-year-old male patient with a history of hypoplastic left heart syndrome presenting with trans-sternal penetration of aortic pseudoaneurysm. The previously implanted dacron prosthesis showed semi-circular dehiscence. It was exchanged by a Vascutek prosthesis during circulatory arrest and selective antegrade cerebral perfusion.

Control imaging at 1 year after surgery was unobtrusive. 3 years after surgery, the patient is alive and doing well.

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# Surgery of neo-aortic pseudoaneurysm with trans-sternal penetration in a HLHS patient

## **Abstract:**

Neo-aortic pseudo aneurysm after previous surgery is rare and life-threatening. We present a case of a 6<sup>th</sup> re-do surgery in a 23-year-old male patient with a history of hypoplastic left heart syndrome presenting with trans-sternal penetration of aortic pseudoaneurysm. The previously implanted dacron prosthesis showed semi-circular dehiscence. It was exchanged by a Vascutek prosthesis during circulatory arrest and selective antegrade cerebral perfusion.

Control imaging at 1 year after surgery was unobtrusive. 3 years after surgery, the patient is alive and doing well.

## **Keywords**

Aneurysm

Reoperation

Congenital heart disease

Aorta

## **Introduction:**

Pseudo aneurysm of the thoracic aorta after previous surgery (aortic surgery and aortic valve replacement) is a rare and life-threatening condition [1].

Herein we report our surgical management of a neo-aortic pseudo aneurysm with trans-sternal penetration as part of 6th redo in a patient with the history of hypoplastic left-heart syndrome.

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 hypoplastic left heart syndrome (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 stentimplantation at the upper cavo-pulmonary anastomosis and fenestration of the extracardial conduit. Occlusion of superior vena cava as well as stato- und psychomotor retardation and condition after peri-operative stroke were amongst his secondary diagnoses.

PET-CT diagnosis revealed enhancement in the pre-sternal 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 (figure 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, 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 whilst 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 pre-sternal, 4x5 cm large hematoma was connected with the retrosternal left para-aortic space through a 1 cm defect in the sternal corpus (figure 2 a). After re-establishment 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 NIRS control. Exposure of the ascending aortic 22 mm Dacron prosthesis showed a semi-circular dehiscence at the distal anastomosis with the aortic arch. The prosthesis was removed with proximal and distal post-resection. HTK cardioplegia was applied to the heart already arrested by deep hypothermia through the coronary ostia. The valve of the system ventricle appeared tri-cuspid and showed no signs of degeneration or endocarditis. A 24 mm Vascutek prosthesis (Terumo, Inchinnan United Kingdom) was implanted (figure 2 b). 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 min of ECC time. Pericardial closure was performed with a Gore-Tex patch and primary chest closure could be performed.

ICU-stay was prolonged due to impaired gas-exchange in need of CPAP therapy as a result of a pre-known plastic bronchitis and due to stato- and psychomotor retardation of the patient. A paralytic ileus was successfully treated with propulsive measures. In the aortic explant, *Bacillus cereus* was identified. Hence, an antibiotic therapy with vancomycin for four weeks, followed by clindamycin treatment for two weeks was performed as recommended by the antibiotic stewardship team of our center.

CT and echocardiography control imaging one year after surgery was unobtrusive (figure 3).

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

## **Discussion:**

Mediastinal aortic pseudo-aneurysms represent an uncommon complication after surgery of the thoracic aorta or aortic valve [1]. A trans-sternal penetration of such aneurysms is extremely rare. To our knowledge, such condition has only been reported sporadically in adult patients [2,3]. We describe such a condition in a GUCH patient with a history of hypoplastic left heart syndrome.

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 and colleagues for treatment of false Aneurysm of the ascending aorta after its prosthetic replacement [4].

As in all complex cardiac re-do surgical procedures, a careful stepwise planning is needed beforehand to provide for all contingencies [5].

## **Funding**

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## **Conflicts of interest**

None.

## **References:**

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Figure 1 CT-angiography showing an extravasate at the distal anastomosis of the ascending aorta prosthesis with a large hematoma in suspected communication with pre-sternal space (marked with asterisk). a: transversal view, b: sagittal view.

Figure 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.

Figure 3 Unobtrusive control CT-scan one year after surgery (ascending neo-aorta marked with asterisk), a: transversal view, b: sagittal view.

