

Lateral Malrotation of the Kidney with Uncoupled Vasculature

Wai-Yan Wong, Pai-Feng Liu¹, Hueih-Shing Hsu¹
Ming-Kuen Lai¹

Department of Urology, ¹Poh-Ai Hospital, Lotung and En-Chu-Kong Hospital,
Taipei, Taiwan, R.O.C

Lateral renal malrotation is relatively uncommon. We report on a case of such an abnormality associated with an uncoupled course of the renal vessels in which the renal artery coursed ventrally to the vena cava. This represents an extremely infrequent scenario in embryology. (J Urol R.O.C., 12:139-141, 2001)

Key words: malrotation, uncoupled vessels.

INTRODUCTION

Lateral renal malrotation is relatively uncommon [1]. Herein we report on a case of such an abnormality associated with an uncoupled course of the renal vessels in which the renal artery coursed ventrally to the vena cava, which represents an extremely infrequent condition in embryology.

CASE REPORT

A 35-year-old man was admitted for further investigation after a suspected hyperechoic lesion (about 3 x 3 cm) in the middle pole of the right kidney by renosonography. Past history revealed neither urinary tract infection nor flank pain. Physical examination was unremarkable. The hemogram, serum BUN, creatinine, and urinalysis were all normal. Abdominal CT scan (Fig. 1) revealed a right laterally malrotated kidney with a renal artery which coursed ventrally to the kidney to enter the laterally facing hilum. Astonishingly, the renal vein was not coupled but instead, coursed dorsally to enter the hilum, resulting in an extraordinary circumferential appearance. Angiography (Fig. 2) confirmed that the renal artery entered the laterally facing right renal hilum.

DISCUSSION

In normal embryogenesis, the fetal kidney rotates medially by 90° at the same time as it proximally migrates with the entire process completed by the end of the ninth week. The rotation has been postulated to be a

consequence of unequal branching of successive orders of ureteral trees, with excessive ventral versus dorsal branching. As ureteral branching induces differentiation of the metanephric tissue, more parenchyma develops ventrally and the renal pelvis seems to rotate medially. Different degrees of unequal branching result in various forms of malrotation [2]. The most common type of malrotation is the persistent anterior position of the renal pelvis (nonrotation or incomplete rotation). A laterally facing hilum can either be a result of reversed or

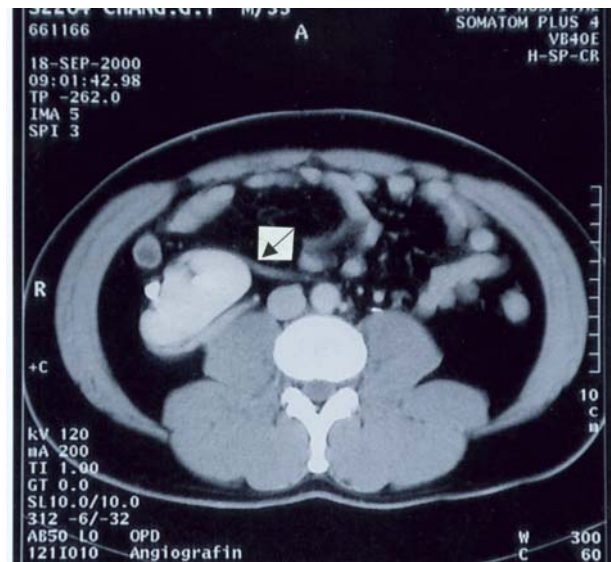


Fig. 1 Abdominal CT scan showing a right laterally malrotated kidney with a circumferential course pattern where the renal artery (arrow) courses ventrally to the hilum.

Received: Nov. 27, 2001

Revised: Jan. 8, 2002

Accepted: Feb. 19, 2002

Address reprint requests and correspondence to: Pai-Feng Liu, M.D

Department of Urology, National Taiwan University Hospital, 7, Chung-Shan S. Rd., Taipei, 100, Taiwan, R.O.C



Fig. 2 Angiography showing the arterial supply entering the laterally facing right renal hilum.

hyper-rotation. In reversed rotation, the renal vessels are twisted anteriorly around the kidney while in hyper-rotation, they are carried posteriorly to the kidney [1].

This is a condition very rarely reported in the literature in which lateral malrotation of the kidney is associated with renal vasculature coursing in a different direction to reach the hilum. The dilemma of classification is encountered where it fails to fit into either 'hyper' or 'reverse rotation'. It was mentioned in the exhaustive and detailed study by Weyrauch that the actual direction of kidney movement is based on the renal vessels, which are in a pair, i.e., whether it travels dorsally or ventrally to the laterally placed hilum [3]. No uncoupled venous course had ever been mentioned according to his observations, and the timing for development of the renal venous system is still undocumented.

The development of such uncoupled vessels is difficult to explain by normal embryogenesis especially when the renal artery lies ventral to the vein. Bremer first proposed that the original dorsal arterial plexus is formed by lateral branches at more-cranial segment lev-

els from the aorta anastomoses with the renal vessels as the kidneys ascend the retroperitoneum. Variations in involution of the periaortic plexus and thereby, the renal vasculature in humans are actually due neither to the large mesonephroi nor to an acute curvature in the caudal trunk of human embryos [4]. With his hypothesis of variable plexus formation, we hereby suppose that the original dorsal arterial plexus intermingled and crossed beyond the venous supply and established a neo-anastomosis by forming a neoplexus ventral to the vena cava as the kidney ascended to its proper position with simultaneous lateral rotation. The former dorsal arterial plexus simultaneously regressed and involuted. Thus the renal vein did not course hand-in-hand with the artery as we had thought. This rare condition also further justifies Bremer's hypothesis of plexus variation, since only by anastomosis of a neovascular plexus can we explain and clarify the independent ventral relationship of the renal artery. If there was no crossing-over of the plexus, the vessels would be expected to be coupled and in a parallel course with the artery always lying dorsal to the vena cava despite renal malrotation, which is not true here. We hereby categorize it as 'hyper-rotation' considering that the venous course was actually formal.

No abnormality of kidney function has been detected secondary to the malrotation in this adult. We might not recommend regular follow up in such a circumstance.

REFERENCES

1. Kelalis PP. Anomalies of the urinary tract. In: Kelalis PP, King LR, Belman AB, eds. *Clinical Pediatric Urology*. 2nd ed., vol. 2. Philadelphia, WB Saunders, 1985:Ch.18:647-8.
2. Bauer SB. Anomalies of the kidney and ureteropelvic junction. In: Walsh PC, Retik AB, eds. *Campbell's Urology*. 7th ed., vol. 2. Philadelphia, WB Saunders, 1998:Ch.58:1728-30.
3. Weyrauch HM, Jr. Anomalies of renal rotation. *Surg Gynecol Obstet* 1939;68:183-8.
4. Bremer JL. The origin of the renal artery in mammals and its anomalies. *Am J Anat* 1915;18:179-84.