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Research Article

Robotic Transmesocolic Vertical Flap Pyeloplasty For Pelviureteric Junction Obstruction In A Horseshoe Kidney: Overcoming Anatomical Challenges In A Pediatric Patient.

Manickam Ramalingam, Senthil Kallappan, Sivasankaran Nachimuthu, Haritha Rajan

Hindusthan Hospital, Coimbatore

INTRODUCTION

Horseshoe kidney is the most common renal fusion anomaly and is frequently associated with pelviureteric junction obstruction (PUJO). Surgical correction can be technically challenging due to abnormal renal rotation, anomalous vasculature, and altered anatomical relationships. With advances in minimally invasive surgery, robotic-assisted pyeloplasty has emerged as an effective and precise technique for the management of PUJO, even in anatomically complex kidneys [1]. We present a case of robotic transmesocolic vertical flap pyeloplasty performed for PUJO in a child with a horseshoe kidney.

Keywords: Horseshoe kidney, PUJ obstruction, vertical flap pyeloplasty

CASE REPORT

A 6-year-old female, the second child of consanguineous parents and born by cesarean section, had normal developmental milestones, presented with a one-month history of abdominal pain associated with fever, dysuria, and vomiting. There was no history of hematuria. Contrast-enhanced computed tomography (CECT) of the abdomen and pelvis revealed moderate hydronephrosis of the left moiety with narrowing at the pelviureteric junction, suggestive of congenital left-sided PUJ obstruction. CT renal angiography demonstrated a horseshoe kidney with fusion of the lower poles across the midline anterior to the aorta and inferior vena cava. Gross hydronephrosis of the left kidney with an anterolaterally positioned PUJ narrowing was noted as shown in **Fig 1 a**. Bilateral double renal arteries were present, with an accessory renal artery arising from the left common iliac artery. A single renal vein was noted on each side, with early tributaries from the right renal vein. Diuretic renography (DTPA scan) revealed a hydronephrotic partially obstructed left moiety with reduced cortical function, while the right moiety was normal in size and function without obstruction as shown in **Fig 1b. Tab. 1** shows the GFR rate between right versus left moieties with relative function.

***Corresponding Author:** **Manickam Ramalingam,** Urology Department Hindusthan Hospital Nava India, Avinashi Road Coimbatore.
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Figure 1a. Ct- Gross Hydronephrosis Of The Left Kidney With An Anterolaterally Positioned Puj Narrowing.

