



VARIATION IN THE COURSE OF RIGHT RENAL ARTERY- A CADAVERIC STUDY

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ABSTRACT

Objectives: Recognize the common variations of renal vascular anatomy to avoid bleeding during transplantation and other surgeries related to kidney.

Method: During dissection we found the variation in the course of right and left renal artery. On the right side renal artery was turning around the renal vein, coming anterior to the vein. While coming anteriorly it was giving segmental branches.

Result: The organs which make extensive migrations during growth may either retain vessels from their original location (as in testis), or receive and incorporate new vessels of the region invaded (as in thyroid gland).

Conclusion: Surgeon should know about blood vessels near kidney before doing any surgery related to kidney, especially in transplantation surgery.

Key Words: Renal vascular anatomy, transplantation

INTRODUCTION

Knowledge of the number, size, course, and relationship of the renal arteries (of donor and recipient) are essential for the renal transplant. To avoid bleeding, knowledge of renal artery, its branches and their variations is important for any vascular reconstruction, endoscopic surgeries, treatment of abdominal aortic aneurism and treatment of renal artery stenosis and clinical evaluation of hypertension. In the present study, we highlight the abnormal course of renal artery.

The main renal artery divides into segmental arteries near the renal hilum (Fig.1 and 2). The first division is typically the posterior branch, which arises just before the renal hilum and passes posterior to the renal pelvis. The main renal artery then continues before dividing into four anterior branches at the renal hilum: the apical, upper, middle, and lower anterior segmental arteries. The apical and lower anterior segmental arteries supply the anterior and posterior surfaces of the upper and lower renal poles, respectively; the upper and middle segmental arteries supply the remainder of the anterior surface.

NORMAL RENAL VASCULAR ANATOMY

In most individuals, each kidney is supplied by a single renal artery that originates from the abdominal aorta. The renal arteries typically arise from the aorta at the level of L2 below the origin of the superior mesenteric artery, with the renal vein being anterior to the renal artery. The renal arteries course anterior to the renal pelvis before they enter the medial aspect of the renal hilum. The right renal artery is longer (as abdominal aorta is slightly to the left of the midline) and usually arises slightly higher than the left.¹

EMBRYOLOGY

1. The embryological explanation of these variations has been presented and discussed by Keibel F and Mall FP². 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.

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2. The lateral splanchnic arteries develop from the intermediate mesenchyme, later termed the aorta-gonad-mesonephros region. One testicular or ovarian and three suprarenal arteries persist on each side. The renal artery arises from the most caudal suprarenal artery. Additional renal arteries are frequently present and may be regarded as branches of persistent lateral splanchnic arteries³.
3. Renal ascend is the change whereby metanephroi, which are at first sacral in level, ascend to a lumbar level, by the end of the embryonic period proper. The ascend is perhaps caused by a straightening of the body. At 5 weeks the kidneys are very close to each other. As it ascends, the kidney taps segmental blood vessels at increasingly more cranial levels and the last vessels to be tapped become the renal arteries. The renal hilum is at first situated ventrally but soon comes to occupy a medial position. This may be caused by increased growth of lateral lip of the hilum rather than by rotation. A pelvic kidney is one that has failed to ascend out of the pelvis. The lower the kidney, the more numerous will be its blood vessels⁴
4. As the kidneys migrate upwards from sacral to lumbar region they are vascularized by a succession of transient aortic sprouts that arise at progressively higher levels. Successive renal arteries thus degenerate and are replaced by new one. The final pair of arteries in this series forms in the upper lumbar region and become the definitive renal arteries. Occasionally, a more inferior pair of renal arteries persists as accessory renal arteries⁵.

