Horseshoe kidney with variable vascular supply is of interest to clinicians and anatomists due to its immense surgical significance. A horseshoe kidney encountered during cadaveric dissection is reported here. The left kidney is vertical and the right kidney is slightly horizontal. The isthmus is narrow and 1.5 cm inferior to the inferior mesenteric artery. The hilum of the right kidney opens anteriorly and the left opens anteromedially. The ureters lie on the anterior surfaces of both kidneys. In addition to renal arteries arising from the aorta described in previous reports, a unique renal artery (Renal Artery 3) was found supplying the right kidney. This RA3 originates from the aorta at L3 vertebral level and takes a long and tortuous course to reach the hilum of the right kidney. Such arterial variation is important for surgical procedures involving the abdominal aorta.

Keywords: horseshoe kidney, renal arteries, anatomic variation

Introduction

- Horseshoe kidney (HSK) is a common congenital renal defect found in 0.25% of the general population.
- HSKs usually demonstrate three anatomical anomalies: ectopic position, malrotation, and variable vasculature.
- HSK is associated with abnormalities such as secondary renal pathology, ureteropelvic junction obstruction, vesicoureteral reflex, and certain renal tumors.
- 80% of HSK is associated with abnormalities in arterial supply.
- Management of the aberrant renal vasculature poses significant risk to surgical procedures involving the abdominal aorta in patients with HSK.
- Here we report a case of HSK with a unique and rare renal vasculature encountered during medical students’ cadaveric dissection.

Case Report

The horseshoe kidney described in the present report was found in an R3-year-old male during routine cadaveric dissection at Sidney Kimmel Medical College, Philadelphia. This was the first HSK case encountered among 532 donations (0.19%) in the dissection laboratory at SKMC during 2008-2018.

Differential malrotation of both kidneys

This was an asymmetric horseshoe kidney with a narrow isthmus that deviated slightly to the left. The isthmus connected the inferior poles of the two kidneys (Fig 1). It was situated anterior to the abdominal aorta at the third lumbar vertebral level (L3), about 1.5 cm inferior to the main trunk of the inferior mesenteric artery. The latter lay anterior to the isthmus and generated a shallow impression on the surface of the isthmus.

Arterial supply and venous drainage

- Two renal arteries (RA1 Left and RA1 Right) arose from either side of the aorta at L1 vertebral level, immediately inferior to the superior mesenteric artery (Fig 2A and 2B).
- Inferiorly, an artery (RA2) arose from the anterior aspect of the aorta at its bifurcation.
- Another artery, renal artery 3 (RA3), was unique to this case and different from the renal arteries described in previous reports.

Figure 1. Anterior view of the horseshoe kidney with the superior-lateral aspects of both kidneys elevated from the posterior abdominal wall to facilitate focusing of the image. The orientation of the image is indicated by superior, inferior, left and right. SMA, superior mesenteric artery; IMA, inferior mesenteric artery; IVC, inferior vena cava; LCIA, left common iliac artery; LU, left ureter; RA1, right common iliac artery; RV1, right renal artery; LCV, left common iliac vein; and SVC, superior vena cava.

Figure 2. Renal vasculature of the right (A) and left (B) kidneys. RA1, the arteries arising at L1 level; RV1, the accompanying vein; RA2, the artery arising from the aorta at its bifurcation; RV2, the vein accompanying RA2; LCV, left common iliac vein; RA3, the artery arising from the aorta at L3 level is partially visible at the inferior aspect of the right kidney and is deep to the right ureter (RU); SMA, superior mesenteric artery; IMA, inferior mesenteric artery; IVC, inferior vena cava; LCIA, left common iliac artery; LU, left ureter; RV1, right renal artery; LCV, left common iliac vein; and SVC, superior vena cava.

Figure 3. Anteroinferior view of the right kidney. The inferior aspect of the right kidney is elevated to show the long and tortuous course of RA3, deep to the inferior margin of the right kidney.

References