Archives of Clinical & Experimental Surgery

Case Report

Arch Clin Exp Surg 2015;4:168-171

doi:10.5455/aces.20130619052931

# Multiple vascular anomalies involving renal, testicular and suprarenal arteries

Suresh Rao[1], Vincent Rodrigues[1], Mohandas Rao KG[2], Nikolai Ovchinnikov[1]

**ABSTRACT**

Knowledge of variations of blood vessels of the abdomen is important during operative, diagnostic and endovascular procedures. During routine dissection of the abdominal cavity, we came across multiple vascular anomalies involving renal, suprarenal and testicular arteries. The left kidney was supplied by two renal arteries originating together from the abdominal aorta, and the right kidney was supplied by two accessory renal arteries, one of which was arising from the right renal artery and the other one from the aorta (about 2 inches below the origin of the renal artery). Accessory renal veins were present on both sides. The right testicular artery was arising from the lower accessory renal artery. The left testicular artery was looping around the inferior tributary of the left renal vein, whereby forming a sharp kink. The left middle suprarenal artery was diving into three small branches; the upper two branches were supplying the left suprarenal gland, whereas the lower branch was supplying the left kidney. Furthermore, detailed literature and the clinical and surgical importance of the case are discussed.

***Key words:*** *Accessory renal artery, vascular variations in abdomen, renal artery variations, compression of vessels, middle suprarenal artery*

## Introduction

Normally, right and left kidneys are supplied by one renal artery, with each arising from the abdominal aorta at the level of L2 vertebra. Renal arteries pass transversely to reach the renal hilum. The right renal artery passes posteriorly to the inferior vena cava in its course. Testicular arteries are also the branches of the abdominal aorta given at the level of L2 vertebra just below the origin of renal arteries. They pass downward and laterally in the retroperitoneal space of the posterior abdominal wall to reach the deep inguinal ring. The middle suprarenal arteries are the branches of the abdominal aorta supplying the corresponding suprarenal glands [1].

Variations in the arteries supplying the kidneys, testes and suprarenal glands are common. It has been reported that the incidence of multiple or accessary renal arteries is 20.2% on the right side and 19% on the left side [2]. The testicular arteries are reported to take origin from four other arteries in different cases other

***Author affiliations*** : *[1]Department of Preclinical Sciences, Faculty of Medical Sciences, University of the West Indies, St. Augustine, Trinidad and Tobago, West Indies, India [2]Department of Anatomy, Melaka Manipal Medical College, Manipal University, Manipal, India*

***Correspondence*** : *Dr. Mohandas Rao KG, MD, Melaka Manipal Medical College (Manipal Campus), Manipal University, Manipal, India*
*e-mail: mohandaskg@gmail.com*

***Received / Accepted*** : *May 31, 2013 / June 19, 2013*

than its normal origin [3]. Among the suprarenal arteries, the middle suprarenal artery is considered to be highly variant [4]. The variety of variations in these vessels reported in the literature is so vast that it becomes nothing but essential for the clinicians and surgeons to be aware of these variations. Keeping this in mind, multiple arterial variations observed in renal, testicular and suprarenal arteries are being reported in the present case.

**Case Report**

During routine dissection of an approximately 55-year-old male cadaver, multiple vascular variations in the abdomen were observed at the University of West Indies, Trinidad and Tobago. The left kidney was supplied by two renal arteries originating together from the abdominal aorta at the level of L2 vertebra (Figure 1). The right kidney was supplied by two accessory renal arteries, of which the upper one was arising from the right renal artery and was entering into the kidney through its anterior surface just above the hilum. The lower accessory renal artery was arising from the abdominal aorta (about 2 inches below the origin of the right renal artery) and was passing anteriorly to the inferior vena cava to reach the lower pole of the kidney (Figures 2,3). Both kidneys had accessory renal veins draining them. The right testicular artery was arising from the right lower accessory renal artery (Figures 2,3), and the left testicular artery was looping around the inferior tributary of the left renal vein, whereby forming a sharp kink during its course (Figure 1). The left middle suprarenal artery was diving into three branches. The upper two branches were supplying the left suprarenal gland, and the lower branch was supplying the left kidney (Figure 1).