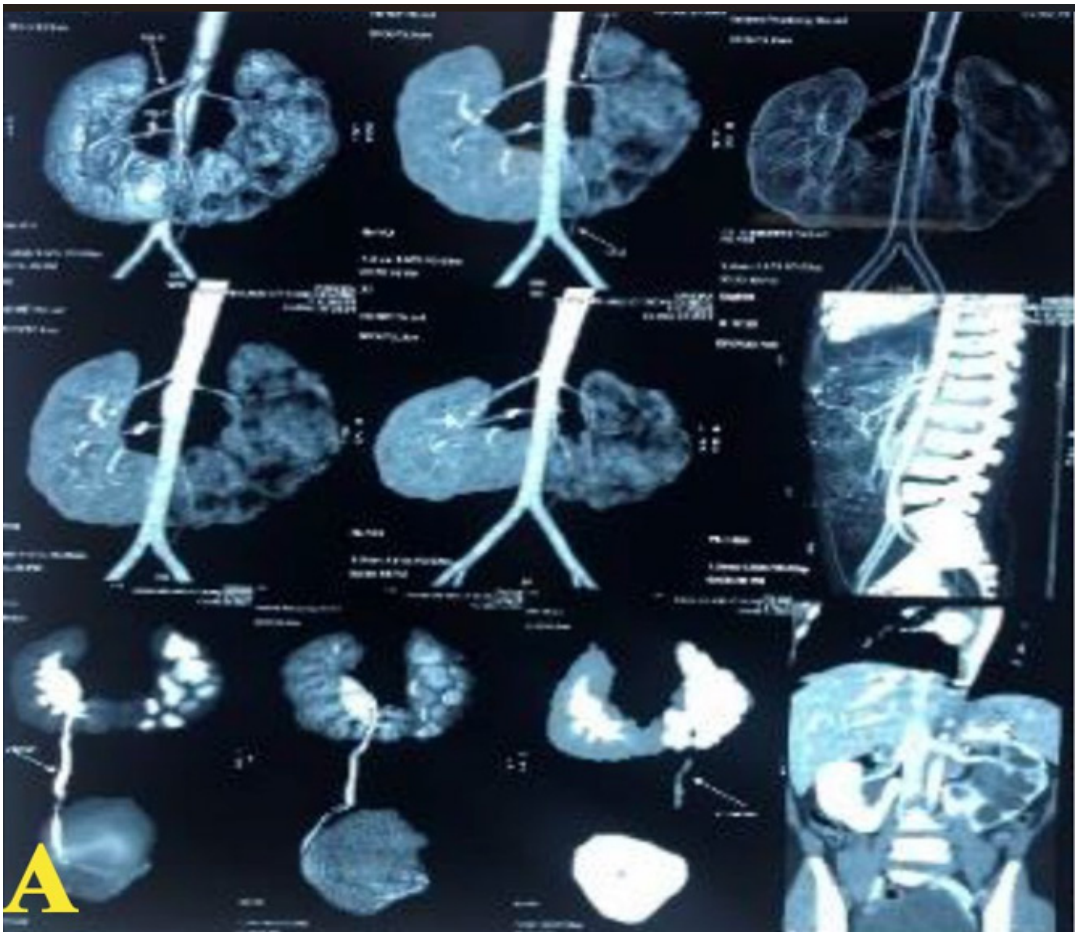


Figure 1b. Dtpa- Obstructed Left Kidney With Reduced Cortical Function.

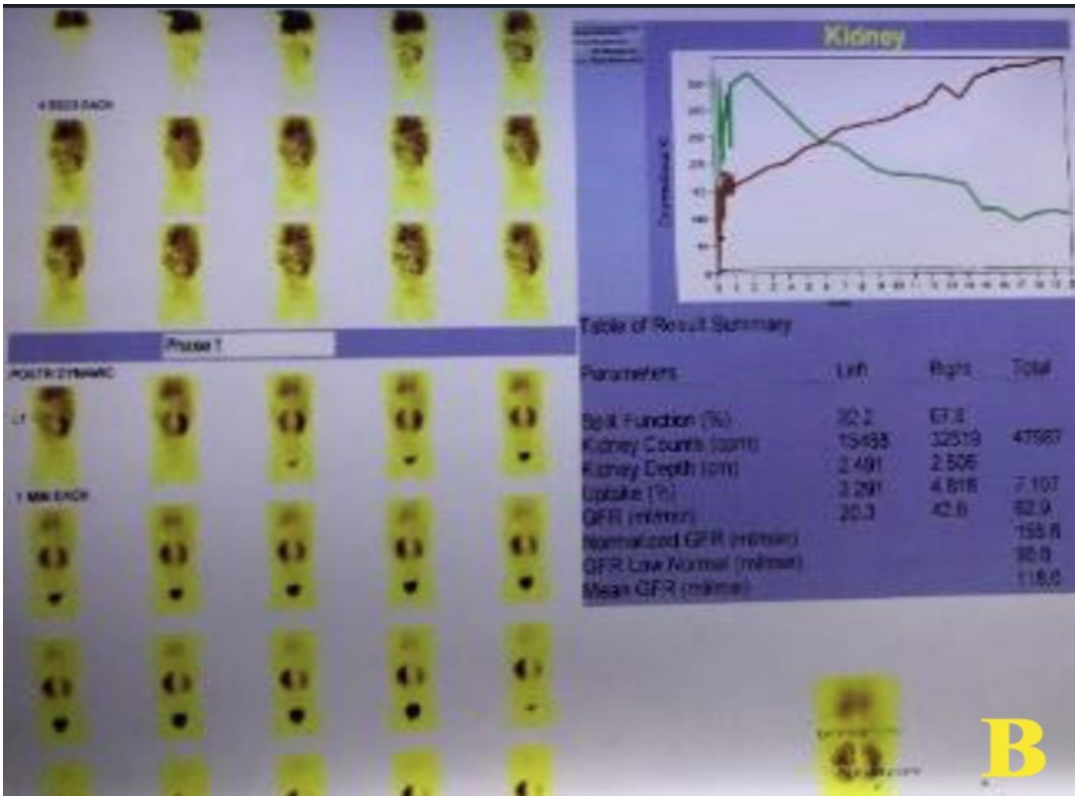


Table 1.

