

A STUDY OF SUPERNUMERARY RENAL ARTERIES IN SOUTH INDIANS

S. Uma Maheswararao¹, M. Narendra Naik², K. Chitti Narasamma³

¹Assistant Professor, Department of Anatomy, Andhra Medical College, Visakhapatnam.

²Assistant Professor, Department of Anatomy, Government Medical College, Ananthapuramu.

³Professor & HOD, Department of Anatomy, Government Medical College, Ananthapuramu.

ABSTRACT

BACKGROUND

Normally each kidney is supplied by one renal artery, which is originating from the abdominal aorta. The present study is aimed at the supernumerary renal arteries and their importance.

MATERIALS & METHODS

20 cadavers which are used for undergraduate dissection constitute the material for study. During routine abdominal dissection of cadavers, kidneys and renal arteries are exposed, morphological variations are noted.

RESULTS

We observed supernumerary renal arteries in 12 out of 20 cadavers. In these, 7 cadavers showed abnormalities on Right side, 5 cadavers showed abnormalities on Left side. In 6 cadavers out of 7, supernumerary arteries were arising from abdominal aorta. In 1 cadaver out of 7, supernumerary arteries were arising from renal artery. In 4 cadavers out of 5, supernumerary arteries were arising from abdominal aorta. In 1 cadaver out of 5, supernumerary arteries were arising from renal artery. These supernumerary renal arteries enter into the kidney through hilum or superior pole or inferior pole.

CONCLUSION

Renal artery variations are very important for surgical procedures over the kidneys like renal transplantation, urological procedures, renal angiographic studies.

KEYWORDS

Kidney, Renal Artery, Supernumerary Renal Artery, Superior Pole, Inferior Pole.

HOW TO CITE THIS ARTICLE: Maheswararao SU, Naik MN, Narasamma KC. A study of supernumerary renal arteries in South Indians. J. Evid. Based Med. Healthc. 2016; 3(62), 3376-3379. DOI: 10.18410/jebmh/2016/728

INTRODUCTION: Normally renal artery arises from abdominal aorta that supplies respective kidney.^(1,2) Usual variations of renal artery are variation in number and unusual branching pattern.^(3,4,5,6) Variations in number of renal arteries have been named as supplementary renal arteries. We studied the supernumerary renal arteries according to Merklin classification.⁽⁷⁾ Accessory renal arteries are common (30% of individuals), and usually arise from the aorta above or below the main renal artery and follow it to the renal hilum. They are regarded as persistent embryonic lateral splanchnic arteries. Accessory vessels to the inferior pole cross anterior to the ureter and may, by obstructing the ureter, cause hydronephrosis. Rarely, accessory renal arteries arise from the coeliac or superior mesenteric arteries near the aortic bifurcation or from the common iliac arteries^(8,9)

MATERIALS & METHODS: The formalin-fixed twenty cadavers were used as main material for the study.

During routine abdominal dissection which is conducted for undergraduate MBBS students at the Department of Anatomy, the kidneys along with their arteries were observed and the structural and numerical variations of renal arteries were noted. We observe the origin of supernumerary renal arteries according to Merklin and Michel classification,⁽⁷⁾ they are: (1) Supernumerary renal arteries originating from aorta; (2) Supernumerary renal arteries originating from main renal arteries; (3) Supernumerary renal arteries originating from other sources.

RESULTS: The supernumerary renal arteries entered the kidney through hilum as hilar supernumerary renal artery, through superior pole as superior polar supernumerary renal artery and through inferior pole as inferior polar supernumerary renal artery. We observed supernumerary renal arteries in 12 out of 20 cadavers. In these, 7 cadavers showed abnormalities on right side, 5 cadavers showed abnormalities on left side. In 6 cadavers out of 7, supernumerary arteries were arising from abdominal aorta. In 1 cadaver out of 7, supernumerary arteries were arising from renal artery. In 4 cadavers out of 5, supernumerary arteries were arising from abdominal aorta. In 1 cadaver

Financial or Other, Competing Interest: None.
Submission 02-07-2016, Peer Review 12-07-2016,
Acceptance 23-07-2016, Published 03-08-2016.

