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Case report

## BILATERAL VARIATIONS OF RENAL VASCULATURE : A CASE REPORT

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### ABSTRACT

During routine dissection, an uncommon variation was found in the renal vessels of a male cadaver. Each kidney was found to have two renal veins and the branches of the renal artery lie outside the hilum. In the present scenario, it has become imperative for the surgeons understand the abnormalities of renal vasculature, as the utility of laparoscopic renal surgeries grew considerably. Otherwise such surgeries may be hampered by these anatomical variations. The presence of these abnormalities is also accountable in radiological Imagings, renal transplant, selective segmental clamping during partial Nephrectomy. Hence, this case report will throw light in the understanding of renal vasculature and its anatomical, embryological variations.

**Key words:** Kidney, Renal vessels, Laparoscopic procedures, Nephrectomy

### INTRODUCTION

The renal arteries are the lateral branches of abdominal aorta just below the origin of superior mesenteric artery. And these paired renal arteries are considered as end arteries and it takes 20% cardiac output. The right renal artery is longer and higher than the left renal artery. In 70% individuals a single renal artery is present but it often varies in disposition. The left renal vein (7.5cm) is three times longer than the right renal vein (2.5cm)<sup>1</sup>. And for this reason, the left kidney is the preferred side for live donor nephrectomy. Left renal vein is may be doubled and sometimes referred to as persistence of the 'renal collar'. However renal vessels variations are very common. Variations are reported by

many researchers<sup>2,3,4</sup>. These variations useful in radiological imagings, renal transplant, renal artery embolization, renovascular hypertension, radical renal surgery<sup>5</sup>. During conservative surgical procedures, these Renal arterial lesions may develop the Hypertension<sup>6</sup>.

### CASE REPORT

During routine conventional dissection in a male cadaver approximately 65 years, unusual dispositions of the renal vessels were found. Variations were found both sides, the presence of unexpected blood vessels to and from the kidney was observed.

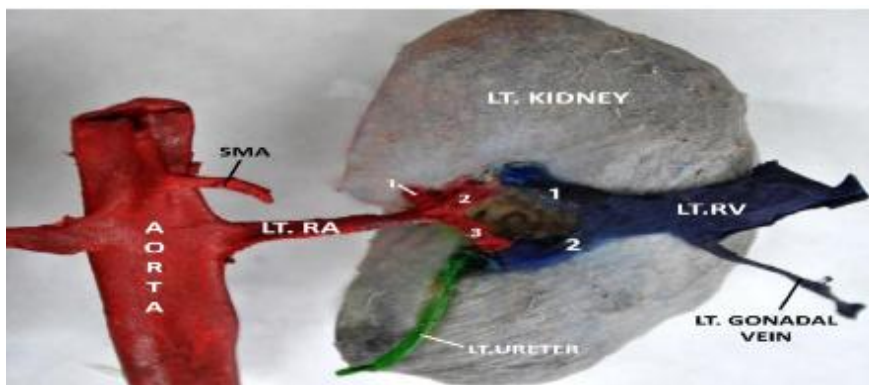
**Variations**

**Renal arteries:** The anterior division of the renal artery divided into three segmental arteries before entering hilum on left kidney (Fig1) and on the right kidney (Fig2) is divided into two segmental arteries.

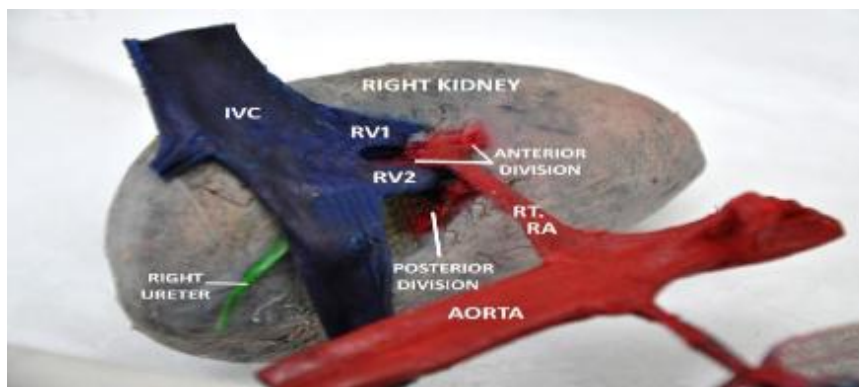
**Renal veins**

**Right kidney:** Additional renal vein is found on the right side (Fig2), which drained into the inferior venacava with the renal vein separately.

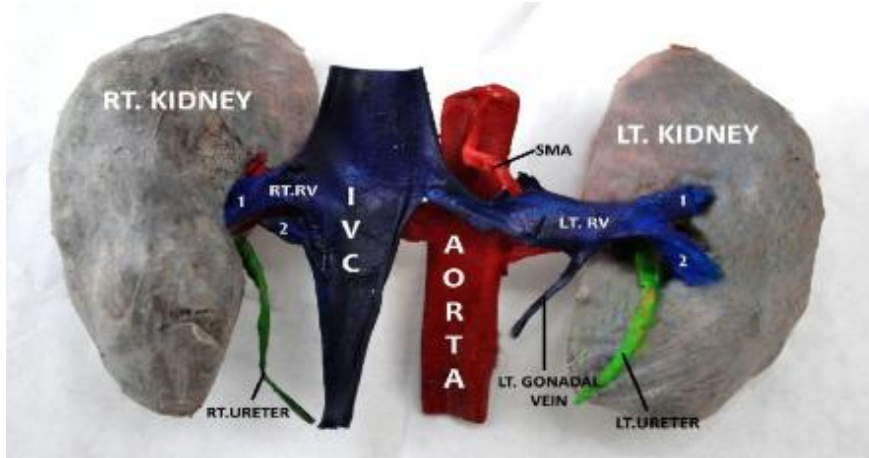
**Left Kidney:** Two tributaries of the left renal vein (Fig1) were also found lying outside the Hilum of the left kidney which joined to form a single vein that eventually drained into the inferior vena cava.



