

Retrocaval Testicular Artery associated with multiple Vascular Variations of the Right Kidney and its Surgical Importance

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Abstract: Variations in the branching pattern of renal vessels are not uncommon. But, a concurrent variation involving the renal vessels and testicular artery is a rare occurrence. In the current case we report the presence of double renal veins, anterior (superior) and posterior (inferior) which drained into the inferior vena cava separately. Sandwiched between these veins was the renal artery which branched into 4 segmental branches outside the renal hilum. We also observed that running between these renal vessels was the right testicular artery which followed an unusual retrocaval course from its origin. Prior knowledge of such type of variations is very important for the surgeons as to failure to identify such variations may lead to diagnostic errors and might bleed profusely during surgical and interventional approaches when unnoticed. Thus, knowledge of these variations is important for urologists, radiologists and surgeons in general.

Keywords: Renal artery; accessory renal artery; double renal veins; retrocaval testicular artery.

INTRODUCTION

Testicular arteries are paired vessels that usually arise from the antero-lateral surface of the abdominal aorta at the level of second lumbar vertebra, 2.5 to 5 cm caudal to the renal arteries. Each artery passes obliquely downwards and posterior to the peritoneum. Descending on the posterior abdominal wall, it reaches the deep inguinal ring where it enters the spermatic cord [1]. Right testicular artery lies anterior to inferior vena cava and posterior to third part of the duodenum [1].

The main source of blood supply to the kidneys is by the renal vessels. Usually a single renal artery arises as a lateral branch from abdominal aorta, which divides near the hilum of the corresponding kidney into two divisions before entering the substance of kidney. Renal vein accompanies the renal artery and lies anterior to it outside the renal hilum. Renal veins of both the sides terminate into the inferior vena cava.

Variations in the branching pattern of renal arteries are widely reported. But the concurrent variations which we report here involving the renal vessels and testicular artery on the right side are very rare and unusual. Reporting such cases is of at most importance because of its surgical importance.

CASE REPORT

During routine dissection classes we observed unilateral concurrent vascular variations on the right side of the male cadaver aged approximately 60 years as follows. There were two renal veins; anterior and posterior instead of the usual single renal vein [Figure 1]. Out of the two renal veins, one was superior and anterior to the renal artery and another inferior and posterior to the renal artery. Both these veins drained into inferior vena cava separately at different sites. The renal artery after its origin from abdominal aorta, immediately divided into 2 branches, of which the lower artery was of a smaller caliber. Both these branches again divided into segmental branches outside the hilum of the kidney. Because of this, there were 4 branches of the renal artery which then entered the substance of kidney through the renal hilum. Between the renal vessels was occupied by the right testicular artery which presented with a unique course. The right testicular artery arose as a ventral branch from abdominal aorta corresponding to the level of origin of renal artery. On its further course, it ran towards right side behind the inferior vena cava as a retrocaval course and then passed through the narrow gap between the branch of renal artery and inferior renal vein [Figure 2]. It then descended downwards medial to the right ureter and entered the pelvis following the normal course. The retrocaval course together with its entrapment between renal vessels resulted remarkably thinner caliber of testicular artery.

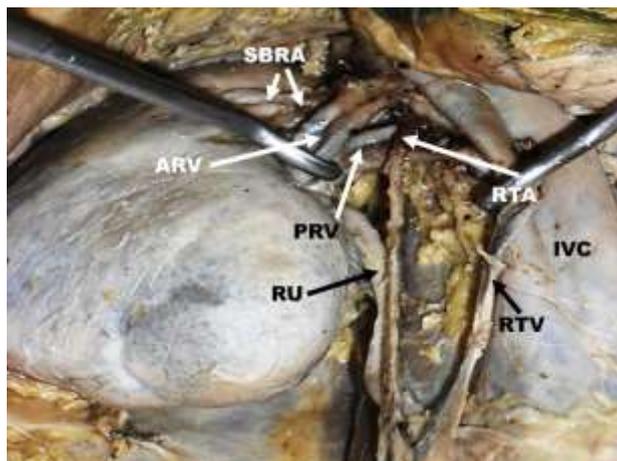


Fig-1: Hilum of the right kidney showing the presence of double renal veins. Right testicular artery (RTA) has been entrapped between the anterior (superior) renal vein (ARV), posterior (inferior) renal vein (PRV) and segmental branches of renal artery (SBRA). IVC - Inferior vena cava, RU- Right ureter, RTV- Right testicular vein.

