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A unique case of bilateral lower extremity post-endovascular aneurysm repair claudication

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Abstract

The majority of abdominal aortic aneurysms have been treated by endovascular aneurysm repair in the past decade. Common perioperative complications after this procedure are mostly related to vascular access and improper stent-graft placement. We present the first case of bilateral lower extremity claudication due to severe angulation of the graft–aorta interface, which may have been prevented by a more critical consideration of the patient's anatomy. Treatment required open explantation and repair of the abdominal aortic aneurysms which led to complete resolution of claudication. The results of this case highlight the importance of adherence to instructions for use guidelines.

Keywords

Abdominal aortic aneurysm, endovascular repair, neck angulation, claudication, instructions for use

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Introduction

The majority of abdominal aortic aneurysms (AAAs) have been treated by endovascular aneurysm repair (EVAR) in the past decade. However, the use of EVAR in patients with unfavorable anatomy remains highly controversial, particularly in severely angulated proximal aortic necks. Surgical approaches should be carefully selected in these complex cases, as pushing the limitations of graft device recommendations often leads to profound sequelae, especially type I endoleaks.[1] Here, we present the first reported case of bilateral lower extremity claudication due to severe angulation of the graft–aorta interface. The results of this case highlight the importance of adherence to instructions for use (IFU) guidelines.

Case report

A 65-year-old male with a history of EVAR of an infrarenal AAA and bilateral common iliac artery aneurysms presented to clinic 3 years post-operatively due to persistent fatigue and bilateral lower extremity claudication. Symptoms began soon after his EVAR procedure and continued to worsen until he was unable to walk more than 25 yards, consistent with Rutherford Class III (severe) claudication. Physical examination revealed weak femoral pulses with no palpable distal pulses. Ankle-brachial indices (ABIs) revealed a right-sided ABI of 0.60 and a left-sided ABI of 0.66. A computed tomography (CT) angiogram of the abdomen and pelvis demonstrated a severe kink of the infrarenal aorta (approximately 69°) at the interface of the native aorta and endograft main body (Figure 1(a) and (b)).

Surgical history was significant for EVAR and Amplatzer® plug embolization of the right internal iliac artery at an outside facility in 2015. Preoperational imaging at that time revealed an infrarenal aortic neck diameter of 16.6 mm and severe proximal aortic neck angulation (Figure 2(a) and (b)). The patient presented to clinic 2 weeks post-operatively with complaints of bilateral lower limb fatigue upon activity. Doppler signals in the posterior tibial and dorsalis pedis arteries were intact and he was referred to a podiatrist. The patient was lost to follow-up until presenting to our clinic in 2018.

We discussed with our patient the option of a further endovascular approach via insertion of a proximal extension of the graft with an aortic cuff and a fenestrated endograft for more

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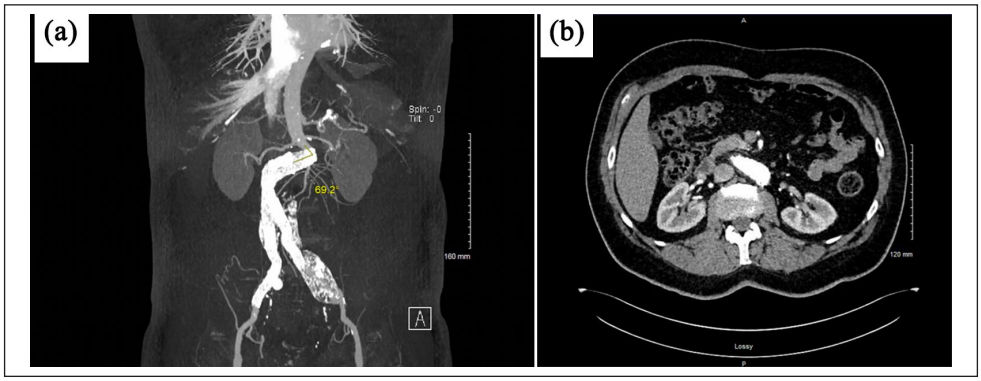

Figure 1. CT angiogram (a,b) showing a severely kinked infrarenal aorta.

