



ABERRANT AND ACCESSORY RENAL ARTERIES, ITS ORIGIN AND COURSE : A CADAVERIC STUDY WITH CLINICAL SIGNIFICANCE

Anatomy

Dr Megha Rapotra Assistant Professor, Department of Anatomy, Chintpurni medical college, Pathankot, Punjab.

Dr Rajan Singh Medical Officer, Civil hospital, Amritsar, Punjab.

ABSTRACT

The renal artery is the lateral branch of abdominal aorta which supplies the kidneys. Its variations are becoming more important due to the increase in renal transplantation, urological and vascular operations, so the Proper knowledge of variations of the arteries supplying the kidney is essential not only to the anatomists but also to the surgeons. The formalin fixed five cadavers constituted the material for study. During routine abdominal dissection conducted for medical undergraduates at Department of Anatomy, kidneys along with their arteries were explored and the morphological variations of renal arteries were noted. We reported 5 cases of aberrant and accessory renal arteries. The main aim of this study is to highlight the variations and clinical significance of renal vasculature.

KEYWORDS

Renal artery, Abdominal Aorta, Kidney, Superior polar artery, Inferior polar artery

INTRODUCTION

The renal arteries are a pair of lateral branches arising from the anterolateral aspect of the abdominal aorta below the level of superior mesenteric artery at the upper lumbar level (L1-L3) and supplies the respective kidney on each side¹. The right renal artery is longer in its course and more towards the left side of midline. Near the hilum of the kidney each renal artery divides into anterior and posterior branches, which in turn divide into segmental arteries to supply the different renal segments. Variation in the number, source, branching and course of the renal arteries are very common. Renal arteries variations are divided into two groups.

1. Early division of renal artery: Ramification of the main renal artery into segmental branches more proximal to the hilum of the kidney is called Early Division.
2. Extra renal artery: It is divided into two types.
 - a. Accessory or Hilar renal arteries: Enter the kidneys through the hilum with the main renal artery.
 - b. Aberrant or Polar renal arteries: Enter the kidneys directly through the capsule without entering through the hilum².

It is better to have awareness to prevent the surgical hazards because of anatomical consideration. These accessory renal arteries or the aberrant arteries account for about 30% of existence, while 70% having the normal type. The knowledge of variations of the renal vessels and its abnormal arrangement at hilum are essential guideline for Urosurgeon during the kidney transplantation and segmental resection for hilar mass³.

MATERIAL AND METHODS

The study was conducted on 10% formalin preserved human cadavers procured from body donation programme running by the department of Anatomy, PGIMER, Chandigarh. In the present study we reported 4 cases of aberrant renal artery (Polar arteries) arising from the abdominal aorta on the right and left side and a single case with accessory renal artery on the right side. During the course of dissection various abdominal viscera were removed. All fat and fascia from the anterior surface of both the kidney were cleared off for better visualization of renal arteries. Further origin, type and course of the main renal artery, accessory and aberrant arteries were noted. Cases were photographed and kept for record.

RESULTS AND OBSERVATION

A) Aberrant or Polar renal artery: Current study observed 4 cases with polar renal arteries.

B) Case 1: We noticed that the aberrant left renal artery originated from the anterolateral aspect of the aorta along with the origin of the normal left renal artery, near superior mesenteric artery. Normal left renal artery get divided into the segmental branches before entering into the hilum. The aberrant renal artery had a parallel course with that of the main renal artery lying superior to it. The trunk of the aberrant renal artery entered the kidney from its anterior surface through its capsule giving off branch to the upper pole called superior polar artery. (Fig:1)

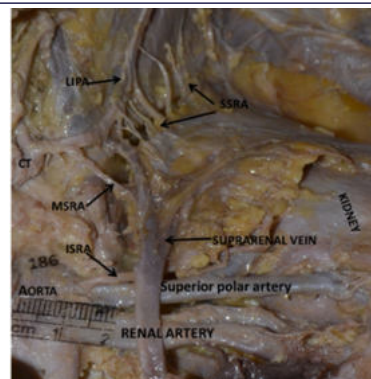


Fig1: Showing aberrant left superior polar artery along with the main left renal artery.

