Clinical Case

Endovascular treatment for Type III Endoleak by disconnection of aortic stent graft components

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ABSTRACT

Endovascular repair of abdominal aortic aneurysms (EVAR) has expanded in recent years. Compared to surgical repair, EVAR is associated with lower 30-day morbidity and mortality although it has higher reintervention rates due to the presence of endoleaks during follow-up. We put forward the case of an 81-year-old patient who, four years after EVAR, presented with a type 3 endoleak owing to disconnection between the main body and the proximal cuffs of the endograft. Emergency endovascular treatment was performed via both surgical and percutaneous femoral access. The endograft components were threaded through a catheter and hydrophilic wire, respectively, and then replaced with two Lunderquist wires, achieving acceptable alignment. Finally, a thoracic endograft was implanted with sufficient overlap in the disconnection area, thus sealing the endoleak. The patient progressed without major complications and was discharged 48 hours after the procedure.

INTRODUCTION

Endovascular aneurysm repair (EVAR) is recommended for patients presenting favorable anatomy and a reasonable life expectancy. Also, we should consider the treatment modality preferred for elective abdominal aortic aneurysm (AAA) repair (class IIa recommendation, level B of evidence).[1]

EVAR, compared with surgical repair, is associated to less mortality and morbidity within 30 days, and discharge is also faster. However, it is also associated to higher rates of reintervention than conventional surgery, and the presence of endoleaks is the most frequent indication.[2,3]

The definition of endoleak is the presence of continuous blood flow toward the aneurysm sac outside the endograft. Endoleaks are classified into primary, when they occur during the endograft implant, or secondary, when they manifest during follow-up.

White et al. classified this post-EVAR complication into: 1) endoleak type 1: proximal (1a) or distal (1b): they correspond to a fixation defect of the endograft to the wall due to incomplete opening, tortuosity or angulation; 2) endoleak type 2: they occur when there is retrograde blood flow in the aneurysm sac through an excluded aortic branch, most commonly the inferior mesenteric artery or a lumbar artery; 3) endoleak type 3: from a disconnection of components (3a) or fabric defect (3b); 4) endoleak type 4: defined as secondary to prosthetic material porosity.[4]

Although a rare entity, endoleak type 3 can lead to aneurysm sac increase, enhancing the risk of rupture.

As years pass, endografts have evolved achieving a decrease in the number of complications, including endoleaks, and overcoming anatomical limitations challenging for implantation.

Anatomical fixation in the aortic bifurcation, and a modular proximal cuff for aortic seal, differentiate the AFX endovascular AAA system (Endologix) from many other endoprosthetic products.

This model of endograft has several advantages associated with anatomical fixation; however, some reports showed an increase in endoleaks type 3a (ET3a).[5]

In response, Endologix improved the device material and released new endograft models to the market. Several studies later showed a decrease in ET3a in comparison with first-generation endografts.[6]

However, there is an ongoing discussion in terms of the presence of ET3a in long-term follow-up after EVAR with this type of endografts.

We present the case of a patient carrier of AAA treated by endoprosthesis, in whom component overlapping was lost, leading to structure disconnection during distant follow-up (4 years), originating ET3a. We present the endovascular treatment for said complication, using thoracic branch endoprosthesis.

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CLINICAL CASE PRESENTATION

Female, 81-year-old patient. History of hypertension, former smoker. Chronic obstructive pulmonary disease (COPD). Hypothyroidism. Previous medication: losartan 100 mg/day, nebivolol 10 mg/day, spironolactone 100 mg/day, rosuvastatin 10 mg/day, clopidogrel 75 mg/day, T4 100 mcg/day.

AAA started 25 mm below the level of the renal arteries origin. Cylindrical and regularly-shaped neck, of 28 mm, with 45° angle between infrarenal neck axis and aneurysmal lumen axis. Saccular dilatation extends distally 110 mm until iliac bifurcation, reaching a greater diameter at abdominal level, of 98 mm, with mural thrombus.

Due to the high surgical risk, mainly due to COPD, and as she presented favorable anatomy, endoluminal treatment was indicated to exclude AAA. After anatomical evaluations and the endoprosthesis being granted by the medical insurance of the patient, the procedure was scheduled.

