

## A Case Report: Anomalous Cystic, Arterial and Venous Variations of Kidneys

Suma Yekappa Hottigoudar<sup>1</sup>, Surraj Susai<sup>\*2</sup>, Srinivasan Subramanian<sup>3</sup>,  
Ch Chaitanya Kumar<sup>4</sup>

<sup>1</sup>Additional Professor, Anatomy, JIPMER, Puducherry, India

<sup>2</sup>Senior Resident, Anatomy, JIPMER, Puducherry, India \*corresponding author

<sup>3</sup>PG junior resident, Anatomy, JIPMER, Puducherry, India

<sup>4</sup>PG junior resident, Anatomy, JIPMER, Puducherry, India

### Abstract

The posterior abdominal wall is considered a treasure house of anomalies and variations of viscera or their vasculature, the kidneys being no exception(5). There are various reports of purely arterial variations of kidneys or cystic kidneys with arterial variations(5,6,9). However this case report is unique in that it describes a combined cystic, arterial and hilum variation of left kidney on one side and venous variation of right kidney on the other side. The findings reveal a uniloculated left cystic kidney with an extra renal artery in front of the left renal vein, and on the right side an extra right renal vein draining into the right gonadal vein.

**Keywords:** Kidneys, cyst, accessory artery, accessory vein, variations

Date of Submission: 07-05-2020

Date of Acceptance: 21-05-2020

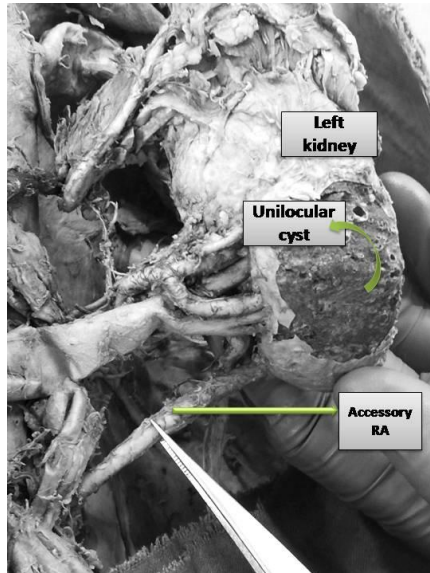
### I. Introduction

The abdominal aorta usually gives rise to a pair of renal arteries, from its lateral aspect, corresponding approximately to the level just below that of the first lumbar vertebra, slightly below the origin of the superior mesenteric artery(1-4). The renal hilum which lies over the medial renal border, closely apposed in line with the plane of the first lumbar vertebra, admits the renal artery followed by the renal vein and renal pelvis in that order from the anterior to posterior limits usually. As per conventional literature, a single artery supplies a kidney and a single vein usually drains a kidney. However increasing evidences by various studies have shown accessory renal artery in 30 percent of the cases (5-7,8). There have also been reports of cystic lesions of kidney associated with aberrant renal artery. The attributive factors for these variations has been explained by embryological development from the lateral mesonephric branches of the dorsal aorta (9). Knowledge and awareness of these possible variations and anomalies of the renal arteries are necessary for sufficient surgical management during renal transplantation, repair of abdominal aorta aneurysm, urological procedures and angiographic interventions (5,10,11).