Corresponding Author:

Dr. S. Uma Maheswara Rao,

C/o. A. R. Joga Rao,

D. No:16-6-24, (Ground Floor), Official Colony,

2nd Lane, Beside C.S.R. Hospital, Maharanipeta,

Visakhapatnam, Andhra Pradesh.

E-mail: drumamahesh100@gmail.com

DOI: 10.18410/jebmh/2016/728

out of 5, supernumerary arteries were arising from renal artery. These supernumerary renal arteries enter into the kidney through hilum or superior pole or inferior pole.

We are unable to find out any supernumerary arteries which take origin from other arterial sources like testicular arteries, ovarian arteries etc.

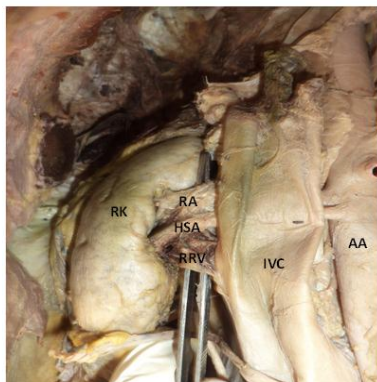


Fig 1: Right kidney showing Hilar supernumerary artery arising from abdominal aorta (RK -right kidney ,RA-renal artery ,HSA- hilar supernumerary artery ,RRV- right renal vein ,AA-abdominal aorta , IVC - inferior vena cava)

Fig. 1

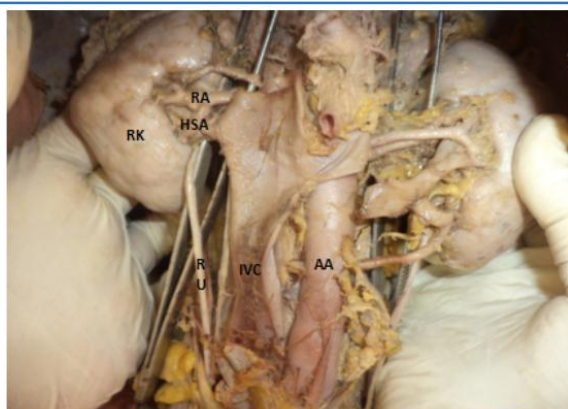


Fig 2: showing right hilar supernumerary artery arising from right renal artery (RK -right kidney ,RA- renal artery ,RU-right ureter,IVC-inferior vena cava ,AA- arch of aorta, HSA-hilar super numerary artery)

Fig. 2

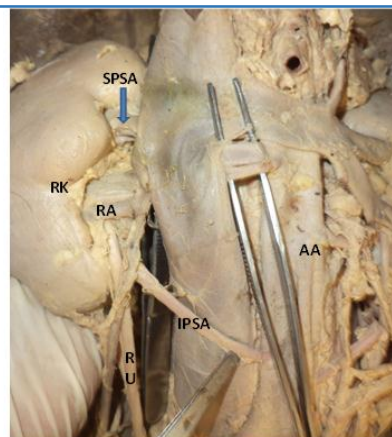


Fig 3 : Showing SPSA arising from Aorta ,IPSA arising from Aorta (RK - right kidney ,SPSA - superior polar super numerary artery , RA- renal artery,IPSA - Inferior polar super numerary artery, RU- right ureter,AA- abdominal aorta)

Fig. 3

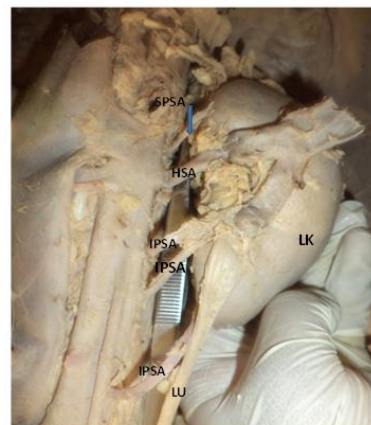


Fig 4 : Showing SPSA,Hilar supernumerary artery ,4 IPSA'S arising from Aorta (LK - left kidney,SPSA – superior polar super numerary renal artery ,HSA - hilar super numerary artery ,IPSA - inferior polar super numerary artery ,LU - left ureter)

