Case Report

A composed graft for subclavian artery reconstruction in case of redo surgery for aortic coarctation

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A B S T R A C T

We report the case of a 66-year-old woman admitted to the intensive care unit (ICU) for ongoing dyspnea and hemoptoe. She was operated upon in 1979 for aortic coarctation by the interposition of a 14 mm Dacron prosthesis from the left subclavian artery to descending aorta. Clinical evaluation performed over the years was normal with no signs of cardiac failure or prosthesis malfunctioning. The computed tomography scans (CT) showed a progressive increase of the descending aorta diameters and the onset of a pseudo-aneurysm of 50 mm in diameter. Patient was re-operated through a median sternotomy enlarged by a left thoracotomy and intra-operative findings revealed the pseudo-aneurysm originating from a dehiscence of the proximal suture. In order to allow a safe reconstruction of the dilated subclavian artery, a T-shaped composed graft was confectioned and then sutured to the descending aorta and the subclavian artery, respectively. Post-operative course was uneventful and three months CT scan showed a normal position of the composed graft.

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1. Introduction

The open surgical repair remains the gold standard of care for aortic coarctation, yielding excellent results in terms of mortality and morbidity eventhough the rate of late complications increases over the years with a rupture-related mortality reaching about 7%. Redo surgery may be challenging for the poor quality of tissues, mostly in case of dilated subclavian artery. We present a simple trick for the reconstruction of the dilated subclavian artery using a composed vascular graft.

2. Case report

A 66-year-old woman was admitted to ICU for ongoing dyspnea, fever and hemoptoe. She was operated upon in 1979 for aortic coarctation by the interposition of a 14 mm vascular prosthesis from the left subclavian artery to the descending aorta.
graft amongst the proximal tract of the subclavian artery and the descending aorta. Patient had a regular follow up (clinical evaluation) over the years and she was monitored by CT scans, every one or two years. A progressive increase in the diameters of the descending aorta was noted year by year; thus, the CT scans were kept closer (every 6 months). The last CT scan showed a patent vascular prosthesis and a saccular pseudo-aneurysm (that was not clearly visible at CT scan six months before) of 45 × 49 mm in diameter, compressing the surrounding structures as the left bronchus (Fig. 1). Patient was then scheduled for routine surgery. Few days later, she was admitted for hemoptoe leading to an emergent operation (suspecting an aorto-brochial fistula) through a median sternotomy enlarged by a left thoracotomy to the 3rd intercostal space. A postero-lateral thoracotomy was avoided because of the emergent condition.

Cardiopulmonary bypass was established between a Y shaped arterial line (amongst ascending aorta and femoral artery) and the right atrium. The aortic arch, the descending aorta and the vascular graft were dissected and carefully exposed, whereas the pseudo-aneurysm was left untouched until the aortic clamping. Two standard clamps were placed to the aortic arch (before the subclavian artery) and to the vascular graft (near the distal suture), respectively.

The pseudo-aneurysm was a soft structure with a smooth surface, closely adherent to the left lung, red/grey in colour, containing clots and different materials. After wall incision and inspection, the proximal suture was dehiscent with a complete detachment of the vascular graft that was removed from the subclavian artery to 1 cm proximally to the distal anastomosis. The pseudo-aneurysm and the dilated portion of the subclavian artery were carefully removed, without touching the posterior-lateral wall of the artery where a patch was sutured later.

In the meantime, a composed vascular prosthesis was confectioned by an end-to-side suture (polypropylene 5/0) amongst two 14 mm vascular grafts (Fig. 2A). Then, the roof of

the horizontal branch was cut, resulting in a larger patch for subclavian artery reconstruction (Fig. 2B).

Afterwards, under lateral clamping of the descending aorta, the proximal branch of the T-shaped graft was sutured to the aortic wall by a continuous 4/0 polypropylene suture. The subclavian wall was then reconstructed by means of a patch of the horizontal branch by a polypropylene 4/0 suture (Fig. 3). After careful air venting, the aortic clamps were removed and the cardiopulmonary bypass was interrupted (Fig. 4A). The pseudo-aneurysm was not sent to the pathological study because the intraoperative finding was strongly suggestive of the lesion.

The postoperative course was uneventful and the patient was discharged on 6 postoperative day (POD).

CT scan performed three months later showed a normal position of the composed graft (Fig. 4B) and at six months follow-up patient was alive without discomforts.

### 3. Discussion

The surgical treatment is nowadays the standard of care for aortic coarctation with different strategies described so far.
The incidence of aneurysmal complications increases over the years and ranges from 3\% for end-to-end anastomosis to 5–28\% for Dacron-patch aortoplasty. A conservative approach for aneurysmal complications should be avoided for the high risk of sudden rupture. Knyshov et al. reported a 100\% rate of rupture within 15 years, while Cohen et al. reported an aortic-related death rate of 7\% in case of previous surgery for aortic coarctation.

Current thoracic aorta guidelines recommend surgery on saccular aneurysms larger than 20 mm or when total aortic diameter is larger than 55 mm. In this case, the pseudoaneurysm became clear at the last CT scanning, with a diameter increase up to 50 mm suggesting an acute cause of the enlargement such as infection (fever). Moreover, the hemoptoe could be caused by an aorto-bronchial fistula; so an emergent operation through a median sternotomy was preferred to a posterior thoracotomy in order to obtain a complete control of the surgical field.

We preferred to perform the surgery on total cardiopulmonary bypass instead of using a left heart bypass because the risk of a sudden laceration of the left pulmonary artery branch during adhesions lysis was high and total cardiopulmonary bypass was recommended for a safe control in case of right heart injury.

The rationale for performing the patch reconstruction instead of an anatomic repair of the aorta with a conventional Dacron graft (end to end anastomosis proximal to left subclavian artery and end to end anastomosis to descending aorta) with a side branch, dealt with the large dimensions of the subclavian artery that would not allow a safe reconstruction using a standard vascular graft: in fact, it was quite hazardous to use the suture of a 12–14 mm vascular graft with a 50 mm subclavian artery. Our composed graft has allowed a remodeling of the subclavian artery that was significantly reduced in diameter (Fig. 4A and B).

Redo surgery for aortic coarctation is a challenging matter and is affected by high rate of mortality and morbidity, including paraplegia, bleeding and recurrent nerve paralysis. The quality of tissues and the dilation of the subclavian artery are significantly related to the surgical outcome because they may increase the risks of injuries and sudden bleeding, leading to a more complicated surgical strategy. The possibility of the reconstruction of the dilated subclavian artery is noteworthy.
because it may prevent further dilation, reducing the risk of rupture. This is a simple trick in case of aortic coarctation, to treat a dilated subclavian artery by means of a vascular patch, previously sutured with another vascular prosthesis by an end-to-side anastomosis. This composed graft allows a safe reconstruction of the subclavian wall and an adequate flow to the distal aorta. It may be used either as a first approach or in case of redo surgery for aortic coarctation.

We believe that magnetic resonance imaging (MRI) may offer a sharper imaging of the thoracic aorta in the follow up of patient operated for aortic diseases; unfortunately, this patient was claustrophobic and the CT scan was safer to avoid patient’s agitation and errors during scans due to movements.

In conclusion, our patient had no complications related to the technique and three months CT scan revealed a patent vascular graft and a decrease of the subclavian artery diameters.

Conflicts of interest
All authors have none to declare.

REFERENCES