



A CADAVERIC STUDY ON MULTIPLE VARIATIONS IN RENAL VASCULATURE IN SAGAR [M.P] POPULATION

Anatomy

Dr. Shashikant Chouhan

P.G 2nd Year Department Of Anatomy Bundelkhand Medical College, Sagar (M.P)

Dr. Aayshri Srivastava*

PG Student 3rd Year Department Of Anatomy Bundelkhand Medical College, Sagar (M.P) *Corresponding Author

Dr. Dharendra Narayan

PG Student 2nd Year Department Of Anatomy Bundelkhand Medical College, Sagar (M.P)

ABSTRACT

Multiple variations of Renal vessels were found during routine dissection of cadaver. A sound knowledge of vascular variations in relation to the kidneys and supra-renal gland is important in Kidney transplant & Supra-renal Transplant. The variation found were: Single Left Renal artery directly originated from aorta was then trifurcated before entering hilum of Kidney. Another variation of 3 different renal arteries originating directly from aorta. Cases were also found of segmental arteries having extrarenal course before entering hilum. Accessory renal veins were also seen and a single case of gonadal vein draining as common trunk with accessory renal vein was found.

KEYWORDS

Renal artery ; Renal vascular variations; Vascular variations; Renal vein, gonadal vein

INTRODUCTION

Renal arteries are a pair of lateral branches from the abdominal aorta. Normally, each kidney receives one renal artery. The venous drainage of each kidney is through one renal vein, which drains the blood from the kidney into the inferior vena cava. Because the inferior vena cava is on the right half of the body, the left renal vein is generally the longer of the two. The Kidneys were situated posteriorly on each side of the vertebral column. Superiorly, they were at the level with the upper border of T12 vertebral level and inferiorly with the L3 level. The right kidney as usual was slightly inferior. Knowledge of these variations is important for urologists, radiologists and surgeons in general. The objective of this case report is to bring awareness to clinicians about the variations in the renal vascular region. This report may also be useful to clinicians performing invasive techniques.



MATERIALS AND METHODS

The study was carried out during routine dissection in the Department of Anatomy, B.M.C, Sagar, M.P in month of march 2024 to April 2025. 20 cadavers were dissected. Type of study- observational. Autopsied bodies were excluded. Abdominal dissection was done and the renal vasculature traced.

Aim And Objectives

To describe abnormal renal vasculature in Sagar [M.P] population

RESULT

During a gross anatomy dissection of the abdomen, we observed multiple Variations in renal vasculature.

The Variation Found Were: Single Left Renal artery directly originated from aorta was then trifurcated before entering hilum of Kidney [upper, middle and lower] (Fig.1); Upper division got bifurcated {Superior and inferior branch} of which inferior branch was again divided into two branches then entered hilum anterior to Left Renal Vein. (Fig.2)



Fig.1 : Left Kidney with Variation of Left Renal artery
LRA → Left Renal Artery ; LRV → Left Renal vein

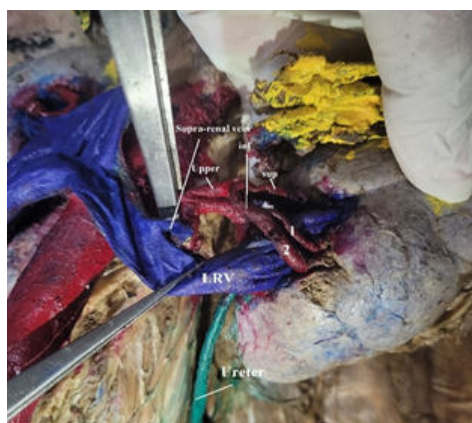


Fig.2 : branches of Upper division of Left renal artery

A single Left Renal vein originated from IVC and entered hilum posterior to two branches of inferior branch of upper division of Left renal artery. Posterior to Left renal vein; Lower division of Left renal artery entered hilum; then Middle division of Left renal artery and most posteriorly Left ureter entered hilum. (Fig. 3)



Fig.3: Left renal vasculature arrangement of entering hilum of Left Kidney

Duplication of Right Renal artery: Two separate Right Renal arteries originated from aorta; [superior & inferior]. Right Superior renal artery got bifurcated before entering hilum in Branch 1 and branch 2. Branch 1 entered hilum at the same level of Right Upper renal vein. Right Inferior renal artery entered hilum directly. (Fig.4)

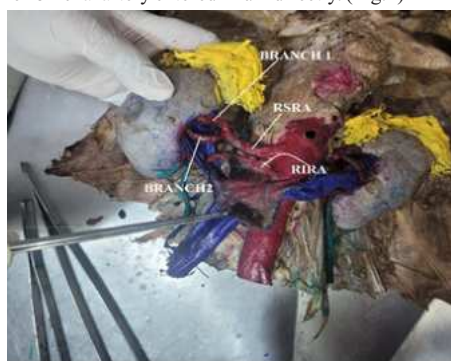


Fig. 4: Right renal artery duplication and arrangement of entering in hilum of Right kidney