**Discussion**

A wide variety of variations of the right and left renal arteries has been reported in the literature. A presence of two renal arteries on the right side, originating from the abdominal aorta, has been reported by Singh et al. [5]. Knowledge of variations of the renal artery and its branching pattern is useful for surgeons performing nephrostomies and renal transplantations. Accessory renal arteries in 30–35% of cases may enter the upper or lower poles of the kidneys. The main clinical importance of those arteries which are entering through the

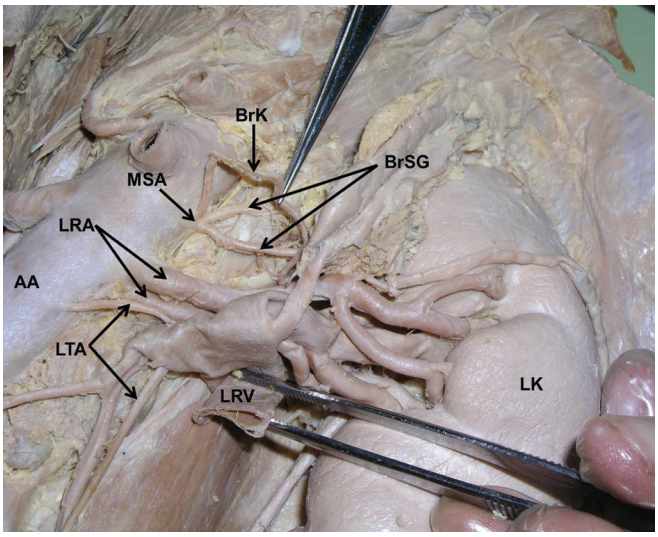


**Figure 1.** Dissection of the abdomen showing the double left renal arteries (LRA) arising from the abdominal aorta (AA). A kink formed by the left testicular artery (LTA) as it was looping around the left renal vein (LRV, cut and pulled downward) can also be noted. The middle suprarenal artery (MSA) giving off two branches (BrSG) to the left suprarenal gland and one branch (BrK) to the left kidney (LK) is also seen.

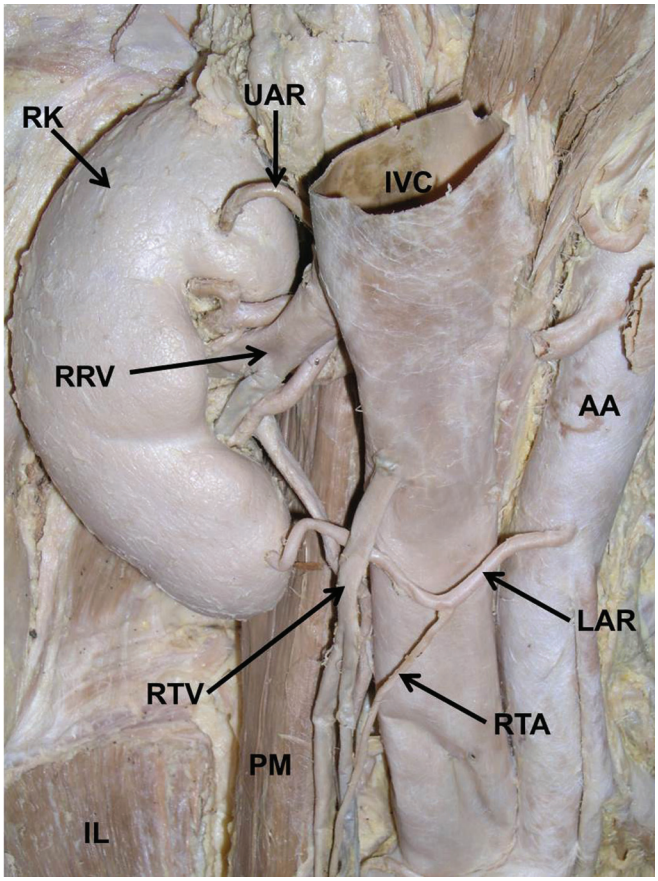


**Figure 2.** Dissection of the abdomen showing the accessary renal arteries on the right side. It may be noted that the upper accessary renal artery (UAR) is passing posteriorly to inferior vena cava (IVC) before piercing the anterior surface of the right kidney (RK) slightly above the hilum. The lower accessary renal artery (LAR) is passing anteriorly to the inferior vena cava (IVC) and posteriorly to the right renal vein (RTV) to enter into the lower pole of the kidney. Origin of the right testicular artery (RTA) from the lower accessary renal artery (LAR) is also seen. (**AA:**Abdominal aorta, **RRV:** Right renal vein, **PM:** Psoas major muscle, **IL:** Iliacus muscle)

