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CADAVERIC STUDIES OF RENAL VESSELS WITH DEVELOPMENTAL CORRELATION

Anatomy

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ABSTRACT

Adequate knowledge of variations of arteries supplying the kidney is essential not only to the anatomists but also to the surgeons. Such variations were observed during routine dissection of department of Anatomy in CIMS, Bilaspur. Study perform during 2015 to 2018 in 50 cadaveric Kidneys. Here, we find unilateral accessory renal artery, bilateral accessory renal artery, double renal artery and vein, triple & quadrant renal arteries. Awareness of variations of renal artery is necessary for surgical management during renal transplantation; aortic aneurysm, urological procedures and for angiographic interventions.

KEYWORDS

Accessory renal vessels, Renal transplantation, supernumerary renal arteries, mesonephric arteries.

Introduction:

Vascular supplies to the kidneys are only the renal arteries, classically. They originate from the lateral aspect of the abdominal aorta, mostly between the L1 and L2 inter vertebral disk, inferior to the origin of the superior mesenteric artery. They are approximately 4 cm to 6 cm long, have a diameter of 5 mm to 6 mm and run in a lateral and posterior course due to the position of the hilum. They run posterior to the renal vein and enter the renal hilum anterior to the renal pelvis. The renal artery also supplies the adrenal gland and ureter on the ipsilateral side.[1]

Mostly 25% of the adult kidneys have two to four renal arteries arising from the Aorta, superior or inferior to the main renal artery.[2] During ascent of the kidney, is supplied by a number of transitory vessels, all originating from the aorta. The definitive renal arteries arise from the lumbar region of the aorta during ascent while the transitory vessels normally disappear, however some older one remains and known as accessory renal artery.[1,3] Kidneys receive their blood supply and venous drainage from successively more superior vessels during ascent of kidney. Usually the Inferior vessels degenerate as superior ones take over .Failure of these vessels to degenerate results in accessory renal arteries and veins. Variation in the number and position of these vessels occur in approximately 30% of people.[4]

The majority of these arteries enter the kidney at the renal hilum although direct entry via the renal cortex also occurs. Accessory arteries which supply the lower pole of the kidney have been shown to obstruct the ureteropelvic junction. Ectopic kidneys are even more likely to have more than one renal artery, and their origins may arise from the celiac, the superior mesenteric artery, or the iliac artery.[1,3-6] Anatomical knowledge of the variations of the renal arteries have vital importance with increasing numbers of renal transplants, vascular reconstructions and various surgical and radiologic techniques being performed in recent years.

Materials & Methods:

The formalin-fixed 50 cadaveric kidneys constituted the material for the study. During routine practical classes conducted for medical undergraduates at the department of anatomy, the kidneys along with their renal arteries were studied and the morphological variations of renal arteries were observed and noted.

Observations:

In our study on 50 cadaveric kidneys from 2015 to 2018 in Chhattisgarh Institute of Medical Science, AYUSH Health University, (C.G) supernumerary renal vessels were found in 12 kidneys.

OBSERVATION TABLE			
No	Supernumerary Renal Vessels	Total Number of kidney	Determinant Side
1.	Unilateral accessory renal artery	07	05 Right, 02 Left
2.	Bilateral accessory renal artery	02	01 Right, 01 Left
3.	Double renal artery and renal vein	01	Right
4.	Triple Renal arteries	01	Left
5.	Quadrant Renal Arteries	01	Right

7 Out of 12 kidneys had additional branches other than renal artery either in superior pole or inferior pole of the respective kidneys and some had accessory renal arteries in the hilum of the kidneys. Two kidneys had bilateral accessory renal arteries, one kidney had double renal arteries and double renal veins, one kidney had double accessory renal arteries and 1 kidney has tripple accessory renal arteries. Eight kidneys having right side additional renal arteries whereas left side only having four kidneys. In our study accessory renal arteries are more common in right side and incidence of supernumerary renal vessels in present study is 24%.

Discussion:

In 30% individuals, Accessory renal arteries are common and usually arise from the aorta above or below, mostly below the main renal artery and follow it to the renal hilum.[2,5] In a study in 267 Thai cadavers, *Khamanarong et al*.(2004) observed 17% double renal arteries and 1% of triple renal arteries.[7] *Bordei et al.* (2004) studied renal vascularization in 272 kidneys and identified 20% double renal arteries and 1.1%triple renal arteries.[8] *Dhar and Lal* (2005) observed multiple renal arteries in 20% of cadavers in a study of 40 cadavers, unilateral anomaly was more common (15%) than the bilateral (5%).[9] *Rao et al.(2006)* showed bilateral pre hilar multiple branching of renal arteries.[10] Bilateral additional renal arteries originating from abdominal aorta also been reported by *Bayramoglu et al(2003).*[11] In an angiographic study of 855 cases of renal arteries, *Ozkan et al(2006)* demonstrated multiple arteries in 24%, bilateral multiple arteries in 5% and early division in 8% of cases; additional renal arteries were found in 16% of the cases on the right side and 13% of the cases on the left side.[12] *Satyapal* et al (2003) observed 1244 pairs of kidneys and

reported additional renal arteries on the right side in 18.6% and on the left side in 27.6% of the cases.[13] *Pestemalci et al* (2009) bilateral triple renal arteries was also reported in a case report.[14]The renal artery arises from the most caudal of the lateral splanchnic arteries.[15] The kidneys begin to develop in the pelvic cavity and during this time they receive blood from the neighboring vessels and, therefore, their blood supply changes sequentially as they ascend to occupy the adult position in the abdomen.[4,15] Interest in the surgical and medical aspects of accessory renal arteries has been high because of hemorrhage and loss of renal parenchyma. Kidneys with accessory renal artery have higher incidence of transplant failures than kidneys showing no variation.[16]

According to Felix, Embryological explanation of these variations, in an 18mm fetus, the developing mesonephros, metanephros, suprarenal glands, and gonads are supplied by nine pairs of lateral mesonephric arteries arising from the dorsal aorta. Felix divided these arteries into three groups as follows: the 1st and 2nd arteries as the cranial, the 3rd to 5th arteries as the middle, and the 6th to 9th arteries as the caudal group. The middle group gives rise to the renal arteries. Persistence of more than one artery of the middle group results in multiple renal arteries.[17] In this study multiple renal arteries are a result of persisting lateral mesonephric arteries from the middle group. Detailed knowledge of the presence of potential variations in renal arterial anatomy is important for successful surgical management during renal transplantation, repair of renal artery aneurysm, angiographic interventions and endovascular repair of isolated superior mesenteric artery dissection.

In this study, 24% supernumerary renal arteries are studied in 50 cadaveric kidneys and we find double, triple and quadrate renal artery which are developmentally correlated. In this study, 66% supernumerary renal arteries are present on right side and 33% on left side.

Conflict of Interests:

The authors declare that they have no conflict of interests.

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