	Left	Right	Total
GFR	20.3ml/min	42.6ml/min	62.9ml/min
% Relative function	32%	68%	
Intrarenal transit	6min	2 min	
Excretory t1/2	Prolonged	13 min	
Retension	++ (pelvis)	Nil	

SURGICAL PROCEDURE

Under general anesthesia, the patient was initially placed in the lithotomy position and Retrograde pyelography confirmed a long-segment narrowing (approximately 3 cm) of the left pelviureteric junction (PUJ) as shown in **Fig 2 a**. The patient was then repositioned to a 70-degree left lateral position.

Robotic ports were placed using three robotic arms along the pararectal line (approximately 11 cm apart) and one 5-mm assistant port. A transmesocolic approach was used to expose the PUJ shown in **Fig 2b**. The malrotated anteriorly located renal pelvis and proximal ureter were carefully mobilized, preserving the intervening left colic artery. As the narrowed UPJ segment was longer a dismembered pyeloplasty was thought to be fraught with tension in the suture line, we decided to make use of the dilated pelvis to create a long vertical flap and do a tension free flap pyeloplasty.

A vertical pyelotomy was performed and a vertical pelvic flap measuring approximately 3 cm was fashioned as shown in **Fig 2c**. Posterior layer of vertical flap anastamosted to spatulated ureter safeguarding intervening left colic artery shown in **Fig 2d.** An Antegrade 4.5 Fr double pigtail stent was placed as shown in **Fig 2e**. A non-dismembered vertical flap pyeloplasty was performed using continuous 5-0 monofilament absorbable suture as shown in **Fig 2f**. Hemostasis was secured and the suture line was reinforced with perinephric fat. A tube drain was placed and the ports were closed with absorbable sutures.

Child was stable intraoperatively, with an estimated blood loss of approximately 50 ml. A 10-Fr urethral Foley catheter was placed.

Figure 2a. RGP confirmed a bit long segment narrow left pelvic ureteric junction.

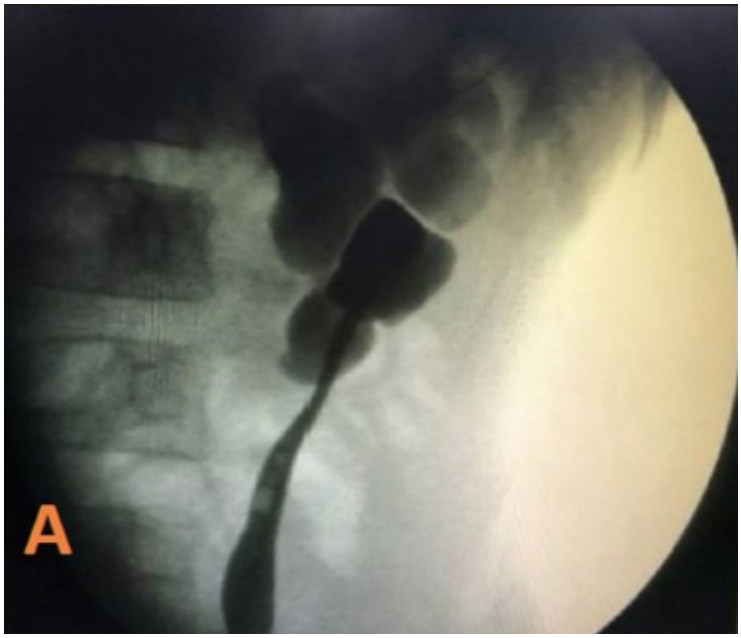


Figure 2b. Initial view showing left moiety (LM) and ureter (U) as seen through mesocolon.