In December 2020, EVAR was carried out by placement of bifurcated Endologix AFX2 BEA® endograft, main body 25-80/I13-40, an Endologix VELA® proximal extension of 28-28 mm of diameter x 95 mm of length (A28-28/C95-O20), and a second Endologix VELA® extension of 28-28 mm of diameter x 75 mm of length (A28-28/C75-O20).

The patient coursed without complications. One year later, CT angiography was carried out, ruling out the presence of endoleaks.

Later, she dropped medical controls, being readmitted due to abdominal pain of sudden onset, accompanied by profuse sweating and hypotension in January 2025.

Emergency CT angiography was carried out, showing infrarenal saccular aneurysmatic dilatation of 116 mm of length x 105 mm of cross diameter, with active extravasation compatible with endoleak type 3 by disconnection of components, proximal extensions of the main body *(Figure 1A and B).*

Abdominal aortogram was carried out. Fluoroscopic imaging showed disconnection of the endograft as the cause for the endoleak *(Figure 1C).*

Endovascular treatment was applied again. It consisted of surgical access and exposition of right common femoral artery, direct puncture of this artery and placement of 7F introducer under 0.035" guide wire, percutaneous puncture of left common femoral artery and placement of 6F introducer under guide wire 0.035".

By right access, a Cobra 5F hydrophilic catheter was advanced under hydrophilic guide wire. The body of the endograft was ascended through it, and later threaded and ascended through the proximal extensions, then positioning distal guide wire and catheter in the aortic arch. It was exchanged by Lunderquist guide wire, which did not achieve endograft components alignment. For this reason, the maneuver is repeated from the left femoral access threading the components. Subsequently, it was exchanged by marker pigtail catheter, where angiographic test was made *(Figure 2A).*

Next, it was exchanged by a second Lunderquist guide wire. This maneuver of adding a second guide wire with the stiffness of the Lunderquist one determined for the main body of the endograft to align with the proximal extensions. Thus, a Medtronic ValiantTM thoracic endograft, with CaptiviaTM release system (36-36/24F, of 107 mm of length), was ascended with good support through the right surgical access. It started to be released, achieving enough overlap in the disconnection area, with the proximal extensions (5 cm) and with the body of the previously implanted bifurcated endoprosthesis (5 m), sealing the endoleak area *(Figure 2B).*

Next, expansion of the new implanted prosthesis was carried out with an elastomeric balloon *(Figure 2C)*. Finally, control testing was made, not showing any leak *(Figure 3).*



FIGURE 1.
A) and B) Axial and coronal image obtained from emergency CT angiography made 4 years ago post-EVAR. Saccular aneurysmatic dilatation is observed, of 116 mm of length x 105 mm of cross sectional diameter and active extravasation (red arrow) toward the aneurysmatic sac. C) Fluoroscopic image of endograft showing proximal extensions disconnection (black arrow) from the main body (white arrow) of the endograft.

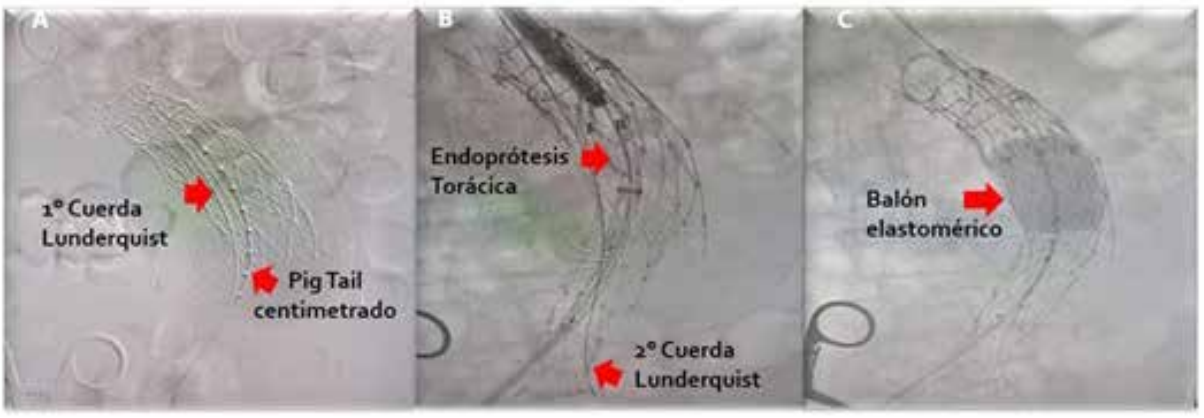


FIGURE 2.
Reconnection of endograft components by bilateral femoral access. A) First extra-stiff Lunderquist guide wire by right femoral access. B) Second extra-stiff Lunderquist guide wire by left femoral access and thoracic endoprosthesis being ascended by right femoral access. C) Elastomeric balloon inflation in overlapping area.

