

Horseshoe Kidney: A Fusion Anomaly

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ABSTRACT

A horseshoe shaped kidney was found in an approximately 35 years old female cadaver during routine dissection at anatomy lab of our department. Further careful dissection was done in situ and ureter and related blood vessels were identified and painted for identification.

The isthmus connecting the inferior poles of the kidneys was ventral to the great abdominal vessels. There were multiple vessels supplying the horseshoe kidney on either side, the ureteric drainage pattern was also not symmetrical.

Horseshoe kidney is the commonest renal fusion anomaly found in one in 400-600 individuals, it is twice common in males than females. It occurs when kidneys are pushed too close to each other during their relative ascent through arterial fork of umbilical arteries in fetal life.

Horseshoe kidney is associated with increased risk of renal calculus. Surgical division of the isthmus improves the renal function even in the absence of any pathology. Due to vascular variations, Angiography or CT scanning with vascular reconstruction is very helpful when planning surgery on horseshoe kidney.

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CASE REPORT

During routine dissection carried out for second year medical undergraduates, a horseshoe shaped kidney was discovered. The cadaver belonged to an approximately 35-year-old female. Further careful dissection was carried out in-situ to study the

pattern of ureter, related blood vessels and presence of other anomalies. Related structures were painted using color-coded paints (red for artery, blue for vein and yellow for ureter) for easy identification.

Horseshoe kidney extended from vertebral level L2 to L4 with isthmus connecting the inferior poles,



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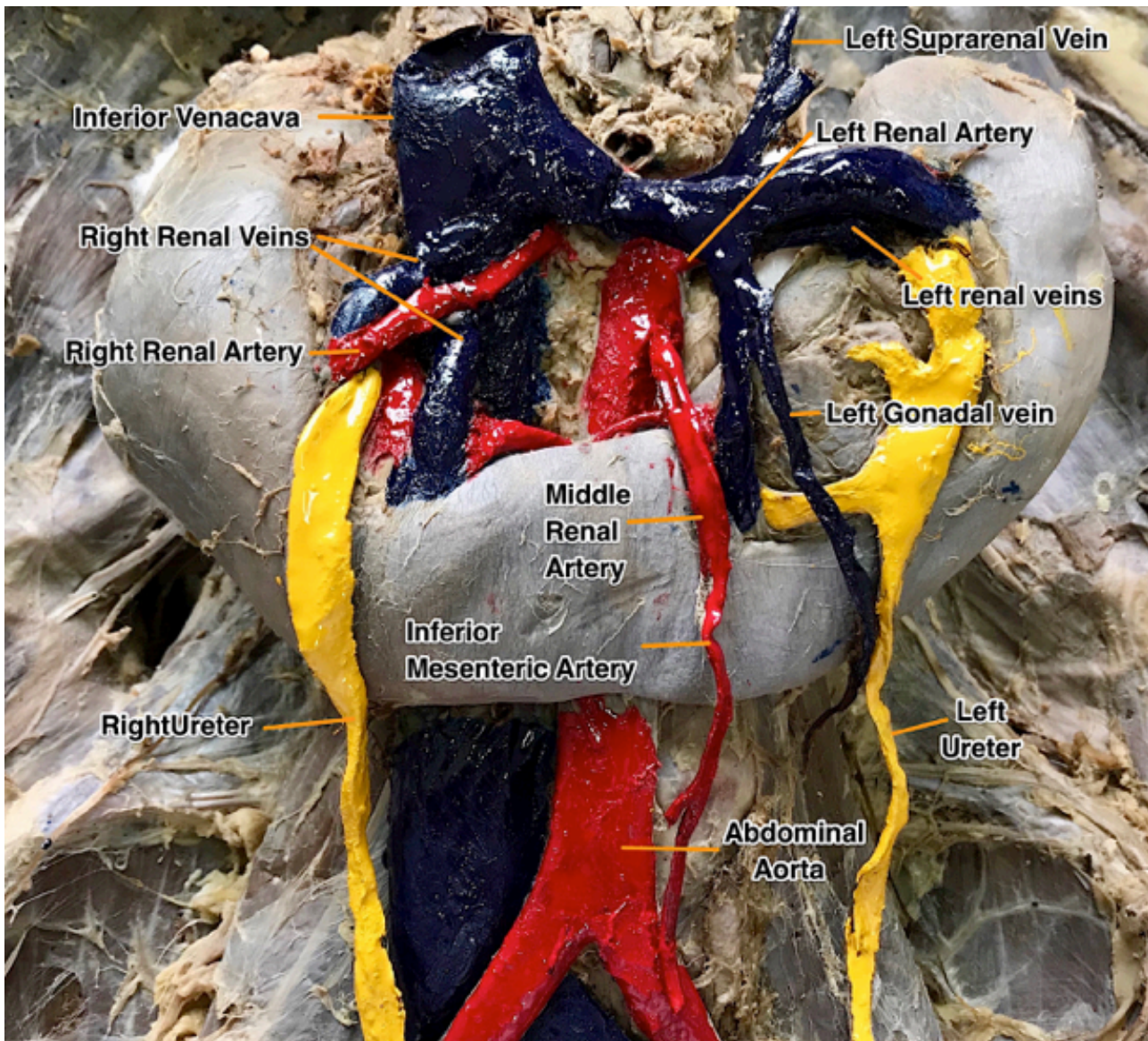


