

# A CADAVERIC STUDY ON ACCESSORY RENAL ARTERIES AND ITS CLINICAL IMPLICATIONS

Vijaianand M <sup>\*1</sup>, Ramamurthi KS <sup>2</sup>.

<sup>\*1</sup> Assistant Professor, Department of Anatomy, Karpagam Faculty of Medical Sciences & Research, Othakkalmandapam (Po), Coimbatore, India.

<sup>2</sup> Associate Professor, Department of Anatomy, Karpagam Faculty of Medical Sciences & Research, Othakkalmandapam (Po), Coimbatore, India.

## ABSTRACT

**Introduction:** Each kidney is normally supplied by one renal artery arising from abdominal aorta. In addition to this, sometimes the kidneys receive additional arterial supply from the so called accessory renal arteries, that arise either from the abdominal aorta or main renal artery or coeliac trunk or superior mesenteric artery and reaches the kidney either through the superior or inferior pole, above or below the main renal artery and may or may not pass through the hilum.

**Aims and Objectives:** The present study aims to find out variations in kidney such as size, shape, position and presence or absence of any extra renal arteries.

**Observation and Results:** The study was performed with 29 well preserved Human cadavers over a period of four years in the Dept. of Anatomy, KFMSR, Coimbatore by following the standard dissection technique. 2 among 29 cadavers showed the presence of accessory renal arteries, both of them are male cadavers accounting for an incidence of around 7%. In both the cases, the accessory renal arteries were unilateral and to the right kidney.

**Conclusion:** Knowing the presence or absence of accessory renal arteries in an individual is highly important as it is associated with life threatening complications [Acute tubular necrosis, graft rejection, etc.] which was reported from the earlier literature studies. With advanced renal imaging techniques, such complications can be prevented or minimized.

**KEY WORDS:** Kidney, Accessory renal artery, Renal transplant, Renal angiography, Hydronephrosis.

**Address for Correspondence:** Dr. Vijaianand M, Assistant Professor of Anatomy, 7, Tarun kudil, IK garden, Gokul Nagar Annexe, Chinnathirupathi, Salem-636008. Tamil Nadu, India.

Mobile: (0) 9655246467 **E-Mail:** [dr.vijaitarun7474@gmail.com](mailto:dr.vijaitarun7474@gmail.com)

## Access this Article online

### Quick Response code



DOI: 10.16965/ijar.2016.498

**Web site:** International Journal of Anatomy and Research  
ISSN 2321-4287  
[www.ijmhr.org/ijar.htm](http://www.ijmhr.org/ijar.htm)

Received: 03 Dec 2016

Peer Review: 05 Dec 2016

Revised: None

Accepted: 04 Jan 2017

Published (O): 31 Jan 2017

Published (P): 31 Jan 2017

## INTRODUCTION

Human Kidneys are a pair of bean shaped excretory organs, that extends from 12th thoracic to 3rd lumbar vertebrae. Each Kidney is supplied by a single renal artery that usually arises from the abdominal aorta and enters the kidney through the hilum. Close to the hilum, the renal artery first divides into an anterior and poster-

rior divisions, and later give rise to segmental arteries by further division in order to supply the reno-vascular segments. Of the total cardiac output about 1/3rd pass through the renal arteries. Apart from the renal arteries, the kidneys receive additional blood supply from the so called accessory or aberrant or supernumerary or supplementary arteries.

Accessory renal arteries occur commonly in 26-30% of the individuals[1].Sadler pointed out that the accessory renal arteries are formed during ascent of the kidney by the persistence of the lateral splanchnic arteries in the embryonic life. These accessory renal arteries usually arise from the abdominal aorta either superiorly or inferiorly to the main renal artery, they may or may not pass through the hilum and supply either the upper or lower pole of the kidney[3,4].If an accessory renal artery passes anterior to the ureter there may be a chance of obstruction of the ureter resulting in hydronephrosis. On rare instances, accessory renal artery arises from coeliac axis or superior mesenteric artery or near aortic bifurcation or from common iliac arteries[5,6,7].After Marshall's strong suggestion, many literature studies accepted that accessory renal arteries are longer with narrow caliber, which may account for arterial stenosis and further increases the risk of causing hypertension[8,9].

