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Case Report

High origin of left testicular artery associated with accessory renal artery and renal cyst; a cadaveric observation

Lakshmi Kantha B.M.[1]*, Amar Singh[2], Shailaja Shetty[3]

[1]Assistant Professor, Department of Anatomy, BGS Global institute of Medical Sciences, Bangalore, Karnataka, India
[2]Assistant Professor, Department of Anatomy, Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India
[3]Professor and HOD, Department of Anatomy, M.S. Ramaiah Medical College, Bangalore, Karnataka, India

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***Correspondence:**
Dr. Lakshmi Kantha B.M.,
E-mail: drchandan24@gmail.com

ABSTRACT

The variation in origin of the testicular artery is not uncommon, few reports about a high origin from the abdominal aorta exist in the literature. The renal artery is known to exhibit variations in its number and position. The knowledge of this variation will help the radiologists and surgeons in avoiding clinical complication during interventions. During routine dissection teaching to first year MBBS students at Sapthagiri Medical College, Bangalore we found variation in vascular pattern of testicular and renal artery associated with renal cyst. Photographs of the variations were taken. There was high origin of left testicular artery and accessory left renal artery associated with bilateral simple renal cyst in adult Male cadaver aged around 60years.There was also prehilar division of right renal artery associated with renal cyst. Anomalies in the origin, course and number of testicular artery were observed in 4.7 percent of cases. Additional renal vessels are known as the accessory renal artery and their incidence varies between 9-76%. In the present case there was high origin of left testicular artery associated with accessory renal artery and renal cyst. This anatomical knowledge of the presence of accessory renal artery and high origin of testicular artery in this case is important for radiologists, surgeons and urologist in their clinical practice.

Keywords: Accessory renal artery, Prehilar division of renal artery, Renal cyst, Testicular artery

INTRODUCTION

The renal and gonadal arteries usually arise from the anteriolateral or lateral aspect of the abdominal aorta. The testicular artery usually arises from the abdominal aorta at the level of the second lumbar vertebra 2.5-5cm below the renal artery.[1]

The testis mainly receives its blood supply from the testicular artery (TA) and drains into the testicular vein. Testicular vessels have an important role in testis thermoregulation. Variations of these arteries and veins have been extensively studied due to their importance in testicular physiology. Moreover, this knowledge has a practical implication during renal and testicular surgery. Anomalies in the origin, course and number of testicular arteries were observed in 4-7 percent of cases in a study of 150 cadavers. A high origin of the T.A from the abdominal aorta, as in our case report, has been noticed in only a few instances in the literature.[2]

The kidneys are supplied by the renal arteries. Usually on each side there is one renal artery originating from the abdominal aorta. Additional renal vessels are known

as the accessory renal artery (ARA). These vessels are sometimes termed as aberrant renal vessels. And their incidence varies between 9-76%. A meta-analysis has showed its median incidence of the ARA to be 30% standard textbooks of anatomy mention the presence of ARA but there are no reports of ARA to the upper and lower pole of the kidney. Entry of the renal vessels into the kidney other than the site of hilum is considered to be a rare finding which is linked to a developmental defect. This anatomical knowledge of the presence of ARA may be important for radiological procedures involving the kidneys. Presence of additional renal vessels may result in erroneous interpretation of angiograms and pyelograms. Prior anatomical knowledge of the variations of the renal vessels may also be helpful for regional complications which include massive hemorrhage.[3]

The prevalence of simple renal cysts was 10.7% in the study population and 17.4% in the 5th or later decades of life. Numerous unsuspected simple renal cysts are detected owing to increasing utilization of ultrasonography and CT. Morphologically; simple renal cysts are individually oval and round. They may be single or multiple. Histologically, simple renal cyst usually have a smooth outline bordered by a single layer of flattered cuboidal epithelium and are filled with clear or straw coloured fluid. Simple renal cysts are acquired. The origin of these cysts remains uncertain. Recently the theory that simple renal cysts are derived from diverticula of the distal convoluted or collecting tubules was introduced. These diverticula increase in number in senescent kidney. Probably as a result of the weakening of the tubular basement membrane. This explains the relationships between senility and simple renal cyst. Mostly simple renal cysts are asymptomatic and not harmful to renal function. Age, sex, renal stones, serum creatinine and smoking may be factors for the presence of simple renal cysts.[4]

CASE REPORT

During routine dissection teaching to first year MBBS students at Sapthagiri Medical College, Bangalore we found variation in vascular pattern of renal artery and testicular artery associated with renal cyst in adult Male cadaver aged around 60 years. There was unilateral high origin of testicular artery with accessory renal artery on left side with prehilar division of right renal artery associated with renal cyst and other associated variations were noted and the photographs were taken.

