

## A Case Report of Multiple Variations in Bilateral Renal Vasculature

**K. M. Parmar <sup>\*1</sup>, Ravindra Kumar B <sup>2</sup>, Jagdish S. Soni <sup>3</sup>.**

<sup>\*1</sup> Professor, Department of Anatomy, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat, India.

<sup>2</sup> Assistant Professor, Department of Anatomy, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat, India.

<sup>3</sup> Professor & Head, Department of Anatomy, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat, India.

**Corresponding Author:** Dr. K. M. Parmar, Department of Anatomy, Parul Institute of Medical Sciences & Research, Parul University, Vadodara, Gujarat 391760, India.

Contact number: +919429952396 E-Mail: kmparmar58@gmail.com

### ABSTRACT:

Knowing variations in renal vasculature is necessary, especially for those involved in kidney retrieval and transplant. It is also necessary for those involved in managing traumas and other surgeries or procedures related to renal system vasculature. During the routine cadaveric dissection of a 70-year cadaver conducted by first-year medical students, we observed multiple variations in the bilateral renal vasculature, like perihilar branching of renal vessels on both sides. On the right side were two renal veins, while on the left, there was one renal vein.

**KEYWORDS:** Renal vasculature, Kidney, Renal Artery, Renal Vein, Variations.

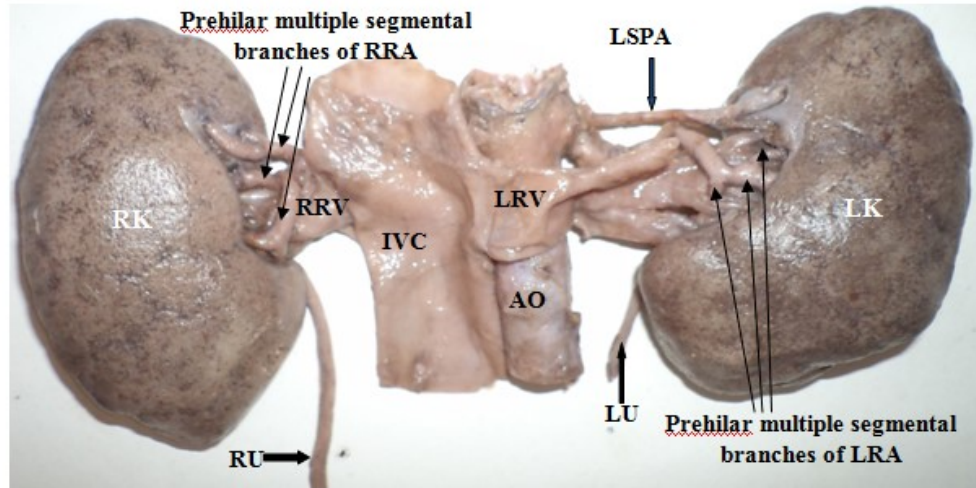
### INTRODUCTION

With the recent advances in the medical field and frequent use of modalities like renal transplants, vascular reconstructions, etc., it is becoming increasingly important to have a thorough knowledge of the variations of the renal arteries (RA). Under normal circumstances, renal arteries from the abdominal aorta as lateral branches arise around the level of the 2<sup>nd</sup> lumbar vertebra, just below the superior mesenteric arteries origin. These renal arteries then proceed toward the kidneys and enter the hilum. There is a renal vein in front of the hilum and a renal pelvis behind it. During its course toward kidneys, it gives of following branches: inferior suprarenal, ureteric, and muscular. One renal vein drains blood from each kidney and opens into the inferior vena cava [1]. In around 70% of cases a single artery is present on either side of the aorta [2]. Cinar Cand Türkvananb A evaluated the prevalence of renal vascular variations using MDCT angiography and found that 31.3% of the enrolled participants had multiple RAs, of which 22.2% had two RAs. In comparison, 7.5%, 1.4%, and 0.2% had three, four, and five RAs, while pre-hilar branching was present in about 6.5% of the subjects. In 21.6% of the subjects, multiple right RVs were present; 19.2%, 2.2% and 0.2% had two, three, and four RVs, respectively. In 5.2% of the subjects, circum aortic left RV was observed, while 4.2% had retro aortic left RV and 7.3% had late venous confluence. [3] In the present paper, unusual course and early and multiple branches of renal arteries on each side, and accessory left superior polar artery, and two renal veins on the right side are reported, which are rare variations.