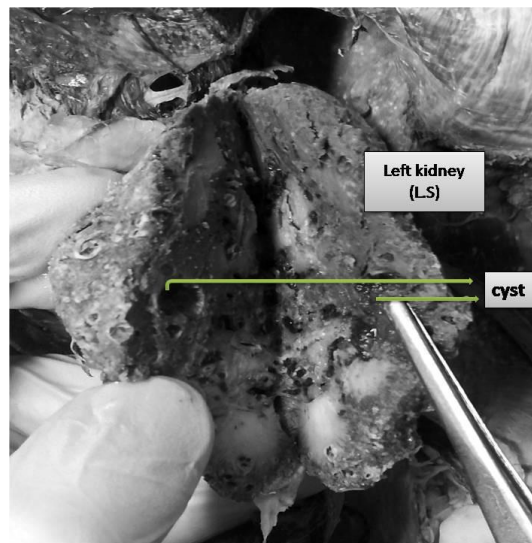
### II. Case Report

While doing a routine cadaveric dissection in a male cadaver, in the department of anatomy at JIPMER, the posterior abdominal wall was explored. It was observed that the left kidney had a uniloculated cystic lesion measuring 2.5×3.5×4 cm<sup>3</sup> respectively. The left kidney was cut through its lateral margin and the cystic nature of the lesion was confirmed (Fig 1,2). This left kidney had an accessory renal artery supplying its lower pole (Fig 3). This accessory renal artery came from the lateral aspect of the abdominal aorta, 49mm below the origin of the superior mesenteric artery. The main left renal artery entering the renal hilum originated 18.7 mm below the origin of the superior mesenteric artery, from the lateral aspect of the abdominal aorta. The main renal artery before entering the left hilum, bifurcated into two branches. It was also noted that the main renal artery on the left side, that entered the renal hilum, was situated in front of the renal vein (Fig 4). However no variations in the venous drainage of the left kidney were noted.

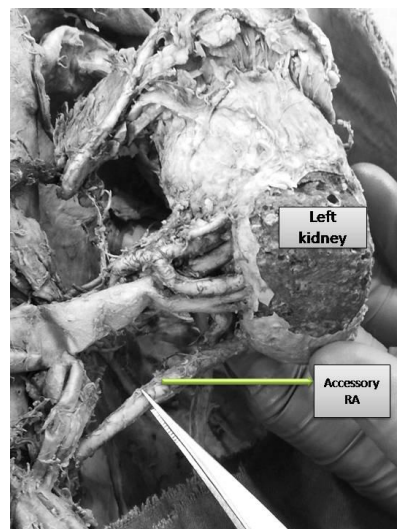
On the right side, an accessory right renal vein was found draining the lower pole of the right kidney. This accessory right renal vein was found emptying into the right gonadal vein (Fig 5,6). However, the architecture of the right kidney was normal and no arterial variations were noted on the right kidney (Fig 5,6). The arrangement of structures in the right renal hilum were also normal and in accordance with standard literature. No other embryological lesions were located anywhere else in the posterior or anterior abdominal wall and no other vascular variations or lesions were traced anywhere else in the cadaver.



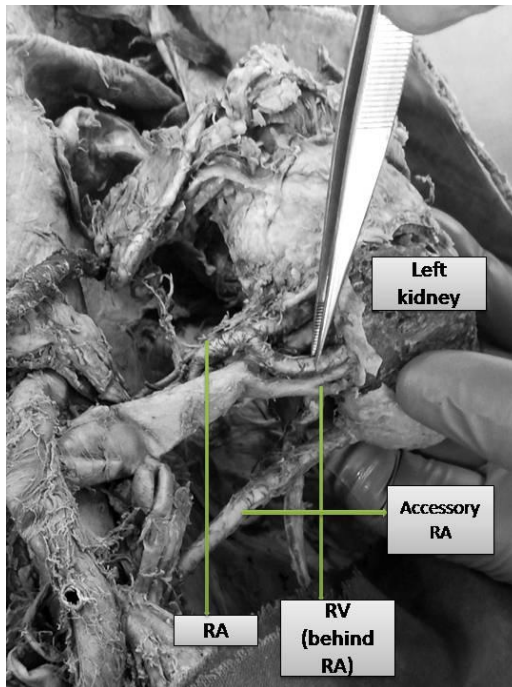
**Figure 1: Unilocular cyst in left kidney**



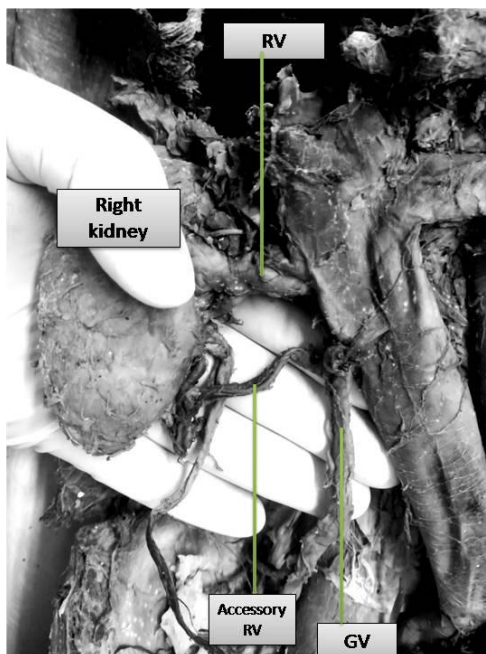
**Figure 2: Cystic nature of the lesion confirmed on longitudinally cutting the left kidney**