Fig. 4

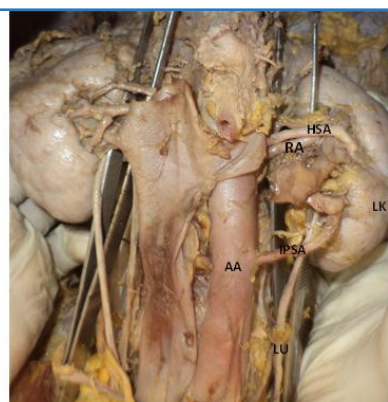


Fig 5 : showing Hilar supernumerary artery ,IPSA arising from Abdominal Aorta (LK- left kidney ,HSA - hilar super numerary artery , IPSA – inferior polar super numerary artery , AA-abdominal aorta , RA - renal artery, LU - left ureter)

Fig. 5

Table 1 : Showing Percentages of Supernumerary Renal Arteries from different sources

No of renal artery	Right kidney	Left kidney	Total
One renal artery	13/20 (65%)	15/20 (75%)	28/40 (70%)
Supernumerary renal artery	7/20 (35%)	5/20 (25%)	12/20 (60%)
a) Arise from Aorta	6/20 (30%)	4/20 (20%)	10/20 (50%)
- HSA	3/20 (15%)	2/20 (10%)	5/20 (25%)
- SPSA	1/20 (5%)	1/20 (5%)	2/20 (10%)
- IPSA	2/20 (10%)	1/20 (5%)	3/20 (15%)
b) Arise from Renal artery	1/20 (5%)	1/20 (5%)	2/20 (10%)
- HSA	1/20 (5%)	1/20 (5%)	2/20 (10%)
- SPSA	-	-	-
- IPSA	-	-	-

Table 1

DISCUSSION: Merklin and Michels classified (23) these supernumerary renal arteries depending upon origin as 1) Supernumerary renal arteries originating from aorta 2) Supernumerary renal arteries originating from the main renal artery 3) Supernumerary renal arteries originating from other arterial sources.^(10,11) Virendra bhudiraja et al⁽¹²⁾ reported that in 48.6% cases supernumerary renal arteries originated from aorta and in 13.5% cases originated from renal arteries on right side & in 45.9% cases supernumerary renal arteries originated from aorta and in 10.8% cases originated from renal arteries on left side.

In present study, 50% cases showed supernumerary renal arteries arising from aorta, 10% cases showed origin of supernumerary arteries from main renal artery. In this 50% cases, 30% cases showed supernumerary renal arteries on right side and 20% cases showed supernumerary renal arteries on left side. In the 10% cases of origin of supernumerary renal arteries from main renal artery, 5% cases showed on right side and 5% cases showed on left side.

Clinical Importance: Usually Superior polar and inferior polar supernumerary renal arteries originating from renal arteries are directed towards superior and inferior poles of kidney.^(13,14) These supernumerary renal arteries are having a vertical relation in comparison to supernumerary renal arteries taking origin from aorta. Vertical relation of these supernumerary renal arteries can lead to infarction of renal poles.⁽¹⁵⁾ These supernumerary renal arteries can also be injured during and surgical procedures of kidneys.⁽¹⁶⁾ Ureteropelvic junction obstruction is a common complication with inferior polar supernumerary renal arteries.⁽¹⁷⁾ The anatomical information about the relations and number of supernumerary renal arteries is very useful before any type of renal surgeries like kidney transplantation procedures, renal vascular surgeries⁽¹⁸⁾ for urologists and gynaecologists.^(19,20) Usually acute tubular necrosis, acute & chronic graft rejection develop as a complication while using the kidneys with supernumerary renal arteries as a transplant.⁽²¹⁾

CONCLUSION: We thought that knowledge of variations of supernumerary renal arteries is necessary for surgical management during kidney transplantation surgeries, repair of abdominal aortic aneurysm, and urological procedures and for angiographic procedures. This study is useful for General Surgeons who are performing kidney surgeries.