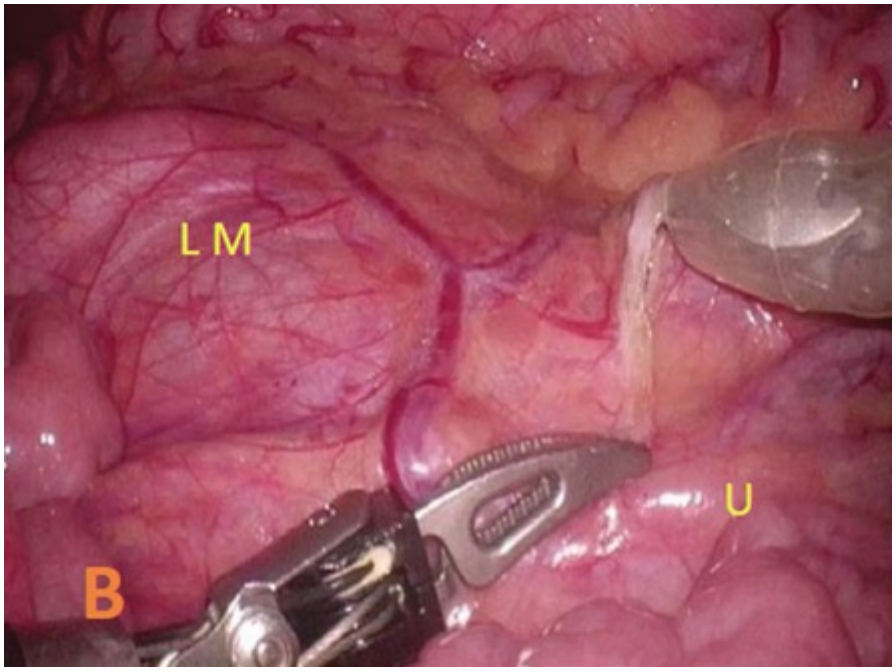


Figure 2c. A 3 cm anterior pelvic flap fashioned.

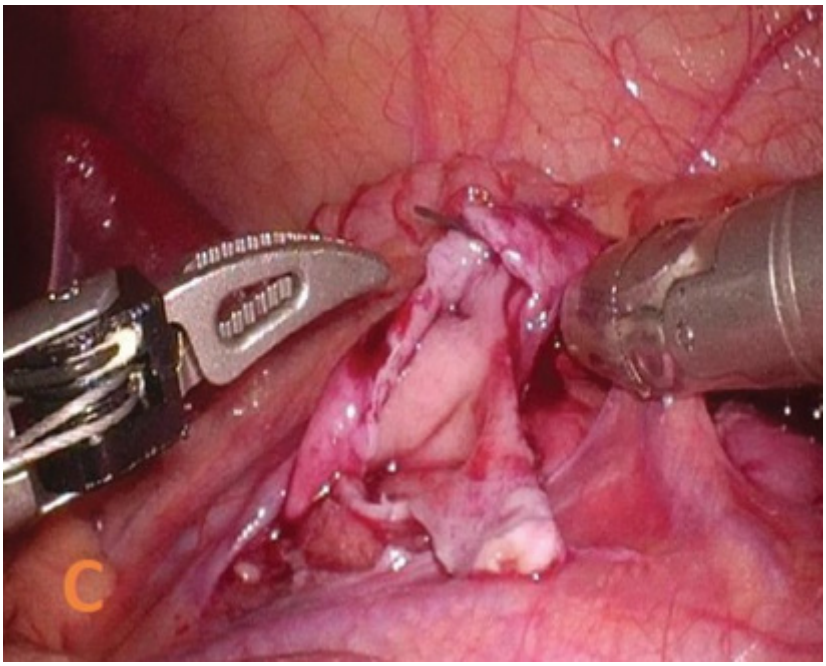


Figure 2d. Posterior layer of vertical flap anastomosed to spatulated ureter safeguarding intervening left colic artery.

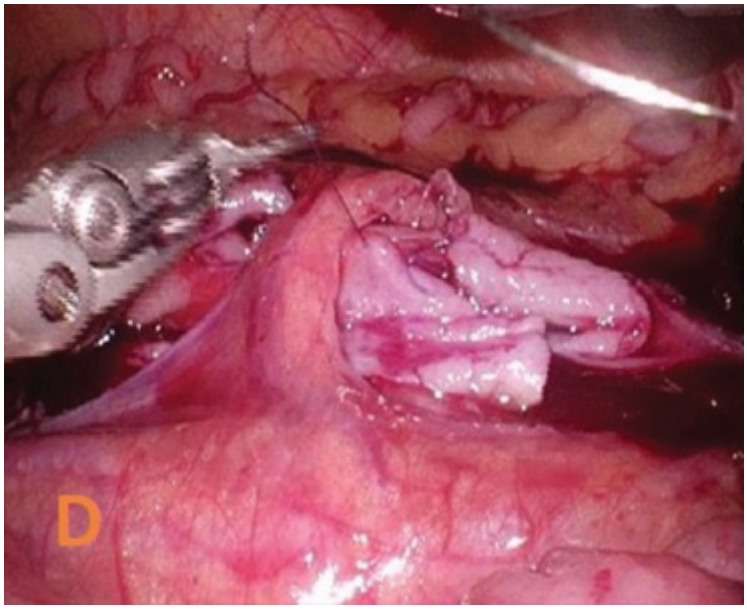


Figure 2e. Antegrade stenting in progress.

