



VARIATIONS OF RENAL VEINS IN A CADAVER – A CASE REPORT

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ABSTRACT In this article we are representing the variation in drainage of renal veins. During dissection of healthy cadaver in dissection hall, we found - Each kidney is drained by two renal veins to instead of one renal vein and they directly drain into Inferior Vena Cava. Knowledge of this type of variation is very important in avoiding complications during operative surgeries.

KEYWORDS : Accessory renal veins, Inferior vena cava, Kidneys.

INTRODUCTION:

The variations of the renal veins are not as common as renal arteries. The venous drainage of each kidney proceeds through a single vein that drains into the inferior vena cava (IVC) at a right angle. The renal veins are formed near the hilum in front of the renal artery. The right renal vein is shorter (2-4 cm) than the left (6-10 cm). It receives blood only from the right kidney, whereas the left renal vein receives the left adrenal and gonadal veins in addition to the vein coming from the kidney¹. The left renal vein passes horizontally between the abdominal aorta and the superior mesenteric artery to reach the IVC. Renal veins are present between the first and second lumbar vertebra. It is usually singular to each kidney, except in the condition called as "multiple renal veins". In some people the left renal vein passes behind the abdominal aorta instead of in front of it, this is termed a retroaortic left renal vein, which is also known as "The Vein of Schnitker." If there is both a vein passing in front of and one behind the aorta this is called a circumaortic renal vein². There is one vein per kidney which divides into 4 divisions upon entering the kidney:

- The anterior branch which receives blood from the anterior portion of the kidney
- The posterior branch which receives blood from the posterior portion.

Because the inferior vena cava is on the right half of the body, the left renal vein is generally the longer of the two. The inferior vena cava is not laterally symmetrical, the left renal vein often receives the following veins:

- Left inferior phrenic vein.
- Left suprarenal vein.
- Left gonadal vein (left testicular vein in males, left ovarian vein in females)
- Left 2nd lumbar vein.

This is in contrast to the right side of the body, where these veins drain directly into the IVC.

Often, each renal vein will have a branch that receives blood from the ureter².

METHODOLOGY:

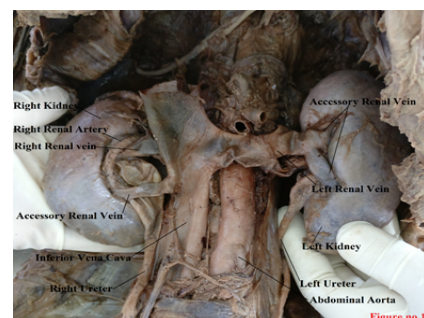
During a routine dissection at the Department of Anatomy at the CSMSS Ayurved Mahavidyalaya, Aurangabad, an anatomical variation in the renal veins was observed. The cadaver donated to the Department of Anatomy, was that of a middle aged Indian man.

After dissection of anterior wall of abdomen, after cutting the root of mesentery removed the abdominal organ within the peritoneal cavity and stripped posterior wall of peritoneum, removed all the fat and fascia from the anterior surface of both the kidney and traced the two renal veins from each kidney. We observed presence of an accessory renal vein draining both the kidneys in addition to its normal renal vein.

OBSERVATION: RENAL VEIN - Origin & Course: The renal veins are formed near the hilum in front of the renal artery. The right renal vein is shorter (2-4 cm) than the left (6-10 cm). It receives blood only from the right kidney, whereas the left renal vein receives the left adrenal and gonadal veins in addition to the vein coming from the kidney.¹ The left renal vein passes horizontally between the abdominal aorta and the superior mesenteric artery to reach the IVC. The most common spinal level for renal veins is between the first and second lumbar vertebra.