### CASE REPORT

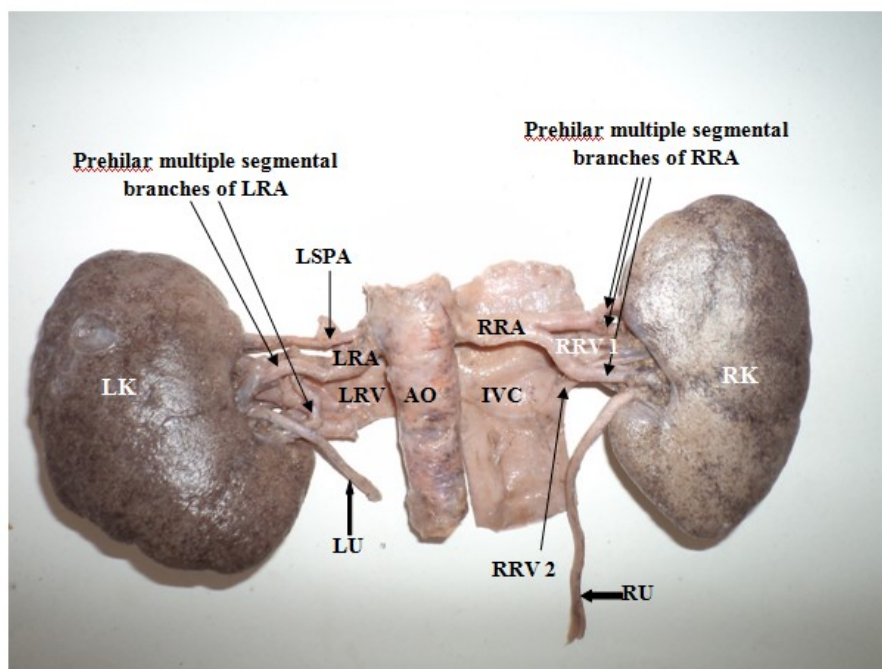
During routine dissections of the 70-year-old male cadaver for the first-year medical students of SBKS, MI&RC, Pipariya in 2012, we noticed an unusual case of bilateral multiple and early branching of renal arteries and their unusual course along with accessory left superior polar artery and two renal veins on the right side. Around the level of the 2<sup>nd</sup> lumbar vertebra, about an inch below the superior mesenteric arteries origin, renal arteries from the abdominal aorta as lateral branches on both sides.

After origin right renal artery bifurcated into upper and lower divisions 4 cm proximal to the hilum. The upper division passed laterally towards the kidney. Further, it ended by dividing into three branches - upper, middle, and lower-among. The upper division ended by dividing into two branches which entered the kidney through the upper part of its medial border, and the middle division enter the kidney through its hilum, and the lower division ended by dividing into two branches which entered the kidney through the lower part of its medial border. The lower division ends by entering the kidney through the hilum. At the hilum, most branches, except 3<sup>rd</sup>, passed between the renal vein and the renal pelvis; the third branch passed anterior to the renal vein. On the right side, we observe d two renal veins draining into the inferior vena cava. [Figure1&Figure2] After origin, the left renal artery bifurcated into upper and lower divisions 3 cm proximal to the hilum. The upper division gave three branches and entered the hilum anterior to the left renal vein. Lower division, on the other hand, entered the kidney through the hilum posterior to the left renal vein. On the left side, we observed the left superior polar artery originating from the abdominal aorta just above the origin of the left renal artery. It is further divided into two branches before entering the kidney through the upper part of its anterior surface. [Figure1&Figure2]



**RK**=Right Kidney, **LK**=Left Kidney, **RRV**=Right Renal Vein, **LRV**=Left Renal Vein, **IVC**=Inferior Vena Cava, **AO**=Abdominal Aorta, **RU**=Right Ureter, **LU**=Left Ureter, **RRA**=Right Renal Artery, **LRA**=Left Renal Artery, **LSPA**=Left Superior Polar Artery and pre-hilar multiple segmental branches of Right and Left Renal Artery.

**Figure 1:** Bilateral pre-hilar multiple branches of renal arteries (Anterior view)



**RK**=Right Kidney, **LK**=Left Kidney, **RRV**=Right Renal Vein, **LRV**=Left Renal Vein, **IVC**=Inferior Vena Cava, **AO**=Abdominal Aorta, **RU**=Right Ureter, **LU**=Left Ureter, **RRA**=Right Renal Artery, **LRA**=Left Renal Artery, **LSPA**=Left Superior Polar Artery and pre-hilar multiple segmental branches of Right and Left Renal Artery.

**Figure 2:** Bilateral pre-hilar multiple branches of renal arteries and two right renal veins (Posterior view).

## DISCUSSION

Variations in the renal arteries are seen in around 30% of the cases and hence cannot be considered uncommon. Different variations of renal vasculature are reported. Giavroglou C A et al. have reported a supplementary left renal artery branch of the right renal artery. [4] Bayramoglu et al., in their case report, documented the occurrence of additional bilateral renal arteries that originate from the abdominal aorta itself. [5] Singh et al. also reported the occurrence of bilateral accessory renal arteries. Additionally, these arteries gave origin to the right and left gonadal arteries. [6] Rao et al. reported a bilateral early and multiple branching of renal arteries that entered the kidney through the hilum [7]. Aroar et al. Their case report documented that around 4 cm proximal to the hilum, the right renal artery divided itself into anterior and posterior segmental branches; however, the left renal artery was anatomical [8].