## MATERIALS AND METHODOLOGY

The present study was performed over a period of 4 years in 29 well preserved Human cadavers of both sexes and several age groups during routine dissection classes for first MBBS students in the Dept.of Anatomy, Karpagam Faculty of Medical Sciences and Research, Coimbatore. Dissection was carried out as per Cunningham's Dissection Manual[10].The abdomen opened in layers, and kidneys were approached finally. A thorough macroscopic examination and tracing was made out extending from the abdominal aorta till the hilum of both kidneys, and visualized for any alterations occur in size, shape and position of either kidney and the presence of accessory renal arteries if any was looked. Results made out statistically.

The present study was performed over a period of 4 years in 29 well preserved Human cadavers of both sexes and several age groups during routine dissection classes for first MBBS students in the Dept.of Anatomy, Karpagam Faculty of Medical Sciences and Research, Coimbatore. Dissection was carried out as per Cunningham's Dissection Manual[10].The abdomen opened in layers, and kidneys were

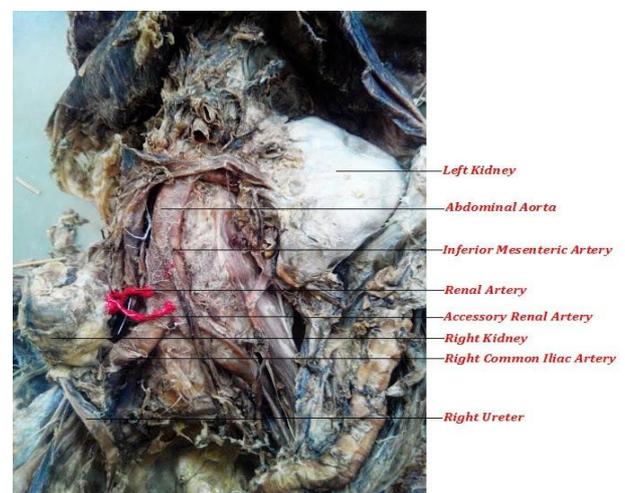
approached finally. A thorough macroscopic examination and tracing was made out extending from the abdominal aorta till the hilum of both kidneys, and visualized for any alterations occur in size, shape and position of either kidney and the presence of accessory renal arteries if any was looked. Results made out statistically.

## OBSERVATION AND RESULTS

Out of 29 cadavers dissected, the accessory renal artery was found to be observed in 2 cadavers that accounts for an incidence of 7%,and both the variations occurred in male cadavers.

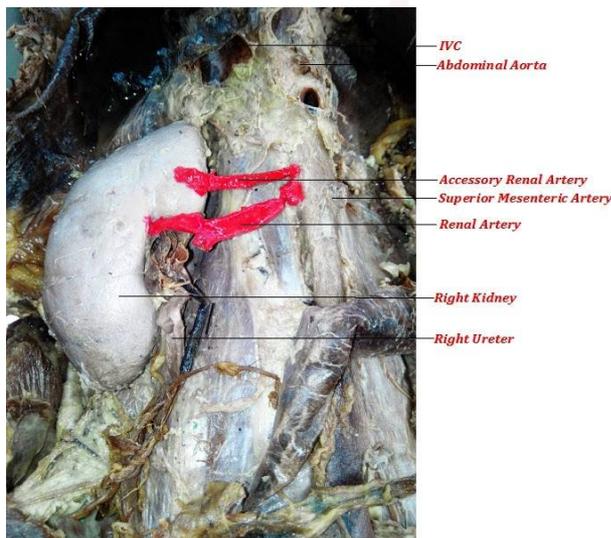
In one cadaver aged around 50,the accessory renal artery was found going to the right kidney. The right kidney in this cadaver lies at a much lower level[ in the pelvis] while, the left was found to be present in normal position indicating the failure of ascent of right kidney during the embryonic period of life. Further, the right kidney is irregular and constricted not having a definite hilum, upper and lower pole. Two arteries arise from abdominal aorta, of this one originates almost near aortic bifurcation at the level of L5 which is a rare entity, and enters the right kidney in the upper half which is considered as accessory renal artery. Another artery arises from the abdominal aorta just 1.5cm proximal to the previous origin also enters the proximal half of the right kidney, which before entering divides into an anterior and posterior division and is regarded as main renal artery (Fig.1).