RSRA → Right Superior Renal Artery ; RIRA → Right Inferior Renal artery

There is duplication of Right Renal vein ; Two separate Right Renal veins originated from IVC [superior and inferior]. Right superior renal vein entered at same level with Branch 1 Superior Right renal artery while Right inferior Renal vein got bifurcated in two & entered hilum at same level posterior to Renal arteries. Right ureter entered hilum most posteriorly (Fig. 5)



Fig.5: variation of Right renal veins (duplication) and arrangement of entering in hilum of Right Kidney

RSRV → Right Superior Renal Vein ; RIRV → Right Inferior Renal Vein

Another variation seen was 5 segmental branches originating before entering hilum. (Fig 6)



Fig 6:- five segmental branches before entering hilum

A case was also seen where artery gives 3 segmental branches from anterior division and a single posterior division. (Fig 7 & 8)



Fig 7:- 4 segmental branches out of which first four are branches of anterior division

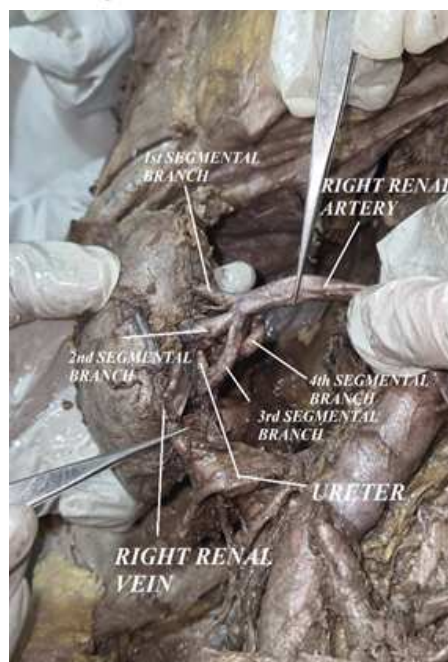


Fig 8:- four segmental branches before entering hilum out of which 3 arises from anterior division.

A single case was also seen where three renal arteries originated directly as lateral branches of abdominal aorta. These three arteries were arranged in parallel pattern. The first/superior artery bifurcated before entering hilum. Similarly, the third/inferior artery also bifurcated. In same case an accessory renal vein was found originated posteriorly and inferiorly while the main renal vein bifurcated before entering hilum. (Fig 9 & 10)

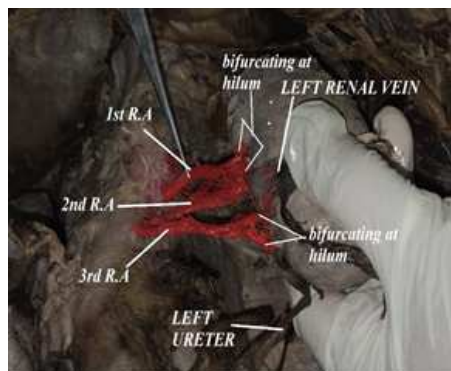


Fig 9:- three different renal arteries originating directly from abdominal aorta in parallel arrangement

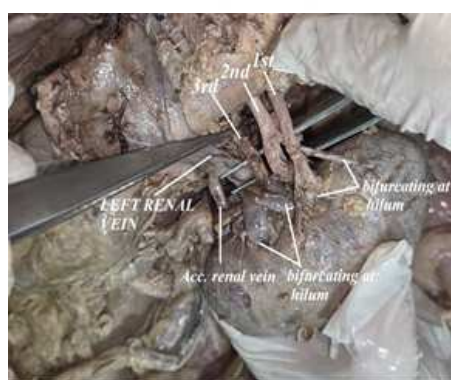


Fig 10:- three different renal arteries originating from abdominal aorta & accessory renal vein arising posteriorly

Two cases were seen where anterior division of renal artery gave 3 segmental branches and the enter hilum anteriorly to renal vein. (Fig 11)



Fig 11:- 3 segmental branches from anterior division of renal artery & enter hilum anterior to renal vein

A single case was found where right gonadal vein drained with right accessory renal vein into a common trunk which ultimately opened in IVC. Also, a posterior accessory vein was also found in same cadaver. (Fig 12 & 13)

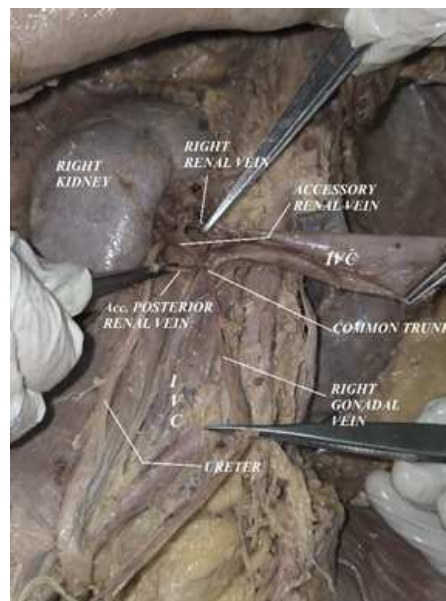


Fig 12:- Right gonadal vein drained with right accessory renal vein into a common trunk which ultimately opened in IVC. Also, a posterior accessory vein was also found

