

Research Article

VARIATION IN RENAL ARTERIES WITH PRESENCE OF UPPER POLAR SEGMENTAL ARTERY

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ABSTRACT

Variation in renal arteries with upper polar artery is clinically important for urologist especially during the renal transplantation. Generally main renal artery divides into anterior and posterior branches just before entering the hilum, but sometimes two or more segmental arteries arise from main renal artery as upper polar arteries. The present study was conducted in 40 kidneys from 20 cadavers during the routine dissection to note the presence of upper polar arteries from the main renal arteries. In six cases, 4 right and 2 left kidneys, upper polar arterial branching patterns was observed. In all six cases a separate upper polar artery arising from main renal artery was seen entering the anteriomedial aspect of the upper pole directly.

Keywords: *Upper Polar Artery; Renal Artery Variations; Segmental Artery; Main Renal Artery, Prehilar Branching*

INTRODUCTION

Normally a single renal artery supplies each kidney arising as a lateral branch of abdominal aorta below the superior mesenteric artery as a 5th branch at the level between the L1 and L2.

From its origin the renal artery supply the each kidney, it run obliquely and laterally downward toward the hilum of kidneys and divides into anterior and posterior branches in reference with renal pelvis.

Renal artery variations are often seen and are generally categories into presence of accessory or aberrant renal arteries, polar arteries and prehilar branches. Prehilar multiple branching of main renal artery variation is frequently seen reported to be present with an incidence of 11.66 % by Budhiraja *et al.*, (2010). Prehilar multiple branching pattern was described as duplicate, triplicate, fork pattern and ladder pattern by Shoja *et al.*, (2008) and Rao *et al.*, (2006). Origin of superior polar artery from main renal artery was reported to be present in 5.4 % cases by Budhiraja *et al.*, (2011) and 12.6% by Gray *et al.*, (1972).

To know the variation of renal vasculature is necessary for the surgeons and radiologist during the renal transplantation, laparoscopic renal surgeries, nephrectomies, other renal surgeries and diagnosis.

MATERIALS AND METHODS

The present study was conducted in 40 kidneys from 20 cadavers during routine anatomical dissection in the Department of Anatomy Maharishi Markandeshwar Medical College and Hospital Kumarhatt, Solan. The kidneys and their renal vasculature were carefully explored and variations in morphological pattern of renal arteries were noted. Renal veins were also reflected for proper visualization of upper polar pattern of renal arteries.

RESULTS AND DISCUSSION

Results

Upper polar arteries from the main renal artery was observed in 6 kidneys (15%). On right side we observed 4 out of 6 kidneys (10%) and on left side 2 out of 6 kidneys (5%). In all six cases a separate upper polar segmental artery was noted originating from main renal artery. The upper polar artery was seen entering the renal parenchyma directly (figure 1, figure 2), from anteromedial side for supplying the upper pole of the kidney.