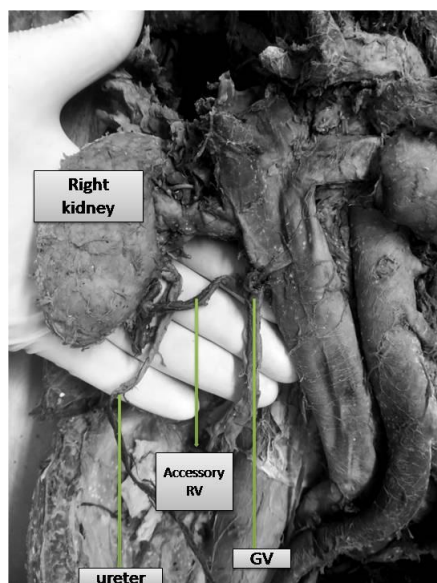
**Figure 3: Accessory renal artery supplying the left kidney and the main renal artery bifurcating into two branches before entering the left renal hilum**



**Figure 4: Left renal artery lies in front of the left renal vein at the hilum**



**Figure 5: Right accessory renal vein in addition to the main right renal vein**



**Figure 6: Right accessory renal vein drains into the right gonadal vein**

### III. Discussion

A thorough understanding of the various developmental mechanisms of the kidney is essential in order to decipher the various renal arterial and venous variations and also to understand the genesis of cystic lesions of the kidney (8). As per conventional literature, a renal artery enters into the renal hilum posterior to the renal vein. In this cadaver, it was noted that the left renal artery entered the hilum anterior to the vein, that is in contradiction to the standard findings in literature. However on the right side, the arrangement of hilum structures were in accordance with literature findings. (5-7,9,10). On the left side, an accessory renal artery was found supplying the lower pole in addition to the main renal artery. This additional renal artery arose from the abdominal aorta just below the origin of the main left renal artery. This is in accordance with the findings of other studies wherein it has been reported that in about one-third of our general population there are variations in the number, location and branching patterns of the renal arteries, with over 30% of patients having one or more accessory renal arteries (11).. However, upto the present day, there has always been a confusion regarding the use of apt terminologies for describing the renal arterial variations as additional, accessory, hilar, inferior and superior polar arteries (5-7,9,10). In this case report, we named our renal arteries as main and accessory left renal arteries. Accessory renal arteries usually arise from the abdominal aorta above or below the main renal artery and follow it to the renal hilum along with the main artery. However, in our report, we observed that the accessory left renal artery entered the hilum at a slightly lower level compared to the main artery. A superior or inferior origin is not uncommon and superior and inferior accessory arteries can reach the superior and inferior renal poles. They are persistent embryonic lateral splanchnic arteries. Inferior accessory renal arteries usually cross anteriorly to the ureter and may cause ureter hydronephrosis by obstruction. The reported incidence of additional renal arteries has a wide range (from 8.7% to 75.7%) and they, too, can cause hydronephrosis by obstruction (3,4,12). The present case discusses discovering one main and one accessory left renal artery supplying the left kidney. Association of cystic lesions of the kidney with aberrant renal arteries is not uncommon. Studies have reported uniloculated or multiloculated cysts in association with accessory renal arteries (13,17). In this study we observed a large uniloculated cyst of the left kidney in addition to the accessory renal artery and hilar variations, which is in accordance with the findings of other studies. However on the right side, no cystic lesions were observed in the right kidney and no arterial variations were observed. This is partially contradictory to the findings of other studies. The arrangement of hilum structures of the right kidney is also normal. However the right renal vein was found to be draining into the right gonadal vein. This entirely new finding has rarely been reported in literature. It serves as an eye-opener with regards to its surgical implications that it may pose on the development of varicose veins of the gonadal coverings on right side, due to the exorbitant back pressure on the right gonadal vein.

The knowledge of these arterial, hilar, cystic and venous variations on both left and right kidneys is important for surgical procedures related to the posterior abdominal wall, renal transplantation, abdominal aorta aneurysm, ureter surgery and angiographic interventions. Though a rare phenomenon, fibromuscular dysplasia in an accessory renal artery can be the underlying cause for renovascular hypertension necessitating the need for specific renal angiography as the appropriate test whenever renovascular intervention is essential(13,16). As the number of segmental arteries within the substance of the kidney increases with the the increase in the number of accessory renal arteries, it increases the chances of bleeding during urological surgery or renal transplantation.

The chances of segmental ischemia and postoperative hypertension also increases (13). Lately, with the increasing impetus for kidney donations on the verge for expansion, it is essential to have a sound knowledge regarding the possibility of donors who may have cystic lesions of the kidney with more than one renal artery (14-17).

