



## Bilateral Accessory Renal Artery- A Case Report

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### Abstract

Renal arteries are a pair of lateral branches from abdominal aorta below the level of superior mesenteric artery at L1-L3 lumbar level. The renal arteries consume about 20% of cardiac output. Normally each kidney is supplied by single renal artery. Accessory renal arteries account to about 30%. These accessory renal arteries arise above or below the main renal artery. The incidence of double renal artery was found to be 23.33% and triple renal artery was found in 3.33%. The present case is regarding the presence of bilateral accessory renal arteries showing double renal artery on right kidney and triple renal artery on left kidney which includes a perforating artery. Embryologically these supernumerary arteries can be attributed to its development, as it develops from pronephros, mesonephros and metanephros. The pronephros and the mesonephros regresses, but the arterial network to these segments remains patent which leads to supernumerary renal arteries. Awareness of renal arterial variation is of immense clinical importance for radiologist and surgeons during vascular and urological procedures including renal transplantation, laproscopic nephrectomy, porto renal shunts, pyelolithotomy, and renovascular anastomoses. Knowledge about bilateral variations prevents inadvertent haemorrhage during renal surgeries.

**Keywords:** Kidney, accessory renal artery, perforating artery, anatomical variations.

### Introduction

The kidneys play a vital role in human body by maintaining homeostasis of water and electrolytes and also by secretion of erythropoietin. It consumes about 20% of cardiac output. Normally each kidney is supplied by a single renal artery. Usually renal artery arises from abdominal aorta at the level of L1-L2. Each artery divides into anterior and posterior branches and again divides into segmental arteries supplying the renal vascular segments. Anson and Kurth in 1955 have quoted "experience shows supernumerary arteries and veins represent the rule in renal vasculature, not the exception". In

70% of individuals, each kidney is supplied by single renal artery. Accessory renal arteries are reported to be present in 30% of individuals. Renal artery and the accessory renal artery are end arteries. The accessory arteries may pierce the upper or lower part of the organ. Due to recent increase in invasive renal interventions such as renal transplant, rological and radiological procedures, it is mandatory for surgeons and clinicians to be aware of possible variations of renal arteries, to prevent diagnostic and therapeutic complication including surgical procedures for transplantation, abdominal aortic diseases etc. The transplantation of kidney with a single artery is technically easier compared to kidneys with multiple renal arteries. The normal renal artery enters the kidney through the hilum whereas accessory renal artery may enter through the hilum or through the surfaces of the kidney.

### Materials and Methods

A formalin fixed male cadaver along with dissection instruments like scapel, toothed and non toothed forceps, blade, calibrated scale, and a pair of gloves were used. The anterior abdominal wall was dissected layer by layer. The peritoneal reflection was traced horizontally and vertically. All visceral organs such as liver, stomach, duodenum, intestines, pancreas, spleen all were dissected away from peritoneal cavity and the peritoneum was stripped to visualise the kidneys.

### Case Report

During routine dissection of abdomen for the undergraduate students, in the Institute of Anatomy, Madurai Medical College, Madurai, we observed bilateral accessory renal arteries, in a 45 year old male cadaver. Right side kidney revealed the presence of an accessory renal artery in addition to main renal artery. The accessory renal artery was found to arise from the posterior aspect of abdominal aorta, coursed laterally immediately posterior to the main renal artery and

entered the hilum of the kidney dividing into segmental branches. The accessory renal artery measured about 4cm in length. The calibre of the accessory renal artery was smaller than that of the main renal artery.