**Fig. 1:** Showing the renal artery dividing before entering in to the hilum.



In another cadaver aged around 60, both the kidney was found to be present in normal position with normal shape. The main renal artery to the right kidney originates from the abdominal aorta at the level of L1 (opposite to origin of superior mesenteric artery) soon bifurcates into an anterior and posterior division before entering into the hilum, and an accessory renal artery arises 0.75-1cm above the main artery from the abdominal aorta, which enters through the upper pole (Fig.2).

**Fig. 2:** Showing the renal artery passing through upper pole.



The left kidney in both the cadavers are of normal shape with nil alterations in size, shape and position seen, and is not supplied by accessory renal artery. We never come across with Bilateral Accessory renal arteries in any of the cadavers. Results are made out statistically.

## DISCUSSION

The artery originating from abdominal aorta or from main renal artery is termed accessory renal artery. It usually arises between T11-L4 levels and its incidence range from 11-61%[11], however the term aberrant or anomalous artery is reserved for those which arises from other than abdominal aorta or main renal artery, such as inferior phrenic, suprarenal artery, ureteric artery, iliac artery, mesenteric artery etc. Perforating artery refers to those which pierces neither the upper pole nor the lower pole, but not passing through hilum. Studies documented that in the recent decades the accessory renal artery frequency has been increased due to the wide use of renal angiography and other imag-

ing techniques. Vasbrinder from his point of view recorded that there is a close association between abnormalities in renal artery and change in position of the kidney from pelvic cavity to lumbar region during its normal development[12]. Persistent foetal renal vessels is also considered a fact for accessory renal arteries and are termed polar arteries, as it enters either to the upper or lower pole[13,14]. Mizoguchi pointed from his study that vascular anomalies in the kidney also results from galatosemia[15]. Accessory renal arteries whether to the upper or lower pole is always associated with embryological defects[10,16].

In our study, we observed accessory renal arteries in 2 of 29 cadavers, and this accounts for 7% of our incidence. Both the cadavers are males, and in both accessory renal arteries are to the right kidney. In one cadaver, Accessory renal artery arises close to L5 level proximal to main renal artery and enters the upper half of the kidney, since it does not have a definite upper pole, lower pole and hilum. In another cadaver, the Accessory renal artery arises close to L1 level just above the main renal artery and enters the upper pole. Our study almost coincides with the study made by Tania Regina Santos Soares[17] from 24 cadavers, who reported an incidence of 6% Accessory renal arteries to right kidney, and 1/3rd each to left kidney and 1/3rd Bilateral. Saritha et al[18] documented an incidence of 8% ARA in 25 cadavers, of which one each for right and left, and one Bilateral. But the study made by Satyapal's in 2001, reported the incidence of Accessory renal arteries higher in left kidney as compared with right[19]. Majority of the case reports documented their Accessory renal arteries to the right kidney.

## CONCLUSION

A thorough imaging regarding accessory renal artery should be mandatory before undergoing renovascular reconstruction, Kidney transplant surgeries, Nephrectomy and other urological related procedures. As the accessory renal arteries are end arteries they are more prone for notable complications such as Acute tubular necrosis, graft rejection associated with decreased graft function, Hypertension and Hydronephrosis. Hence, a sound knowledge

regarding the vascular pattern of the kidney including accessory renal artery should be essential for the Radiologists, Urologists and Physicians in order to avoid the foresaid complications, and we hope this study further triggers the knowledge of experts for the betterment in their respective field of medicine.