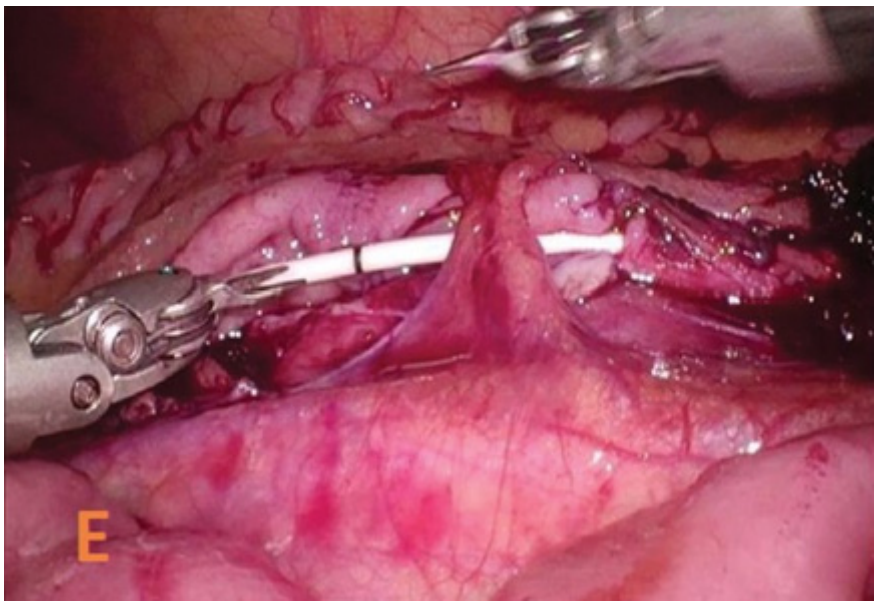
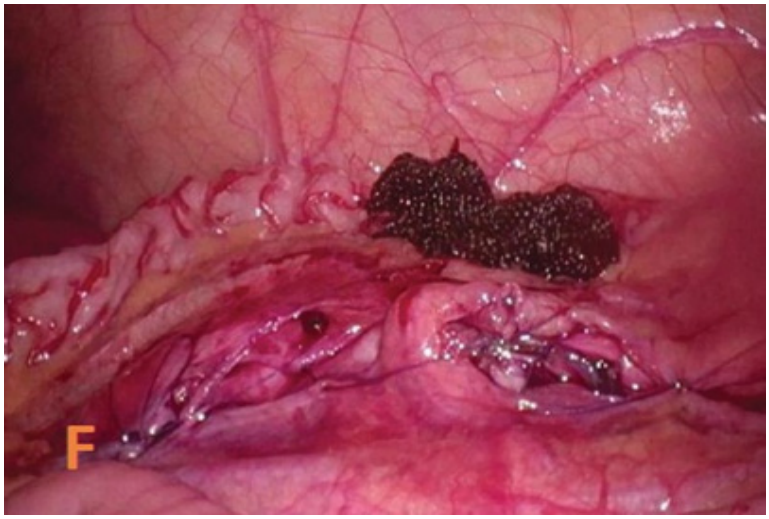


Figure 2f. Completed vertical flap pyeloplasty.



RESULTS

The operative time was 150 minutes and the estimated blood loss was approximately 50 ml. No intraoperative or postoperative complications were encountered. The patient received appropriate intravenous antibiotics, proton pump inhibitors, analgesics, anticholinergic medications, and supportive care. The urinary catheter was removed on postoperative day 2, and the drain was removed on postoperative day 4 after noting minimal collection. The patient was discharged on postoperative day 5. On 2 -month follow-up computed tomography showed a well decompressed pelvicalyceal system and stent in situ as shown in **fig 3a**. Postoperative renography showed improvement in renal drainage and function as shown in **Fig 3b** and **Table 2**. Stent removal was done, Retrograde pyelography confirmed fairly broad PUJ at the anastomotic site. Ureteroscopy showed a widely patent PUJ as shown in **Fig 3c**. On 1-year follow-up her renal function remained well.

