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How Aortic Stent Grafting Could Improve Treatment of Thoracic Aortic Aneurysms

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Abstract | **Case Report**

Thoracic aortic aneurysms (TAA) are degenerative conditions of the arterial wall with high morbidity and mortality. Traditionally managed by open surgery, descending thoracic aortic aneurysms (DTA) are now increasingly treated via endovascular aortic repair (TEVAR), which offers significant benefits in terms of survival and postoperative recovery. This article discusses the pathophysiology of TAA, highlights the advantages of aortic stent grafting, and presents a clinical case of a 56-year-old patient with a 17 cm saccular aneurysm successfully treated using TEVAR. The report outlines the technical steps involved, the characteristics of modern endoprostheses, and concludes with the growing role of minimally invasive techniques in vascular surgery.

Keywords: Descending thoracic aortic aneurysm, Aortic stent graft, Vascular surgery, Case report, Minimally invasive surgery, Surgical vs endovascular treatment.

INTRODUCTION

The aorta is the largest diameter artery in humans, the diameter of the descending aorta varies from 3 to 2.4 cm [1]. We talk about an aortic aneurysm (AA) when the diameter is greater than 4 cm [1]. These are diseases of the arterial wall [1] Aortic aneurysm is the 13th cause of death in Western countries [2,3]. The incidence of thoracic aortic aneurysms is estimated at 4.5 cases per 100,000 [2-4]. Descending thoracic aortic aneurysms (DTA) represent approximately 40% of thoracic aortic pathologies. The standard treatment for ATD has long been the flattening-graft with implantation of a prosthesis under extracorporeal circulation for ATD measuring more than 6 cm. Operative mortality rates for elective DTA surgery vary between 6 and 15%, and are considerably higher in cases of urgent surgery. The introduction in the 1990s of endovascular treatment of aortic aneurysms (AAA) revolutionized the learning and practice of vascular surgeons. [5] The introduction in the 1990s of endovascular treatment of aortic aneurysms (AAA) revolutionized the learning and practice of vascular surgeons. [6] The concept of a covered stent for the treatment of aortic aneurysms has a dual authorship since the first cases were published in 1986 by Volodos [7] and in 1991 by Parodi [8]. The obvious and immediate interest of endovascular treatment of AATD is to avoid a surgical procedure whose complexity is linked to the need for thoracotomy, selective intubation with pulmonary exclusion, circulatory assistance with frequent systemic heparinization and proximal aortic clamping in patients often with comorbidities in these degenerative pathologies.[9] treatment with thoracic endoprostheses for ATD seems to provide a likely benefit in terms of mortality (up to 4 times less than elective surgery). Similarly, immediate postoperative severe morbidities tend to be reduced by half. [5] at 5 years Most patients die from problems not related to aortic pathology but from cardiovascular complications and cancers.[5]

PATHOPHYSIOLOGY

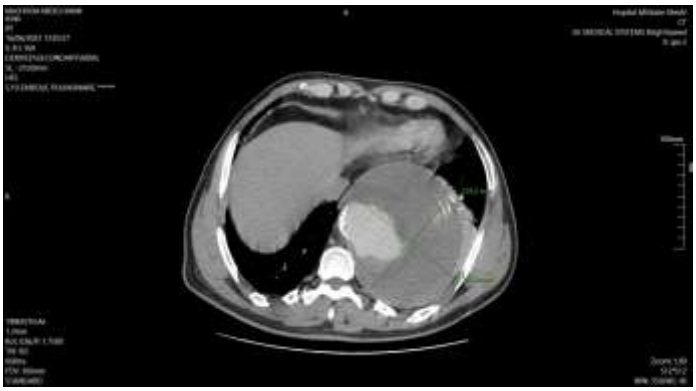
These are diseases of the arterial wall. They begin with lesions of the media, which is the muscular tunic of the arteries. These lesions are caused by structural abnormalities of the wall, trauma, the consequences of an infection or even atherosclerosis [1]. Thus weakened, under the effect of blood pressure, the aorta dilates and will be likely to rupture and lead to the death of the patient by internal bleeding.[10] Aortic aneurysms are degenerative aneurysms. They are related to 3 phenomena: proteolysis (degradation) of the extracellular matrix, the progressive disappearance of smooth muscle cells of the media, replaced by areas of

