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Case Report

Supradiaphragmatic origin of the right renal artery: a case report[☆]

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ABSTRACT

Renal arteries are the main blood supply to the kidneys. They originate from the abdominal aorta at the level of the first and second lumbar vertebrae. However, variations in their origin are common. Therefore, studying renal arteries before any surgical intervention such as renal transplant surgery, conservative or radical renal surgeries, renal trauma, and others, is crucial to avoid undesirable avoidable complications or morbidities. Herein, we report a case of an isolated right supradiaphragmatic renal artery that was discovered incidentally in a 66-year-old female patient with normal blood pressure.

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Introduction

Renal arteries originate from the abdominal aorta at the first and second lumbar vertebrae levels. Most commonly, the right renal artery emerges at the lower border of L1 in 25% of the cases and the left renal artery at the upper border of L2 in 24% of the case [1,2]. However, variations in their origin are common. They may present as more than one renal artery emerging from different locations (20%–30%) or as the ectopic origin with the thoracic aorta being an extremely rare origin [3–5]. The importance of knowing these variations is more important than ever as the number of renal transplants, renal surgeries, renal artery embolization, and procedures performed by urologists are increasing. Moreover, this variation will impli-

cate the success, and increase the complications, and morbidity of such procedures [2,3]. Herein, we present a case of a 66-year-old patient diagnosed incidentally with an ectopic right renal artery.

Case report

A 66-year-old female, vitally stable patient presented with mild right upper quadrant pain for the past year. Upon investigation; labs were all within normal ranges, an abdominal ultrasound revealed an unilocular, fluid filled, well-circumscribed, thin walled, lesion in the left liver lobe. A

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Fig. 1 – X: An axial abdominal arterial phase contrast-enhanced CT-scan showing an abnormal origin of the right renal artery which arises from the thoracic aorta and above the level of diaphragms. Two hepatic cysts were noted. **Y:** A coronal section of abdominal computer tomography scan (CT) angiography showing: (A) The right renal artery. (B) The abdominal aorta. (C) The left renal artery.