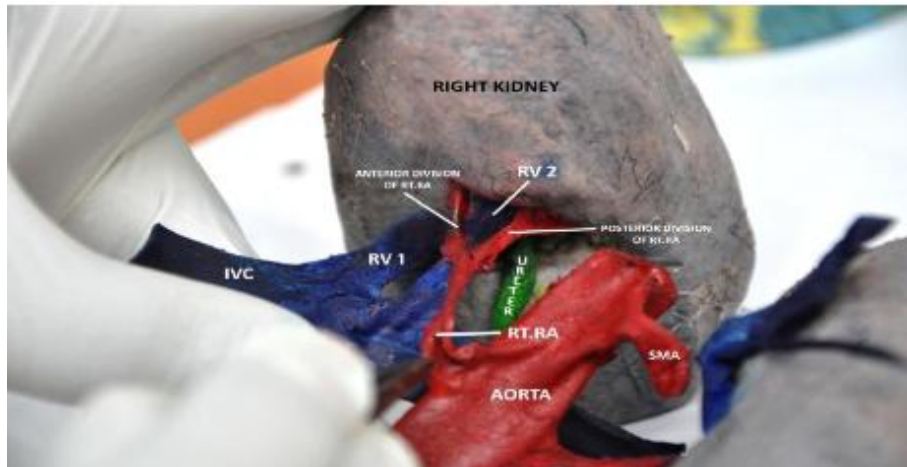
**Figure 1.** Left renal artery (LT.RA) 1,2,3 shows Segmental arteries Left renal vein (LT.RV) 1,2 Tributaries of left renal vein Superior mesenteric artery (SMA) Left ureter (LT. URETER), Left gonadal vein (LT. GONADAL VEIN)



**Figure 2.** Right renal artery (RT.RA) Renal vein1 (RV1) Renal vein (RV2) Inferior vena cava( IVC)



**Fig:3:** Right kidney (RT. KIDNEY) 1(Renal vein1), 2 (Renal vein2) Right renal veins (RT. RV) Right ureter (RT. URETER) (Left Kidney (LT.KIDNEY) Left renal vein (LT.RV) 1,2 ( Tributaries of left renal vein) Left gonadal vein (LT. GONADAL VEIN) Left ureter (LT. URETER) Superior mesenteric artery (SMA)



**Fig.4:** Right renal vein (RV1) Right renal vein (RV2) Right renal artery ( RT.RA) Inferior venacava (IVC)

## DISCUSSION

The vascular patterns of the kidneys are inevitable to understand in order to perform various procedures for treatment. Graves<sup>7</sup> first described the vascular segments of the kidneys into five: apical, superior, inferior, middle and posterior. Each segment receives blood supply by the branches from the main renal artery.

Embryological explanation of these variations are discussed by Keibel and Mall<sup>8</sup>. During development the mesonephric arteries are present between the 6<sup>th</sup> cervical to the 3rd lumbar segments and classified into three groups:

**i) Cranial Group** consists of 1st and 2nd arteries located cranial to the coeliac trunk

**ii) Middle group** Consists of 3rd to 5th arteries that pass through the suprarenal body.

**iii) Caudal group** consists of 6th to 9th arteries.

The gonads, mesonephros and metanephros are supplied by arterial segments from rate arteriosum urogenital which is the network formed by mesonephric arteries, later some of the roots of this network degenerate and blood supply and blood supply to the area are replaced by the neighbouring root. This describes why the segmental branches have variation in their point of origin.

The occurrence of variations of renal vein can be explained on the basis of embryologic development. The development of the veins is a part of a complex developmental process of the

inferior vena cava. The processes start of the 4<sup>th</sup> week and ends at the 8th week of conception. Three pairs of parallel veins formed initially, they are posterior cardinal vein, sub cardinal vein and supracardinal vein.

Renal veins are formed by the anastomoses of sub cardinal and supracardinal veins. Initially two renal veins formed i.e. Dorsal and ventral vein. The dorsal vein usually degenerates, ventral vein forms the renal vein. Around the 8<sup>th</sup> week, the bilateral cardinal venous system converts into unilateral right sided inferior venacava. At this time, two renal veins are present on each side, one on ventral plane and another dorsal to it. With further development, there is a confluence of two tributaries producing a single vessel. The persistence of these two veins results in the additional renal vein on the right side.

In this case, the renal vein on the right side falls under the category of type IA and on the left side it is type III of the classification of Sathyapal et al<sup>9</sup>.

## CONCLUSION

A detailed knowledge of variations of renal vessels is obligatory for the safe performance of endovascular procedures, clamping of vessels during partial nephrectomy and abate the complications in various surgical procedures.

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