OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Case Report

Juxtarenal Abdominal Aortic Aneurysm Associated with a Horseshoe Kidney: A Case Report and Surgical Considerations

Aghoutane N[1,2]*, Larza Y[1,2], Taraa M[1,2]

[1]Faculty of Medicine and Pharmacy of Fez, Sidi Mohamed Ben Abdellah University
[2]Department of Vascular Surgery, Military Hospital Moulay Ismail, Meknes, Morocco

DOI: https://doi.org/10.36348/sjm.2025.v10i04.008 | **Received:** 15.03.2025 | **Accepted:** 21.04.2025 | **Published:** 24.04.2025

***Corresponding Author:** Aghoutane N
Faculty of Medicine and Pharmacy of Fez, Sidi Mohamed Ben Abdellah University
Department of Vascular Surgery, Military Hospital Moulay Ismail, Meknes, Morocco

Abstract

Introduction: Abdominal aortic aneurysm (AAA) is a frequent vascular pathology, especially in elderly males. Horseshoe kidney (HSK), the most common renal fusion anomaly, presents a surgical challenge when associated with AAA. We report a case of successful open repair of a juxtarenal AAA in a patient with HSK. ***Case Presentation:*** A 68-year-old male with hypertension, diabetes, and active smoking was diagnosed with a 60 mm juxtarenal AAA and horseshoe kidney during routine imaging. The patient underwent elective open repair via a retroperitoneal approach. A bifurcated aorto-bi-iliac graft was placed. The right renal artery was reimplanted, and an inferior polar artery was revascularized using a saphenous vein graft. ***Discussion:*** HSK complicates AAA surgery due to anomalous renal vasculature and anteriorly located isthmus. Open repair allows precise revascularization and direct access to the aorta. Renal preservation strategies are crucial to reduce postoperative complications. ***Conclusion:*** Open surgical repair remains a reliable option in AAA with HSK when renal revascularization is necessary. Thorough preoperative planning and tailored reconstruction are key to achieving optimal outcomes.

Keywords: Abdominal Aortic Aneurysm, Juxtarenal Aneurysm, Horseshoe Kidney, Open Surgical Repair, Endovascular Repair, Renal Protection.

INTRODUCTION

Abdominal aortic aneurysm (AAA) is a frequent degenerative pathology, particularly in elderly males with cardiovascular risk factors such as smoking, hypertension, and diabetes mellitus [1]. Horseshoe kidney (HSK), the most common congenital renal fusion anomaly, occurs in approximately 0.25% of the population and is often asymptomatic [2]. The association of AAA and HSK is rare but clinically significant due to the frequent presence of multiple renal arteries and the atypical position of the renal isthmus, which can complicate surgical access and increase the risk of renal ischemia or injury [3, 4].

Management of AAA in patients with HSK requires a tailored approach that takes into account anatomical variations, the extent and morphology of the aneurysm, and the origin and size of accessory renal arteries. Although endovascular repair (EVAR) is increasingly used in standard AAA, it may be technically challenging or contraindicated in HSK cases due to the presence of low-lying or aberrant renal arteries [5,6]. Open surgical repair remains a valid option, particularly when complex renal revascularization is required.

We report the case of a 68-year-old male with a juxtarenal AAA associated with HSK, who underwent successful open repair with renal artery reimplantation and saphenous vein grafting. The surgical challenges and decision-making process are discussed.

CASE PRESENTATION

A 68-year-old male, an active smoker with a history of type 2 diabetes mellitus and hypertension, was referred for further evaluation after a routine abdominal ultrasound revealed an asymptomatic abdominal aortic aneurysm. Clinical examination was unremarkable, and there were no signs of distal embolization or renal insufficiency.

A computed tomography angiography (CTA) confirmed the presence of a 60 mm fusiform juxtarenal

AAA. A congenital horseshoe kidney was identified, with the renal isthmus located anterior to the aneurysm. Vascular anatomy revealed a dominant right renal artery, and an inferior polar artery arising directly from the aneurysmal sac supplying the lower pole of the HSK (Fig. 1).

Given the unfavorable anatomy for EVAR (short proximal neck, complex renal arterial supply), the patient was scheduled for elective open surgical repair.