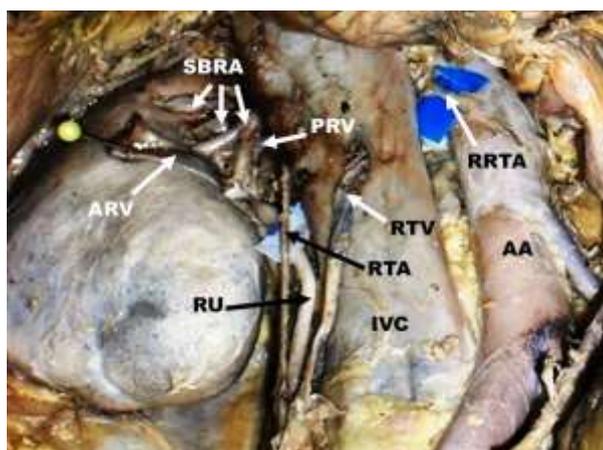


Fig-2: Showing the retrocaval right testicular artery (RRTA) arising from abdominal aorta (AA). Anterior renal vein (ARV) has been reflected to show the multiple segmental branches of renal artery (SBRA). PRV- Posterior renal vein, RTA- Right testicular artery, RTV- Right testicular vein, IVC- Inferior vena cava, RU- Right ureter.

DISCUSSION

Knowledge of vascular variations in and around the renal hilum is of at most importance to surgeons performing surgical procedures in posterior abdominal wall. Variation in renal arterial pattern is more common when compared to corresponding venous system. Among renal veins, variations of right renal veins are more common than the left [2]. The incidences of additional renal veins are reported to be 3.3% on the right side and 2.6% on the left side [3]. Presence of more than 2 renal veins on the right side was found in about 8.0% to 9.7% of cases [4]. Pushpa et al., has reported a case with segmental branches of right

renal artery intervening between two right renal veins. In this case both veins drained separately into inferior vena cava [5]. This case is similar to our case but we also noticed the presence of the right testicular artery entrapped between the renal vessels near the renal hilum which has not been reported. Such type of unusual presence of testicular artery near renal hilum shows a major significance in renal surgery, in partial or total nephrectomy and in renal transplant [6]. Because of these unpredictable circumstances, the renal hilum should be examined properly prior to any surgical procedure in this region by radiographic examination [7], so as to avoid any complications.

Testicular artery represents a single source of blood supply to the gonads without a second supply from other arterial sources. In the current era, anatomy of testicular arteries has assumed much importance mainly because of the development of new operative techniques within the abdominal cavity for operations such as varicocele and undescended testes [5]. So it very necessary to keep in minds the variations involving the testicular artery.

In our case we found that the right testicular arose as a ventral branch of abdominal aorta corresponding to the level of origin of the renal arteries. It then presented a retrocaval course wherein it passed behind the inferior vena cava and reached near the hilum of the right kidney where the artery was present between the segmental branches of renal artery and inferior renal vein. Because of this, the diameter of the testicular artery was greatly reduced. Then it descended downwards and followed the normal course. The left testicular artery was normal.

A case of retro-caval right testicular artery has been reported by Lelli et al.[8], but the entrapment of the right testicular artery between the renal vessels has not been reported, which is a uniqueness of our case. Entrapment of testicular artery between the renal vessels near the hilum of the kidney may be misinterpreted by the surgeons for being as one of the renal vessels which may be very fatal. In such cases there is a high risk of hemorrhage during urological procedures or renal transplantation.

The retrocaval course of the gonadal artery can be explained in terms of embryology. The embryogenesis of the inferior vena cava involves the development, regression, anastomosis and replacement of three pairs of venous channels: posterior cardinal, subcardinal and supracardinal veins. Anastomoses between the supracardinal and the subcardinal veins, which occur bilaterally, form the renal segment of the inferior vena cava [6]. Usually, the lateral splanchnic artery, which persists as the right testicular artery, passes caudally to the supra-cardinal anastomosis. In

the adult, when it passes cranial to this anastomosis, the right testicular artery is located behind the inferior vena cava [1]. It has been reported that in less than 20% of the cases, the testicular artery passes behind the inferior vena cava [9].

During laparoscopic surgery of the male abdomen and pelvis many complications occurred due to unfamiliar anatomy of the vessels in the region of operation [10]. Concurrent rare anomalies that we report here may cause confusions during surgical and radiological approaches and also during renal transplantation. The testicular artery may get compressed between the renal artery and vein, which may lead to degeneration of the testis due to inadequate blood supply [11].

CONCLUSION

The multiple vascular variations as we reported here may remain unnoticed until they are discovered during operation or radiological investigation. Therefore; the prior knowledge of variations in and around the renal hilar region may greatly contribute to the success of any surgical, invasive and radiological procedures related to this area to avoid possible vascular complications and is necessary for adequate surgical management.

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