

Bilateral Accessory Renal Arteries With A Rare Origin of The Testicular Artery : An Embryological Basis

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ABSTRACT

A rare origin of the testicular artery from the renal artery seems to be an unrecognized variation which may be of particular importance to the radiologists and the surgeons while operating near the renal pedicle or in the retroperitoneal region.

During dissection in a 60 year old male cadaver, we found

bilateral accessory arteries and an anomalous origin of the left testicular artery from the main renal artery.

The knowledge of this variation will help the radiologists and surgeons in avoiding clinical complications during urological interventions and surgical procedures which are related to the abdomen, such as renal and gonadal surgeries.

Key Words: Accessory renal artery; Renal transplantation; Vascular variations

INTRODUCTION

Classically, and in 75% of the people, the kidney is supplied by a single renal artery; about 25% of the adult kidneys have two or four renal arteries. It is a misnomer to call such vessels as accessory; aberrant or even supernumerary and because they are not extra but essential, tissue – sustaining arteries without anastomoses between them, which correspond to the segmental branch of a single renal artery [1].

The testicular artery usually arises from the abdominal aorta at the level of the second lumbar vertebra, below the renal artery. In 5-6% of the individuals, it originates from the main or the accessory renal artery [2].

We report here, a case with the occurrence of bilateral accessory renal arteries and a rare origin of the left testicular artery from the main renal artery.

Such variations in the gonadal and renal arteries have clinical and surgical significance with respect to their potential influence on the blood flow to the kidney and the gonads and to the haemorrhagic complications following retroperitoneal operations.

OBSERVATIONS

During the routine dissection of a 60 year old male cadaver, certain variations in the renal and testicular arteries were observed.

On the right side, the main renal artery originated from the abdominal aorta, 8.5 cm above its bifurcation. It passed behind the inferior vena cava and broke up into two terminal branches of equal size with a long stem to reach the kidney hilum. The accessory renal artery arose distally, 3.3 cm above the aortic bifurcation and ascended to reach the lower end of the renal hilum by crossing the right testicular artery anteriorly.

On the left side, two accessory renal arteries originated from the left lateral part of the abdominal aorta and ran into the left kidney. The superior accessory renal artery arose 10.3cm above the aortic bifurcation and ran into the superior pole of the left kidney and the inferior accessory renal artery originated 3.3 cm above the bifurcation of the aorta and entered the lower end of the hilum.

The left testicular artery originated from the left main renal artery, midway between its origin and the renal hilum and passed in front of the lower (inferior) accessory renal artery. The rest of the course of the testicular artery and its termination was normal.

DISCUSSION

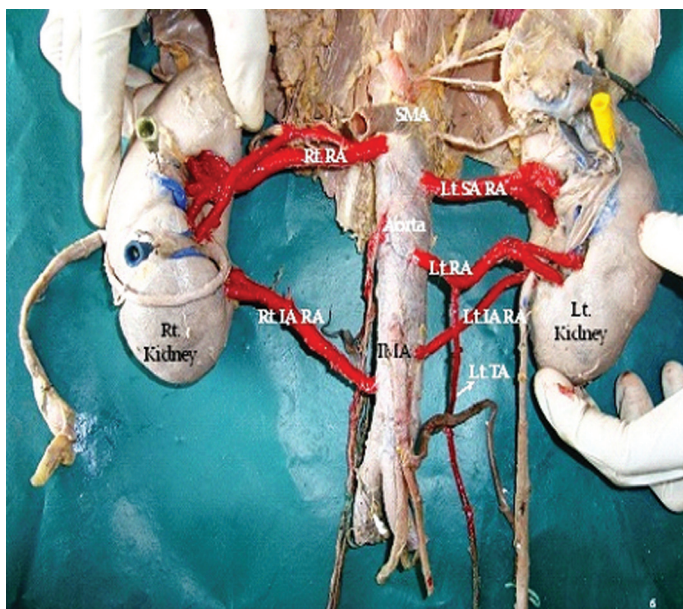
The term, 'accessory' has been applied to an additional artery in the renal pedicle, or to a vessel which enters the kidney at either pole, whether it has been derived from the main renal artery or from the aorta or from a branch of the aorta [3]. The accessory arteries usually arise from the aorta, above or below the main renal artery and follow it to the renal hilum.

The reported incidence of the accessory renal arteries has a wide range between 8.7% and 75.7%[4,5].

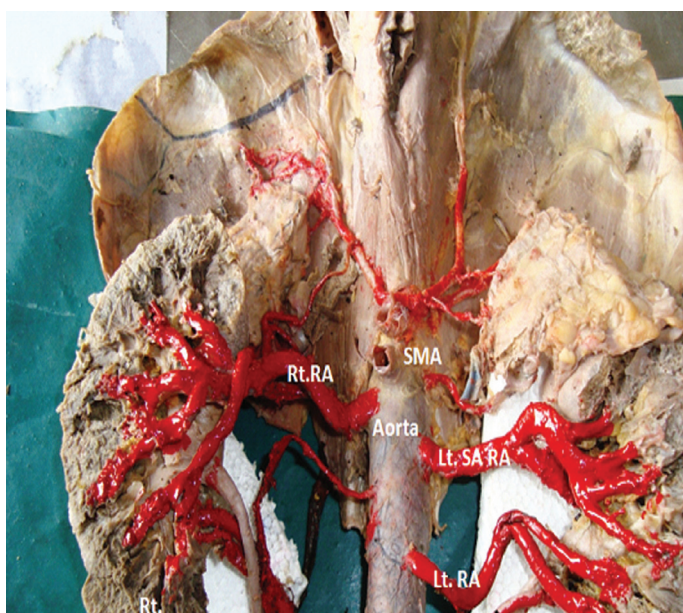
Aquino et al., documented 12% patients with accessory renal arteries during the repair of abdominal aortic aneurysms [6]. According to Eisehrath's series of dissections, the superior accessory arteries which arose from the aorta were found in 0.5% of the cadavers and the inferior accessory arteries which arose from the aorta were found in 0.04% cadavers. Although the accessory arteries were not found to occur as frequently as has been stated by many authors, they were found often enough to be constantly borne in mind during operations [7].

