Inferior renal polar artery and its surgical importance

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Abstract
Introduction
Renal artery variations have gained importance in the last decade because of the widespread development in transplantation surgery. Variations in the renal vasculature are of importance not only for the surgeons, but for the radiologists, especially in the interventional radiological approaches. Post surgical complications and the risk of kidney loss is higher in the cases with multiple renal arteries when compared with the kidneys having a single renal artery. The aim of this study was to discuss the surgical importance of the inferior renal polar artery.

Case report
During routine dissection, a case of accessory right renal inferior polar artery was found. The main renal artery was arising from the aorta about 1.7 cm below the superior mesenteric artery extending laterally towards the hilum of the kidney. At about 1.3 cm below the origin of the inferior mesenteric artery from the anterolateral aspect of the aorta, an accessory renal artery measuring 5.1 cm in length, was seen coursing upwards, backwards and laterally and entered the right kidney through its lower pole. This inferior polar renal artery in our case passed superficial to the ureter and testicular vein of the right side and hence can lead to partial obstruction of ureter leading to hydronephrosis, or testicular vein predisposing to varicocele.

Conclusion
Surgeons should exclude the possibility of presence of such accessory renal arteries obstructing ureter or testicular vein prior to the surgical treatment of hydronephrosis and varicocele. The awareness about the presence of such variations is important from the academic, surgical and radiological point of view.

Case report
During routine dissection, a case of right accessory renal polar artery was found at inferior pole in an adult male cadaver in the Department of Anatomy, Maulana Azad Medical College, New Delhi. We observed that at about 1.3 cm below the origin of the inferior mesenteric artery from the anterolateral aspect of the aorta, an accessory renal artery measuring 5.1 cm in length, was seen coursing upwards, backwards and laterally and entered the right kidney through its lower pole. This accessory right inferior polar renal artery was seen to be passing over the abdominal part of ureter and testicular vein. The main right renal artery was arising from the aorta about 1.7 cm below the superior mesenteric artery extending laterally towards the hilum of the kidney. It passed behind the inferior vena cava and reached the near upper pole of the right kidney. The main right renal artery gave three branches; one branch passed in front and entered the kidney at its upper pole and the second branch ran posterior to the right renal vein and entered the hilum of the right kidney while the third branch entered the kidney between the upper pole and hilum of the right kidney (Figure 1). On the left side, a single renal artery was observed, which divided into segmental branches on reaching the

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hилум of the left kidney. No other anomalies were observed in the posterior abdominal wall.

Discussion
Most of the abnormalities of renal artery are due to changing positions of the kidney as a part of its normal development and ascent. Knowledge of the embryology of the renal vasculature and structural development of the kidney is essential to understanding of the multitude of anomalies that may occur. With the complex development of the kidneys through the three stages of pronephros, mesonephros and metanephros, and the migration of the kidney from the pelvis to the lumbar region, along with its longitudinal location and simultaneous acquisition of a vascular supply, there is reason to understand why the possibility for anomalous development in the kidney may be greater than for other organs within the body.

The embryological explanation of these variations has been presented and discussed by Keibel F and Mall FP. In an 18 mm foetus, the developing mesonephros, metanephros, suprarenal glands and gonads are supplied by nine pairs of lateral mesonephric arteries arising from the dorsal aorta. The 3rd to 5th pair of arteries give rise to renal arteries. Graves accordingly described an artery arising from the aorta or main renal artery should be accessory and all other sources should be called aberrant artery. When these vessels enter the upper or lower pole of the kidney they are termed as 'polar arteries'.

Incidence of multiple renal arteries has been reported to be 20.2% on the right side and 19% on the left side. There was much discrepancy regarding the side of accessory renal arteries, many authors have reported a higher frequency on the left side, others reported this variation to be more frequent on the right side. Availability of a huge amount of data about the presence of multiple renal arteries, categorised as accessory, aberrant or additional, presence of extra renal arteries unilaterally or bilaterally, superior and inferior polar arteries, necessarily warrants the importance of a uniform and internationally acceptable nomenclature and classification of renal arteries. Other factors like genetic background, oxygenation and haemodynamic changes may also account for presence of an accessory renal artery. Recent reports have also associated galactosemia with renal vascular anomalies.

Bordei P et al. reported 54 cases, out of which six cases were bilateral. In about 28 cases, supplementary renal artery entered the kidney through the hilum, in 16 cases it was inferior polar, in five cases it was superior polar artery. In this study, we found accessory right renal artery on the right side entering the lower pole as inferior polar artery. On the left side, normal renal artery was found. Inferior polar renal artery in our case passed superficial to the ureter and testicular vein on the right side and hence can lead to partial obstruction of the ureter leading to hydronephrosis, or testicular vein predisposing to varicocele.

Although it is very rare, fibromuscular dysplasia in an accessory renal artery can be responsible for renovascular hypertension. Selective renal angiography should be performed as the 'gold standard' test when renovascular intervention is considered. Every accessory renal artery is related to segmental arteries, so the risk of bleeding during urological...
Conclusion

Surgeons should exclude the possibility of presence of such accessory renal arteries obstructing the ureter or testicular vein prior to the surgical treatment of hydronephrosis and varicocele. The awareness about the presence of such variations is important from the academic, surgical and radiological point of view. With an increasing number of cases of renal transplantation, successful graft with multiple arteries may become a routine procedure and failure to restore circulation in the accessory renal artery after surgery may cause unnecessary ischemia or necrosis of renal tissue.

Our findings should help the surgeons to reduce the incidence of accidents during urological surgery or renal transplantation.

References