Crossing Into the Unknown. A Peculiar Cause of Ureteropelvic Junction Obstruction in a 14-Year-Old Boy

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Ureteropelvic junction obstruction (UPJO) is a common cause of upper urinary tract obstruction and consequent hydronephrosis. We present a case of right UPJO caused by a crossing vessel suspected to be the right second lumbar vein. While crossing vessels are a common cause of UPJO in older children and adults, they are usually attributed to lower pole vessels. We believe that this is the first case report of UPJO caused by a lumbar vein. Recognition of crossing vessels requires knowledge of variant vasculature anatomy around the kidneys. Due to this unusual crossing vessel origin, our case likely represented an anatomical variant that would be of interest to both fields of urology and radiology.

CASE

A 14-year-old male presented to his primary care physician with bilateral flank pain. An ultrasound (U/S) was ordered showing significant right-sided hydronephrosis and dilation of the proximal left collecting system with no evidence of an obstructing calculus. The patient was sent to the emergency department where pediatric urology was consulted. A plan was made to follow him as an outpatient after a repeat U/S and renal scan (MAG3 with Lasix).

The patient was seen again in the pediatric urology clinic. The U/S showed Society of fetal ultrasound grade III hydronephrosis of the right kidney (Fig. 1) and the renal scan showed no drainage of the right kidney (Supplementary Fig. 1). Ureteropelvic junction obstruction (UPJO) was suspected, and consent was signed for a retrograde pyelogram and right laparoscopic dismembered pyeloplasty with double-J stent insertion.

In the operating room, the patient was placed under general anesthesia. A retrograde pyelogram showed minimal entrance of contrast into the right renal pelvis and confirmed the diagnosis of UPJO (Fig. 2). During the laparoscopic pyeloplasty, the right ureteropelvic junction (UPJ) was visualized and the source of the obstruction was found to be a crossing vessel. The vessel appeared to originate from the posterior lumbar region, course anteriorly over the lower pole of the kidney, and traverse over the renal pelvis, subsequently causing the obstruction.

The vessel finally drained into the right gonadal vein and into the inferior vena cava (Fig. 3).

A routine dismembered pyeloplasty ensued with no complications and the crossing vessel was left intact and transposed posteriorly. The patient recovered in hospital and was discharged 2 days postoperatively.

DISCUSSION

The etiology of UPJO can be broadly dichotomized into either intrinsic or extrinsic causes— intrinsic causes represent abnormalities within the collecting system such as ureteral peristaltic or stenosis, while extrinsic causes are unrelated to the collecting system such as crossing vessels or surgical instruments. These causes do not exclude each other and multiple etiologies of UPJO may coexist within a single patient.

Variations in renal hilar anatomy are common in the general population; the normal hilar arrangement of a single hilar artery and vein is found in only half of individuals. Knowledge of variant hilar anatomy is required for surgical intervention as a common cause of extrinsic UPJO is crossing vessels. These vessels can course anterior or posterior to the UPJ, resulting in compression of the UPJ and consequent obstruction of urine flow.

Crossing vessels commonly arise from aberrant vasculature originating from the renal vessels, iliac vessels, vena cava, or aorta. A common example found in 6.8%-39% of cases would be an inferior segmental artery that arises from the aorta and courses anteriorly over the UPJ into the lower pole of the kidney. Normal vasculature may also contribute to UPJO. An example would be earlier than normal branching of the renal artery into the segmental arteries which would bring the lower segmental artery in close proximity to the UPJ.
abnormal kidney development such as malrotation may contribute to UPJO by bringing the UPJ in closer proximity to hilar vessels. Significant crossing vessels have been found to be associated with up to 63% of UPJO patients versus only 19.2% in those without UPJO. Common etiologies for these crossing vessels include extra renal vessels, aberrant lower pole segmental vessels, and retroaortic renal arteries.

**Figure 1.** Ultrasound Kidney, Ureter, Bladder (KUB) of the right kidney showed dilation of the calyces and renal pelvis, as well as thinning of the renal cortex, representing SFU grade III hydronephrosis. Right kidney was 12.9 cm in size and AP diameter was 43 mm. SFU, Society of fetal ultrasound.
Our attempt to identify the obstructing vessel postoperatively was limited by the lack of imaging such as a prior computed tomography. The vessel’s course was also not extensively explored during the pyeloplasty to minimize procedure length and patient harm. However, the vessel’s anatomic features and eventual connection to the right gonadal vein leads us to believe that the vessel was a vein. As the vein did not appear to have originated from the renal hilum or right renal vein, it is likely neither an extra renal vein, a branch of the renal vein, nor a lower pole segmental vein. Although we were unable to explore the distal aspect of the vein, it coursed into the posterior abdominal wall. Reviewing the anatomy of the vena cava near the level of the renal veins, we believe that the obstructing vein represented a right second lumbar vein. The vessel is approximately at the same anatomical position and originates from the posterior abdominal wall.

Although the patient’s UPJO was most likely due to the presence of the crossing vessel, a dismembered pyeloplasty was done to ensure that intrinsic causes of obstruction were not missed. In the pediatric population, most cases of UPJO are caused by intrinsic factors. Additionally, the etiology of a UPJO often cannot be isolated to a single source and extrinsic factors such as crossing vessels were found to coexist with an intrinsic UPJO in 54.5% of patients. There was also an option of ligating the crossing vein during the pyeloplasty. It is not recommended to ligate lower pole crossing vessel due to the risk of renal parenchymal ischemia. While it was confirmed during the operation that the crossing vein did not arise from the kidney, we decided to preserve the vessel due to ignorance regarding the area of drainage and to prevent any iatrogenic complications resulting from ligation, and to preserve the original anatomy.

Figure 2. A retrograde pyelogram done intraoperatively showing right UPJO. UPJO, Ureteropelvic junction obstruction.
CONCLUSION
Crossing vessels constitutes a common cause of UPJO in teenagers. This case presents a peculiar cause of UPJO by a lumbar vein and may represent an anatomical variant to be mindful of in future cases.

SUPPLEMENTARY MATERIALS
Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.urology.2019.01.016.

Figure 3. Images taken intraoperatively show the right kidney, UPJ, and the crossing vessel. (A) The right renal pelvis is dilated and the crossing vessel over the UPJ appears to be the cause of the UPJO. (B) The black dotted line highlights the lower pole of the right kidney indicating that the crossing vessel does not originate from there. (C) The blue dotted line indicates the course of the crossing vessel into the posterior abdominal wall. The white dotted line highlights the lower pole of the right kidney. UPJ, ureteropelvic junction; UPJO, ureteropelvic junction obstruction. (Color version available online.)
References