Figure 3a. CT- no evidence of extravasation and stent insitu.

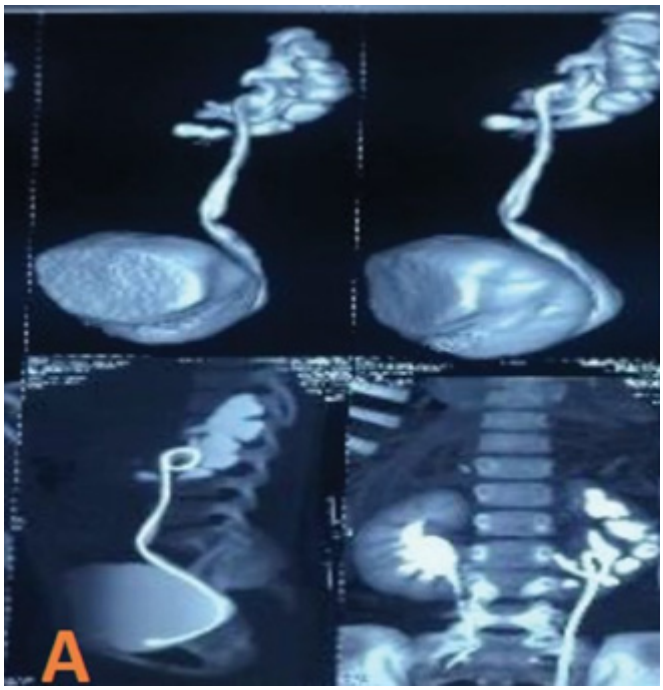


Figure 3b. DTPA shows improvement in renal drainage and function.

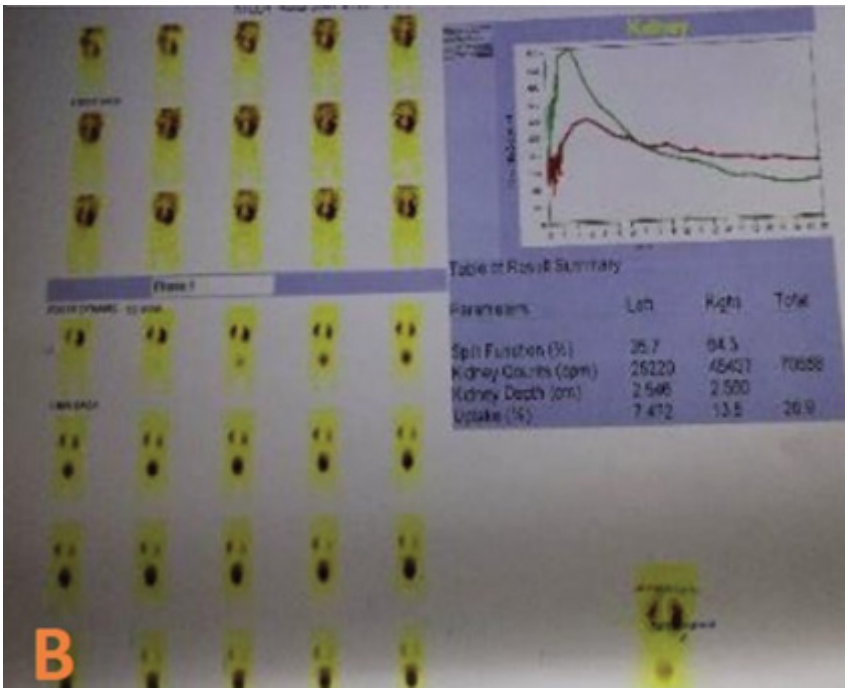


Figure 3c. Ureteroscopy shows a widely patent PUJ.