In the present case there was high origin of left testicular artery at the level of left renal artery in adult male cadaver aged around 60 years. The left testicular artery was descending downwards posterior to left renal vein (Figure 1).

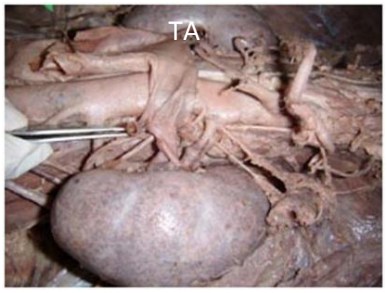

Figure 1: Showing high origin of testicular artery (TA) at the level of renal artery (RA).

The right kidney measured around 9.5cm× 6.5cm×2cm in dimension. Right renal artery arising 0.5cm below superior mesenteric artery and it measures around 5cm. Right renal artery giving rise to three pre-hilar divisions after 1.8cm from the point of origin. The first prehilar division arising 0.5cm from the point of origin, going towards upper pole of right kidney measuring 3.7cm. The second prehilar division was arising 1.8cm from the point of origin, going towards anterior surface of right kidney; measuring 1.7cm. This was dividing into upper and lower divisions. The third prehilar division was arising 1.8cm from the point of origin, going towards posterior surface of right kidney; measuring 3.2cm. This was dividing into upper and lower divisions at about 2.5cm from the point of origin (Figure 2).

Figure 2: Showing the prehilar division of right renal artery.

Figure 3: Showing the renal cyst over posteromedial surface of right kidney.

Right kidney also showed three renal cyst measuring 1.5cm, 1.2cm and 0.5cm in diameter on upper part of posteromedial surface (Figure 3).

Left renal artery (LRA) and left testicular artery (LTA) and left middle suprarenal arteries (MSA) are arising 2.2cm below the superior mesenteric artery (SMA) (Figure 4).

Left renal artery (LRA) measures 2.4cm giving three pre-hilar divisions at 0.5cm from the point of origin. The first pre-hilar division measures 1.3cm going towards anterior surface of left kidney and also giving left inferior suprarenal branch. The second pre-hilar division measures 1.6cm going towards posterior surface of the kidney (Figure 4).

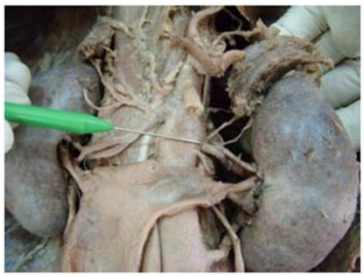

Figure 4: Showing the accessory left renal artery with prehilar division of left renal artery.

There was accessory left renal artery arising from 0.5cm above and lateral to inferior mesenteric artery measuring 3.4cm and dividing into four pre-hilar divisions at 3.2cm from the point of origin. Among the pre-hilar division three pre-hilar branches are going towards the anterior surface of left kidney and one is going towards posterior surface (Figure 5).

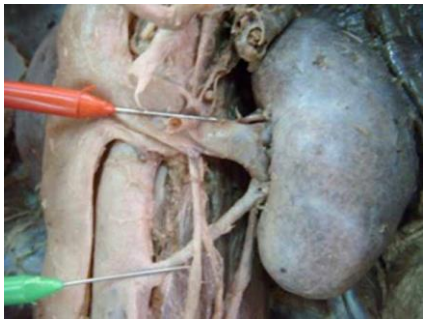

Figure 5: Showing acessory left renal artery (ALRA).

Figure 6: Showing the single renal cyst over posteromedial surface of left kidney.

There was single renal cyst measuring 2cm in diameter on the posteromedial surface of left kidney (Figure 6).

DISCUSSION

Anatomical variations of TAs are common. Variants were noticed in 4.7 percent of cases in a study of 150 cadavers.[5] Another study of 90 fetuses revealed a frequency of 8.8 percent.[6] In another case, Onderoglu et al reported the case of a high origin of the right TA located at the level of the right renal artery lineage.[7]Brohi et al. described the case of a high origin of the left TA which originated from the left renal artery.[8]

Çiçekcibasi et al classified the variations into four alternative types:

Type I - TA arising from the suprarenal artery.
Type II - TA originating from the renal artery.
Type III - TA of high-positional origin from the abdominal aorta, close to the renal artery lineage.
Type IV - TA duplication originating from the aorta or from various vessels.[6] Our case report is of Type III.

