



Bilateral Accessory Renal Arteries: A Case Report

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Abstract

Anomalous blood vessels are always interesting from a purely scientific point of view, especially since they so often shed light on obscure problems of phylogeny and ontogeny. The evolutionary history of kidney and renal artery is recapitulated during embryonic development. Most of the variations of human renal vessels can be explained on the basis of phylogeny as many conditions which are anomalous in human are normally present in some animals. The most common variation of renal artery is the presence of an accessory renal arteries, occurring in approximately 30% of cases. The precise knowledge of renal vascular pattern is significant in conduct of various renal surgeries, interventional radiology, and urologic procedures. Variations in renal vascularization have assumed greater importance in conservative surgeries; hence the presence of accessory arteries cannot be overlooked during surgical resection, partial nephrectomy and renal transplant. The present case report aims at highlighting the possible variation in renal vasculature and its embryological and clinical significance.

Key words: Accessory renal artery, Aorta, Kidney, Renal artery, Renal transplant

INTRODUCTION

Anatomical knowledge of the variations of the renal artery has grown in importance with increasing numbers of renal transplants, vascular reconstructions and various surgical and radiological techniques being performed in recent years. The paired renal arteries arise as lateral branches from the abdominal aorta just below the origin of superior mesenteric artery at the upper lumbar level (L₁-L₃). The right renal artery is

longer than left renal artery owing to the location of the abdominal aorta more towards the left side of midline. Near the hilum of the kidney, each renal artery divides into anterior and posterior branch, which in turn divides into number of segmental arteries supplying the different renal segments. The paired renal arteries takes about 20% of the cardiac output to supply organs that represent less than one hundredth of total body weight⁽¹⁾.

Accessory renal arteries constitute the most common, clinically variant vascular variant and are seen upto one third of patients. In 70% of cases there is a single renal artery supplying each kidney. Multiple renal arteries are unilateral in approximately 30% of patients and bilateral in approximately 10%⁽²⁾.

An accessory renal artery is the one that is accessory to the main artery accompanying the same towards the hilum and entering the kidney through the hilum to supply it, while the aberrant artery supplies the kidney without entering the hilum⁽³⁾. According to Graves (1956), any artery arising from the aorta in addition to the main renal artery should be named accessory and the renal arteries arising from sources other than aorta should be aberrant⁽⁴⁾.

Prior knowledge of these possible variations of renal arteries may help the surgeon in planning renal transplantation, repair of abdominal aorta aneurysm, urological procedures and also for angiographic interventions⁽⁵⁾.

MATERIAL AND METHOD

During routine dissection study of undergraduate students vascular abnormalities of right and left kidney were encountered in a unknown middle aged male cadaver. The cadaver was embalmed and preserved as per standard procedure. Abdominal viscera were removed to get clear access to posterior abdominal wall structure like kidney and associated blood vessels. Dissection steps done carefully, and finally both kidney, renal vessels, aorta and accessory renal arteries removed intact and photograph were taken.

OBSERVATION

In our study, we found a rare case of bilateral accessory renal arteries, arising as lateral branches from the abdominal aorta.

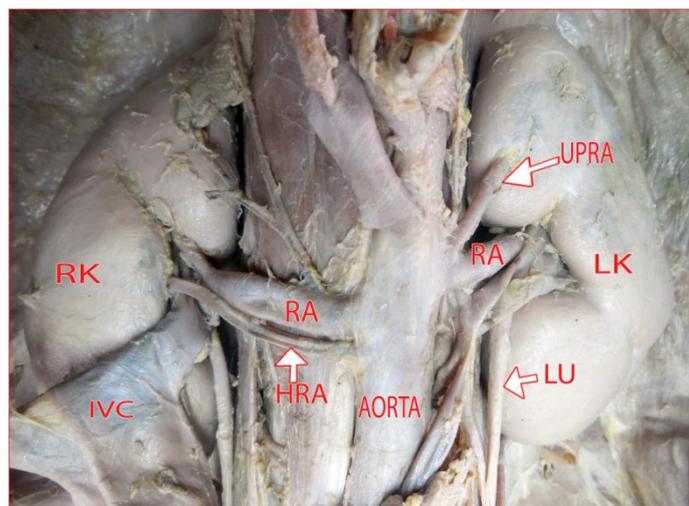


Figure: Photograph of abdomen showing right and left kidney with bilateral accessory renal arteries.