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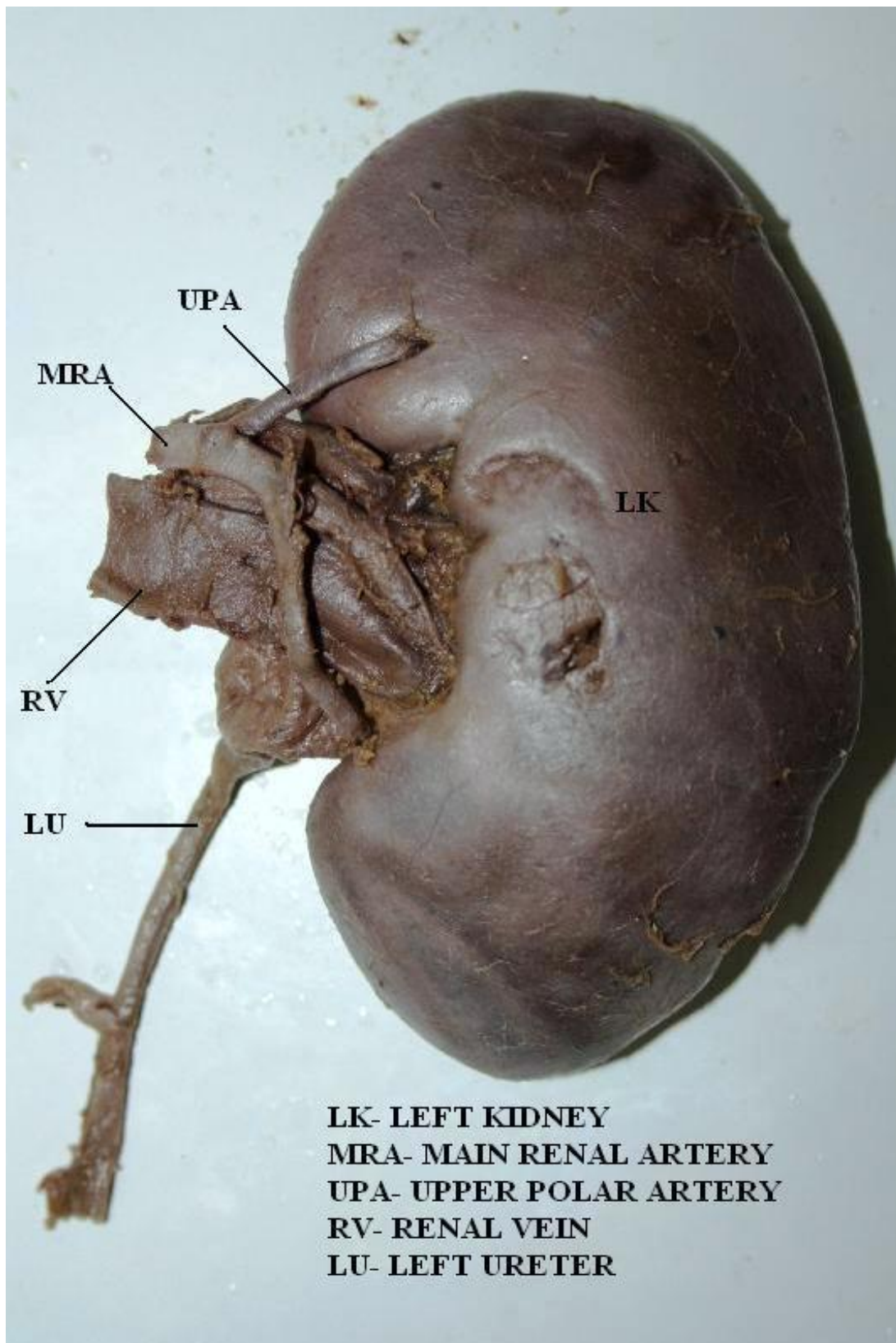


Figure 1: Left kidney showing the presence of upper polar artery (UPA) arising from the renal artery and entering renal parenchyma directly

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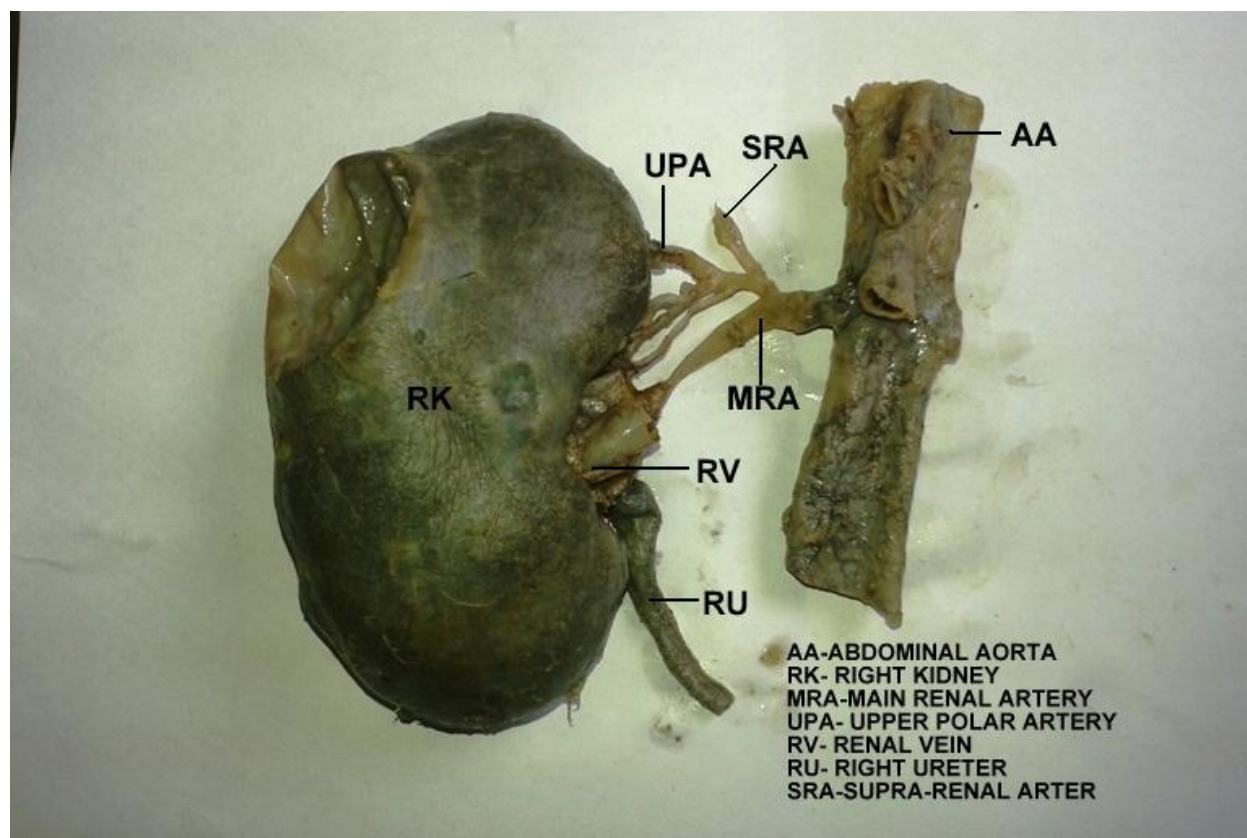