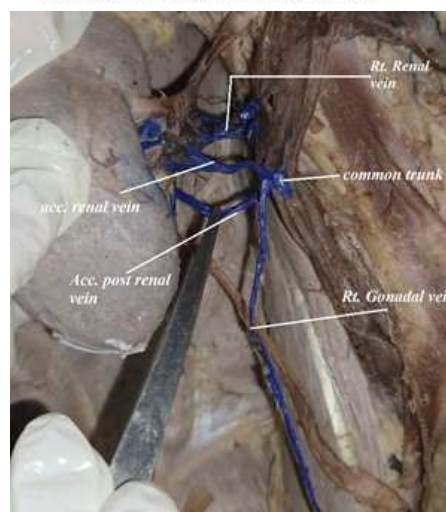


Fig 13:- right gonadal vein drained with right accessory renal vein into a common trunk which ultimately opened in IVC. Also, a posterior accessory vein seen

Out of 20, 05 cadavers showed variation in bilateral renal vasculature while 2 cadavers showed unilateral variation in renal vessels. So, the total variation becomes $05 + 02 = 07$ cadavers. So, the prevalence becomes 35%.

DISCUSSION

The renal arteries arise from the aorta just below the level of origin of the superior mesenteric artery. The accessory renal arteries are seen frequently. (1-3). They enter the kidney either above or below the hilum. Their relations with the nearby structures can vary. Bayramoglu et al reported bilateral additional renal arteries originating from the abdominal aorta and an additional right renal vein accompanying the additional right renal artery. (4) These anomalies were associated with unrotated kidneys with extrarenal calyces and pelvis. The abnormalities in the renal arteries are mainly due to the various developmental positions of kidney. (5). The kidneys begin their development in the pelvic cavity and then ascend to their final position in the lumbar region. When the kidneys are situated in the pelvis, they are supplied by the branches of common iliac arteries. While the kidneys ascend to lumbar region, their arterial supply also shifts from common iliac artery to the abdominal aorta. Accessory renal arteries arise from the abdominal aorta either above or below the main renal artery and follow it to the hilum. It is important to be aware that

accessory renal arteries are end arteries; therefore, if an accessory artery is damaged, the part of kidney supplied by it is likely to become ischemic. Janschek et al reported cases of multiple renal veins. In their study, variations were more common on the right side (23%) than on the left (6.7%). (06) Doubling of the right renal veins has been reported by Malcic-Gürbüz et al. (07)

The presence of multiple renal arteries and renal veins may compress the renal pelvis and result in hydronephrosis.

The awareness of these variations in the origin of the arteries in this region of hilum of the kidney, and para-aortic region, may be of utmost importance to urologists who perform nephron-preserving surgery, kidney transplantation, and the management of renal vascular hypertension. These variations can be demonstrated preoperatively by selective angiography. Knowledge of these variations may also provide safety guidelines for endovascular procedures like therapeutic embolization and angioplasties. Multiple vascular variations near the hilum of the kidney are present in seemingly normal patients and a sound knowledge of possible variations is very useful for radiologists, urologists and surgeons in general.

CONCLUSIONS

Describing anatomical variations such as the one in the present study is not only of academic interest, but also important to help radiologists on the correct interpretation of image examinations and for surgeons who will do any intervention in the related area. We believe that complex anatomical variations with direct clinical implications such as the described in the present study are worth of publication and discussion.

REFERENCES:

- [1] Singh G, Ng YK, Bay BH. Bilateral accessory renal arteries associated with some anomalies of the ovarian arteries – a case study. *Clin Anat* 1998; 11:417-20..
- [2] Satyapal KS, Haffjee AA, Singh B, et al. Additional renal arteries: incidence and morphometry. *Surg Radiol Anat* 2001; 23:33-8.
- [3] Bordei P, Sapte E, Iliescu D. Double renal arteries originating from the aorta. *Surg Radiol Anat* 2004; 26:474-9.
- [4] Bayramoglu A, Demiryurek D, Erbil KM. Bilateral additional renal arteries and an additional right renal vein associated with unrotated kidneys. *Saudi Med J* 2003; 24:535-7.
- [5] Moore KL, Persaud TVN. *The developing Human: Clinically Oriented Embryology*. 7th ed. Philadelphia: WB Saunders, 2002
- [6] Janschek EC, Rothe AU, Hölzenbein TJ, et al. Anatomic basis of right renal vein extension for cadaveric kidney transplantation. *Urology* 2004; 63:660-4.
- [7] Malcic-Gürbüz J, Akalin A, Gümtüçü B, Cavdar S. Clinical implications of concomitant variations of the testicular, suprarenal and renal veins: a case report. *Ann Anat* 2002; 184:35-9.