RA- Renal artery, RK- Right kidney, LK- Left kidney, HRA- Hilar renal artery, UPRA- Upper polar renal artery, LU- Left ureter.

The left accessory renal artery was arising from the abdominal aorta along the origin of left renal artery. Then it was running upward and laterally towards the upper pole of left kidney. We called this branch as the polar artery.

The right accessory renal artery was small in caliber, thin walled and was arising from aorta just below the origin of right renal artery. This artery was running below and parallel to the main artery and entered into the kidney through the hilum. Because of this, this artery we called as hilar artery. So we found one hilar renal artery on right side and one polar artery on left side in our case.

Right and left renal artery was arising from the abdominal aorta at the level of upper border of L₂ and lower border of L₁ vertebra respectively.

DISCUSSION

In the anatomy books the variations in the origin of the renal artery were divided into two groups. They were: 1) The early division and 2) the extra renal arteries. The early division consisted of the branching of the main renal arteries into segmental branches, which lay more proximal in terms of their origins. Extra renal arteries were divided into two groups: the hilar and the polar

arteries. The hilar arteries entered the kidneys from the hilus with the main renal artery, where as polar arteries entered the kidneys directly from the capsule outside the hilus ⁽⁶⁾.

Numerous anatomic variations regarding the vascularization of kidneys including presence of multiple arteries with or without congenital abnormal kidneys, retroaortic course of the renal vein and abnormal origins of the renal arteries, have been reported in the literature. Accessory renal arteries constitute the most common, clinically important vascular variant and are seen in up to one third of patients. Most of the abnormalities in the renal arteries are due to the various developmental position of kidney. Following table compare the % age incidence of accessory renal arteries in the various studies ⁽⁷⁾.

Table: % age incidence of accessory renal arteries in the various studies.

Authors	% of total Accessory renal arteries
Macallister	43
Rupert (1915)	61
Eisendrath (1990)	45
Anson & Kruth (1955)	20
Merklin & Michel (1958)	30
Bergman et al (2000)	30
Nayak (2008)	20
Saldarriaga et al (2000)	24.9
Zaoyapan et al (2009)	42
Budhiraja et al (2010)	11.66
Anupama Gupta et al (2011)	28.33

The reported incidence of accessory renal arteries has a wide range between 8.7% and 75.7% owing to social, ethnic, and racial difference ⁽⁸⁾. It is more common in African (37%) and caucasians (35) when compared with other populations, and less common in Hindus 17% ^[6]. It is important that a surgeon has prior knowledge of all such accessory renal arteries supplying the upper and lower pole because inadvertent injury or failure to restore circulation during renal surgeries and transplant operations might even result in necrosis ⁽⁹⁾.

Dhar and Lal studied the renal vasculature in 40 cadavers and revealed multiple renal arteries in 20% of cadavers, unilateral anomaly was more common than bilateral (5%) ⁽¹⁰⁾. Khamnareng et al. conducted a study in 267 cadavers observed 17% double renal arteries and 1% of triple renal arteries ⁽¹¹⁾. Rao et al. have observed bilateral pre hilar multiple branching of renal arteries ⁽¹²⁾.

Bordei et al. analyzed 272 kidneys for a study of renal vascularization and identified 54 (20%) double renal arteries and 3 (1.1). triple renal arteries ⁽¹³⁾.

Embryology:

Ontogenic basis of accessory renal artery has been convincingly explained by Keibel and Mall (1912). As the kidney ascends from the pelvis during the ontogeny, they receive their blood supply from the vascular structures close to them. Initially renal arteries are the branches of common iliac arteries. Later, while the kidneys ascend they receive new branches from the aorta, and the inferior branches disappear. In the ninth week of the intrauterine life the kidneys come in contact with the suprarenal glands and the ascend ceases. The kidneys receive their most cranial branches from the aorta. These are the permanent renal arteries. Failure of degeneration of initial branches leads to formation of accessory renal artery.

CONCLUSION

Knowledge of the variations in the renal arteries is important for urologist, radiologist and surgeons in general. It is of great importance in performing operation like segmental resections, partial nephrectomy, and renal transplantation. These variations can be confirmed preoperatively by selective angiography. Its awareness may also provide safety guidelines for endovascular procedures like therapeutic embolization and angioplasties and helps in the management of renal vascular hypertension.

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