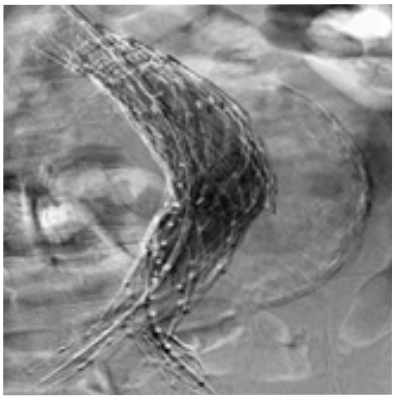


FIGURE 3.
Final angiographic image after thoracic endoprosthesis implantation to treat endoleak type 3 by disconnection of previously implanted abdominal endograft components, with aneurysmatic sac exclusion being visible.

The patient coursed the postoperative period with no major complications and was discharged 48 hours later.

DISCUSSION

The incidence of endoleak type 3 is low. Clinical trials like the EVAR Over and registries like the EUROSTAR show an incidence of 3 to 4.5%. If the incidence of ET3a is analyzed according to the device used, we observe a higher presentation in first-generation devices compared with the current third-generation ones, recording a 1% incidence with the latter, with the subsequent reduction in post-EVAR reinterventions.[7,8,9]

An early diagnosis of this post-EVAR complication in follow-up is essential. It has been established that multislice CT with IV contrast is the study of choice to assess the appearance of leaks within the first month after the surgery, to then repeat controls at 6 and 12 months, and then once a year.

The Endologix device has the advantage of passive anatomical fixation in the aortic bifurcation, preventing the distal migration of the main component, and later proximal anchoring is made.

In the follow-up, endoleak type 3 has been detected, both early and late, as a consequence of the design proper of the endograft (fabric fixation with the device only in the superior and inferior ends).[10]

The disconnection of the endograft components may occur between the main module (bifurcated body) and a main proximal extension, or between the main body and the iliac extension.[11]

Several reports show a greater frequency of ET3a with Endologix AFX devices.[12,13,14,15]

According to the system of notifications of Medical Devices from the US Food and Drug Administration (FDA), and the yearly clinical updates for physicians provided by manufacturers, a line of Endologix AFX endografts (AFX with Strata, AFX with Duraply and AFX2) is associated with a high frequency of endoleaks type 3.[16]

The FDA, furthermore, by providing information related with the risk of endoleak type 3 of the Endologix AFX devices from several different information sources, including studies in the real world, published abstracts and peer-reviewed literature, advices health effectors to use other alternatives available for endovascular treatment.[17]

The treatment for ET3a could be both conventional or endovascular. The current recommendations refer to endovascular therapy as being first line, and to leave conventional surgery for cases where the first option failed. The treatment for ET3a includes the placement of sheathed stents, sealing the gap between the components as done in our case.[18,19]

A thoracic device has been chosen to treat ET3a after EVAR. This endograft particularly enabled, once enough alignment is achieved for the components with two extra-stiff Lunderquist guide wires, ensuring a good overlapping

area, 5 cm with the main module and 5 cm with the proximal extension. A report by Russo A et al. has been found in literature, using this type of prosthesis to contain an ET3a.[20]

The Maleux et al. study shows that 25% of patients treated for this complication presented a new ET3a in follow-up. This fact underscores the significance of a close follow-up for these patients to achieve an early diagnosis and treatment for ET3a.[21]

CONCLUSIONS

Endovascular repair for AAA (EVAR) has expanded. The most frequent complication is the presence of endoleaks. ET3a due to endograft modules disconnection has been observed more frequently with first-generation devices. The resolution of the disconnection of the implanted device components timely was feasible and safe, using an endograft designed for implantation at thoracic level, but due to its characteristics could be used and implanted at abdominal level. A follow-up by imaging tests is relevant to detect this post-EVAR complication early.

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