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Case Report

Chimney technique for juxtarenal aortic aneurysms with long renal artery distance

Huseyin Durmaz

Konya City Hospital, Department of Cardiovascular Surgery, Konya, Türkiye

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Abstract

Abdominal aortic aneurysms (AAA) can be repaired with endovascular aneurysm repair (EVAR), a minimally invasive procedure, in some comorbid conditions. In some anatomical situations, EVAR can be difficult to perform, and these anatomical difficulties can affect the success of EVAR. The chimney endovascular technique can be used in the repair of juxtarenal abdominal aortic aneurysms, one of these anatomical challenges. The purpose of this case report is to present the treatment of a complicated juxtarenal aortic aneurysm with a very large distance between the right and left renal arteries using the chimney technique. A 62-year-old man presented with abdominal pain and a juxtarenal abdominal aortic aneurysm measuring 57.4 mm at its widest point was detected on contrast-enhanced computed tomography. Evaluation of the patient's computed tomography images revealed that the right renal artery originated from the abdominal aneurysm sac, with a distance of approximately 53.3 mm from the left renal artery. The patient underwent EVAR using the chimney technique. Routine blood tests revealed no pathology at the 1-month postoperative follow-up. Contrast-enhanced computed tomography revealed renal graft patency and confirmed the absence of an endoleak. This case report emphasizes that EVAR strategies are case-specific and that specific strategies should be developed for certain anatomical challenges. In the presence of comorbidities, the chimney technique should be considered a solution-oriented method for juxtarenal aneurysms.

Keywords: Endovascular aneurysm repair, abdominal aortic aneurysm, vascular surgery, chimney technique

INTRODUCTION

Abdominal aortic aneurysms (AAA) can be repaired with endovascular aneurysm repair (EVAR), a minimally invasive procedure, in some cases. In some anatomical situations, EVAR can be difficult to perform, and these anatomical challenges can impact the success of EVAR [1]. The chimney endovascular method can be used in the repair of juxtarenal abdominal aortic aneurysms, one of these anatomical challenges [2].

The aim of this case report is to treat a complicated juxtarenal aortic aneurysm with a very long distance between the right and left renal arteries using the chimney method.

CASE REPORT

A 62-year-old male patient presented to our internal medicine clinic with abdominal pain and was referred to us after an abdominal Doppler ultrasound revealed an abdominal aortic aneurysm. The patient's physical examination revealed a pulsatile abdominal mass. Routine blood tests revealed no significant pathology. A contrast-enhanced computed tomography scan revealed a juxtarenal abdominal aortic aneurysm measuring 57.4 mm in diameter at its widest point (Figure 1). Evaluation of the patient's computed tomography images revealed that the right renal artery originated from the abdominal aneurysm sac and was approximately 53.3 mm from the left renal artery. The patient could undergo open surgery or endovascular intervention. Because the patient had a history of previous abdominal surgery, the decision was made to perform leg EVAR. After surgical preparations were completed, the patient was taken to the leg

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Corresponding Author: Huseyin Durmaz, Konya City Hospital, Department of Cardiovascular Surgery, Konya, Türkiye
Email: durmazz1@hotmail.com