Gupta V et al. reported that on the right side, there were three renal arteries and two veins. The upper, middle and lower renal arteries. On the left side were two renal arteries; upper and lower. All the arteries arose from the aorta. [9].

In accessories by Potaliya P, et al. the authors observe that of the 60 resected kidneys specimen, renal artery variations such as pre-hilar branches of the renal artery in 3.33% of specimens while 6.67% had additional renal artery; polar artery was present in 1.67% of specimen. Additional renal veins were present in 3.33% of specimens [10].

Shetty P et al., in their case report, specified that the right kidney's hilum was directed posteriorly. On either side were two renal arteries and two renal veins [11].

In a study conducted on cadavers in Australia, the authors reported that 22% of subjects (12.12% kidneys) had multiple renal arteries. A commonly reported pattern was the presence of one variant renal artery (93.1%), while 5.6% and 1.4% had two and three multiple arteries, respectively [12].

Variations of the renal arteries are either in terms of the abnormal origin of arteries or the presence of accessory arteries. Only twice before bilateral, multiple, pre-hilar, early branching of the renal arteries has been reported. Knowledge about the variations in the anatomy of the renal artery is important, particularly for those persons that are involved in kidney retrieval and the transplantation and interventional techniques for renal assessment. This knowledge can also be useful while managing renal trauma or performing renal artery embolization. It can also become handy while performing abdominal aortic aneurysm surgery or other types of surgeries on kidneys.

## CONCLUSION

Appropriate knowledge of variants of renal arteries is clinically very essential. Our case report will add to the knowledge of these variations and enable clinicians to handle the variation cases tactfully.

**Ethics Approval and Consent to Participate:** Not applicable.

**Human and Animal Rights:** Necessary Permissions obtained from the regulatory authorities.

**Conflict of Interest:** The authors declare no conflict of interest.

**Acknowledgment:** None

## REFERENCES

- [1]. LeslieSW, SajjadH. Anatomy, Abdomen and Pelvis, Renal Artery. [Updated2019Oct21]. In: Stat Pearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2020Jan Available from: <https://www.ncbi.nlm.nih.gov/books/NBK459158/>
- [2]. StandringS. Gray's Anatomy. The Anatomical Basis of Clinical Practice. 39thEd. London, Elseiver Churchill Livingstone Publishers.2005;1274–1275.
- [3]. Cinar C, Türkvanb A. Prevalence of renal vascular variations: Evaluation with MDCT angiography. Diagnostic and Interventional Imaging.2016;97; 891—7.
- [4]. Giavroglo C, Kokkinakis H. Main arterial supply of a kidney from the opposite renal artery: an unusual case. Act a Radiol.2005Oct;46(6):567-8.
- [5]. BayramogluA, Demiryure kD, Erbi lKM. Bilateral additional renal arteries and an additional right renal vein associated with un rotated kidneys. Saudi Med J. 2003May; 24(5): 535-7.
- [6]. Singh G, NgYK, BayBH. Bilateral accessory renal arteries associated with some anomalies of the ovarian arteries: a case study. C linAnat.1998;11(6):417-20.
- [7]. Rao M, Bhat SM, Venkataramana V, Deepthinath R, Bolla SR. Bilateral pre hilar multiple branching of renal arteries: A case report and literature review. Kathmandu University Medical Journal. 2006;4(3); 345-8.
- [8]. AroraAK, VermaP, LalitM, MahajanA, SharmaM (2012) Variant Segmental Renal Arteries in The Right Kidney- Clinical Correlations- A Case Report. Anat Physio 12: 103. doi:10.4172/2161-0940.1000103
- [9]. Gupta V, et al. Bilateral variations in renal vasculature.IJAV.2010;3:53–55.
- [10]. Potaliya P, Sharma S, Kataria D, et al. Multiple renal vascular variations: A case Series. Int JAnatVar.2018;11(3):90-92.
- [11]. Shetty P, Nayak S B. A Detailed Study of Multiple Vascular Variations in the Upper Part of Abdomen. J Cardiovasc Echogr. 2017;27(1): 7-9. doi: 10. 4103/2211-4122. 199060

- [12]. Tardo DT et al. Anatomical variations of the renal arterial vasculature: An Australian perspective. JMIRO. 2017 Oct;**61(5)**; 643-9.

**Article information**

**Manuscript Submitted:** 03-05-2023

**Manuscript Revised:** 20-05-2023

**Manuscript Accepted:** 13-06-2023

**Manuscript published:** 31-07-2023

Scan here to access this article online.



**Copyright information**



Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)