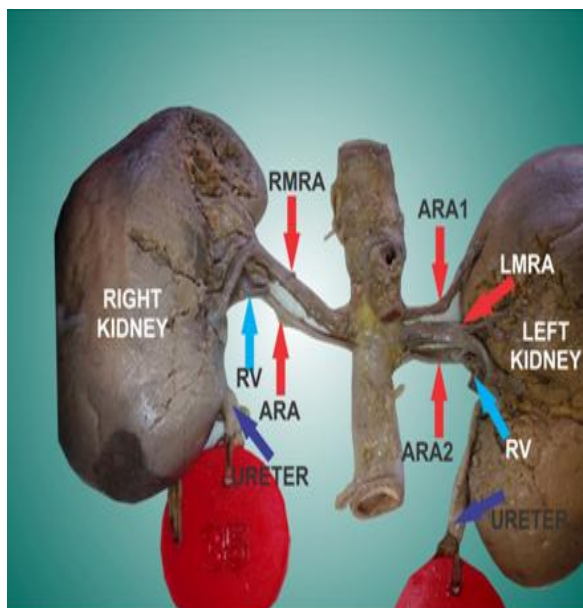


FIG : 1 – BILATERAL ACCESSORY RENAL ARTERIES.  
(RMRA-right main renal artery. ARA- accessory renal artery.  
LMRA- left main renal artery.  
ARA1- first accessory renal artery on left kidney.  
ARA2-second accessory renal artery. RV- renal vein).

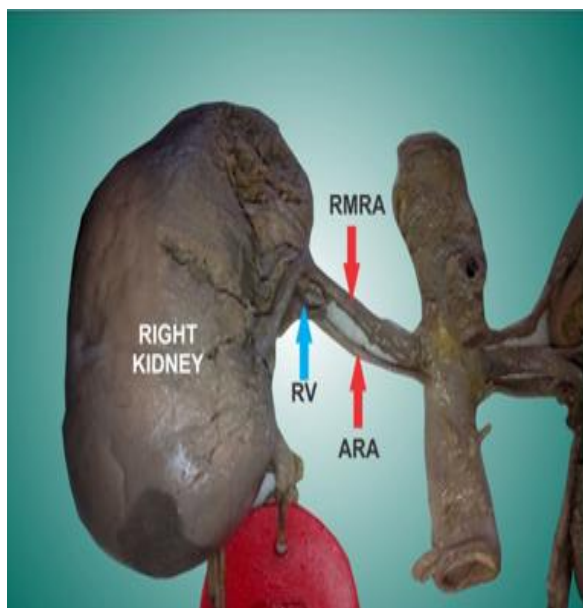


FIG: 2 – RIGHT KIDNEY WITH DOUBLE RENAL ARTERY  
(RMRA-right main renal artery,  
ARA- accessory renal artery).

On the left side: Left kidney was found to be supplied by three renal arteries arising from abdominal aorta. The main renal artery was found to arise from the antero lateral aspect of aorta and coursed laterally to enter into the hilum of kidney. The second accessory renal artery originated immediately below the main renal artery and was found to follow the same course as that of main renal artery and entered the hilum of the kidney. The first accessory renal artery ( perforating renal artery) was found to pierce the surface of kidney at the upper pole. The perforating renal artery was found to divide into two branches 2 cm lateral to its origin and each branch pierced the surface of kidney at different sites in the upper pole of left kidney.

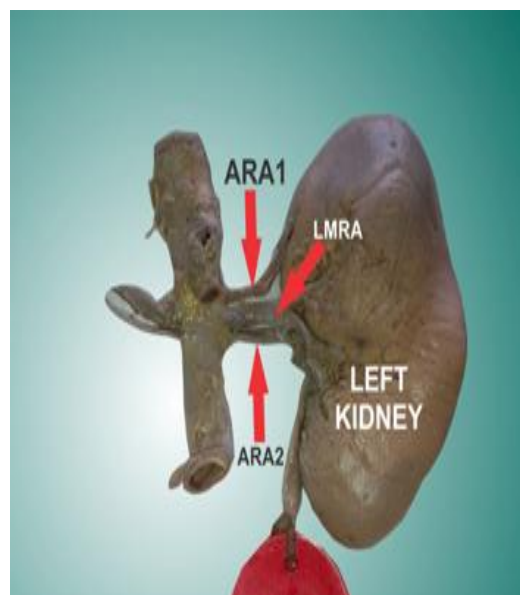


FIG:3–LEFT KIDNEY WITH TRIPLE RENAL ARTERY  
(ARA1- first accessory renal artery. ARA2- second accessory renal artery. LMRA- left Main renal artery)

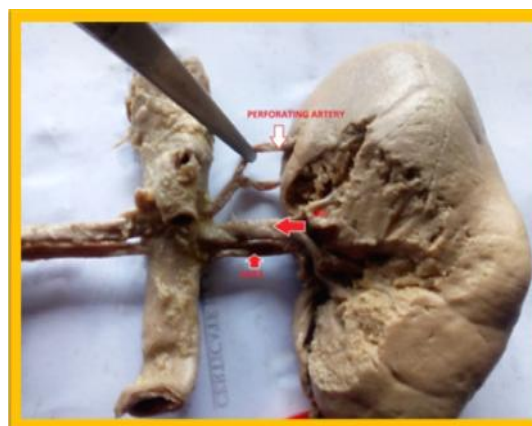


FIG: 4 – showing perforating artery piercing the surface at the upper pole of left kidney

## Discussion

According to Standring and Moore and Persaud, kidneys receive a single renal artery in about 70% to 75% of cases. The incidence of accessory renal artery according to Standring is about 30%.