Case 2: In this case an extra renal artery was oozing out from the anterolateral aspect of aorta, few cm above the main right renal artery. It goes slightly downward and forward parallel to the main artery. On its way this superior polar artery gives off 2 right inferior suprarenal arteries and right inferior phrenic artery. After that aberrant renal artery entered into the upper pole of the kidney. Aberrant renal artery was more in caliber as compare to the normal one. (Fig:2)

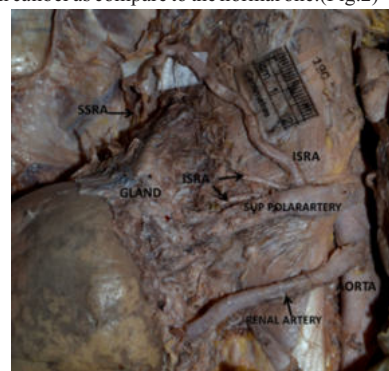


Fig 2: Showing right superior polar artery along with the right renal artery.

Case 3: In this case an aberrant renal artery was arising from the abdominal aorta few cm below the origin of the main right renal artery. The course of main artery was upward and forward toward the hilum of kidney but another artery i.e. inferior polar artery goes straight horizontally and get inserted into the lower pole of the right kidney. During its course almost from the mid point of the artery it give off to a common trunk. soon this trunk get bifurcated into right testicular artery which goes downward and one ascending branch i.e. right inferior suprarenal artery. (Fig:3)

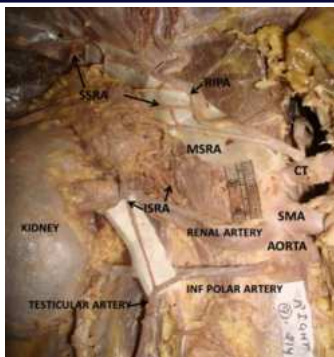


Fig 3: Showing inferior polar artery with the normal renal artery. Inferior polar artery also giving right testicular artery and inferior suprarenal artery.

Case 4: In this case an aberrant right renal artery of almost same calibre like that of main right renal artery arose from the aorta few cm below the origin of renal artery. Then artery goes superficial to the main renal artery in crisscross manner and become superior polar artery. Main renal artery on its way gives off multiple inferior suprarenal arteries. (Fig:4)



Fig 4: Showing right superior polar artery crossing the main renal artery anteriorly.

Case 5: Accessory or Hilar renal arteries: We found only single case of accessory renal arteries. In this case two extra hilar arteries were present along with the normal one. All the arteries arising from the anterolateral aspect of the aorta, goes obliquely downward toward the hilum of the kidney. (Fig:5)

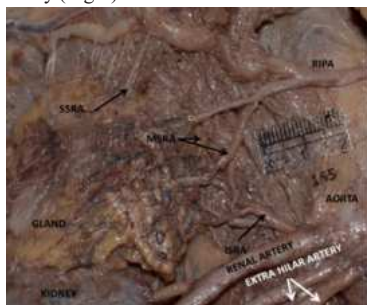


Fig 5: Showing two extra hilar arteries originating from the abdominal aorta very close to main renal artery.

DISCUSSION:

Different origins of renal arteries and frequent variations are explained by the development of mesonephric arteries. Deficiency in the development of mesonephric arteries results in more than one renal artery⁴. The anatomical knowledge of multiple arteries is essential before performing any transplantation surgeries, where microvascular techniques are employed to reconstruct the renal arteries⁵. The embryological explanation of these variations has been presented and discussed by Keibel F and Mall FP. In an 18 mm fetus, the developing mesonephros, metanephros, suprarenal glands and gonads are supplied by nine pairs of lateral mesonephric arteries arising from the dorsal aorta. Felix divided these arteries into three groups as follows: the 1st and 2nd arteries as the cranial group, the 3rd to 5th arteries as the middle group and 6th to 9th arteries as the caudal group. The middle group gives rise to renal arteries. Persistence of more than one renal

arteries of the middle group results as multiple renal arteries. Thus, the duplicated renal arteries in our study are a result of two persisting lateral mesonephric arteries from the middle group⁶.