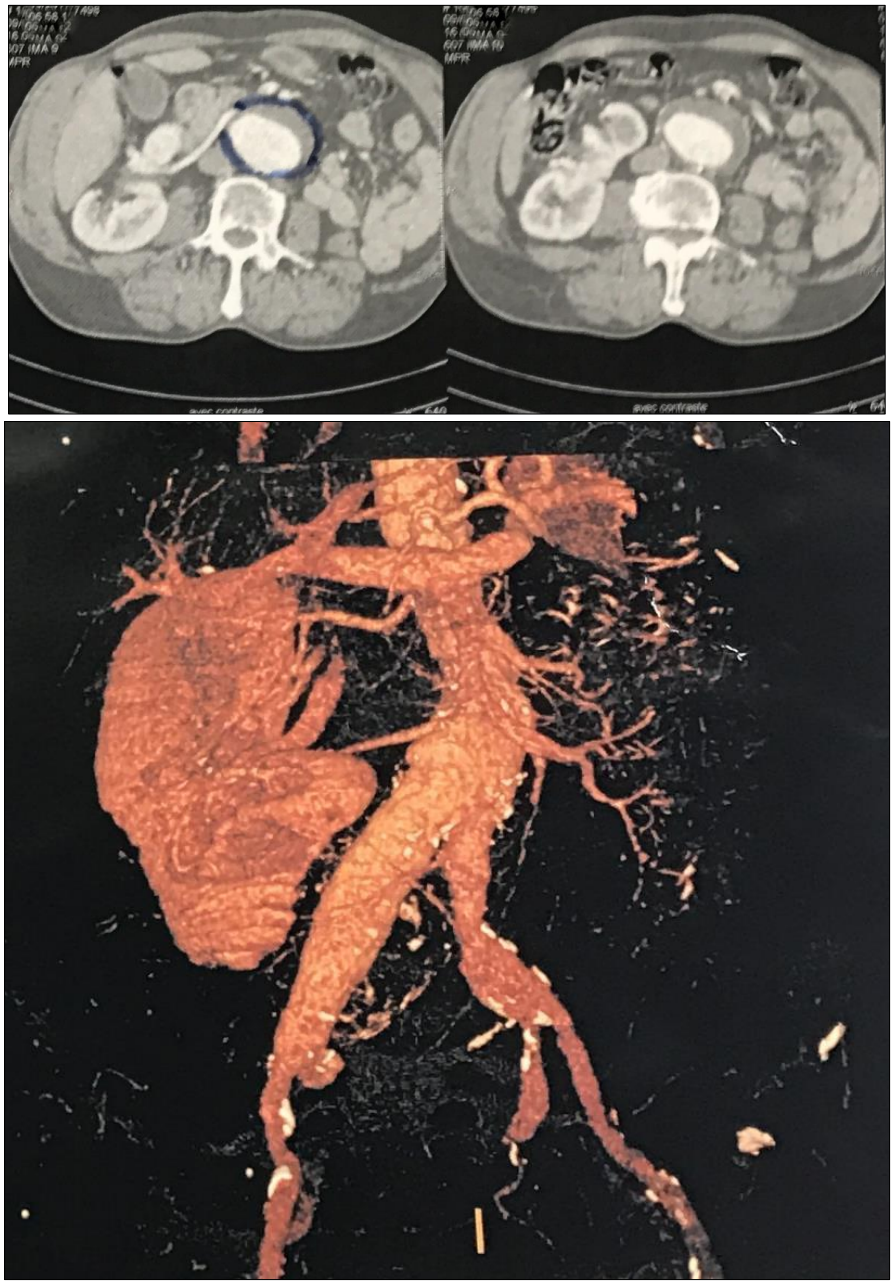

Figure 1: CT angiography with reconstruction showing a juxtarenal abdominal aortic aneurysm associated with a horseshoe kidney

Surgical Procedure

A retroperitoneal approach was selected to minimize dissection around the renal isthmus and to facilitate proximal aortic control (Fig.2). Following proximal aortic clamping above the aneurysm, an aorto-bi-iliac bypass was performed using a bifurcated Dacron graft. The right renal artery was reimplanted into the right limb of the graft via an end-to-side anastomosis. The inferior polar artery was revascularized using an interposition reversed saphenous vein graft anastomosed to the left iliac limb of the prosthesis (Fig.3). Total operative time was approximately 4 hours, with no intraoperative complications or major bleeding.