Decker and Du plessier (5) had reported accessory renal artery in 15% and 20% on right and left side respectively. Khammanrong et al(8) observed that incidence of double renal artery was 17 % and triple renal artery was 1%. The incidence of triple renal artery is reported to be 3.33% by Ambica wadhwa (2).

Study made by Dhar and Lal(4) reported that unilateral occurrence of accessory renal artery is 15 % and bilateral occurrence in 5%. Anand A.Jamkar et al (3) reported accessory renal artery in 27.35% and 22.63% on right and left sides respectively. Erol sener(6) had reported bilateral triple renal arteries in a 49 year old male patient with aortoiliac occlusive disease. Although extra renal arteries are common (24%) in Turkish population ,the probability of finding bilateral extra renal arteries, i.e the probability of having more than one renal artery in both kidneys of a kidney donor during kidney transplantation is low (5%) (ozkan et al .,2006). According to soni et al (2010). double renal arteries was seen on left side and triple renal artery was seen on right side. These authors reported incidence of triple renal arteries to be 1-2%.

Bilateral triple renal arteries were observed by Pestemalci et al(12) in 2009. Vrindha Ankolekar, Ratnabali sengupta(16) in their study on 60 cadaveric kidneys observed 23.33% double renal artery and triple renal artery in 3.33%.The accessory renal artery may be unilateral or bilateral of which the unilateral occurrence of accessory renal artery is 11.67% and bilateral occurrence is 6.67%

Accessory renal arteries are the one arising from aorta in addition to main renal artery. Aberrant vessels are those that originate from other than aorta (eg.inferior phrenic artery, suprarenal artery, ureteric artery etc.). Variation in vascular pattern can be explained on the basis of its development. Initially the mesonephros develop between 5<sup>th</sup> and 16<sup>th</sup> week of gestation and is located between 6 cervical and third lumbar segments. The metanephros initially develops in sacral region and gradually ascends between 6<sup>th</sup> and 9<sup>th</sup> week from the pelvis to lumbar level. New arteries develop from abdominal aorta as it ascends up and the caudal branches involute and disappear. A less complete reduction results in multiple arteries arising from abdominal aorta.

In the present case report, bilateral accessory renal arteries were observed. Right accessory renal artery originated from the abdominal aorta immediately below the main renal artery, coursed laterally and entered the hilum by dividing into segmental branches. The arrangement of structures in the hilum anteroposteriorly was renal artery, renal vein, ureter, and accessory renal artery. Similarly on the left side, two accessory renal arteries was observed. One accessory renal artery

passed superior to main renal artery, and it pierced the surface of kidney at the upper pole after dividing into two branches. The second accessory renal artery originated from aorta immediately below the main renal artery, coursed laterally and entered the hilum. The arrangement of structures in the hilum anteroposteriorly was renal artery, renal vein, ureter and the second accessory renal artery. The calibre of accessory renal arteries on both sides was observed to be smaller than the main renal artery.

The anomalies of accessory renal artery may be important in clinical point of view because it may cause hydronephrosis, due to occlusion or compression of ureter, nephrotosis and malrotation of kidneys, arterial hypertension, or damage to accessory renal artery may produce ischaemia and infarction of kidney during any urological procedures. The transplantation of kidney with single renal artery is technically easier compared to kidneys with multiple renal arteries.

## Conclusion

Anatomical knowledge of the existence of accessory renal arteries is important to prevent inadvertent damage during renal surgeries. Precise knowledge of vascular variations of human kidney is essential for surgeons and radiologist to avoid complications during interventional radiological procedures, renal transplantation, for exploration and treatment of renal trauma, renovascular hypertension, renal embolization, angioplasty for acquired or congenital lesions, abdominal aortic aneurysm, and conservative and radical renal surgeries.

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