mucoid degeneration, rich in vacuoles and sulfated polysaccharides (giving a positive Alcian blue stain). Aortic arch aneurysms (annuloectatic aortic diseases) can be idiopathic or associated with connective tissue diseases such as Marfan syndrome, Ehler-Danlos syndrome or bicuspid valves [2,4]. Twenty percent of Marfan syndrome patients receive surgery for aortic root aneurysms [11]. Other causes are rare. Chronic dissections of the ascending aorta usually develop with an associated aneurysm [2,4]. Aneurysm formation following bacterial infection of the wall of the ascending aorta is rare. Syphilis, once the main cause of ascending aortic aneurysms, is now extremely rare. Arteritis is even rarer; Takayasu's disease usually produces obstructive lesions, but may present with aortic aneurysms in 15% of cases [2]. Giant cell arteritis can also involve the aorta [12].

OBSERVATION

Mr **MACHROUM ABDELKARIM**, 56 years old, with no previous history, consulted the emergency department for chest pain with progressive epigastralgia, three months ago Clinical examination revealed a patient who was conscious, hemodynamically stable and showing signs of congestive heart failure. with chest X-ray showing mediastinal widening and thoraco-abdomino-pelvic CT angiography in favor of a saccular ascending thoracic aortic aneurysm of 117 mm in diameter extending over 118 mm. Inflammatory, thrombophilic and infectious tests done by internists were without particularity.

Front thoracic X-ray showing mediastinal Enlargement



cross-section showing a17 cm diameter thoracic saccular aneurysm

Angioscan frontal section showing a thoracic saccular aneurysm 17 cm in diameter

THERAPEUTIC STRATEGY:

Medical management:

The patient was treated with a B-Blocker as it has a negative chronotropic inotropic effect and also reduces the mean arterial pressure applied to the aortic wall, particularly during physical effort. antiplatelet (aspirin 75mg/ days) and statin (Atorvastatin 20 mg/ days) to reduce intramural thrombus formation and control cardiovascular risk factors.

Endovascular management:

**Characteristics of aortic endoprostheses

They consist of two main components: a metal stent (framework) and a prosthetic coating. The stent (metal frame) is made of Nitinol (an alloy of nickel and titanium) for its shape memory and biocompatibility, while the prosthetic lining (sheath or synthetic fabric) is made of ePTFE (expanded polytetrafluoroethylene): a highly resistant, microporous material.[13]

** Endovascular navigation and preoperative image acquisition

High-quality imaging is essential for the placement of aortic stents, with a hybrid room combining a high-performance fixed imaging system with a conventional surgical environment including rigorous asepsis and radiation protection.

** Technique for aortic endoprosthesis placement for aortic aneurysm

- Under spinal anesthesia and antibiotic prophylaxis,
- Vascular access: surgical approach of both scarpa with control and puncture of both common femoral arteries with placement of an 18F introducer.
- Stent placement: navigation using a 0.035 hydrophilic guide to move the aneurysm, then mounting a pigtail probe under the guide and opacification to highlight the aneurysm with upper and lower markers, followed by insertion of a rigid guide (Lunderquist type) and advancement of the stent under fluoroscopic guidance.
- Deployment: Precise positioning of the stent graft in the proximal anchoring zone, then progressive deployment of the stent graft by removing the sheath. Final check by angiography to verify:(Exclusion of the aneurysm. Absence of leakage (endoleak). Permeability of collateral branches).
- Closure: Removal of material and closure of surgical approach Intensive postoperative monitoring for 48 hours.

CONCLUSIONS

Aortic surgery has been revolutionized by endovascular techniques. Endoprosthesis has become the gold standard for aneurysms of the abdominal sub-renal aorta and thoracic aorta with favorable anatomy. Endovascular treatment of thoracoabdominal aneurysms

The endovascular treatment of thoracoabdominal aneurysms is an option for patients at surgical risk and in expert hands, while the endovascular treatment of thoracic aortic aneurysms remains in the realm of controlled studies. It should be noted that these technological advances have allowed the development of hybrid operating theatres with superior imaging capabilities, enabling other less invasive venous or arterial vascular techniques to be performed.

Highlights

- Thoracic aortic aneurysms (TAAs) are life-threatening vascular conditions with a high mortality risk if left untreated.
- Endovascular stent grafting (TEVAR) is a procedure that has reduced operative mortality and morbidity compared with traditional surgery.
- A case of a giant saccular thoracic aortic aneurysm (17 cm) is presented and successfully managed using endovascular techniques.

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