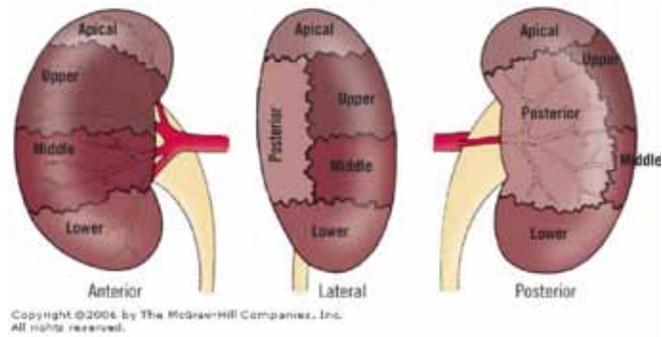


Figure 2: Kidney divisions based on the blood supply

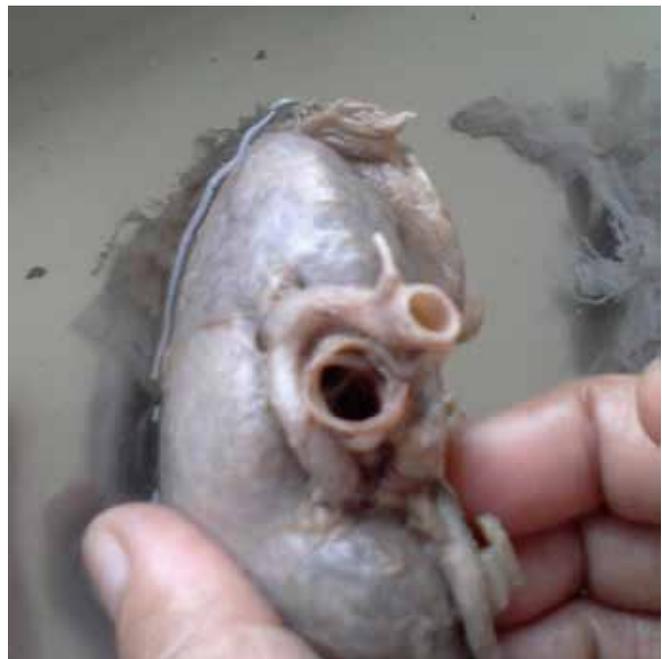


Figure 3: Kidney in cadaver showing variation in blood vessels

DISCUSSION

During dissection we found the variation in the course of right renal artery. Left sided renal artery was also seen

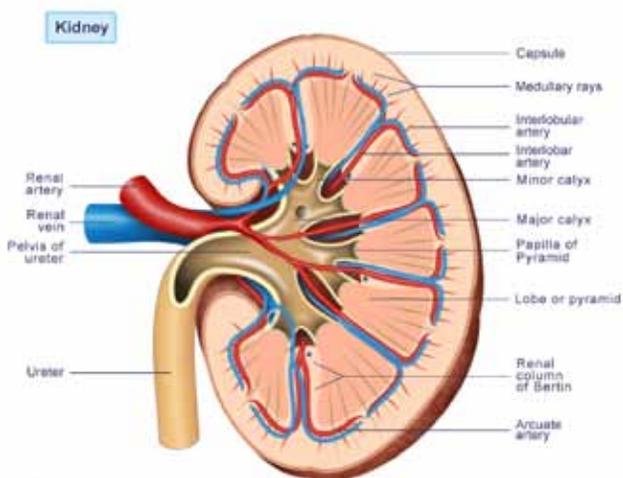


Figure 1: Kidney, Sagittal section

(expecting some variation). On the right side it was turning around the renal vein, coming anterior to the vein. On the left side also same variation was noticed. Variation of the renal arteries are generally caused by incomplete reduction of the originally multiple arterial supply⁶. An embryological explanation of any anomaly should show that from some pre-existing embryological condition both normal and abnormal results may be derived; the agents which may cause the anomaly may be simple in themselves, as pressure, or the blocking of a vessel, or the relative overgrowth or arrest of development of certain parts. The organs which make extensive migrations during growth may either retain vessels from their original location (as in testis), or receive and incorporate new vessels of the region invaded (as in thyroid gland)⁷.

To avoid bleeding during surgical or investigative procedures one should keep in mind these variations. Precise

knowledge of renal artery and its branches is important for any vascular reconstruction, endoscopic surgeries, treatment of abdominal aortic aneurism, and treatment of renal artery stenosis and clinical evaluation of hypertension. Right kidney is situated at the lower level than the left kidney. If we compare human anatomy with birds and many reptiles interesting findings are as follows-

COMPARATIVE ANATOMY

1. In the birds and many reptiles kidneys are situated in the pelvic region
2. The right kidney and its arteries are situated cranial to the left kidney in the phylogeny of mammals.

CONCLUSION

To avoid bleeding, knowledge of renal artery, its branches and their variations is important for any

vascular reconstruction, endoscopic surgeries, treatment of abdominal aortic aneurism, and treatment of renal artery stenosis and clinical evaluation of hypertension.

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