

## Case Report

# AN ADDITIONAL RIGHT RENAL VEIN AND PRE HILAR PRIMARY TRIBUTARIES OF LEFT RENAL VEIN: EMBRYOLOGICAL BASIS AND CLINICAL SIGNIFICANCE: A CASE REPORT

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## ABSTRACT

In clinical Anatomy, the renal venous system is relatively understudied compared to the arterial system. The present study reports the presence of an Additional renal vein on the right side draining directly into the Inferior venacava and pre hilar primary tributaries of the left renal vein. The above findings were observed in a male cadaver during routine dissection of abdomen for undergraduate students in the Department of Anatomy, Rajarajeswari Medical college and hospital, Bengaluru, Karnataka India.

The Anatomical knowledge of renal veins and its variations are of extreme importance for the surgeon who approaches the retroperitoneal region mainly in the face of current frequency of Renal transplant surgeries. Knowledge of Anatomy and Anomalies of Renal veins is necessary for retroperitoneal surgery and venographic procedures in addition to providing safety guidelines for endovascular procedures. In view of immense clinical significance attached to the variations in the renal vascular patterns, the present case has been discussed with emphasis to its embryological basis.

**KEY WORDS:** Renal vein, Additional renal vein, pre hilar primary tributaries, venous drainage patterns.

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## INTRODUCTION

The kidney develops in a highly complex plexiform vascular environment. The large renal veins lie anterior to the renal arteries and open into the Inferior venacava almost at right angles. The left renal vein is three times of the right in length [1].

Variations in the number and arrangements of renal vessels are common. For most part of the body, variations or anomalies of veins are far

most frequent than those of arteries, but this is not true of the vascular pedicle of the kidney. Pick and Anson found supernumary arteries in 32.25% of kidneys but supernumary veins in only 14.4% [2].

The right renal vein is usually a single vessel formed near the hilum in front of the renal artery. It describes a horizontal course towards the Inferior venacava, in which it drains. In literature, a significant prevalence of anatomical

variations on the left renal vein (about 92%) was found and the presence of multiple right renal veins (more than 2 vessels) was found in about 8.0 to 9.7% of cases [3].

In the present case, an Additional renal vein on the right side and a group of pre hilar primary tributaries of left renal vein was noted.

Although the renal arterial system has been the topic of repeated anatomical investigations, there is a lack of similar exhaustive studies addressing the renal venous architecture. Development of renal veins is a complex process with alternative patterns of formations.

Familiarity with variations in terms of their variant pattern or supernumary numbers is essential in order to avoid vascular injury during various surgical and interventional procedures [4].

In the light of above mentioned factors, the following case report of an Additional right renal vein and pre hilar primary tributaries of the left renal vein has been discussed.

### CASE REPORT

A few variations in the hilar blood vessels of both the kidneys were noticed in a 65 year old

male cadaver during routine dissection of posterior abdominal wall for under graduate students in the Department of Anatomy, Rajarajeswari Medical College and Hospital, Bengaluru, Karnataka, India. No other abnormalities were found in the vicinity. A block dissection of the kidneys with the adrenal glands and related blood vessels was done, structures were painted and relevant photographs were taken.

### OBSERVATIONS

Kidneys of both the sides were found to be of normal size and were in normal anatomical location. Small cysts were found on the surface of both the kidneys making the texture a bit coarse.

On close examination of the hilum of right kidney, an Additional renal vein was found emerging from the lower part of the hilum in addition to the main renal vein and was found opening independently into the Inferior venacava. (Fig. 1)

Fig. 1: Showing the Additional Right Renal Vein (White Arrow)



This additional renal vein was emerging at the level of L2 below and parallel to the main renal vein. The right Suprarenal vein and the right Testicular vein was found draining separately into the Inferior venacava above and below the two renal veins respectively. The right renal

artery emerged from Abdominal aorta, coursed behind the Inferior venacava, dorsal to the main renal vein and entered the hilum behind the main renal vein. It was seen giving off an upper polar branch, inferior suprarenal branch and several minute ureteric branches.

The right pelvis and ureter were found in normal location and was single. The additional renal vein measured 1.5cms and was not receiving any tributaries. On the left side, the left renal vein was single and was found to be formed by prehilary primary tributaries which were arranged as three anterior and one posterior tributary in front of and behind the renal artery respectively. (Fig. 2 & 3)

**Fig. 2:** Showing Anterior Pre Hilar Primary Tributaries of Left Renal Vein (Yellow Arrow)



**Fig. 3:** Showing Posterior Pre Hilar Primary Tributary of Left Renal Vein (Lifted with Probe) and cysts over the surface of right kidney.