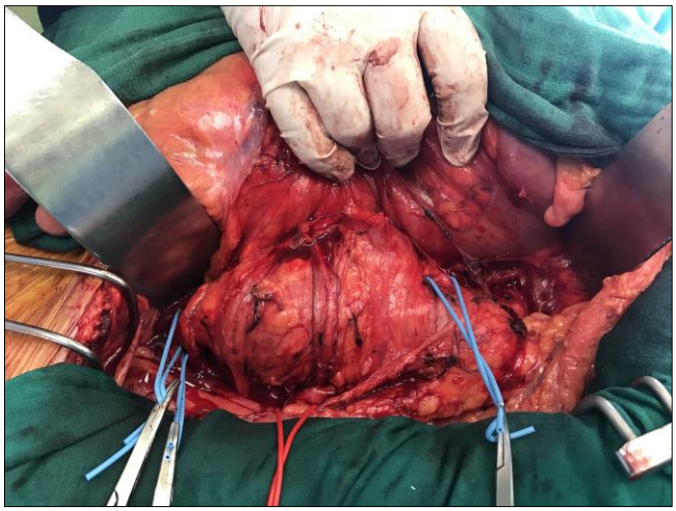

Figure 2: Operative view showing the juxtarenal abdominal aortic aneurysm through a retroperitoneal approach

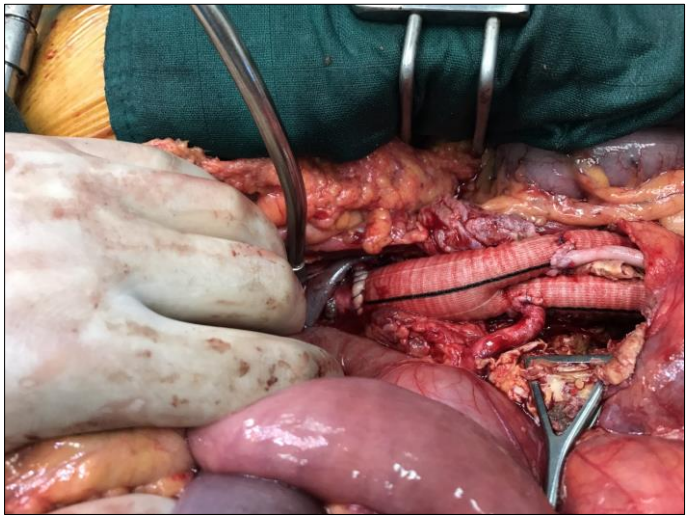

Figure 3: Operative view showing the aorto-bi-iliac bypass with revascularization of the right renal artery and the inferior polar artery

Renal Protection

To mitigate the risk of postoperative acute kidney injury, a perioperative renal protection strategy was applied. This included preoperative and intraoperative intravenous hydration, maintenance of adequate mean arterial pressure during and after clamping, and the use of forced diuresis with loop diuretics (furosemide) immediately after declamping. Cold renal perfusion was not deemed necessary due to the short ischemia time (<30 minutes). Urine output was closely monitored throughout the procedure.

No intraoperative complications occurred, and total aortic cross-clamp time was limited to under 45 minutes. The patient was transferred to the intensive care unit with preserved diuresis and stable hemodynamic parameters.

Postoperative Course

In the immediate postoperative period, the patient developed transient renal insufficiency (elevated creatinine and reduced urine output), which was managed with intravenous hydration and forced diuresis using loop diuretics. Renal function returned to baseline by postoperative day 8. Follow-up visits at 1, 3, and 6 months, and then annually, revealed stable renal function, no graft-related complications, and satisfactory clinical status. CTA at 6 months showed patent grafts with good renal perfusion bilaterally.

DISCUSSION

The coexistence of AAA and HSK is rare, but when present, it introduces considerable anatomical and technical challenges. The renal isthmus, typically composed of parenchyma and fibrous tissue, usually lies anterior to the aorta at the L3 level and may obstruct direct transperitoneal access to the aneurysm [3]. The retroperitoneal approach, as chosen in this case, avoids dissection of the isthmus and provides a direct route to the juxtarenal aorta [7].

HSK is associated with aberrant renal vasculature in 63–80% of cases [8]. These vessels may arise from the aorta, iliac arteries, or directly from the aneurysmal sac, as observed in our patient. The management of accessory renal arteries is still debated. Some authors recommend revascularization of arteries >2 mm in diameter or those supplying more than 25% of the renal parenchyma [9]. In our case, the inferior polar artery supplied a significant portion of the HSK and was therefore preserved through venous grafting.

Although EVAR is an attractive option, especially in elderly or high-risk patients, it carries limitations in HSK due to the high prevalence of accessory renal arteries and the frequent lack of adequate proximal landing zones [5-10]. Several techniques such as chimney grafts or fenestrated endografts have been described but remain technically demanding and not widely available [6-11]. Open surgical repair remains the gold standard in cases requiring renal reimplantation or complex vascular reconstruction. The long-term results of such reconstructions are generally favorable, particularly when saphenous vein grafts are used [12].

