A CASE REPORT OF SUPERIOR BILATERAL ABERRANT RENAL ARTERIES WITH ACCESSORY LEFT RENAL VEIN

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Abstract

Knowledge of renal vasculature anomalies is important during the preparation of renal and abdominal surgeries. In this case report, we described a rare finding of bilateral aberrant renal arteries, located at the superior pole of both kidneys, in a cadaver of an elderly Asian man during an anatomy practical session. The aberrant arteries branch from the abdominal aorta, slightly above the level of the normal renal arteries. Additionally, an accessory left renal vein was found to originate from the superior pole of the left kidney which later drains into the left renal vein. No accessory right renal vein was observed. The left renal vein was usually located anterior to the aorta, and bilateral testicular veins were noted to drain into common destinations.

Keywords**:** Aberrant Renal Artery, Accessory Renal Vein, Renal Vasculature Anomalies

Introduction

Anomaly in renal vasculature is relatively common. Most of the time the anomaly remains silent, asymptomatic, and only discovered incidentally. Nevertheless, these anomalies can become clinically important when their existence leads to symptomatic clinical presentations. Their presence may affect surgical procedure in the peritoneal region specifically and may be life-threatening if ignored.

A previous study (1) estimated the incidence of renal arterial anomalies to be between 9% to 76% and differentiated based on gender and race. Renal arterial anomalies are broadly divided into aberrant and accessory renal arteries.

Aberrant renal artery (ARA) is an artery that directly supplies the kidney at the superior or inferior pole without passing through the hilum. ARA arises from either abdominal aorta, suprarenal artery, common iliac artery, internal iliac artery, superior mesenteric artery or spermatic artery (2). The name of the aberrant artery depends on the side of the kidney and the entry pole, for example 'right superior renal polar artery' or 'left inferior renal polar artery'.

The incidence of inferior pole ARA was more commonly reported (3) compared to the superior pole, and unilateral renal artery anomalies are more common compared to bilateral incidence. A study (4) has reported aberrant renal arteries entering the superior or inferior poles of the kidney and consequently causing a ureteric obstruction that result in hydronephrosis. Numerous studies in the literature acknowledged the existence of inferior pole ARA complications, but few complexities are likewise mentioned in the superior pole ARA.

In a previous study (5), superior pole renal artery stenosis was discovered via angiography in a resistant hypertensive patient following five months of renal sympathetic denervation. The patient persistently manifested hypertensive episodes even after a successful ablation. Superior pole ARA would be more vertical in its trajectory. This results in slower perfusion to the kidney due to its lower arterial pressure, which also leads to reduced perfusion of the renal parenchyma. This was demonstrated in a radiological investigation that resulted in increased blood pressure or upper pole infarction in several cases (6).

On the other hand, an accessory renal artery is the one that is accompanying the main renal artery and entering the kidney together through the hilum of the kidney (7). The incidence of the unilateral accessory renal artery is

more common on the left side and usually arises from the lateral border of the abdominal aorta. It was observed that the accessory renal artery is usually longer and narrower compared to the main renal artery.

In the textbook of anatomy, the right renal vein (RRV) is shorter than the left (LRV), thus RRV drains directly into the inferior vena cava (IVC). LRV on the other hand lies anterior to the abdominal aorta and received tributaries from the left suprarenal and left gonadal veins. Renal veins and the IVC develop between the fourth and eighth weeks of intrauterine life, involving formation, anastomoses and regression of three paired veins i.e., posterior cardinal, sub cardinal and supra cardinal veins (8).

Anomalies of renal veins are also relatively common (3). They are usually unnoticed but routinely found during venography, retroperitoneal surgery or necropsy as well as during renal transplantation. The RRV anomalies are more common than LRV ones, with 19.2% and 7.1 % incidences respectively (9).

The classification of renal venous anomalies has been studied using various radiological methods (10). They normally result from anomalies in vessel embryogenesis and are closely related to the development of inferior vena cava (IVC). RRV anomalies are less complex, depending on the different embryological development (11).

Renal venous anomalies are categorized into three main types: 1) multiple renal veins (12) which involves two or more renal veins either unilaterally or bilaterally, 2) retro aortic left renal vein (RLRV), characterised by the vein having retro aortic course before entering the inferior vena cava, and 3) circumaortic left renal vein (CLRV), which involves two or more renal veins forming a ring structure around the aorta (13).

Renal vein anomalies are also known to be associated with clinical disorders including haematuria, pelvic congestion syndrome, nutcracker syndrome, renal ectopy and varicocele (14).

Case Report

During a routine anatomy dissection practical session for second-year medical students under the Urinary System module, 20 kidneys were introduced to the students. A cadaver of an elderly Asian man with the unknown medical background was found to have aberrant renal arteries (ARA) at the superior poles bilaterally (Figure 1 [3] and [10]).

The identification of the ARA was strongly evidenced by their branching out from the abdominal aorta, slightly above the level of the normal renal arteries. There were no other aberrant arteries that were observed either to the inferior pole, anterior surface, or posterior surface of both kidneys. The abdominal aorta was located to the left of the inferior vena cava. However, no testicular arteries were identified because of prior resection. Furthermore, the right inferior suprarenal artery (Figure 1 [2]) was observed to branch from the aberrant right superior renal polar artery.

