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Case Report

An unusual variation of the left renal vessels: a case report

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Abstract

Knowledge of the variations of renal vessels is important during operative, diagnostic and endovascular procedures in the abdomen and pelvis, and its importance has been increased because of the widespread development in renal transplantation surgeries. Taking into account of this, we observed an accessory renal artery and an accessory renal vein on the left side; the accessory renal vein forming a venous collar around the abdominal aorta. Also, we found a communicating vein connecting the accessory renal vein with gonadal vein. Left gonadal vein drained into the accessory renal vein, which drained into the inferior vena cava by passing underneath (posterior) the aorta. No such anatomical variations were found on the right side. Such unusual and complex variations must be kept in mind during radiological and surgical procedures to prevent inadvertent injury to the related structures, and also for their clinical implications.

Key words [renal artery] [renal vein] [accessory renal artery] [accessory renal vein] [nutcracker syndrome]

Introduction

Renal arteries are a pair of lateral branches of the abdominal aorta, arising at the level of L1 & L2 vertebra, just below the origin of the superior mesenteric artery. Renal arteries course anterior to the renal pelvis before entering the hilum. Right renal artery is longer and passes posterior to the inferior vena cava, whereas the left renal artery passes behind the left renal vein, the body of pancreas and splenic vein. A single main renal artery is seen in 70% of individuals, and accessory renal arteries are common (30%) and usually arise from the aorta above or below the main renal artery and follow it to the renal hilum. These accessory renal arteries are called as persistent embryonic lateral splanchnic arteries [1]. Near the hilum, each renal artery divides into anterior and posterior divisions which further divide into segmental, lobar, interlobar and arcuate arteries. These are end arteries with no anastomoses.

Generally, each kidney is drained by a single renal vein at the hilum of kidney. Right renal vein is shorter and drains into inferior vena cava, whereas the left renal vein is three times longer than the right renal vein and drains into inferior vena cava by coursing anterior to the aorta. In addition, left renal vein also receives tributaries of left gonadal vein from below and left suprarenal vein from above. Left renal vein may be double, one vein passing anterior and the other passing posterior to the aorta before draining into inferior vena cava. This is referred to as persistence of the 'renal collar' [1]. Accessory renal vein running posterior to the aorta may be compressed by aorta and leads to retrograde increase in venous return which increases pressure in gonadal veins (present case) leading to varicosity of veins and nutcracker syndrome. Accessory renal arteries are end arteries which supply particular segment of the kidney, and its accidental damage may lead to ischemia of that region [2, 3]. Accessory renal arteries may also compress upon the ureter causing hydronephrosis.

Thus, a thorough knowledge of these variations is important for surgeons, urologists and radiologists.

Case Report

During routine dissection of a 57-year-old female cadaver, we found the presence of unexpected blood vessels to and from the kidney. Two renal arteries arose from the abdominal aorta on the left side. Main renal artery originated just below the level of origin of superior mesenteric artery and had tortuous course to reach the hilum of kidney. It coursed behind the main renal vein and divided into three branches at the hilum. Accessory renal artery originated 2 cm below the main renal artery and it coursed anterior to the renal vein and ureter.

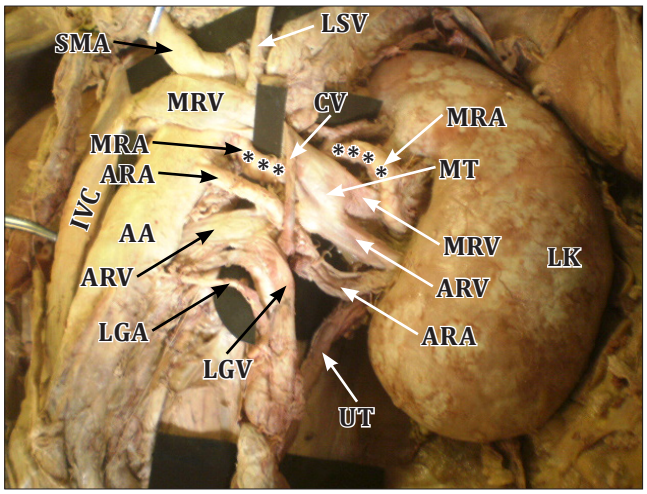

Figure 1. Figure illustrates the complex variants of the left renal vessels with the main renal vein and the accessory renal vein forming a venous loop around the abdominal aorta anterior to the main renal artery. *(**AA**: abdominal aorta; **IVC**: inferior vena cava; **LK**: left kidney; **MRA**: main renal artery; **MRV**: main renal vein; **ARA**: accessory renal artery; **ARV**: accessory renal vein; **MT**: main trunk; **CV**: communicating vein; **LGV**: left gonadal vein; **LGA**: left gonadal artery; **SMA**: superior mesenteric artery; **LSV**: left suprarenal vein; **UT**: ureter; *******: tortuous course of main renal artery behind the main renal vein)*

Accessory renal artery entered the kidney near lower pole of left kidney (Figure 1).