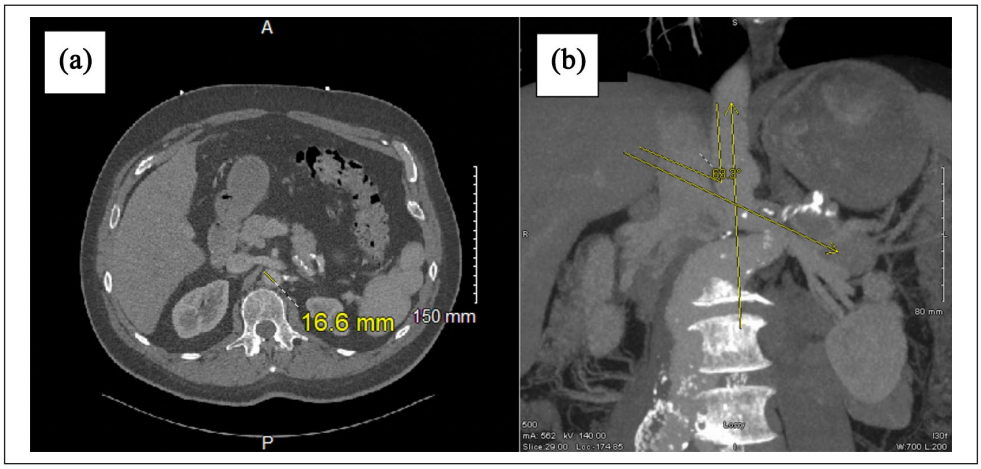

Figure 2. Preoperational images showing (a) an infrarenal aortic neck diameter of 16.6 mm and (b) severe proximal aortic neck angulation of 63.3°.

proximal coverage of the suprarenal segment. Due to the small diameter of the patient's aorta, these options were deemed unsuitable, and open surgery was recommended. The patient elected for open explantation of the endograft and reconstruction of the abdominal aorta using an 18×9 mm bifurcated graft. The left limb of the graft was attached via end-to-side anastomosis to the left external iliac artery, and the right limb was attached via end-to-side anastomosis to the femoral artery. Common iliac arteries were oversewn and ligated at their takeoff bilaterally due to aneurysmal dilation.

The patient was discharged home 5 days post-operatively without any complications and returned to clinic 3 weeks post-operatively. He had strong bilateral femoral pulses with a right-sided ABI of 0.9 and a left-sided ABI of 0.8. The symptoms of fatigue and claudication had resolved. A CT angiogram to evaluate the oversewn common iliac aneurysms showed thrombosed aneurysms bilaterally and a patent graft with significant blood flow improvement to the bilateral lower extremities.

Discussion

EVAR is an increasingly popular alternative to open surgical repair in the management of AAA and is associated with advantages of decreased short-term mortality rates and length of stay.[2,3] However, EVAR is not without its drawbacks, with frequent complications such as migration of the endograft, thrombosis, and iliac limb kinking. Ischemic complications are relatively common after EVAR with intentional embolization of the internal iliac arteries, with buttock claudication reported in approximately one-third of cases.[4] In our case, preoperative CT imaging showed significant angulation at the proximal aortic neck limiting flow distally, resulting in the unusual presentation of bilateral lower extremity claudication. Previous studies have reported complications with graft limb occlusion or endograft kinking, resulting in lower extremity ischemia.[5,6] In our patient, both limbs of the graft were patent. To our knowledge, this is the first reported case of bilateral lower extremity claudication after EVAR unrelated to limb or graft occlusion.

Endograft technology has vastly improved since the development of first-generation devices. A wide variety of endografts now exist for specific settings, negating the superiority of any single model over all others. Regardless of the endograft model, specific IFU are designed by the manufacturer to minimize the risk of complications. Failure to comply with IFU in EVAR is associated with higher reintervention

rates and lower overall survival rates.[7] Noncompliance to endograft recommendations is high, however, with a study reporting that nearly half of its EVAR patients had at least one IFU violation.[8]

The extent to which surgical options were discussed with our patient before the initial repair is unclear, but documentation reveals that he wished to proceed with an endovascular procedure. Our patient's initial EVAR used a GORE® EXCLUDER® AAA Endoprosthesis with recommended IFU as follows: an infrarenal aortic neck diameter range of 19–32 mm and proximal aortic neck angulation $\leqslant 60°$.[9] Our patient's anatomy did not meet these criteria at initial evaluation, making him an unsuitable candidate for this device according to manufacturer specifications. Given the severe angulation of the patient's infrarenal aortic neck and the small aortic diameter, an open procedure would have been an appropriate option for this patient. The patient was considered for a second endovascular approach using a bare metal or Palmaz stent, but due to the angulation of the infrarenal aneurysm neck, such a procedure would introduce risk for even further intervention were it not to succeed. Treatment with an alternative endovascular device such as the Aorfix (Lombard Medical, Inc., Irvine, CA, USA) may have been considered if the patient had comorbidities that would discourage open surgery. However, implantation of endografts in patients with severely angulated proximal neck anatomy has the potential for increased technical problems during the procedure as well as adverse short-term outcomes.[10]

Conclusion

We report a rare case of a 65-year-old man who required reintervention due to bilateral lower extremity claudication 3 years after endovascular repair of his infrarenal AAA due to significant kinking at the interface of the native aorta and endograft main body. Although uncommon, graft interface kinking and its potential sequelae should be considered with endograft placement following endovascular intervention. Remaining within manufacturer, IFU for endovascular graft devices are critical to ensure optimal post-operative results and minimize device-related complications.

Authors' Note

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Author contributions

All authors listed made significant contributions to the manuscript. R.J.L. described the case report, discussion, and gathered relevant images. A.S. was instrumental in drafting the discussion portion of the final product. S.A., the vascular surgeon who performed the open procedure described in this case, was the principal investigator and provided thoughtful edits and suggestions to the drafts.

Declaration of conflicting interests

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