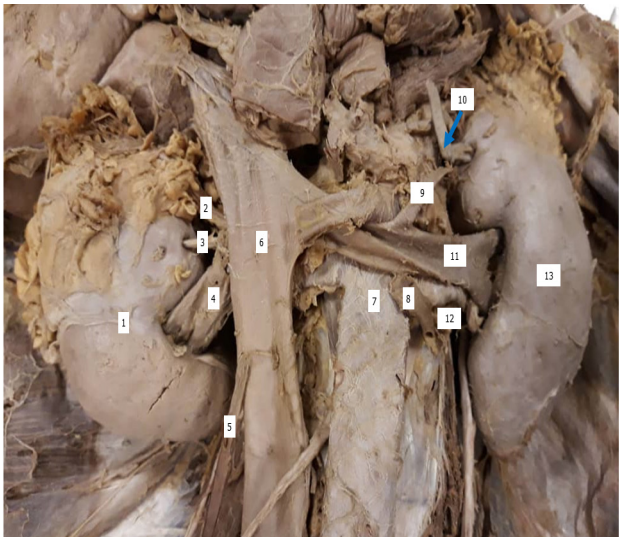

Figure 1: Photograph of an anterior view of both kidneys. [1] Right kidney, [2] Inferior right suprarenal artery, [3] Right superior renal polar artery, [4] Right renal vein, [5] Right testicular vein, [6] Inferior vena cava, [7] Aorta, [8] Left testicular vein, [9] Accessory left renal vein, [10-cut off] Left superior renal polar artery, [11] Left renal vein, [12] Left renal artery, and [13] Left kidney.

Additionally, an accessory left renal vein (Figure 1 [9]) was spotted to originate from the superior pole of the left kidney which drained into the left renal vein. No accessory right renal vein was observed. The normal left renal vein was located anterior to the aorta and bilateral testicular veins were noted to drain into common destinations. There was no duplication of inferior vena cava observed. The schematic diagram of the findings is illustrated in Figure 2.

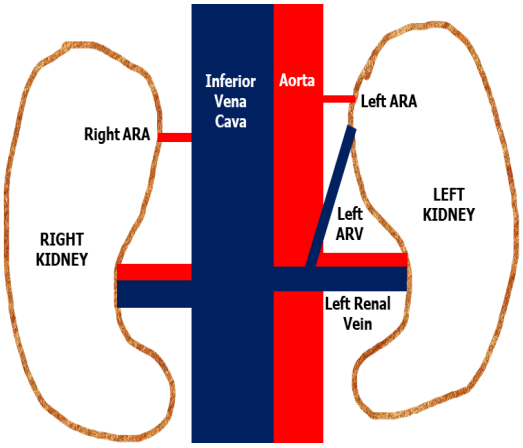

Figure 2: Schematic diagram of an anterior view of both kidneys. Right and left Aberrant Renal Artery (ARA), both originated from the aorta supply both superior lobe of the kidney, respectively. Accessory left renal vein (ARV) drain from superior lobe of the left kidney into left renal vein.

Discussion

The preoperative examination of renal vasculatures is unquestionably valuable to predict the success rate of renal transplantation. Several criteria are scrutinized for surgical planning especially the calibre of a renal vessel, location, and also the anomalies such as accessory, aberrant and incidental renal vessels (1). Comprehensive knowledge of renal arterial supply is important to avoid any iatrogenic incidence intraoperatively especially during vascular reconstruction renal surgery, renal transplantation and abdominal aortic aneurysm (15).

In this case report, we found superior pole aberrant renal arteries (ARA) bilaterally, which incidence is less common as compared to the inferior pole ARA, making this a rare discovery. The presence of a superior pole ARA is believed to persistently supply the superior pole of the kidney and may also supply the inferior suprarenal artery. No medical history was available of the subject, but speculatively, in renal surgery, resection of remaining renal vascular segments will compromise its viability. The extra vessel may also provoke pain on the affected side of the body. Adhesion and faulty rotation are believed to create tautly and tension on the vessel thus stimulates the pain receptor. This condition is relatively common in the incidence of the inferior pole ARA.

The origins of the right and left ARA were discovered to be at different levels. The right ARA developed at a lower level than the left ARA. Nine pairs of lateral mesonephric arteries emerging from the dorsal aorta supply the developing suprarenal glands, mesonephros, metanephros, and gonads throughout embryology. These lateral mesonephric arteries were categorised into three groups: cranial, middle, and caudal arteries. Renal arteries arise from the middle group of arteries; however, multiple renal arteries develop from the persistence of more than one middle group artery. As a result of bilaterally persisting mesonephric arteries of the middle group of arteries, the abnormal renal arteries are persisted in this scenario (16).

We also found an accessory left renal vein originating from the superior pole of the left kidney which drained into the inferior vena cava. This finding is well-described in the first type of renal venous anomalies as previously reported (12). The identification of renal vein is important during renal transplantation especially in transferring gonadal vein for reconstruction. Furthermore, a rare entrapment of the testicular artery between two ipsilateral renal veins was also reported (17). Nonetheless, this entrapment was not seen in our case.

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Ethical clearance

The study's approval was granted on 12th June 2020 (UPM/FPSK/JAM/500-3/16).

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Competing interests

There are no conflicts of interest declared by the authors.

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