All these four tributaries joined to form the left renal vein which drained into the Inferior venacava after crossing the Abdominal aorta anteriorly. The left renal vein was longer than the right and received the left suprarenal vein and left testicular vein before opening into Inferior venacava.

The left renal artery was single, emerged from Abdominal aorta and coursed behind the left renal vein. It was found to give an upper polar branch, left Inferior suprarenal branch and several minute ureteric branches. The left pelvis and ureter were found in normal location and was single. No other abnormalities were found in the vicinity.

## DISCUSSION

Satyapal K.S (1995) classified different renal venous drainage patterns. Accordingly, any additional vessel that drains separately from the kidney and independently into the Inferior venacava should be considered as a normal variation and be named an Additional renal vein classified as Type III. He further classified the pattern based on drainage pattern of the primary renal vein tributaries and the renal vein proper as a basis on both the right and left sides.

**Type IA** consisted of two primary tributaries only, an upper and a lower one, while **Type IB** had in addition a posterior primary tributary.

**Type IIA** displayed more than two primary tributaries eg: upper, middle and lower, while **Type IIB** had in addition a posterior primary tributary.

Type III consisted of any of the above classification patterns as well as displaying an Additional renal vein.

In the present case, the additional renal vein on the right side & pre hilar tributaries on the left side fits into Type III Pattern of venous drainage.

Dhar (2002) reported emergence of two renal veins at the hilum of right kidney, which drained separately into the Inferior venacava as in our case [5].

Anson et al (1947) reported that the right renal vein rarely received tributaries, whereas left renal vein regularly had complex connections with other venous channels which were the basis of collateral pathways after caval interruption [6].

**Embryological basis:** During development of Inferior venacava, the renal collar forms a circum aortic venous ring being contributed anteriorly by sub cardinal veins and inter sub cardinal-anastomosis, posteriorly by supracardinal veins and inter supracardinal anastomosis and on each side by supracardinal-sub cardinal anastomosis [7].

The bilaterally symmetrical cardinal venous system converts into unilateral right sided Inferior venacava at around eight weeks. Inferior venacava is established in the right of Aorta consequent to this 'venous shift' to the right of the body. At this time, two renal veins are present

on each side, one on ventral plane and another dorsal to it.

In right side, 1 renal vein opens into the lateral portion of renal collar and other opens more dorsally towards cranial part of supracardinal vein. With further development, there is a confluence of 2 tributaries producing a single vessel that connects with lateral portion of renal collar.

The persistence of these 2 veins may result in the additional renal vein of right side as seen in the present case.

These shifting of venous arrangement to the right “discourage” the retention of any additional left sided renal veins, which would be required to reach across the aorta.

Furthermore, complex embryogenesis of left renal vein would further ‘discourage’ this process. Since right side is free of these impediments, additional right renal vein may be retained .hence presence of additional right renal vein is much more common than the left side [8].

Gupta et al (2011) revealed that the incidence of accessory renal vein on the right side is 33% and on the left side to be 3.3% in cases studied [9].

Vascular variations shows a major significance in renal surgery, in partial or total nephrectomy and in renal transplant. The renal hilum should be examined properly prior to any surgical procedure in this region by radiographic examination which is also important for post operative management.

Contrast enhanced CT Scan can provide enough information about venous variations of kidney which is very important especially before any abdominal operation like operation of abdominal aortic aneurysm.

## CONCLUSION

Variations of the renal venous system are clinically silent and remain unnoticed until discovered during autopsy or operation. To the transplant surgeon, the morphology of renal vessels is of special significance since variations and anomalies may strongly influence the technical feasibility of operation.

During retro peritoneal surgery, the surgeon may be unaware of a posterior primary tributary and may tear it while mobilizing the kidney or clamping the aorta. Furthermore, these variations require appreciation especially since laparoscopic ally assisted nephrectomy is performed in increasing frequency.

There is considerable discrepancy concerning incidence of renal vein variations. Although they are clinically silent, recognition of these uncommon variations is desirable prior to therapeutic and research decisions. Pre operative knowledge of these anomalies is advantageous prior to nephrectomy, caval interruption procedures etc.

**Conflicts of Interests: None**

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