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EVAR procedure. Under general anesthesia, bilateral femoral incisions were made in the supine position to access the femoral arteries. 5000 IU of heparin was administered. Access to the aneurysm was achieved by inserting a needle into each common femoral artery and subsequently placing a 7 Fr sheath. Additionally, a needle was inserted into the left brachial artery and a 6 Fr sheath was placed. A 0.035-inch soft guidewire with a 5 Fr pigtail catheter was introduced through the right femoral artery, advanced to the thoracic aortic arch, and then a 0.035-inch rigid guidewire was secured in place. A 0.035-inch soft guidewire with a 5 Fr pigtail catheter was advanced through the left femoral artery into the abdominal aorta, accurately identifying the bilateral renal arteries. The pigtail was then fixed just above the celiac artery. Contrast-enhanced imaging was performed, and the renal arteries were marked. The right renal artery was cannulated using the left brachial artery. Right renal artery stenting was performed with 6x57 mm and 7x27 mm Atrium Advanta V12 renal stents (chimney method). The use of two renal stents was due to the distance between the right and left renal artery (Figure 2). A 28 x 16 x 166 MM Medtronic Endurant 2 main stem was delivered from the right femoral artery, and a 16x13x156 MM Medtronic Endurant 2 contralateral leg was delivered from the left femoral artery. Follow-up imaging revealed bilateral renal artery patency and confirmed the absence of an endoleak. Both femoral arteries were repaired with 6/0 prolene sutures. A compression bandage was applied to the left brachial artery. The procedure took 1 hour and 25 minutes, and fluoroscopy time was 32 minutes. A total of 250 mL of contrast medium was administered during the procedure. Postoperatively, the patient's pulse, blood pressure, urine output, cardiac function, and renal function remained stable and showed no significant changes compared to preoperative levels. The patient was discharged from the hospital on the 4th postoperative day. At the 1-month follow-up, routine blood tests revealed no pathology, and a follow-up contrast-enhanced computed tomography scan revealed renal graft patency and confirmed the absence of an endoleak (Figure 3).

