

PREHILAR BRANCHING OF MAIN RENAL ARTERIES WITH PRESENCE OF SUPERIOR POLAR SEGMENTAL ARTERY

RAKESH KUMAR AGARWAL, VISHNU GUPTA, VINAY SHARMA,
C.S. RAMESH BABU

Department of Anatomy, Muzaffarnagar Medical College. Muzaffarnagar (U.P)

ABSTRACT

Prehilar branching of main renal arteries is frequently encountered and is clinically important especially in cases of 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 prehilar branches. The present study was conducted in 50 kidneys harvested from 25 cadavers to note the presence of prehilar branching of main renal arteries. In seven cases, 4 right and 3 left kidneys, prehilar branching was observed. In all seven cases a separate superior polar segmental artery arising from main renal artery was seen entering the anterior aspect of the superior pole directly.

Keywords: Prehilarbranches; Renal artery variations; superior polar artery.

INTRODUCTION

Classically a single renal artery supplies each kidney arising from the lateral part of abdominal aorta as a 5th branch between the upper edge of the L1 and the lower edge of L2.

From their point of origin, they run obliquely, downward and laterally, toward just the kidneys and divides into anterior and posterior branches before entering the hilum.

Renal artery variations are not uncommon and is generally grouped into presence of accessory / aberrant renal arteries, polar arteries and prehilar branching. Prehilar multiple branching of main renal artery is a frequently seen variation reported to be present with an incidence of 11.66 %¹. Prehilar multiple branching pattern was described as

duplicate, triplicate, fork pattern and ladder pattern.^{2,3} Origin of superior polar artery from main renal artery was reported to be present in 5.4 % cases by Budhiraja et al⁴ and in 12.6% by Gray & Skandalakis et al.⁵.

With the advent of laparoscopic renal surgeries, donor nephrectomies, renal transplantation and other retroperitoneal surgeries, it becomes mandatory for the surgeons to thoroughly understand the variations in renal vasculature.

MATERIALS & METHODS

The aim of the present study is to observe the presence of prehilar branching of main renal artery and origin of superior polar artery from main renal artery.

The present study was conducted

Address for Correspondence :-

Dr. Rakesh Kumar Agarwal, JR-III, Department of Anatomy, Muzaffarnagar Medical College. Muzaffarnagar-251203, U.P. Mob: 09927019899, Email ID: drrakeshagarwal@rediffmail.com

in 50 kidneys harvested from 25 cadavers during routine anatomical dissection. The kidneys and their renal pedicles were carefully dissected and variations in morphological pattern of renal arteries were noted. Renalveins were also reflected for proper visualization of segmental pattern of renal arteries.

OBSERVATIONS& RESULTS

Prehilar branching of the renal artery was observed in 7 kidneys (14%) – 4 right kidneys (8%) and 3 left kidneys (6%). In all seven cases a separate superior polar artery was observed originating from main renal artery. The superior polar artery was seen entering the renal parenchyma directly (fig.1,fig.2).

DISCUSSION

The incidence of prehilar branching of renal artery in our study is 14 % which is close to the incidence of 11.6 % reported by Budhiraja et al¹. Characteristically in all our cases the superior polar artery arise from the main renal artery as a prehilar branch and enters the renal parenchyma directly.

Rao et al³ observed prehilar superior polar artery bilaterally in a case. Sampaio & Passos⁶ noted the presence of extrahilar superior polar artery with a single hilar artery in 14.3 % cases. Saldarriaga et al⁷ 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 al⁷. Budhiraja et al⁴ reported the origin of superior polar artery from main renal

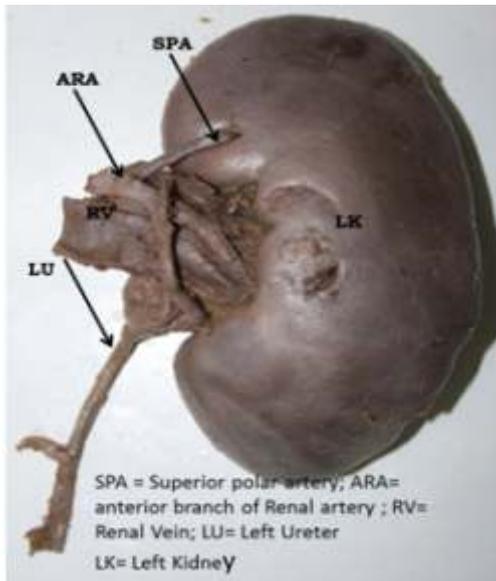


Figure 1: Left kidney showing the presence of superior polar artery (SPA) arising from anterior branch of renal artery and entering renal parenchyma directly. Note the anterior branch of renal artery passing in front of renal vein dividing further into three branches.

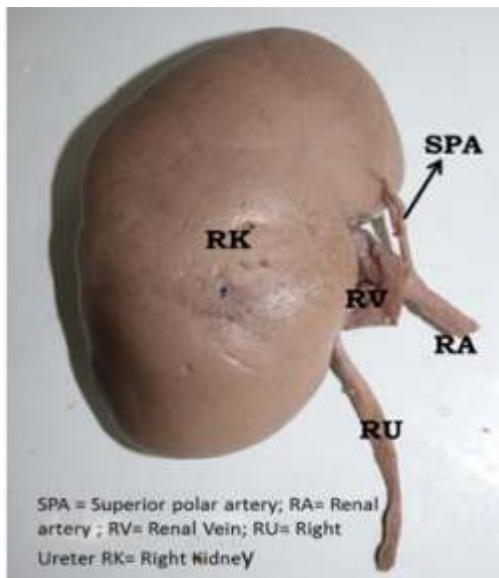


Figure 2: Right kidney showing the prehilar origin of Superior polar artery. Superior polar artery enters the renal parenchyma directly. Main renal artery enters renal hilum without further branching

artery in 5.4 % cases only.

Prehilar multiple branching of renal arteries were reported by Rao et al.³. These branches were directed towards apical, middle, inferior and posterior vascular segments of kidney. As multiple prehilar branches of renal artery correspond to segmental arteries, the risk of hemorrhage during renal transplantation, segmental ischemia and postoperative hypertension due to loss of parenchyma increases. The surgical accessibility to clamping of segmental arteries from anterior and posterior approaches was determined by Weld et al.⁸

There are few reports of the origin of the superior polar artery from the segmental branch^{9,3}. In the present study we observed the superior polar artery emerging from segmental arteries in 3.0% of cases, and entering the upper pole along the medial border. As a result, these arteries have to travel vertically before entering the kidney.

According to the report by Beyer and Daily¹⁰, 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 divide 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 have been discussed previously by few authors^{2,8}. Nayak¹¹ described a case in which three renal arteries provided seven segmental branches, supplying one kidney. Among the seven branches, two entered the kidney by piercing through its anterior surface,

and the remaining five entered through the hilum. In another case, Rusu¹² 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 hilar branching patterns of the renal artery. In most of the cases these segmental branches arose from the main renal artery some distance before it reached the hilum.

Shoja et al.² tried to identify a prehilar branching pattern in a study performed on 81 renal arteriographies. They classified the morphological types as follows: scalariform (7.4%) and divergent (92.6%), which in turn have two (80.2%) and three branches (12.4%). Based on their study, they generated two classes of morphological models: eight cardinal (82.7% of cases) and 10 less frequent (17.3% of cases), drawing the conclusion that although these model should be applied, the morphological variability of the prehilar branching was still high.

CONCLUSION

The superior polar artery is a segmental artery supplying the superior pole of the kidney. Its origin from the main renal artery as a prehilar 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 are also important for radiologists, anatomists and urologists.

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