

# Endovascular management of a disconnected bridging stent during fenestrated endovascular aortic repair

## Summary

A fenestrated endovascular repair of a pararenal abdominal aortic aneurysm was complicated by disconnection of a bridging renal stent and successfully managed endovascularly.

**Keywords:** abdominal aortic aneurysm, endograft fenestration, thoracic stent-graft, hypothyroidism, arterial hypertension, chronic obstructive, pulmonary disease, oxygen therapy

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## Case presentation

A 69-year-old man with a pararenal abdominal aortic aneurysm (AAA) measuring 56mm and extending as far as the aorto-iliac bifurcation and with a history of hypothyroidism, arterial hypertension, and chronic obstructive pulmonary disease requiring oxygen therapy, was admitted to the cardiovascular department to undergo elective endovascular surgery with a fenestrated stent-graft.

## Procedure

Bilateral femoral as well as right axillary artery access points were prepared using surgical cut down to allow for three endovascular delivery systems. A Relay NBS Plus 30×100 mm thoracic stent-graft (Terumo Aortic, Sunrise, FL, USA) was advanced through the vasculature and deployed in the descending thoracic aorta with the distal end just above the celiac trunk.<sup>[1]</sup> A custom-made fenestrated Anaconda device (Terumo Aortic, Inchinnan, UK) with a proximal diameter of 34mm and four fenestrations for visceral vessels and the left iliac artery 10×150mm and right iliac artery 12×140mm as far as both common iliaes.

Subsequently, the visceral and renal arteries were cannulated and balloon-expandable covered stents were used to bridge the celiac trunk (6×22mm) and superior mesenteric artery (9×27mm) (both Bentley BeGraft) as well as the left (6×28mm) and right renal (5×38mm) arteries (both Atrium Advanta V12). An abdominal angiography showed persisting flow around the fenestrated graft and the bridging stents and the probable type III endoleak was addressed by repeat ballooning in the overlap between the thoracic and abdominal endografts.

Although we concluded the intervention assuming that the endoleak was at the point of connection of the two devices, detailed image review by the endovascular team showed evidence of a previously unseen disconnection between the left renal bridging stent and the endograft fenestration requiring reintervention.

## Reintervention

Our plan for the secondary intervention involved the following four strategies:

- Advance a guide wire through the lumen of the disconnected bridging stent to reconnect with another covered stent.
- Capture the disconnected bridging stent with a retrieval device such as a vascular snare, collapse and remove it to allow deployment of a new covered stent.
- Capture the stent with an endoscopic forceps device, remove and replace it with a new stent.
- If the first three maneuvers fail, seal the fenestration with an Amplatzer plug (St Jude Medical).

On postoperative day 2, the patient was prepared with vascular access from the right groin. A 0.035 hydrophilic guidewire catheter was used to cannulate the left renal artery fenestration. The stent was cannulated with normal and stiff exchange guidewires using a loop towards the upper sac. Despite trying with a variety of catheters, it was not possible to advance to the renal artery for better support, however. We tried an Agilis steerable introducer (Abbot) with a Magic Torque guidewire (Boston Scientific) for greater support but without

being able to achieve stability in the renal artery. The Agilis introducer was withdrawn and a 7×90 mm Destination introducer (Terumo) was advanced instead towards the fenestration with the idea of capturing a corner of the device with a Multi-snare (pfm medical) retrieval device—but again without success.

The introducer was then used to advance a Boston Scientific endoscopic forceps for retrieval of foreign bodies and the stent was captured and dragged from the left renal artery into the aneurysmal sac of the aorta. The left renal artery was then catheterized with a JR 3.5 6-Fr catheter which allowed an Amplatz super-stiff guidewire to be placed along which a balloon-expandable covered stent (Atrium Advanta V12) deployed from the ostium of the left renal artery to the corresponding endograft fenestration, remodeling the stent with 8×20 and 10×20 angioplasty balloons.

The result was satisfactory on the final angiography showing perfusion of all the visceral vessels and absence of endoleak.

## Discussion

Abdominal aortic aneurysms, defined as an increase of 50% or more of the aortic diameter in relation to healthy vessel,<sup>1</sup> are common in patients over 65, usually affect the infrarenal segment (less than 5% are suprarenal) and are associated risk factors are: advanced age, male sex, Caucasian race, family history, smoking, previous aneurysms and atherosclerosis.<sup>2,3</sup> It is important to first establish the transversal diameter of the aneurysm because diameters of 5.5 cm or more are associated with a 3–6% risk of rupture within the first year after diagnosis.<sup>4</sup>

AAAs can be treated by either open surgical or endovascular repair, the latter involving the placement of an endoprosthesis (tubular or, more typically, bifurcated) in order to exclude the aneurysmatic segment of the aorta.<sup>5</sup> Endovascular repair has become more common and different endografts are available which have improved on earlier results by reducing postoperative complications. The first endoprosthesis was in 1990 and, since then, models have developed and design has evolved to include new features for more complex cases such as fenestrations to allow perfusion of the visceral vessels such as the one used in this case; a custom-made, fenestrated Anaconda.<sup>6</sup> The most frequent complications reported are: arterial perforation, vascular occlusion, fenestration disconnection, endoleaks (especially types I and III), spinal cord ischemia, mesenteric ischemia, thrombosis in the access vessels, stent-graft occlusion, access site hematoma, maldeployment, and stent-graft migration.<sup>7</sup> The main risk factors for stent-graft migration are: poor patient selection, inappropriate stent-graft sizing, inaccurate deployment, the effects or pulse dynamics, and inexact measurements.<sup>8</sup>

The literature mostly reports invasive surgical methods to address stent-graft migration.<sup>9</sup> However, there is very little in the literature describing endovascular reinterventions to address migration and stent disconnection with the fenestrated Anaconda device.<sup>10</sup> The implications of and risks associated with bridging stent disconnection and stent-graft migration made reintervention inevitable in the case reported here, and four maneuvers were agreed by the multidisciplinary team of the Clínica las Américas to recuperate the disconnected Atrium Advanta V12 stent. Initially, we used a snare to try to capture the stent. When that failed, we tried an endoscopic forceps and dragged

the stent from the renal artery and released it inside the aneurysm sac, subsequently implanting a new balloon-mounted covered stent in the renal artery across an Amplatz support guidewire.

## Conclusion

Endovascular repair of abdominal aortic aneurysms was initially associated with many complications but the evolution of the technology over the years has notably reduced these risks and even favored it over open surgical repair if used inside instructions for use. Migration and stent disconnection are two of the most feared complications and there is no report of these in the literature associated with the Anaconda device. In this case, endovascular recovery of the stent with adequate angiographic results and without clinical consequences for the patient.

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## Conflicts of interest

Author declares that there are no conflicts of interest.

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