Notkovich described the relationship of the TA to the renal vein. In his study, the anatomical variations are divided into three types:

Type I - TA arising from the aorta, passing posterior or inferior to the renal vein but without making contact with it.
Type II - TA originating from the aorta, superior to the renal vein and crossing in front of it.
Type III - TA arising from the aorta and passing posterior or inferior to the renal vein and coursing superiorly and around the renal vein.[9] In the present case report it is classified as Type I.

Variations in the origin, course and branches of Testicular artery are attributed to their embryologic derivation. Felix proposed that there are nine lateral mesonephric arteries in an 18 mm embryo and that they are grouped as follows:

1. The cranial group, which is made up of the first and second mesonephric arteries that are located proximal to the celiac trunk of the abdominal aorta and directed posterior to the suprarenal gland.
2. The middle group, which is made up of the third to fifth mesonephric arteries which run along the ventral surface of the suprarenal gland.
3. The caudal group, which is made up of the sixth to ninth mesonephric arteries which run along to the ventral surface of the suprarenal gland.

The caudal group forms the arterial plexus of the urogenital system.[10]

The anatomical variations of TAs are of clinical importance as well as embryological and anatomical

interest. Practical implications can be found in the kidney and gonadal blood flow. Such conditions could lead to varicocele under circumstances.[2]

The variant becomes more significant in light of the fact that testicular arterial blood flow was found to be significantly decreased in men with varicocele. Additionally, anomalous TA origin may affect the testicular perfusion and testicular function.[2]

Since age-related disturbances in spermiogenesis are well described in the literature, it would be wise for the clinician to differentially diagnose age-related impaired spermiogenesis from perfusion induced spermiogenesis.[2]

Variation in the number, source, branching and course of the renal arteries are very common. These accessory renal arteries or the aberrant arteries account for about 30% of existence, while 70% owes for the normal type. Further there is a difference in terminologies related to an aberrant renal artery and an accessory renal artery. An accessory renal artery is the one that is accessory to the main artery accompanying the same towards the hilus and entering the kidney through the hilum to supply it, while the aberrant artery supplies the kidney without entering its hilum.[11]

Different origins of the renal arteries and its frequent variations are explained in various literatures owing to the development of mesonephric arteries. These mesonephric arteries extend from C6 to L3 during the development. Most cranial vessels disappear while the caudal arteries form a network, the rete arteriosumurogenitale that supplies in future the metanephros.[11]

The metanephros in future develops into adult kidney deriving its blood supply from the lowest suprarenal artery which gives out a permanent renal artery. Persistent roots of the network form these segmental arteries of the adult kidney having variations at their point of origin.[11]

The kidney grafts with multiple arteries resulted in post-transplant morbidity and graft loss following the ligation of the polar arteries. The transplantation of the kidney with the single renal artery is technically easier compared to the kidney with multiple arteries.[11]

Aberrant or accessory arteries have been of interest to the clinicians for some years, mainly because of the possible part the vessel may play in the causation of hydronephrosis.[11]

The prevalence of simple renal cysts was 10.7% in the study population and 17.4% in the 5th or later decades of life. Numerous unsuspected simple renal cysts are detected owing to increasing utilization of ultrasonography and CT. Morphologically; simple renal cysts are individually oval and round. They may be single or multiple.[4]

Simple renal cysts are acquired. The origin of these cysts remains uncertain. Recently the theory that simple renal cysts are derived from diverticula of the distal convoluted or collecting tubules was introduced. These diverticula increase in number in senescent kidney. Probably as a result of the weakening of the tubular basement membrane. This explains the relationships between senility and simple renal cyst.[4]

Mostly simple renal cysts are asymptomatic and not harmful to renal function. Age, sex, renal stones, serum creatinine, and smoking may be factors for the presence of simple renal cysts.[4]

CONCLUSION

Anomalies in the origin, course and number of testicular artery were observed in 4.7 percent of cases. Additional renal vessels are known as the accessory renal artery and their incidence varies between 9-76%. In the present case there was high origin of left testicular artery associated with accessory renal artery and renal cyst. This anatomical knowledge of the presence of accessory renal artery and high origin of testicular artery in this case is important for radiologists, surgeons and urologist in their clinical practice.

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