Many authors state that such vessels may be important from the clinical point of view in that they may cause; i) Hydronephrosis due to occlusion or compression of the ureter by an inferior accessory artery, ii) Nephroptosis and Malrotation of the kidney, and iii) Arterial hypertension and subsequent renal infarction by the constriction of the renal arteries.

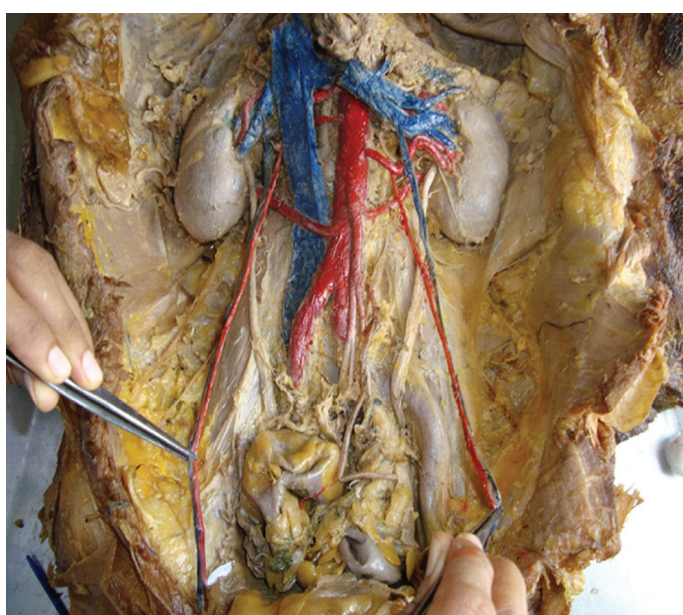
In the study of Notkovich which included 405 gonadal arteries, gonadal arteries of renal origin were found in 14 percent of the and they were seen to take their origin from the principal renal artery, from its branches or from an accessory renal artery. Asala et al., found that the testicular artery originated from the renal artery only in 2.6% of the cases [8]. Shoja MM. et al., noticed that the gonadal artery originated from the main or the accessory renal artery in 14 percent of the sides[2].



[Table/Fig-1]: Photograph showing bilateral accessory renal artery with left testicular artery arising from left main renal artery



[Table/Fig-2]: Dissected specimen showing intrarenal course of renal arteries



[Table/Fig-3]: In situ specimen depicting the above said variation

The aberrant origin of the gonadal artery from the renal arteries occasionally may be accompanied by other variations in the celiac trunk, the inferior mesenteric, the hepatic suprarenal and the inferior phrenic arteries [2].

Machnicki and Grzybiak examined four types of variations of the testicular arteries according to their site of origin from the aorta or the renal arteries. With this criteria, a single testicular artery arising from the main renal artery has been classified as a 'type B' variation [9]. Cicekbasi et al., classified the gonadal artery which originated from the main renal artery as type II, with a frequency of 5.5% [2].

EMBRYOLOGICAL BASIS [2,3,6]

The mesonephric arteries extend from the sixth cervical to the third lumbar segments and are divided into three groups : (1) the cranial group consisting of the 1st and 2nd arteries, which are located cranial to the celiac trunk; (2) the middle group consisting of the 3rd – 5th arteries, which pass through the suprarenal body; and (3) the caudal group consisting of the 6th – 9th arteries.

In the upper lumbar region, the mesonephric arteries form a network, the rete arteriosum urogenital, from which the gonads, the mesonephros and later, the metanephros are supplied with arterial segments. Eventually, some of the roots which supply this network degenerate, the area to which they supply being taken over by a neighbouring root. This arrangement explains why those arteries which persist to form the segmental arteries have some variation in their point of origin.

In our case, the right superior accessory had a proximal origin in the pedicle, probably the result of a variation in the degeneration of the rete arteriosum, while the right inferior accessory and the superior inferior accessory which arise from the aorta are persistent mesonephric arteries.

Likewise and similarly, the accessory renal artery arises embryologically from the retention of the early series of the mesonephric or the segmental lateral splanchnic arteries. Hence, it seems that the embryonic origins of the accessory renal and the aberrant gonadal arteries have some overlapping features.

CONCLUSION

The presence of such variations may become a major risk when this type of gonadal artery represents the single blood supply to the gonad, without a second supply from the aorta or other arterial sources. Thus, it becomes imperative to carefully preserve the gonadal artery in order to prevent the occurrence of any vascular troubles of the gonad. With the increasing demand for kidney transplantation, living donor grafts and allografts with multiple arteries have become a necessity.

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