From the left renal hilum, two primary tributary renal veins were found. The main renal vein and an accessory renal vein with a distance of 2 cm joined near hilum to form the main trunk. Main trunk coursed further to bifurcate near aorta. Main renal vein coursed anterior to the aorta and accessory renal vein coursed posterior to the aorta before each draining into inferior vena cava separately. Thus there was 'renal collar' or venous loop around the aorta. This venous loop was anterior to the main renal artery (Figure 1). Left gonadal vein drained into the accessory renal vein at right angle and it also drained into the main renal vein through a small communicating vein (Figure 1). In the present case the importance of left gonadal vein draining into the accessory renal vein which coursed posterior to the aorta may be accounted for having led to increased pressure within the gonadal vein. The main renal vein also received a tributary from the left suprarenal gland. No such variations were found on the right side.

Discussion

The variations in the renal vessels are mainly due to various developmental positions of the kidney [3]. Renal arteries exhibit a high degree of variations compared to the renal veins, as reported by Sener et al., Zagyapan et al. and Soni et al. [4–6]. A variation occurring in both arteries and veins together is rare; also, variations among the renal veins are not as common as arteries [7]. Variations in the renal vasculature are of importance to the surgeons and for radiologists in the interventional radiological approaches. Misinterpretation of a variant renal vessel may be hazardous to the patient. Laparoscopic surgical procedures require knowledge of accessory renal vessels, as in our case, in order to avoid complications like complete necrosis of a particular renal segment [7].

Nayak reported that the variations of right renal veins are more common than the left renal veins. Andrade et al. discussed variation in the left renal vein, which had a retro-aortic course to reach the inferior vena cava. Also, they reported of an anastomotic affluent vein from the inferior mesenteric vein to the main left renal vein [8]. Krishnasamy et al. reported multiple variations of renal vein and artery on the right side [9].

There was an extensive study by Satyapal on classification of drainage patterns of the renal veins. The present case was grouped according to the classification as group III with an accessory renal vein. As compared to his study of 44 (14.4%) cases, right accessory renal veins (40 cases) were more common than the left accessory renal veins (4 cases). In contrast to his study, the present case was unique with the left main renal vein, left accessory renal vein and a communicating vein between left gonadal vein and the left main renal vein. Also, variations in the arteries made the present case to have more complex pattern of distributing renal vessels.

In the present case, we describe a "venous collar" or "venous loop" formed by the main renal vein (running anterior to the aorta) and the accessory renal vein (running posterior to the aorta and 2 cm below the main renal vein), which loops around the aorta, and also runs anterior to the main renal artery which is tortuous in its course. Such a loop may compress the main renal artery, or the accessory renal vein may get compressed between the aorta and lumbar vertebral column, giving rise to nutcracker like syndrome. In the latter situation, the drainage of left gonadal vein into the accessory renal vein must be taken into account, due to the subsequent increase in the gonadal vein pressure. As the gonadal vein was also connected to the main renal vein through a communicating vein, this increase in pressure is sort of compensated by this communication, wherein the main renal vein drains into the inferior vena cava after passing anterior to the aorta. Thus, such complex variations in the renal vessels have not been reported in the literature so far, to the best of our knowledge.

Renal vasculature variations are important for the angiographers who can demonstrate their presence preoperatively and thus overcome the surgical and radiological difficulty that may otherwise be encountered. For the latter, a conventional arteriography or CT angiography can be of great help in reducing such unexpected problems and improving the outcomes [9].

Safety guidelines may also be provided for endovascular procedures like angioplasties and therapeutic embolization, if these variations are well known.

The awareness of these variations is also of importance to the urologists who perform kidney transplantation, due to the significance of renal vein anatomy and also in deciding on

the suitability of a donor kidney. The knowledge of entry of renal veins into the inferior vena cava and their variations is equally important during catheterization and planning porto-renal shunt procedures [10].

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