Figure 2: Right kidney showing the origin of upper polar artery. Upper polar artery enters the renal parenchyma directly from anteromedial side. Note the upper polar artery giving three branches

Discussion

The incidence of upper polar branch of renal artery in our study is 15 % which is close to the incidence of 14.3 % reported by Sampaio *et al.*, (1992). Characteristically in all our cases the upper polar artery arises from the main renal artery and enters the renal parenchyma directly.

Gray & Skandalakis *et al.*, (1972) observed superior polar artery from the main renal artery in 12.6% of the cases.

Saldarriaga *et al.*, (2008) observed superior polar artery arising from renal artery in 17.2 % cases on the right side and 13.5 % cases on the left side. We have also observed superior polar artery more frequently on the right side similar to Saldarriaga *et al.*, (2008). Budhiraja *et al.*, (2011) reported the origin of superior polar artery from main renal artery in 5.4 % cases only.

Variations of renal arteries were observed by Rao *et al.*, (2006) these branches were directed towards superior, middle, inferior and posterior vascular segments of kidney. As upper polar branches of renal artery correspond to segmental arteries, due loss of parenchyma it increases the risk of hemorrhage during renal transplantation, segmental ischemia and postoperative hypertension. The surgical accessibility to clamping of segmental arteries from anterior and posterior approaches was determined by Weld *et al.*, (2005).

There are few reports of the origin of the upper polar artery from the segmental branch by Bakheit *et al.*, (2003) and Rao *et al.*, (2006) as a result; these arteries have to travel vertically before entering the kidney. According to the Beyer *et al.*, (2004) such vertically directed upper polar (superior polar) arteries cause upper pole infarction. Near the hilum of the kidney each renal artery divides into an anterior and posterior branch, which in turn divides into segmental branches in the renal sinus or prior to their entrance through the hilum. The hilar pattern of segmental branches of the renal arteries had been discussed previously by

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few authors Shoja *et al.*, (2008) and Weld *et al.*, (2005). Nayak *et al.*, (2008) described a case in which three renal arteries provided seven segmental branches, supplying one Kidney. Among the seven branches, two entered to the kidney by piercing through its anterior surface, and the remaining five entered through the hilum. In another case, Rusu *et al.*, (2006) mentioned double right hilar renal arteries disposed side by side, the superior hilar and inferior hilar both dividing into two segmental branches each, which were arranged anterior and posterior to the renal pelvis, respectively. We also observed upper polar branching patterns of the renal artery. In most of the cases these segmental branches arise from the main renal artery some distance before it reach to the hilum. Shamilla *et al.*, (2013) observed pre-segmental branches which arose from the main renal artery in 13.4% case. They enter either through upper pole or lower pole as polar artery. The renal vasculature variations as a superior polar artery arose from main renal artery in 9.26% cases were observed by Bordei *et al.*, (2004).

Conclusion

The upper polar artery is a segmental artery supplying the upper pole of the kidney. Its origin from the main renal artery as an upper polar branch is clinically important because inadvertent damage of this segmental artery during renal transplant surgeries will produce infarction of the superior segment of the kidney. Knowledge of such variations is also important for radiologists, anatomists and urologists.

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