**Conflicts of Interests: None**

## REFERENCES

- [1]. Sampaio FJ, Passos MA. Renal arteries: anatomic study for surgical and radiological practice. *Surg Radiol Anat* 1992;14:113-117.
- [2]. T.W.Sadler. *Langman's Medical Embryology*, Twelfth edition, page.239.
- [3]. Harvey RW; A case of multiple renal arteries. *Anat Rec*,1914;6(8):333-339
- [4]. Nayak BS; Multiple variations of right renal vessels. *Singapore Med J*,2008;49(6):153-155.
- [5]. Lacout A, Thariate J, Marcy PY; Main right renal artery originating from the superior mesenteric artery. *Clin Anat*,2012 Nov;25(8):977-8.
- [6]. Gesase AP; Rare origin of supernumerary renal vessels supplying the lower pole of the left kidney. *Ann Anat*,2007;189(1):53-8.
- [7]. Asala SA, Asumbuko-Kahamba NM, Bidmos MA; An unusual origin of supernumerary renal arteries: case report. *East Afr Med J*, 2001; 78(2):686-7.
- [8]. Boijesen E. Anomalies and malformations. In: Baum S, ed. *Abrams' angiography*. 4th ed. Philadelphia: Little Brown and Company, 1997; 1217-1229.
- [9]. Engelbrecht HE, Keen EN, Fine H, et al. The radiological anatomy of the parenchymal distribution of the renal artery. *S Afr Med J* 1969;43:826-834.
- [10]. Romanes GJ. *Cunningham's Manual of Practical Anatomy Vol 2, The Abdomen*, 15th Edition.
- [11]. Graves FT. The aberrant renal artery. *J Anat* 1956;90:553-8.
- [12]. Vasbrinder GB, Nelemans PJ, Kessels AG, Karoon AA, Maki JH, Leiner T et al. Renal artery diagnostic imaging study in hypertension. *Ann Internal Medicine* 2004;141:624-682.
- [13]. Sinnatamby CS (Ed). *Last's Anatomy Regional and Applied*, Edinburgh; Churchill Livingstone, 2006:295
- [14]. Khamanarong K, Prachaney P, Utravichien A, Tong-Un T, Shripaoraya Lx. *Anatomy of Renal arterial supply*. *Clinical anatomy* 2004;17(4):334-336.
- [15]. Mizoguchi N, Sakura N, One H, Naito K, Hamakawa 19. Congenital Porto-Left renal Venous Shunt as a cause of galactosemia. *J Inherit Metab Dis* 2001;24(1):72-78.
- [16]. William PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE et al. *Cardiovascular system*. In *Gray's Anatomy 38th Ed*. Edinburgh; Churchill Livingstone; 1995:1547.
- [17]. Tania Regina Santos Soares, Juliana Soares Ferraz, Camila Buziquia Dartibale and Inandira Rafaella Marco Oliveira. Variations in human renal arteries. *Acta Scientiarum. Biological Sciences Maringa*, 2013;35(2):277-282.
- [18]. S.Saritha, Nagajothi, M.Praveen Kumar, G.Supriya. Cadaveric study of accessory renal arteries and its surgical correlation. *International Journal of Research in Medical Sciences* 2013;1(1):19.
- [19]. K.S.Satyapal, A.A.Haffejee, B.Singh, L.Ramsaroop, J.V.Robb sand, J.M.Kalideen. *Additional Renal Arteries Incidence and Morphometry, Surgical And Radiologic Anatomy*, 2001;14(1):33-38.

### How to cite this article:

Vijaianand M, Ramamurthi KS. A CADAVERIC STUDY ON ACCESSORY RENAL ARTERIES AND ITS CLINICAL IMPLICATIONS. *Int J Anat Res* 2017;5(1):3439-3442. DOI: 10.16965/ijar.2016.498