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Case Report

Endovascular Treatment with a Branched Arch Endograft of an Aneurysmal Dissection of Innominate Artery in a Marfan Patient

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Abstract

Here we will discuss a 38-year-old Caucasian patient, presenting with Marfan disease, integrated in a family history, who benefited from endovascular surgical management of her innominate artery (IA) dissection with aneurysmal progression.

Keywords: Endovascular treatment; aneurysmal dissection; innominate artery; Marfan patient; (TEVAR); hybrid operative room

Introduction

Because this is an observational work, institutional review board approval was not necessary.
Patient consent was obtained to include their information in this publication.
All authors report no conflicts of interest or funding sources.

Central Message

The first report of endovascular treatment by branched arch endograft of an aneurysmal dissection of innominate artery in Marfan patient.

Case presentation:

Here we will discuss a 38-year-old Caucasian patient, presenting with Marfan disease, integrated in a family history, who benefited from endovascular surgical management of her innominate artery (IA) dissection with aneurysmal progression.
She has a medical past history related to her Marfan disease:

- Valvular heart disease with mitral plasty in 2000
- Mechanical Bentall in 2012.
- Cardiac transplantation in January 2019 in a context of postpartum left ventricular dysfunction.
- Type B aortic dissection in February 2019 with extension of the left subclavian artery (LSA). She was treated by Thoracic endovascular repair (TEVAR) and STABILISE with LSA reimplantation, with a CT-scan control showed a good result, despite a suspended dissection of the left common carotid artery.

During the follow-up, a percutaneous (right cervical punction) myocardial biopsy was performed for chronic reject suspicion and an innominate artery dissection with aneurysmal evolution has been identified on the CT scan performed in January 2021. The initial diameter of the TABC was 29*29mm, the decision for treatment was made in view of the increase in IA diameter to 32*31mm and volume from 22.4 cm3 to 26.2 cm3 (approximately 20%) (Figure 1).

It was decided after a multidisciplinary meeting to choose an endovascular approach in this patient with a group C innominate artery aneurysm, in front of an operative risk evaluated at 30% with open repair (transplanted patient, quadridux, pectus excavatum, ...), with a custom-made branched arch endograft 28-32mm (Terumo Aortic, USA).

The procedure was performed under general anesthesia with fusion imaging in a hybrid operative room. There was a right common carotid dissection, and we decided to perform after systemic heparinization a right carotid-subclavian bypass with a right common carotid graft replacement through right cervicotomy to ensure a distal landing zone for the right branch and we choose a Left axillary approach to left branch.

Bilateral percutaneous femoral access was obtained routinely. The device is advanced over a trans-valvular Lunderquist stiff wire (Cook Medical). After a control aortogram, the branched endograft was deployed via the femoral stiff wire under rapid pacing.

After the branched stent graft deployment there were no carotid pulse due to a compression of the tunnels in the ascending aorta. We rapidly decided to place 2 covered stents for the right side (VIABAHN 13*10) by puncturing the right common carotid artery, this allows a right carotid pulse to be recovered. We also decided to place 1 covered stent for the left side (VIABANH 10*10) by puncturing the left axillary artery after identification of the re-implantation of the left subclavian artery. There was an estimated low flow of 10 minutes for the right side and 25 minutes for the left side (with a bispectral index > 45, a still sinus rhythm, and a temperature of 34.8° during this period). In a second step, it was decided to complete the procedure by placing two covered stents (V12 12-59mm and 10-59mm for the right and left side respectively) considering the compression of the tunnels in the ascending aorta.

Total surgery time was 285 minutes with a total fluoroscopy time of 76 minutes and a total radiation dose of 34 Gy.cm². Femoral accesses sites were closed using Proglide sutures. The other surgical access were closed in the conventional way.

There were no neurological deficits on awakening or in the postoperative period.
The follow-up was marked by:

- Left axillary hematoma with reintervention at Day 6: Clavien-Dindo 3b.
- Right pleural effusion drained at Day 10: Clavien Dindo 3a.

Postoperative CT scan showed a good exclusion of the IA aneurysm, complete aortic remodeling, and an aortic arch stenosis due to endograft compression. The pressure gradient was measured at 20 mmhg, and the patient remain asymptomatic. We decided to begin a curative anticoagulation with unfractionated heparin and then AVK.

The patient was discharged to the ICU at D25 and spent 6 days in the ICU immediately after the operation. She recovered uneventfully without neurological sequelae. The 1-year follow-up showed aneurysm exclusion and regression, with good branch patency, and a complete aortic remodeling without endoleaks (Figure 2).

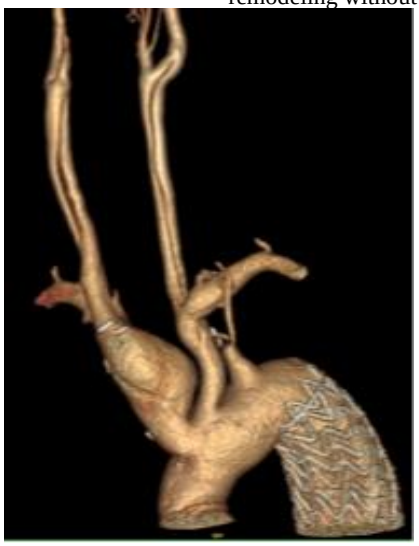

Figure 1: Preoperative CT scan 3 months before surgery

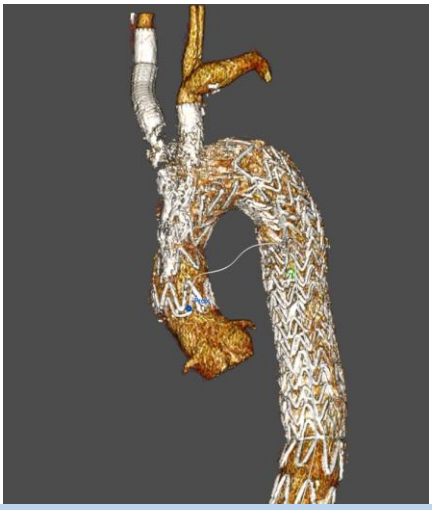

Figure 2: Postoperative CT scan 16 months after surgery

Discussion and conclusions:

Main cause of innominate artery aneurysm is arteriosclerosis, but other etiologies can cause a innominate aneurysm like connective tissue diseases, trauma, infectious complications or certain inflammatory

diseases. Rupture is the most threatening complication, but embolization phenomena is also possible despite a small aneurysm [1].

Treatment is surgical, with the current standard of care who remains open surgery [2]. This surgical treatment can also be done by hybrid or endovascular approach, mainly in group A aneurysm for the last.

Connective tissue diseases such as Marfan's disease are generally a relative contraindication to endovascular management [3]. due to the risk of dilatation or dissection of the aorta or its branches at the stent graft landing zones during deployment. Indeed, an open or hybrid approach should be preferred to make a suitable landing zone in these cases.

Recently, a similar case was managed by a hybrid approach with a sternotomy approach to the aorta and placement of an anterograde stent graft [4].

Several cases of TABC aneurysms have already been treated endovascularly, but these were mainly group A aneurysms, with exclusion of the aneurysm without considering the aortic arch as was done here in front of this group C aneurysm [5].

To our knowledge, this is the first time that an aneurysmal dissection of the TABC has been treated with an aortic arch branch stent graft, which is usually reserved for aortic arch aneurysms.

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