### **Acknowledgement/financial/competing interests**

The authors would like to acknowledge the dissection hall support staff of anatomy department, JIPMER, Puducherry, for their helping role in the setting up of cadaver for dissection purpose. Further, the authors would like to declare that they have no conflicts of interest with other researchers and no financial aid was required for this dissection.

### **References**

- [1]. Clemente CD. *Clemente Anatomy, A Regional Atlas of the Human Anatomy*. 4th Ed., Baltimore: Williams & Wilkins. 1997; 230–231.
- [2]. Bauer FW. The aortic origin of renal arteries. *Arch Path*. 1968; 86: 230–233.
- [3]. Moore KL, Dalley AF. *Clinically Oriented Anatomy*. 4th Ed., Philadelphia-Baltimore-New York-London-Buenos Aires-Hong Kong-Sydney-Tokyo: Lippincott, Williams & Wilkins. 1999; 286–287.
- [4]. Drake RL, Vogl AW, Mitchell AWM. *Gray's Anatomy for Students*. 2nd Ed., Edinburgh-London-Melbourne-New York, Churchill Livingstone. 2005; 324–326.
- [5]. Satyapal KS, Haffjee AA, Singh B, Ramsaroop L, Robbs JV, Kalideen JM. Additional renal arteries: incidence and morphometry. *Surg Radiol Anat*. 2000; 23: 33–38.
- [6]. Nathan H. Aberrant renal artery producing developmental anomaly of kidney associated with unusual course of gonadal (ovarian) vessels. *J Urol*. 1963; 89: 570–572.
- [7]. Bergman RA, Afifi AK, Miyauchi R. *Illustrated encyclopedia of human anatomic variations: Opus II Cardiovascular System: Arteries: Abdomen: Renal and Gonadal Arteries*. (accessed May 2009).
- [8]. Vasbinder GB, Nelemans PJ, Kessels AG, Kroon AA, Maki JH, Leiner T, Beek FJ, Korst MB, Flobbe K, de Haan MW, van Zwam WH, Postma CT, Hunink MG, de Leeuw PW, van Engelshoven JM. Renal artery diagnostic imaging study in hypertension (RADISH) study group: Accuracy of computed tomographic angiography and magnetic resonance angiography for diagnosing renal artery stenosis. *Ann Intern Med*. 2004; 141: 674–682.
- [9]. Felix W. Mesonephric arteries (aa. mesonephricae). In: Kiebel F, Mall FP, eds. *Manual of Human Embryology*, Vol. 2. Philadelphia, Lippincott. 1912; 820–825.
- [10]. Nathan H, Glezer I. Right and left accessory renal arteries arising from a common trunk associated with unrotated kidneys. *J Urol*. 1984; 132: 7–9.
- [11]. Olsson O, Wholey M. Vascular abnormalities in gross anomalies of kidneys. *Acta Radiol Diagn*. 1964; 2: 420–432.
- [12]. Singh G, Ng YK, Bay BH. Bilateral accessory renal arteries associated with some anomalies of the ovarian arteries: A case study. *Clin Anat*. 1998; 11: 417–420.
- [13]. Sampaio FJ, Passos MA. Renal arteries: Anatomic study for surgical and radiologic practice. *Surg Radiol Anat*. 1992; 14: 113–117.
- [14]. Kadotani Y, Okamoto M, Akioka K, Ushigome H, Ogino S, Nobori S, Higuchi A, Wakabayashi Y, Kaihara S, Yoshimura N. Management and outcome of living kidney grafts with multiple arteries. *Surg Today*. 2005; 35: 459–466.
- [15]. Benedetti E, Troppmann C, Gillingham K, Sutherland DE, Payne WD, Dunn DL, Matas AJ, Najarian JS, Grussner RW. Short- and long-term outcomes of kidney transplants with multiple renal arteries. *Ann Surg*. 1995; 221: 406–414.
- [16]. Patasi B, Boozari A. A Case Report: Accessory Right Renal Artery. *IJAV*. 2009; 2: 119–121.
- [17]. Singh S, Chowdhury V, Dixit R, Manchanda A. Multilocular cystic nephroma of the kidney : A case report. *Indian J Radiol Imaging* 2006;16:901-4

Suma Yekappa Hottigoudar, et. al. "A Case Report: Anomalous Cystic, Arterial and Venous Variations of Kidneys." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(5), 2020, pp. 01-05.