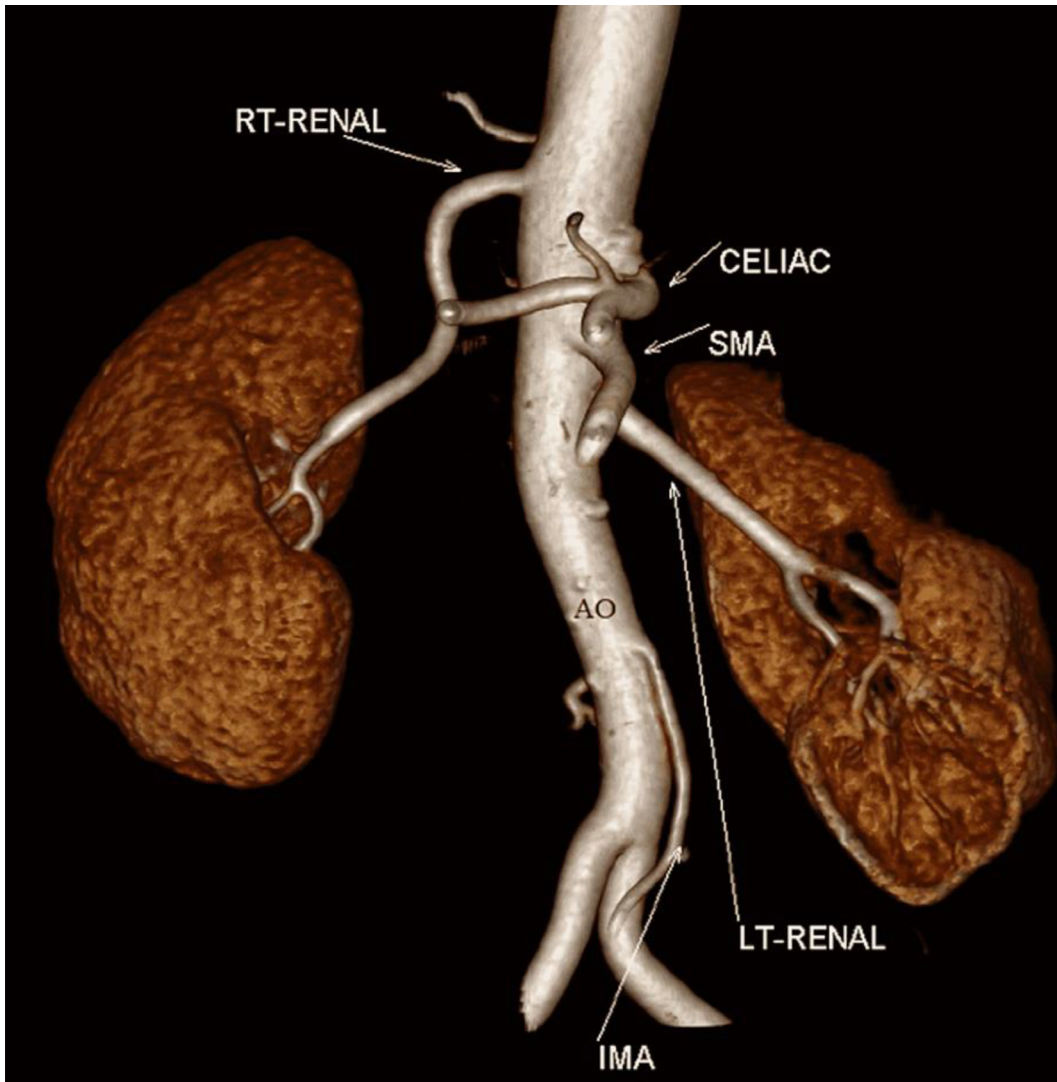


Fig. 2 – A reconstructed version of the CT scan showing the right renal artery arising superior to the celiac artery.

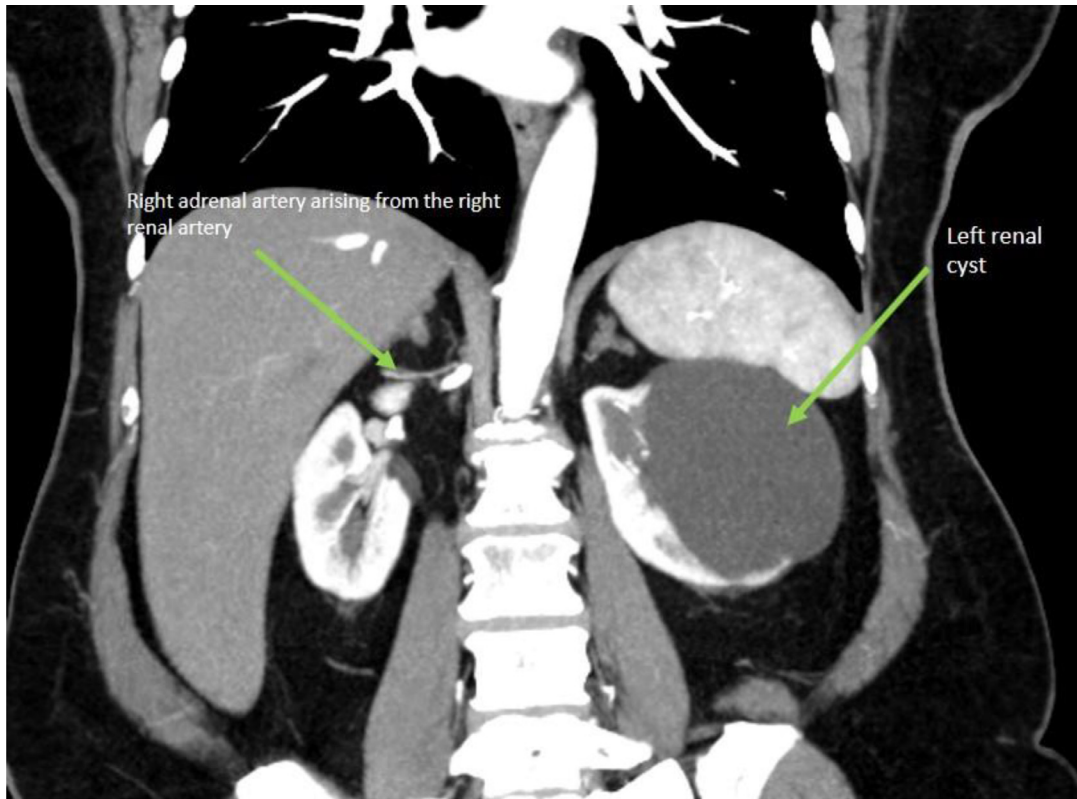


Fig. 3 – Coronal abdominal arterial phase contrast-enhanced CT-scan shows a right adrenal artery arising from the right renal artery and a large left renal cyst.

