

Multiple congenital vascular abnormalities with one of the two feeding right renal arteries arising from the left iliac artery

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Abstract

Background: The kidney is the organ of the human body with the most common congenital anomalies in either development or vascular supply. Although the presence of a second feeding artery arising from a different level of the aorta is not uncommon, the occurrence of a feeding renal artery arising from the contralateral common iliac artery is an infrequent finding.

Case description: We present a case bearing significant abnormalities, including malrotation of the right kidney, the presence of two feeding arteries arising from very uncommon sites, and the presence of two main renal veins with anomalous drainage.

Conclusion: Awareness of such defects is essential in treatment planning in cases of endovascular surgery for abdominal aneurysm repair, as well as in cases of renal tumors where partial nephrectomy or embolization is contemplated or in the case of kidney transplantation. HIPPOKRATIA 2024, 28, 1: 35-37.

Keywords: Renal artery, congenital vascular anomalies, accessory renal artery, kidney

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Introduction

Anatomical variations of the renal arteries involve their number, origin, and the existence and course of accessory or ectopic arteries. The origin of the renal artery is normally from the abdominal artery at the L1-L2 vertebral level, just inferior to the superior mesenteric artery, with the right usually being longer than the left renal artery. Approximately 70 % of individuals have a single renal artery in each kidney¹. In about 30 % of people, accessory renal arteries (ARA) are common and may arise above or below the main renal artery. In a cadaveric study of 206 kidneys, multiple renal arteries were identified, 87 % unilaterally and 13 % bilaterally². ARA is more commonly detected unilaterally (30 %) than bilaterally (10 %)¹. We present an extremely rare case of congenital renal vasculature abnormalities involving the presence of two right renal arteries originating from extremely unusual sites.

Description of Case

A 68-year-old man underwent, for staging purposes, an abdominal computed tomography (CT) scan following a recent diagnosis of metastatic prostate cancer to the bones with a Gleason score of 4 + 4 = 8 bilaterally.

The patient denied having had any previous abdominal imaging and did not disclose any relevant surgical history. His significant co-morbidities were diabetes type II on metformin and arterial hypertension. Staging imaging with CT angiography revealed a rotated right kidney with an extrarenal pelvis of 16.5 mm in diameter and certain anomalies of the kidney vasculature. More specifically the CT scan showed the presence of two feeding arteries; the first originating from the abdominal aorta, 6.5 mm below the level of the origin of the inferior mesenteric artery, and the second from the left common iliac artery (Figure 1 and Figure 2). The renal venous system also presented significant anatomical variations as the right renal venous drainage was accomplished through two veins; the first drained to the left common iliac vein while the second drained to the inferior vena cava. The patient was never symptomatic.

Discussion

Anomalous origin of the renal artery, either from the abdominal aorta, or from other branches of the abdominal aorta is not uncommon, with over 30 % having more than one artery supplying the kidney³. Origin from the common cello-mesenteric trunk and the superior mesenteric

artery^{4,5} have been reported, as well as a case of anomalous origin of the left renal artery from the celiac axis and the inferior mesenteric artery, respectively⁶. Garti and Meiraz reported a case of anomalous origin of the left renal artery from the abdominal aorta, just above the celiac artery⁷. Also, not uncommonly, multiple origins of ARAs, even under the inferior mesenteric artery, have been described⁸.

However, the origin of the renal artery from a contralateral branch of the abdominal aorta is sporadic, with the present being the third reported case ever, with all three cases involving the right renal artery^{9,10}.

During embryogenesis and during the kidney's ascent, an extensive network of small branches originating from the lateral aorta, known as the rete arteriosum urogenitale, supplies the kidney. At the final stage of

kidney development the transitory vessels normally become obliterated and disappear⁴. However, multiple renal arteries are found in rare cases where more than one mesonephric branch persists. The close anatomical relationship in the fetal pelvis between the superior mesenteric artery, the celiac artery, and the right renal artery during embryogenesis may explain the anatomical variation of the right renal artery from these sites.