OBSERVED VARIATION:

Cadaver showed the Accessory Renal Veins on both sides of kidney. On the both right and left side Accessory renal veins drained into Inferior vena cava. The accessory vein emerged from the lower part of the hilum just below the right renal pelvis and then it traversed almost parallel to the right renal vein. Right renal vein was found to have two tributaries from the kidney, one upper and another lower. The upper tributary was crossed by one of the branches of the right renal artery. It opened into the lateral part of the inferior vena cava opposite to the left renal vein, but the accessory renal vein on the right side opened into the posterior aspect of the inferior vena cava at a distance of 1.5 cm below the opening of the right renal vein. Left renal vein was found to have two tributaries upper and lower emerging from the hilum of left kidney, but as it traveled medially towards inferior vena cava two tributaries joined to form a single vein draining into Inferior vena cava. (Figure no 1).

**DISCUSSION:**

Variations of renal veins are usually clinically silent and remain unnoticed until discover during venography, operation or autopsy. To transplant surgeon, morphology acquires special significance, since variations influence technical feasibility of operation. Variations restrict availability of vein for mobilization procedures³. The occurrence of congenital variations of renal vein can be explained on the basis of its embryological development. The development of the renal veins is a part of the complex developmental process of inferior vena cava. The process starts from the 4th week of conception and ends at about the eight week. There is vast network of three pair of parallel veins in communication. Embryologically, the bilateral symmetrical

cardinal venous system becomes a unilateral right sided inferior vena cava around the 8th week of development. Initially two renal veins are present on each side at the ventral and dorsal plane. Convergence of both tributaries results in the single vessel formation. Persistence of these two veins leads to the presence of accessory or additional renal veins. These are in the order of appearance; the posterior cardinal veins, the subcardinal veins and the supracardinal veins. The renal veins are formed by anastomoses of the subcardinal veins and supracardinal veins. Two renal veins form as ventral and dorsal; the dorsal vein usually degenerates, the ventral vein forms the renal vein⁴. Complex embryogenesis involves the shifting of venous arrangement to the right possibly discouraging any retention of accessory left sided renal veins. Thus right-sided anatomical variations of the renal vein are more common.

There are several **variations in renal venous anatomy**. Some of these are specific to the left renal vein.

Left renal vein anomalies are generally classified into four types²:

- **Type I** - Ventral pre-aortic limb of the left renal vein is obliterated, but the dorsal retro-aortic limb persists and joins the IVC in the normal position
- **Type II** - Results from the obliteration of the ventral pre-aortic limb of the left renal vein, and the remaining dorsal limb turns into a retro-aortic left renal vein (RLRV). Left renal vein lies at the level of L4 to L5 and joins the gonadal and ascending lumbar veins before joining the IVC
- **Type III** - It is the circumaortic left renal vein or venous collar - due to persistence of subsupracardial and intersupracardial anastomoses and the dorsal limb of the left renal vein. If all small retroaortic veins that empty into the IVC are considered, the incidence of a circumaortic left renal vein could be as high as 16%
- **Type IV** - The ventral pre-aortic limb of the left renal vein is obliterated, and the remaining dorsal limb becomes the RLRV
- **Other (non-classified)** - Supernumerary renal veins can involve either kidney.
- **Double retroaortic left renal vein** is a very rare entity that is usually clinically silent and detected incidentally at imaging, surgery or autopsy⁵.

CONCLUSION:

Detailed knowledge about major congenital anomalies of the renal veins is vital. Presence of the accessory renal vein may clinically remain unnoticed and can be found only in venography, operation or autopsy. Such variations should be known to the angiographer, catheter design, and planning porto-renal shunt procedures and to a transplant surgeon. Knowledge of variant renal vascular variations is essential for vascular surgeons and urologists operating in this region⁶. Sound knowledge and understanding of these variations is also essential to make distinctive diagnosis of retroperitoneal lymph node pathologies, masses and renal vascular pathologies and to impede complications at the time of surgery. During retroperitoneal surgery or nephrectomy, the surgeon may be falsely assured by the normal anterior renal vein, confidently clamp the aorta and mobilize the kidney. In this process, the retroaortic renal vein may shear off, leading to fatal haemorrhage⁷. **Circumaortic left renal vein** or **circumaortic renal collar** is an anomaly of left renal vein when a supernumerary or accessory left renal vein passes posterior to the aorta, apart from the normal renal vein passing anterior to the aorta. This anomaly is potentially hazardous, if unrecognised during retroperitoneal surgery⁸.

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