Section: Anatomy

Research

RENAL ARTERY VARIATIONS: A CADAVERIC STUDY WITH CLINICAL RELEVANCE

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Abstract

Background: The renal arteries are two of the largest branches of the abdominal aorta and arise laterally just below the origin of the superior mesenteric artery at the level of the L1 vertebral body. The right ostium is often higher than the left ostium when the arteries occur at different craniocaudal levels. The right renal artery is longer and runs behind the inferior vena cava, the right renal vein, the head of the pancreas, and the second part of the duodenum. The left renal artery passes behind the body of the pancreas, the left renal vein and the splenic vein. **Materials and Methods:** The study was conducted on formalin-fixed 50 cadavers (100 Kidneys) of both sexes during routine abdominal dissection for medical undergraduates with their arteries were explored, and the morphological variations of renal arteries were noted. During the course of dissection various abdominal viscera were removed and preserved as specimen for teaching purposes. over two years in GSVM medical college and Naraina Medical college Kanpur (UP). **Result:** We observed that One accessory artery was seen in 2/50 kidneys in which one is lies 4 cm above the lowerpole. And another is lie at 3.5 cm above the lower pole of the kidney In our current study, we observed that The presence of accessory renal artery was found only in 2 specimens (4%). **Conclusion:** The results of the present study are discussed and indicate common variations in renal arteries. Most variations involved the origin, branching, and presence of the adrenal artery. accessory renal arteryalso vary significantly in number, origin, route, and branching. Knowledge of variability in renal artery supply has far-reaching clinical, surgical, and academic implications.

INTRODUCTION

The renal arteries are two of the largest branches of the abdominal aorta and arise laterally just below the origin of the superior mesenteric artery at the level of the L1 vertebral body.[1] The right ostium is often higher than the left ostium when the arteries occur at different craniocaudal levels. The right renal artery is longer and runs behind the inferior vena cava, the right renal vein, the head of the pancreas, and the second part of the duodenum.[2] The left renal artery passes behind the body of the pancreas, the left renal vein and the splenic vein. Variations in renal arteries have been called aberrant, supernumerary, supplementary, accessory, among other terms. It is therefore necessary that the morphology and the nomenclature of these vessels are standardized.[3] Variation in the number, origin, pathway and branching pattern of renal arteries is common. Before reaching the kidney, each renal artery divides into five segmental arteries that supply blood to different areas of the kidney.[4] The renal artery enters the renal hilum, branches within the renal sinus and sends out interlobar arteries, which are situated between the renal pyramids in the cortex and take an arched course along the base of the pyramid, between the medulla and the cortex. Here, the interlobar arteries are designated arcuate arteries. Interlobular arteries branch from the arcuate arteries and ascend through the cortex towards the renal capsule. As they travel to the renal capsule, the interlobular arteries give off branches, the afferent arterioles, to each glomerulus.[5] From the arcuate artery, several branches known as interlobular arteries divide at right angles and extend through the renal cortex to the outside of the kidney. Each

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interlobular artery forms multiple afferent arterioles and terminates ina capillary bed known as the glomerulus, where blood is filtered to create urine.
The accessory renal artery (ARA) is a vestigial structure formed during renal ascension from the pelvis to the lumbar region. As the kidney ascends, it is nourished by higher vessels branching off the aorta, developing the main renal artery at the second lumbar vertebra. At the same time, the lower primitive branches curl up and disappear. Failure of these lower embryonic vessels to degenerate results in ARA.[6]

MATERIALS AND METHODS

The study was conducted on formalin-fixed50 cadavers (100 Kidneys) of both sexes during routine abdominal dissection for medical undergraduates with their arteries were explored, and the morphological variations of renal arteries were noted. During the course of dissection various abdominal viscera were removed and preserved as specimen for teaching purposes. over two years in GSVM medical college and Naraina Medical college Kanpur (UP).

The Following Parameters Were Observed
The presence of an accessory renal artery.

RESULTS

All accessory arteries were arising from the abdominal Aorta below the normal renalartery. One accessory artery was seen in 2/50 kidneysin which one is lies 4 cm above the lowerpole. and another is lie at 3.5 cm above the lower pole of the kidney In our current study, we observed that The presence of accessory renal artery was found only in 2 specimens (4%).

Figure 1: Age distribution of the study subjects

DISCUSSION

Knowledge of changes in renal vascular anatomy is essential in managing renal trauma, renal transplantation, renal vascular hypertension, renal artery embolisation, angioplasty, or revascularisation of congenital and acquired lesions. Abnormalities of the renal arteries are probably more common than in other major arterial systems.
Accessory renal arteryabnormalities are clinically significant in that they can cause

a) Hydronephrosis due to obstruction or compression of the ureter by the inferior artery,
b) Arterial hypertension due to stenosis of the renal artery and subsequent renal ischemia,
c) The risk of renal infarction during urological or oncological surgical procedures and kidney transplantation. Since the polar artery is a segmental artery, improper ligation or division is dangerous and leads to renal tissue necrosis.[5] Knowledge of the wide variations in the arterial supply to the kidney is of the utmost importance for surgery, as it helps one understand the danger of too violent a pull on the vascular pedicle, which may cause rupture of the anomalous vessel and fatal hemorrhage. This statement has significant relevance today as the definition of renal arterial anatomy affects kidney transplant surgery, vascular surgery for renal artery stenosis, renovascular hypertension, Takayasu disease, renal trauma, and uroradiological procedures.

Most of the abnormalities of renal artery are due to changing position of kidney as a part of its normal development and ascent. The kidney begins their development in pelviccavity. During further development they ascend to lumber region which is their final position. When they are in pelvic cavity they are supplied by internal iliac artery or common iliac artery. While the kidney ascends to lumber region their arterial supply also shifts from common iliac to abdominal aorta6 Embryological explanation of these variations has been presented and discussed by Felix (1912) 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.[7] In our current study, we observed that The presence of accessory renal artery was found only in 2 specimens (4%). While comparing our study, Uğur Ozkanet al found that Additional renal arteries on the right side were found in 16% and on the left side in 13% of cases. Of all the extra renal arteries, the percentage of accessory and aberrant renal arteries were 49% and 51%. Another study by Vrinda Ankolekar et al who observed the presence of accessory renal artery (ARA): ARA was found in 15 specimens (25%), eight on the right side. Seven specimens on the left side. Another study by Satyapal et al observed 27.7%, Ronald et al. observed 17%, Avneesh Gupta et al observed 24%.[8,9]

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CONCLUSION

The results of the present study are discussed and indicate common variations in renal arteries. Most variations involved the accessory renal arteryorigin, branching, and presence. accessory renal arteryalso vary significantly in number, origin, route, and branching. Knowledge of variability in renal artery supply has far-reaching clinical, surgical, and academic implications. Recognising possible changes is essential for surgeons dealing with kidney harvesting and transplantation, various endoscopic procedures, and different surgical techniques.

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