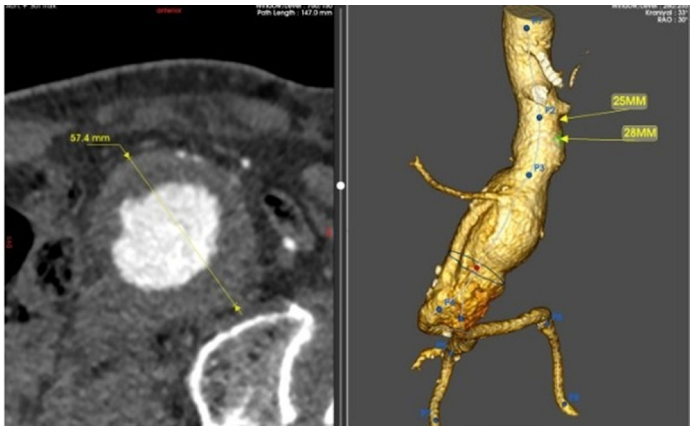

Figure 1. Abdonimal aortic aneurysm

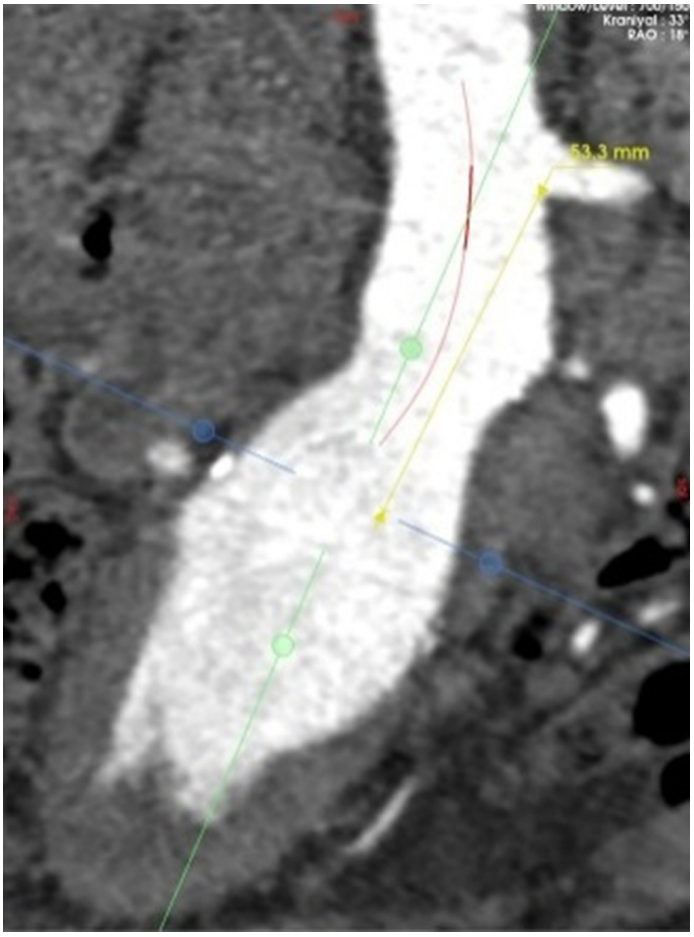

Figure 2. Distance between right and left renal arteries

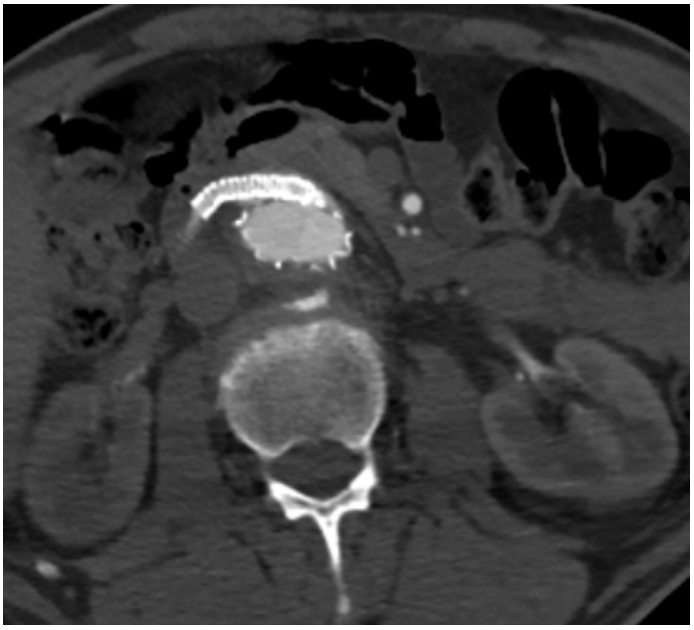

Figure 3. Postoperative renal artery stent image

DISCUSSION

Various techniques are prominent in treating anatomically challenging juxtarenal aneurysms. These include open surgery, fenestrated endografts, and chimney grafts. Recent studies have documented the safety and effectiveness of both chimney and fenestrated techniques for elective juxtarenal aneurysms [3]. Antoniou et al. have shown that fenestrated or branched endovascular aortic repair is associated with lower perioperative mortality and acute renal dysfunction compared to open surgery [4]. Another study found that open surgery was associated with better mid- and long-term survival rates without increasing perioperative mortality. Endovascular intervention is recommended in elderly patients at high risk for open repair [5]. In our case, although fenestrated or chimney grafts could have been used due to the juxtarenal aneurysm and previous abdominal surgery, the chimney graft was preferred. The main advantage of the chimney method is that it maintains blood flow to critical side branches during aneurysm repair [6]. In our case, because the right renal artery arose from the aneurysm sac, it was important to maintain blood flow to the right renal artery to prevent potential renal comorbidities. Because the distance between the right and left renal arteries was approximately 55 mm, the single renal stent used in the conventional chimney method proved inadequate, necessitating lengthening of the right renal stent. It is understood that longer renal stents are needed in some cases [7]. One of the disadvantages of the chimney method is the endoleak that can develop due to the proximal renal stent (1a) [8]. In our case, the absence of an endoleak on follow-up aortography was one of the positive outcomes. The chimney stent graft can fracture due to compression by the main body stent graft, leading to renal stent thrombosis. In some cases, the renal stent graft may thrombose without any apparent cause [9]. In our case, renal stent patency was demonstrated on the 1-month follow-up imaging. In some cases, aneurysm sac enlargement and endograft displacement may occur as a late complication. Some studies show higher rates of freedom from reintervention after the first month after aneurysm repair compared to open surgery [10]. This suggests that late complications may be more common with EVAR than with open surgery.

CONCLUSION

This case report emphasizes that EVAR strategies are case-specific and that case-specific strategies should be determined for certain anatomical challenges. In the presence of comorbidities, the chimney method should be considered a solution-oriented method for juxtarenal aneurysms. We believe that future studies will be promising for aneurysms with anatomically challenging positions.

Patient Consent for Publication: Informed consents were obtained both surgical approach and publication.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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