

# Retroaortic Left Renal Vein- A Cadaveric Study

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## ABSTRACT

Left renal vein is about 7.5cm long. It passes across the posterior abdominal wall posterior to the body of pancreas and splenic vein and near its end, lies in front of the aorta to open in inferior vena cava just below the superior mesenteric artery origin. It is located at the left renal artery level i.e., in between first lumbar and second lumbar vertebrae. In this case, the left renal vein united with the inferior vena cava at a lower level- third lumbar vertebra by crossing behind the abdominal aorta. Retroaortic left renal vein passes posterior to the abdominal aorta and is an uncommon condition. Retroaortic left renal vein compression between the aorta and the vertebrae is known to cause urological complications such as varicocele, hematuria and ureteropelvic junction obstruction. It is of great surgical importance for a left renal surgery.

**Key Words** *Third lumbar vertebra; Abdominal aorta; Hematuria; Varicocele*

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## INTRODUCTION

Renal veins are two in number Right and Left; they are large in size and are present anterior to renal arteries, and open into the inferior vena cava, nearly at right angles. They are located at the renal arteries level, i.e., amidst L1 and L2 vertebrae. The left renal vein (7.5 cm) is three times the length of the right (2.5 cm); it passes posterior to the body of pancreas and the splenic vein and near its end across the posterior abdominal wall, is anterior to the aorta, just below the superior mesenteric artery origin. The left testicular or ovarian vein enters the renal vein from below and the suprarenal vein enters it from above but nearer the midline, receiving one of the left inferior phrenic veins. The left renal vein

joins the inferior vena cava slightly superior to the right renal vein, which is located behind the descending duodenum.<sup>1</sup>

A Retroaortic left renal vein passes behind the abdominal aorta, and its variance is a rather rare condition.<sup>2</sup>

Renal vein formation is important to understand the formation of anomaly. Early development stages, a pair of precardinal veins drain the body wall which is rostral to the developing heart, while the paired postcardinal veins drain the caudal part of body wall. The pre and postcardinal veins on each side are drained into a common cardinal vein, and ultimately into the sinus venosus of the heart tube. As the embryo grows, a range of bilateral longitudinal channels

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supplements the the postcardinal veins, that anastomose with the posterior cardinal system and with each other. These channels are the subcardinal, supracardinal, azygos line, subcentral and precostal veins. The subcardinal veins undertake the drainage of the mesonephros, and intercommunicate by a pre-aortic anastomotic plexus, which later constitutes the part of the left renal vein that passes anterior to the abdominal aorta. The supracardinal veins join with each other through the medium of the azygos veins and the subcentral veins. The most rostral of the connections, along with the supracardinal–subcardinal and the intersubcardinal anastomoses, complete a venous ring, called the ‘renal collar’ (Figure 1), around the aorta below the superior mesenteric artery origin.<sup>3</sup> Right renal vein is derived from the mesonephric vein which originally drains into the right subcardinal vein which joins with the inferior vena cava. Left renal vein originates from the mesonephric vein, which primarily empties into the left subcardinal vein, a small part of the left subcardinal vein and inter subcardinal anastomoses. The left renal vein has a similar

relationship as these anastomoses are positioned opposite the aorta. (Figure1).<sup>4</sup> Retroaortic left renal veins are formed when, instead of the anterior part of the renal collar, the dorsal portion persists.<sup>5</sup>

MATERIALS & METHODS

During routine dissection for Post Graduate scholars at Sri Dharmasthala Manjunatheshwara