Renal protection during open repair of juxtarenal AAA, particularly in patients with complex renal anatomy such as horseshoe kidney, is a critical component of perioperative management. In our case, renal ischemia time was minimized by performing renal artery reimplantation promptly after proximal aortic clamping. Cold perfusion techniques were not deemed necessary due to the short ischemic interval. Postoperatively, the patient received intravenous volume expansion, close hemodynamic monitoring, and forced diuresis using loop diuretics. These renal protective strategies contributed to the rapid resolution of transient renal insufficiency and restoration of baseline renal function by day 8. Such approaches are consistent with best practices recommended in high-risk vascular procedures [13, 14]. The postoperative renal dysfunction in our patient was likely due to transient ischemia during clamping and was successfully managed conservatively. This highlights the importance of early postoperative renal monitoring and supportive care to optimize outcomes.

CONCLUSION

The management of abdominal aortic aneurysm in patients with horseshoe kidney requires a precise understanding of renal vascular anatomy and careful surgical planning. Open repair with tailored renal revascularization remains a safe and effective approach in anatomically complex cases. The use of the retroperitoneal approach and vein grafts for renal preservation provides a durable and physiologically sound solution. Long-term follow-up is essential to monitor renal function and graft patency.

REFERENCES

1. Lederle FA, Johnson GR, Wilson SE, *et al.*, The aneurysm detection and management study screening program: validation cohort and final results. Arch Intern Med. 2000;160(10):1425–30.
2. Glodny B, Petersen J, Hofmann KJ, *et al.*, Kidney fusion anomalies revisited: clinical and radiological analysis of 209 cases of horseshoe kidney. BJU Int. 2009;103(2):224–35.
3. O'Hara PJ, Hakaim AG, Hertzer NR, *et al.*, Surgical management of aortic aneurysm and coexistent horseshoe kidney: review of a 31-year experience. J Vasc Surg. 1993 May;17(5):940-7. Erratum in: J Vasc Surg 1993 Oct;18(4):586.
4. Natsis K, Piagkou M, Skotsimara A, *et al.*, Horseshoe kidney: a review of anatomy and pathology. Surg Radiol Anat. 2014 Aug;36(6):517-26
5. Loftus IK, Thompson MM, Fishwick G, *et al.*, Endovascular repair of aortic aneurysms in the the presence of a horseshoe kidney. J Endovasc Surg. 1998 Aug;5(3):278-81.
6. Belczak SQ, Lanziotti L, Botelho Y, *et al.*, Open and endovascular repair of juxtarenal abdominal aortic aneurysms: a systematic review. Clinics (Sao Paulo). 2014 Sep;69(9):641-6.
7. Sachsamanis G, Charisis N, Maltezos K, *et al.*, Management and therapeutic options for abdominal aortic aneurysm coexistent with horseshoe kidney. J Vasc Surg. 2019 Apr;69(4):1257-1267
8. de Virgilio C, Gloviczki P, Cherry KJ, *et al.*, Renal artery anomalies in patients with horseshoe or ectopic kidneys: the challenge of aortic reconstruction. Cardiovasc Surg. 1995 Aug;3(4):413-20.
9. Göksel O, Cinar B, Kömürcü G, *et al.*, Surgical treatment of abdominal aortic aneurysms associated with horseshoe kidney. Vascular. 2006 Jan-Feb;14(1):27-31.
10. Kin K, Takano H, Nakagawa T, *et al.*, Hybrid Repair of an Abdominal Aortic Aneurysm: Debranching with Endovascular Aneurysm Repair in a Patient with Horseshoe Kidney. Ann Vasc Dis. 2017 Mar 24;10(1):41-43
11. Sharma K, Babrowski T, Milner R. A Novel Chimney Approach for Management of Horseshoe Kidney During EVAR. EJVES Short Rep. 2016 Aug 31;33:16-19.
12. Morel E, Frontario SC, Rao N, *et al.*, Abdominal aortic aneurysm with horseshoe kidney with central renal artery: A vascular dilemma. J Vasc Surg Cases Innov Tech. 2024 Jul 22;10(5):101579.
13. Rosenfeld ES, Macsata RA, Nguyen BN, *et al.*, Thirty-day outcomes of open abdominal aortic aneurysm repair by proximal clamp level in patients with normal and impaired renal function. J Vasc Surg. 2021 Apr;73(4):1234-1244.e1.
14. Zarbock A, Küllmar M, Ostermann M, *et al.*, Prevention of Cardiac Surgery-Associated Acute Kidney Injury by Implementing the KDIGO Guidelines in High-Risk Patients Identified by Biomarkers: The PrevAKI-Multicenter Randomized Controlled Trial. Anesth Analg. 2021 Aug 1;133(2):292-302.