Variations in the renal arteries are not uncommon. These variations are essential for the clinician to perform procedures such as renal transplantation, renal vascular operations more safely and efficiently⁷. In literature many variations of the renal arteries were reported. Dissection done by Dhar and Lal on 40 cadavers reported a single main renal artery on either side and Multiple (accessory) renal arteries in 20% of the specimens⁸. M Loukas in a study on 54 cases coated double renal artery, out of which 16 cases were inferior polar, 5 were superior polar and in 28 cases the supplementary renal artery entered the kidney through the hilum⁹. In a Thai cadaveric study, 82% cases were observed having single renal artery, 17% with double and a single case with three renal arteries¹⁰. In another study findings included 1 hilar artery in 53.3%, 1 hilar artery with 1 superior pole branch in 14.3%, 2 hilar arteries in 7.9%, 3 hilar arteries in 1.9%, superior polar artery in 6.8%, inferior polar artery in 5.3% and other variations in 8.5%¹¹. Bordei P et al. reported 54 cases of double renal arteries¹². Incidence of multiple arteries has been reported to be 20.2% and 19% on right and left sides, respectively by Janschek EC et al.¹³. Saldarriaga B et al. reported ninety seven (24.9%) out of 390 kidneys having additional arteries; 87 (22.3%) had one additional artery and 10 (2.6%) had two additional arteries¹⁴. We also observed single case with three hilar arteries.

CONCLUSION:

The person dealing with kidney retrieval and transplantation, various endourological procedures and innumerable interventional techniques, familiarity about the possible variations in renal arterial pattern is especially important. These type of variations are important for the clinicians while doing renal transplantation, repair of abdominal aorta aneurysm, angiographic interventions, laparoscopic renal surgeries and donor nephrectomies¹.

REFERENCES:

1. Anterpreet K Arora et al. 2012. Variant Segmental Renal Arteries in The Right Kidney- Clinical Correlations-A Case Report. *Anat Physiol*, Vol-2:3.
2. Gollamandala Syamala et al. 2015. Morphology and Variations of Renal Artery Pattern: A Case Report. *Journal of Dental and Medical Sciences*. Vol 14:Issue 4:29-31.
3. Standring S, ed. *Gray's Anatomy*. 2008. The Anatomical Basis of Clinical Practice. 40th Ed., Edinburgh, Churchill & Livingstone. 1231-1233.
4. Gaikwad Avinash S et al. variations in renal vasculature - case report. *Jour. of Ayurveda & Holistic Medicine*. Volume-III, Issue-I.
5. Brannen GE et al. 1982. Microvascular management of multiple renal arteries in transplantation. *J Urol*. 128(1):112-115.
6. Keibel F and Mall FP. 1912. *Manual of human embryology*, Vol. 2, J.B. Lippincott, Philadelphia, 820-825.
7. Vrinda Ankolekar et al. 2013. Renal artery variations: a cadaveric study With clinical relevance. *Int J Cur Res Rev*. Vol 05; 154-161.
8. Dhar and Lal. 2005. Main and accessory renal arteries-a morphological study. *Ital J Anat Embryol*. 110(2):101-10.
9. Loukas M et al. 2005. Rare case of right accessory renal artery originating as a common trunk with the inferior mesenteric artery: a case report. *Clin Anat*. 18(7):530-5.
10. Khamanarong K et al. 2004. Anatomy of renal arterial supply. *Clin Anat*. 17(4):334-6.
11. Sampao FJ. 1992. Renal arteries: anatomic study for surgical and radiological practice. *Surg Radiol Anat*. 14(2):113-7.
12. Bordei P et al. 2004. Double renal arteries originating from the aorta. *Surg Radiol Anat*. 26(6):474-9.
13. Janschek EC et al. 2004. Anatomic basis of right renal vein extension for cadaveric kidney transplantation. *Urology*. 63(4):660-664.
14. Saldarriaga B et al. 2008. A direct anatomical study of additional renal arteries in a Colombian mestizo population. *Folia Morphol*. 67(2):129-134.