triphasic computer tomography scan using Opitray (a non-ionic contrast) was performed. A 2.8×2.4 centimeters and a 1.4×1.2 centimeter cystic lesions were seen in the left liver lobe, no septations or calcifications were seen, and no contrast enhancement during the venous or the arterial phase. In addition to that, an ectopic right supradiaphragmatic renal artery was incidentally seen in the arterial phase. The artery originates at the T11-T12 vertebral disc space level and pierces the diaphragm at the T12-L1 vertebral disc space level coursing toward the right renal hilum (Fig. 1). A reconstructed version of the image was done for a better view of the renal arteries (Fig. 2).

The right renal artery measured 91 mms in length (40 mms were above the diaphragm) and 5 mms in diameter without stenosis or calcifications. The right kidney was normal in position (the superior pole and inferior pole were at the levels of T12 and L3 vertebral bodies, respectively). The right adrenal artery also originated at the level of T12, and an incidental large left renal cyst was noted, measuring 9.5×8.5 centimeters with benign features (Fig. 3).

No other abnormalities in the aorta, celiac trunk, veins, kidneys, accessory vessels, or left renal artery were detected. In light of these findings, the patient was diagnosed with a simple hepatic cyst, a supradiaphragmatic origin of the right renal artery, an ectopic right adrenal artery and a simple left renal cyst. The patient was scheduled on follow up ultrasounds to monitor the size and the stability of the cysts.

Discussion

Variation in renal arteries origin is common, supradiaphragmatic (thoracic) renal arteries remain an extremely rare variant with a limited number of cases being reported in the literature [3,5,6]. It has no predilection for sex or age. However, it is less common to present on the left side [1]. According to Kim [1], the number of cases of thoracic origin of the renal artery in the literature is 14 including theirs.

The etiology of such variations is speculated to be the result of abnormalities during embryological development. As the kidneys ascend to their final anatomic location in the retroperitoneum, they are supplied by a group of mesonephric arteries (9 pairs) which are divided into cranial, middle, and caudal groups. In cases of supra-diaphragmatic origin of the renal artery, it is believed that the cranial group of lateral mesonephric arteries does not involute, which leads to a renal artery originating proximal to the celiac trunk [1–3]. This is more common on the right side as in this case, however, this can be due to the superior position of the right renal artery compared to the left counterpart [6].

There is no specific presentation of the supradiaphragmatic (thoracic) origin of the renal artery, as many previous cases are discovered incidentally [3–6]. However, hypertension was diagnosed in a considerable number of cases [1]. It has been reported a coexistence of an accessory renal artery with a supradiaphragmatic renal artery [3].

Variants of the renal artery are associated with postoperative complications such as bleeding, ischemia, may be associated with renal artery stenosis and complicate surgical procedures such as renal transplants [2].

Considering the aforementioned, studying the renal artery course with computer tomography angiography preoperatively may halt the rates of iatrogenic injuries to the patients and improve the outcome of procedures involving the renal artery such as renal trauma, resection of metastasized renal cell carcinoma, abdominal aortic aneurysm surgery, renal transplant, partial or radical renal surgeries, and others.

Conclusions

The renal artery has many variants; the supra-diaphragmatic origin of the renal artery is amongst the rarest. More reports and studies are needed to understand the exact etiology and presentation of such abnormalities. However, studying the renal artery anatomy before operating high-risk procedures involving renal arteries such as renal transplants and endovascular embolization can decrease the rates of complications post-operatively.

Patient consent

Written informed consent to publish this case and use anonymized radiologic material was obtained from the patient.

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