REFERENCES

1. Beregi JP, Mauroy B, Willoteaux S, et al. Anatomic variation in the origin of the main renal arteries: spiral CTA evaluation. *European Journal of Radiology* 1999;9(7):1330-1334.
2. Willam PL, Bannister LH, Berry MM, et al. Cardiovascular system. In: Gray's anatomy. 38th edn. Edinburg: Churchill Livingstone 1995:p.154.
3. Awojobi OA, Ogunbiyi OA, Nkposong EO. Unusual relationship of multiple renal arteries. *Urology* 1983;21(2):205-206.
4. Dhar P, Lal K. Main and accessory renal arteries-a morphological study. *Italian Journal of Anatomy and Embryology* 2005;110(2):101-110.
5. Krishnasamy N, Rao M, Somayaji SN, et al. An unusual case of unilateral additional right renal artery and vein. *International Journal of Anatomical Variations* 2010;3:9-11
6. Shoja MM, Tubbs RS, Shakeri A, et al. Asymptomatic bilateral ureteropelvic junction obstruction due to supernumerary renal arteries. *Saudi J Kidney Dis Transpl* 2008;19(5):806-808.
7. Merklin RJ, Michels NA. The variant renal and suprarenal blood supply with data on the inferior phrenic, ureteral and gonadal arteries: a statistical analysis based on 185 dissections and review of the literature. *J Int Coll Surg* 1958;29(1 Pt 1):41-76.
8. Nathan H, Glezer I. Right and left accessory renal arteries arising from a common trunk associated with unrotated kidneys. *Journal of Urology* 1984;132(1):7-9.
9. Satyapal KS, Haffjee AA, Singh B, et al. Additional renal arteries: incidence and morphometry. *Surgical and Radiologic Anatomy* 2001;23(1):33-38.
10. Sykes D. The arterial supply of the human kidney with special reference to accessory renal arteries. *British Journal of Surgery* 1963;50(222):368-374.
11. Talovic E, Kulenovic A, Voljevica A, et al. Review of supernumerary renal arteries by dissection method. *Acta Medica Academica* 2007;36(2):59-69.
12. Budhiraja V, Rastogi R, Anjankar V, et al. Supernumerary renal arteries and their embryological and clinical correlation: a cadaveric study from north India. *ISRN Anatomy Article ID – 405712*, 2013;p. 4.
13. Vasanthi A, Adinarayana KPS. Bilateral accessory renal arteries. *Journal of Evolution of Medical and Dental Sciences* 2014;3(6):1507-1511.

14. Rao M, Bhat SM, Venkatramana V, et al. Bilateral Prehilar multiple branching of renal arteries: a case report and literature review. Kathmandu University Medical Journal 2006;4(3):345-348.
15. Kadir S. Angiography of the kidneys. In: Kadir S. Diagnostic angiography. Philadelphia Pa: WB Saunders 1986:445-495.
16. Choi JH, Kim HJ, Lim JW, et al. Radiologic evaluation of the renal axis in patients with an accessory renal artery. J Korean Soc Radiol 2010;62(3):263-269.
17. Brannen GE, Bush WH, Correa RJ, et al. Microvascular management of multiple renal arteries in transplantation. Journal of Urology 1982;128(1):112-115.
18. Nayak S. Presence of accessory renal artery and kinking of aorta due to the abnormal origin of renal arteries. The internet Journal of Biological Anthropology 2008;1(2):1-4.
19. 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(6):417-420.
20. Sampaio FJ, Passos MA. Renal arteries: anatomic study for surgical and radiological practice. Surgical and Radiologic Anatomy 1992;14(2):113-117.
21. Netter FH. The netter collection of medical illustrations, Volume 6, kidneys, ureters, and urinary bladder. Novartis, New Jersey 1997:p. 17.