CASE REPORT

Surgery on a Pelvic Kidney with Vascular Variations: A Case Report

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Abstract

Pelvic kidneys are the most common form of renal ectopia, resulting from failure of normal embryological ascent of the kidney. The incidence of renal ectopia is approximately 0.1–0.2% of individuals. Out of the renal ectopia, pelvic kidneys are the commonest variant. These kidneys frequently exhibit anomalous vascular supply and drainage, posing significant surgical challenges. We report a case of a 61-year-old man with renal cell carcinoma in a right-sided pelvic kidney supplied by branches from the median sacral artery and lower abdominal aorta, with venous drainage into the left common iliac vein and to the lower inferior vena cava. Ectopic kidneys are associated with vascular anomalies in up to 70%–80% of cases, along with structural abnormalities such as malrotation and ureteric variations. They are predisposed to complications including hydronephrosis, nephrolithiasis, infection and rarely renal cell carcinoma.

This case highlights the importance of precise anatomical knowledge and preoperative planning during surgeries of pelvic kidneys.

Key words: pelvic kidney; renal ectopia; aberrant vasculature; median sacral artery; renal cell carcinoma

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Introduction

Renal ectopia refers to abnormal positioning of the kidney due to disruption of its ascent during embryogenesis. Normally, the developing kidneys migrate from the sacral region to the lumbar region between the 6th and 9th weeks of development (2). Failure of this ascent results in ectopic kidneys, most commonly located in the pelvis. The incidence of renal ectopia is approximately 0.1%–0.2% of the population, with pelvic kidneys accounting for 55%–70% of these cases (1, 3). These kidneys are often associated with significant anatomical variations, particularly in vascular supply and ureteric course, due to persistence of embryonic vessels (4). Clinically, ectopic kidneys are important due to their increased susceptibility to complications such as urinary obstruction, infection, stone formation and malignancy (5).

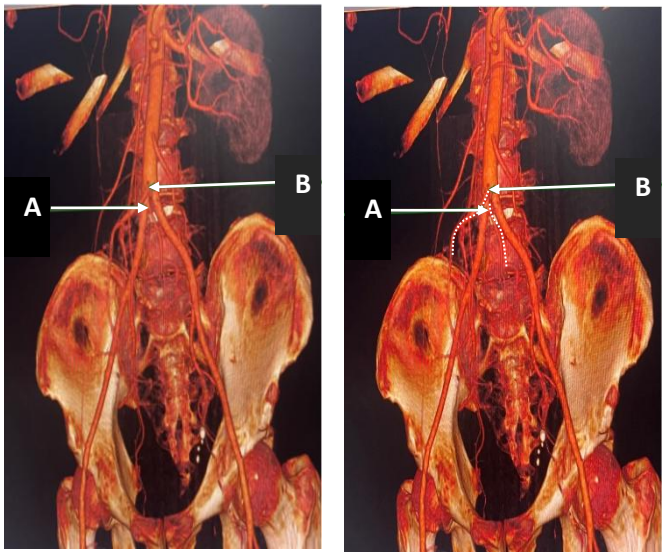


Figure 1: CT angiogram. A – Median Sacral artery, B – Branch from lower abdominal aorta

