

Variant Segmental Renal Arteries in The Right Kidney- Clinical Correlations- A Case Report

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Abstract

Renal artery variations are becoming more important due to the gradual increase in interventional radiological procedures, urological and vascular operations, and renal transplantation. Right renal artery was divided in to two segmental arteries (anterior and posterior) 4 cm proximal to the hilum of right kidney while left renal artery was normal in origin and course. To plan the adequate surgical procedure and to avoid any vascular complication, Multi Detector Computer Tomography (MDCT), angiography and arteriography should be performed prior to surgery (nephrectomy). As the number of renal surgical and radiological interventions increase, a better understanding of the anatomy of renal arteries and their branches gain importance.

Keywords: Kidney; Renal; Nephrectomy; Segmental artery; Vascular

Introduction

The renal arteries are a pair of lateral branches arising from the abdominal aorta below the level of superior mesenteric artery at the upper lumbar level (L1-L3) [1]. Each renal artery divides into anterior and posterior divisions at or very close to the hilum of the kidney. Further it divides into segmental arteries to supply the respective segments of the kidney being themselves the end arteries [2]. Renal artery variations are divided into 2 groups: early division and ERA (Extra Renal Arteries). The branching of the main renal artery into

segmental branches more proximally than the renal hilum level is called early division. ERA are divided into 2 groups: hilar (accessory) and polar (aberrant) arteries. Hilar arteries enter kidneys from the hilum with the main renal artery, whereas polar arteries enter kidneys directly from the capsule outside the hilum. Conventional textbooks of anatomy define the order of hilar structures from above downwards and from anterior to posterior as renal vein, renal artery and pelvis [1]. Normally, each kidney receives one renal artery. The venous drainage of each kidney is through one renal vein, which drains the blood from the kidney into the inferior vena cava. The left renal vein also receives left suprarenal and left gonadal veins, in addition to the vein coming out from the kidney [3]. Variations in number, source and course of the renal arteries are common [4]. Knowledge of the variations of renal vascular anatomy has importance in exploration and treatment of renal trauma, renal transplantation, renal artery embolization, surgery for abdominal aortic aneurysm and conservative or radical renal surgery [5].

Case Report

In the present case report, during routine abdominal dissection conducted in an adult male cadaver while teaching medical undergraduates, we observed a variation in the segmental branching pattern of renal artery. The variation was detected unilaterally in the right kidney. The hilar region was dissected carefully and the structures and their relations were clearly defined. Appropriate photographs were taken (Figures 1-3).



Figure 1: Anterior view of abdomen showing details of right hilar renal regions. AA: abdominal aorta; MRA: main right renal artery; RA1 and RA2: anterior and posterior segmental branches. RRV: renal vein; UT: ureter; IVC: inferior vena cava; IMA: inferior mesenteric artery.

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Results

On the right side

The size of the right kidney was 13x7x5 cm. It received a renal artery which took origin from the anterior aspect of the abdominal aorta at the level of L1- L2 vertebrae (corresponding to the left renal artery) just inferior to superior mesenteric artery (Figure 2). Right renal artery was divided into two segmental arteries (anterior and posterior) 4 cm proximal to the hilum of right kidney (Figure 2). The main renal artery and the two branches of the common trunk were almost of same caliber. The arrangement of the structures in the hilum antero-posteriorly was right anterior segmental renal artery, right renal vein, right posterior segmental renal artery and ureter (Figure 3). Superoinferiorly, the order at the hilum was: anterior segmental branch of the main right renal artery, right renal vein, posterior segmental branch and ureter. The renal vein at the hilum was found to be lying between the two segmental branches.

On the left side

The left renal artery had its origin from the abdominal aorta, as normal, followed a normal course and had normal topographical relationships in the hilum.

Discussion

The abnormalities in the renal arteries are mainly due to the various developmental positions of the kidney [6]. Different origin of renal arteries and their frequent variations are explained by the development of mesonephric arteries [7]. There were early divisions in 67 (8%) patients, 32% of which occurred on the right side, 25% on the left, and 22% on the both sides [8]. Early ramification of the main renal artery

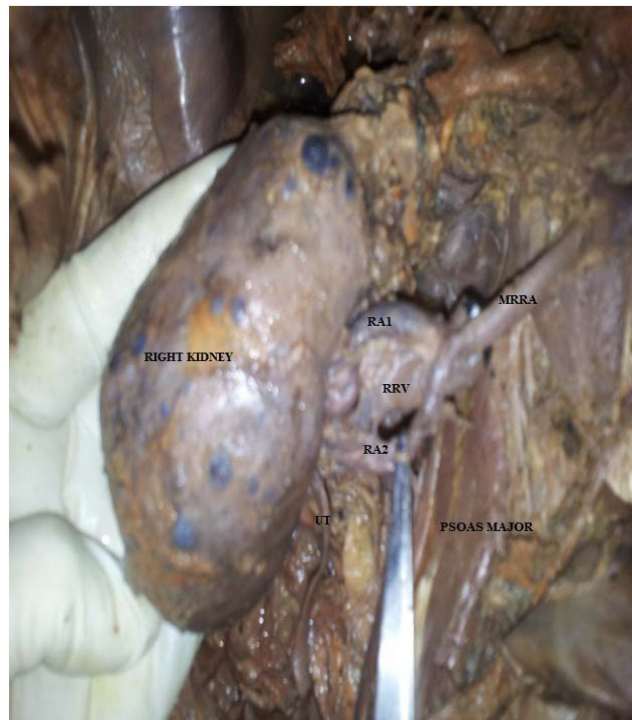


Figure 3: Right hilar region showing anterior (RA1) and posterior (RA2) segmental branches of right renal artery and their relation to the structures at the hilum.

as observed in our study was slightly greater than that reported by [9]. Such a morphological expression is important due to these branches being erroneously interpreted as being additional arteries in diagnostic imaging studies and determines surgical complications in renal transplants; since the first 15 mm of the renal artery can be used for anastomosis with the recipient's iliac artery. It should also be emphasised that early ramification of the main renal artery and the presence of additional arteries represent exclusion criteria in laparoscopic renal surgery [9-11] also reported renal artery which before entering the kidney was divided into two branches. According to study by [12], renal artery originating from the level of L1-L2 intervertebral disc was found in 37.0% and 38.9% of patients on the right and left sides, respectively. Renal artery variations, including extrarenal artery (ERA), were found in 27% and ED (early division) in 26.7% of the patients [12]. According to David Sykes (1963), when there were many accessory renal arteries, the superior accessory artery is a separate segmental artery and the inferior accessory artery is a separate lower segmental artery [13].

Conclusion

It is important to consider this variation by the clinicians performing invasive techniques while using non-angiographic, non-invasive methods for investigating renal artery stenosis, as well as during surgery related to renal arteries. Early division of renal arteries may constitute a danger in nephrectomy and in the partial resection of the kidney. The objective of this case report is to bring awareness to clinicians about the variations in the renal vascular region and their hilar relation.

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Figure 2: Right hilar region showing anterior (RA1) and posterior (RA2) segmental branches of right renal artery.

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