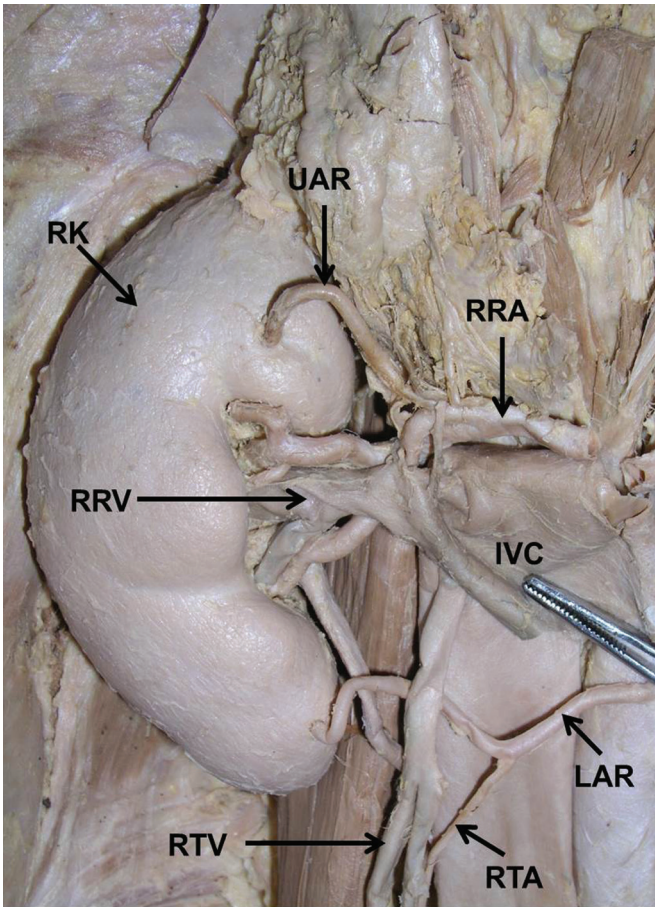


**Figure 3.** Further dissection of the abdomen showing the origin of the upper accessary renal artery (UAR) from the right renal artery (RRA). Inferior vena cava (IVC) has been cut and pushed downward to expose the right renal artery. Origin of the right testicular artery (RTA) from the lower accessary renal artery (LAR) is seen. (**RK:**Right kidney, **RRV:** Right renal vein, **RTV:** Right testicular vein)

lower pole is that they may obstruct the ureter, leading to hydronephrosis [5]. The anatomical knowledge of accessory or multiple arteries is essential before performing any transplantation surgeries where microvascular techniques are employed to reconstruct the renal arteries [6]. Intra-operative bleeding and post-surgical complications are often observed as a result of multiple or accessory renal arteries. A careful suturing is required by the surgeons in the cases having accessory or multiple renal arteries [7].

Variations in the origin of testicular arteries are common and frequently reported. The arteries may vary at their origin; one or both arteries may arise from the renal artery, suprarenal artery or lumbar artery. They may arise from a common trunk, and there may be two, three or four on one side. [3] However, the testicular artery arising as a branch of an accessary renal artery is a unique observation. The gonadal artery variations are reported to be more common in male than in female fetuses, and are more on the right side than on the left [8,9]. However, in the present case it can be noted that the testicular artery variations were bilateral. On the left side, though the origin of the artery was normal, during its course it hooked around the renal vein, whereby forming an abrupt kink. Though such looping of the testicular artery has been reported by some of the earlier workers, the frequency of such observations is very limited [10,11]. The arching of the left testicular artery around the left renal vein could lead to compression of the renal vein and the artery itself. Anatomical knowledge of the testicular artery is vital while performing operative techniques of treating varicocele and undescended testes within the abdominal cavity. During varicocelectomy the testicular artery must be preserved in order to prevent the testicular atrophy. In microvascular autotransplantation of intra-abdominal testis, origin and course of the testicular artery must be carefully identified [12]. Therefore, awareness of the possible existence of such variations of testicular arteries is of great importance during surgical procedures in this region.

There are many reports of variations in the origin of suprarenal arteries, especially the middle suprarenal artery [4]. Brohi et al. reported a case of high origin of the left testicular artery with a suprarenal branch from it on the left side [13]. However, the middle suprarenal artery giving an accessory renal artery is being reported for the first time, to the best of our knowledge. In the case of spontaneous retroperitoneal hemorrhage from an adrenal artery aneurysm, knowledge of such variation might help surgeons during surgery. It is also important during laparoscopic adrenalectomy because such variations may affect the orientation of the surgeon [12]. The thorough knowledge of anomalous arterial anatomy of the suprarenal gland is required for surgical and radiological interventions of retroperitoneal organs of the upper abdomen to avoid complications.

**Conclusion**

Even though the isolated cases of a presence of abnormal/accessory renal arteries, abnormal origin and course of testicular arteries or abnormalities of suprarenal arteries are not rare, occurrence of such complicated variants in one case is very rare. Furthermore, variations reported here are of immense importance in

view of their unique localization relative to other abdominopelvic organs and structures.

**Conflict of interest statement**

The authors have no conflicts of interest to declare.

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