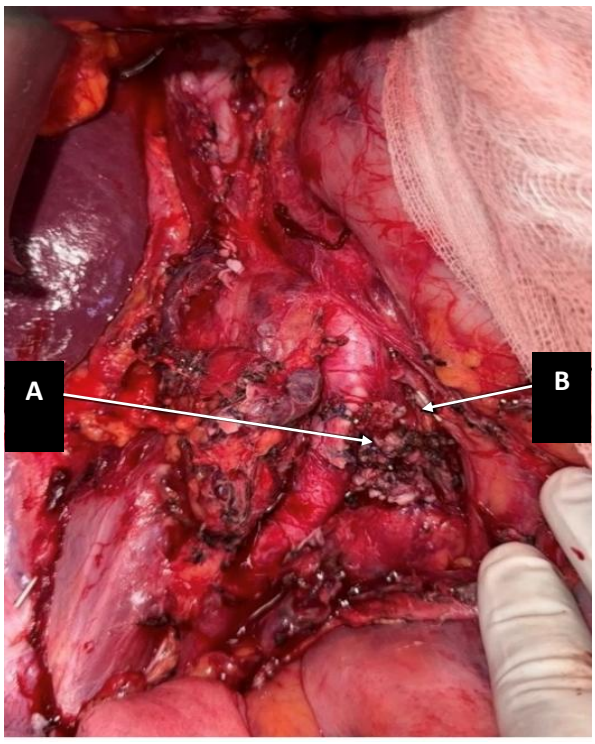


Figure 2: During surgery. A – Median Sacral artery, B – Branch from lower abdominal aorta

Case Report

A 61-year-old man underwent evaluation for an incidentally detected renal lesion. Imaging suggested an abnormal renal location with features suggestive of renal cell carcinoma. The arterial supply was derived from a branch of the median sacral artery along with additional branches from the lower abdominal aorta (Figure 1 and 2). This pattern reflected persistence of embryonic vessels. In addition, venous drainage was to the left common iliac vein and a second vein was draining into the lower inferior vena cava. Intraoperatively, the pelvic kidney was identified anterior to the sacrum. The hilum of the Kidney was facing antero-medially.. The ureter was short with an abnormal course. Careful dissection allowed safe completion of right radical nephrectomy without complications.

Discussion

Renal ectopia occurs in approximately 0.1%–0.2% of the population (1). Types of Renal Ectopia includes: simple uncrossed ectopia, pelvic kidney, iliac kidney, abdominal kidney, thoracic kidney, crossed renal ectopia, fusion anomalies such as horseshoe kidney, and solitary ectopic kidney. Such renal ectopia arise due to abnormal migration and rotation during embryogenesis (2, 3).

Vascular Variations in Ectopic Kidneys

Pelvic kidneys constitute 55–70% of ectopic kidneys (3), and vascular anomalies are present in majority of these cases (4, 7). Common variations include, multiple renal arteries accessory or supernumerary, originating from the aorta, common iliac, and internal iliac arteries. Incidence of such variations are common being 25–30% in the general population, and up to 70–80% in ectopic kidneys (7, 10). Aberrant origin of renal arteries from the aortic bifurcation or iliac arteries is seen in 20–30% of cases, while, early prehilar branching is present in 10–15% (4, 7, 10). Multiple renal veins are observed in 15–30% of cases, with, aberrant venous drainage into the iliac veins or low IVC being observed in 20–25% of cases (7). Circumaortic and retroaortic renal veins have been observed in 5–8% and 2–3% of cases respectively (3), Segmental artery variations are seen in over 30% of the cases (10).

Structural and Clinical Complications

Structural anomalies seen in patients with ectopic kidneys, include malrotation and an abnormal ureteric course (3, 5). These patients can get complications such as hydronephrosis (20–40%) and nephrolithiasis (20–30%). While upper urinary tract infections are common due to urinary stasis (5). Renal cell carcinoma tends to occur in 2–3% of the cases leading to high morbidity and mortality (6).

Surgical and Interventional Complications

Surgery in pelvic kidneys is technically demanding due to the aberrant anatomy of the vasculature and the distorted anatomy of the kidneys and surrounding structures. Major hemorrhage has been reported during and after surgery in 5–15% of patients (8, 9). Segmental renal ischemia or infarction too has been reported in 5–10% of patients undergoing surgery (8-10). While, thrombosis or vascular compromise complicate 2–6% of cases (8). Ureteric injuries are less common accounting for 2–5% of interventional complications. Due to the distorted anatomy and related structures incomplete tumor resection and intraoperative technical difficulty have been reported in variable number of cases (9).

Conclusion

Pelvic kidneys demonstrate complex anatomical variations requiring careful surgical planning. Awareness of vascular and structural anomalies and preoperative planning is essential to avoid complications.

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