The origin from the common iliac artery, even for a single renal artery, bears significant importance as devastating renal ischemia could be provoked by ligation or exclusion of the common iliac artery's branches (e.g., in endovascular repair, open aneurysm surgery, malignancy, or retroperitoneal lymph node dissection). The presence of ARA has been identified in 9 % to 20 % of patients with abdominal aortic aneurysm¹¹. Spanos et al assessed the effect of blocking the ARA during endovascular repair of aortic or complex aneurysms on acute kidney injury (AKI), renal infarction, chronic renal failure, and death¹¹. In a population of 1014 patients, they identified the presence of ARA in 9-20 % of patients with an abdominal aortic aneurysm. The European Society of Vascular Surgery and Society for Vascular Surgery guidelines advise preserving large ARAs (>3 mm) and those that supply more than one-third of the kidney during endovascular aortic aneurysm repair¹². Therefore, preoperative angiography is recommended in such operations to avoid such complications.

Conclusions

Although abnormalities related to the anatomy of the kidneys are common, the finding of ectopic and anomalous vasculature involving both the arterial supply and venous drainage, along with renal parenchyma development abnormalities, is infrequent. Even though asymptomatic, the knowledge of the presence of ectopic renal arteries, especially when they arise from origins other than the abdominal aorta, is crucial when planning endovascular, laparoscopic, or open surgical procedures such as partial nephrectomy and kidney transplantation, or an-



Figure 1: Coronal plane of abdominal computed tomography angiography in the arterial phase showing a dichotomous, rotated right kidney with two feeding arteries; the first one originating from the abdominal aorta (superior black arrowhead), and the second one from the left common iliac artery (inferior black arrowhead). The venous drainage is accomplished through two veins; the first is drained to the left common iliac vein (white arrowhead), while the second is drained to the inferior vena cava (arrow).

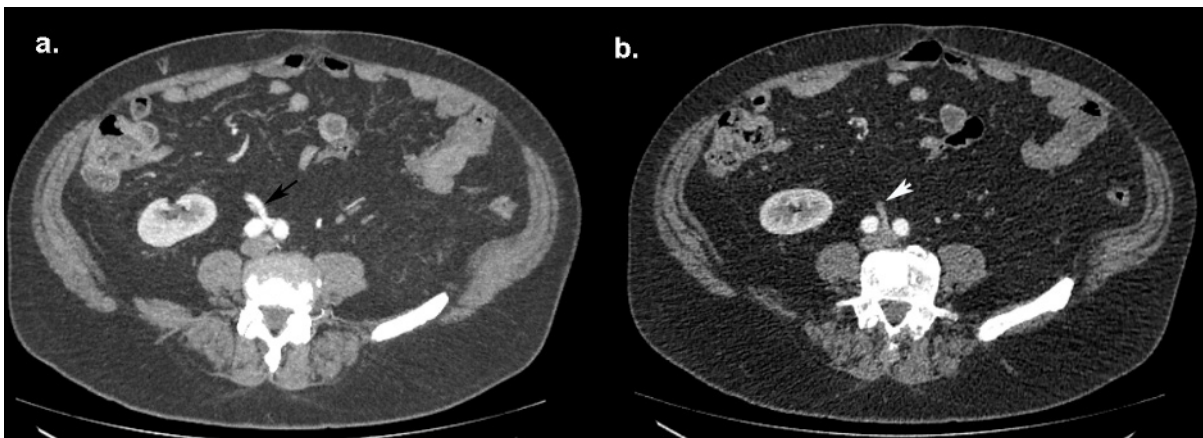


Figure 2: Axial plane of abdominal computed tomography angiography in the arterial phase showing a) maximum intensity projection (MIP) at the level of the inferior right renal artery that is originated from the left common iliac artery (black arrow) and b) at the level of the inferior right renal vein that drains to the left common iliac vein (white arrowhead).

giographic embolization for large renal masses.

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