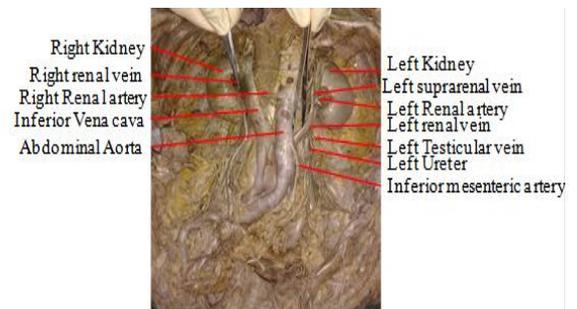
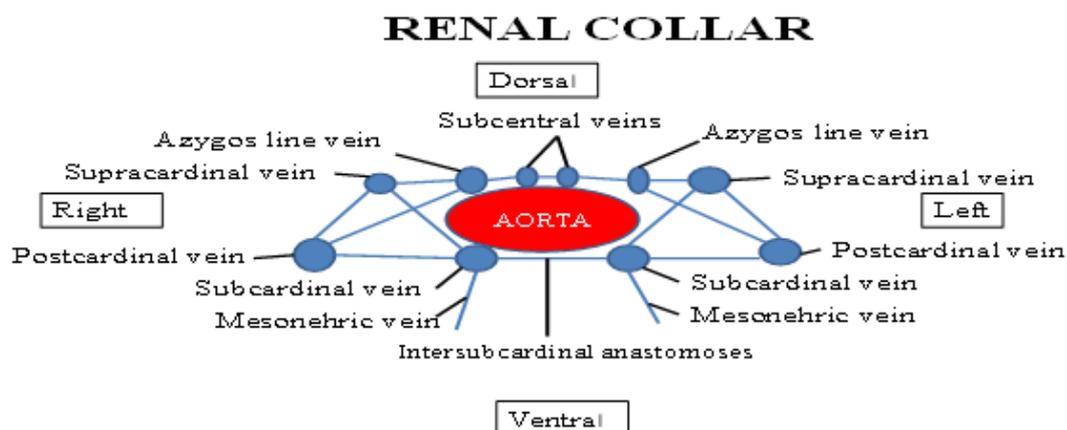
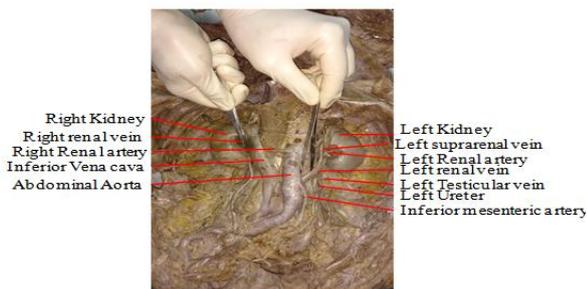


Figure 1

College of Ayurveda, Udupi, in a male cadaver variation was observed in the path of the left renal vein. Left renal vein drained in inferior vena cava by crossing posterior to the abdominal aorta. (Figure 2) It was larger in calibre and received the suprarenal vein above and testicular vein below. It joined the inferior vena cava at a lower level i.e., L3 vertebra, 3-4cm above the



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**Figure 2** Cadaver Findings

division of aorta where the origin of inferior mesenteric artery was seen. (Figure 2) Right renal vein had a normal course. Renal arteries were normal.

## OBSERVATION AND RESULTS

A Retro aortic left renal vein was observed passing at a lower level, L3 vertebra, opening into inferior vena cava by passing behind the abdominal aorta.

## DISCUSSION

Retro Aortic Left Renal Vein incidence has been stated to be nearly 0.5% to 3.7% amongst healthy population, with incidence rates of 1.7% in men and 1.6% in women respectively.<sup>6</sup>

Renal vein anomalies diagnosis has its importance in retroperitoneal surgery. Lack of knowledge of this situation during the retroperitoneal surgery can result in, nephrectomy, bleeding and even death. The left renal vein is lengthier and hence is the preferred vein in renal transplantation. Therefore, the path and course of the left renal vein is important to know.<sup>7</sup>

The posterior "nutcracker phenomenon" occurs when the retro aortic left renal vein is compressed between the aorta and the vertebra due to lack of space. It is stated that elevated pressure in the left renal vein is caused due to strain of the left renal vein which results in hematuria, leading to obstruction in the left kidney and venous communications.<sup>8,9,10,11</sup> It is well recognised that, in renal vein obstruction cases, the gonadal, ascending lumbar, adrenal, ureteral, and capsular veins are the potential collateral venous pathways. These anomalous communications between channels are responsible for hematuria. In addition, increased drainage pressure can result in dilatation of the afferent venous system. In such cases, men may present with left-sided varicocele and women with pelvic congestion syndrome<sup>12,13,14</sup>

## CONCLUSION

Retroaortic left renal vein is a variation of left renal vein where it joins the inferior vena cava by crossing posterior to the abdominal aorta. Retroaortic left renal veins are formed when instead of the anterior portion of the renal collar, the dorsal portion persists. Diagnosis of the renal vein variations are necessary in retroperitoneal surgery.

Retroaortic left renal vein causes nutcracker phenomenon which leads to hematuria, left sided varicocele in men and pelvic congestion syndrome in females therefore it is clinically important.

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