Figure 1: Dissected specimen of horseshoe kidney

ventral to abdominal aorta and inferior venacava (figure 1). Maximum transverse length was 17 cm and vertical diameter varied from 4.5 to 6 cm. Maximum circumferential length was 33 cm.

Multiple veins drained horseshoe kidney on either side; all veins drained into inferior venacava. Left suprarenal vein and left gonadal vein joined the left renal vein. Three renal arteries supplied the kidney. In addition to the usual left and right renal artery supplying each moiety, there was a middle renal artery arising from abdominal aorta dorsal to the isthmus (approximately L3 vertebral level). Middle renal artery divided one cm distal to its origin into

two branches and the branches diverged laterally to enter the renal tissue. Ureters curved anterior to the isthmus with low insertion on right side. On left side three major calyces were seen outside the renal tissue; each inserting at different levels of the left moiety.

DISCUSSION AND REVIEW OF LITERATURE

Horseshoe kidney; known by other names like en arcuatus, renal fusion or super kidney; is the most common renal fusion anomaly. It is found in 1 in 400 to 600 individuals^{1, 2} and is twice common in males.³ 'A transverse bridge of tissue, the isthmus,

which usually but not always contains functioning renal substance, connects the two renal moieties. The isthmus connects the inferior poles, most commonly anterior to the great abdominal vessels.²

Vascular supply to horseshoe kidneys is variable. One vessel to each moiety is seen in 30% of cases, but multiple anomalous vessels, as seen in our case, are common. In view of this variable arterial anatomy, angiography or CT scanning with vascular reconstruction is very helpful when planning surgery on horseshoe kidneys.²

Embryologically, kidneys are formed at pelvis and later shift to more cranial abdominal position due to diminution of body curvature and growth in the lumbar and sacral regions. During their relative ascent, kidneys pass through the arterial fork formed by umbilical arteries. While doing so if kidneys are pushed too close together, their inferior poles may fuse to give rise to horseshoe kidneys. Position of horseshoe kidney is lower because its ascent is prevented by inferior mesenteric artery.¹

Horseshoe kidney is vulnerable to obstruction and calculus disease⁴. The high rate of stone formation is probably secondary to infection and poor

drainage from the renal pelvis. Surgical division of the isthmus improves the function of the kidneys whether there is any apparent pathology or not.⁵ Numerous other pathologies have been described in horseshoe kidney⁶⁻⁹ but correlation of causation of pathologies with this anomaly has not been established.^{10,11} Literature also describes numerous other anomalies associated with horseshoe kidney^{3, 12}; in our case no other major anomaly was found. Prevalence of this anomaly in south Asian population has not been documented.

CONCLUSIONS

Horseshoe kidney is fusion anomaly of kidneys, not very uncommon and is present twice commonly in males than females. Usually discovered as incidental finding in radiological investigations, it increases the risk of renal calculi due to poor drainage but correlation with other renal pathologies including malignancies is not well established. The vasculature and drainage pattern of horseshoe kidney is variable and hence angiography or CT scanning with vascular reconstruction is helpful before planning any surgery in patients with this anomaly.

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