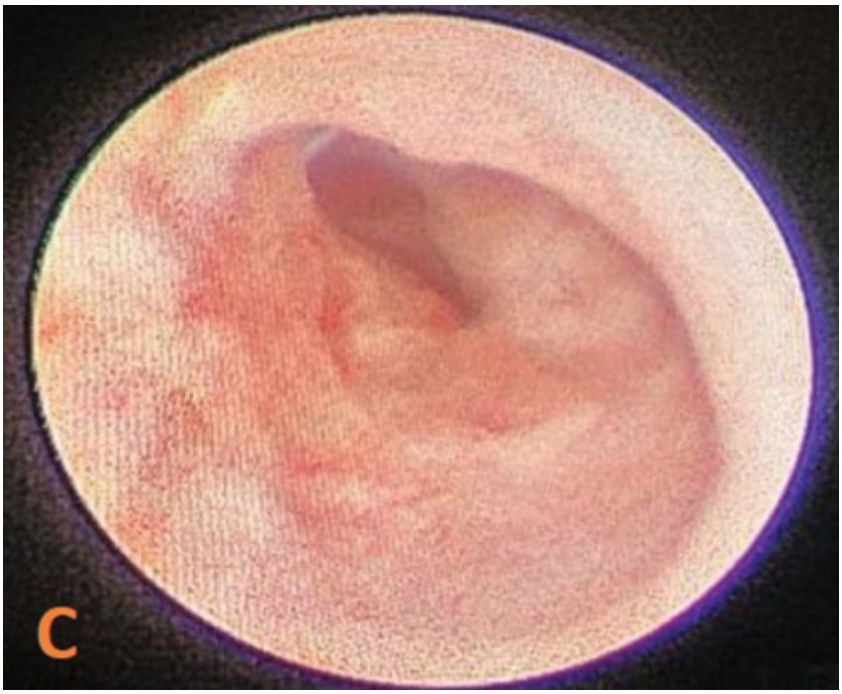


Table 2.

	Left	Right	Total
GFR	36ml/min	64 ml/min	62.9ml/min
% Relative function	32%	68%	
Intrarenal transit	3 min	4 min	
Excretory t1/2	Prolonged	13 min	
Retension	++ (pelvis)	Nil	

DISCUSSION

Horseshoe kidney is the most common renal fusion anomaly and is frequently associated with several urological abnormalities. The abnormal fusion of the lower poles during embryogenesis results in malrotation of the kidneys, abnormal vascular supply, and altered spatial orientation of the renal pelvis and ureter, which predisposes patients to urinary drainage problems [1].

Among the associated anomalies, pelvi-ureteric junction obstruction (PUJO) is the most frequently reported condition, occurring in approximately 15–35% of patients with horseshoe kidney. The etiology of obstruction is multifactorial and may include high ureteral insertion, anomalous crossing vessels, abnormal renal rotation, and compression by the renal isthmus [2].

Open dismembered pyeloplasty has historically been regarded as the standard surgical treatment for PUJO. However, with the development of minimally invasive techniques, laparoscopic and robotic-assisted pyeloplasty has become a widely accepted alternatives with comparable success rates and improved postoperative recovery [3]. The robotic platform offers significant advantages including three-dimensional visualization, enhanced dexterity, tremor filtration, and improved suturing precision, which are particularly useful during reconstructive procedures in anomalous kidneys [4-5].

In the present case, the presence of a horseshoe kidney with abnormal renal rotation and accessory vascular anatomy posed additional surgical challenges. A transmesocolic approach was utilized to access the pelviureteric junction directly, which provides a shorter operative route and avoids extensive mobilization of the colon in cases where the renal pelvis lies anteriorly.

A vertical flap pyeloplasty was performed instead of a dismembered Anderson-Hynes pyeloplasty due to the long-segment narrowing and presence of a dilated renal pelvis. This technique allows the creation of a well-vascularized pelvic flap, enabling tension-free reconstruction while preserving ureteral continuity.

We performed a robotic vertical flap pyeloplasty, which is a non-dismembered reconstructive technique particularly useful in cases with a dilated renal pelvis and a short proximal ureter. The technique allows creation of a well-vascularized

pelvic flap to widen the obstructed segment while maintaining ureteral continuity.

Recent studies have reported excellent outcomes of robotic pyeloplasty in pediatric patients with complex renal anatomy. Abdulfattah S, Aghababian A, Saxena S et al. demonstrated high success rates of robotic pyeloplasty in children with anatomical anomalies, highlighting the safety and feasibility of the robotic approach [6]. Similarly, recent case reports have described successful robotic pyeloplasty in horseshoe kidneys with favorable postoperative outcomes [7-8].

Our case further supports the growing body of evidence that robotic-assisted pyeloplasty is a safe and effective minimally invasive option for managing PUJO in children with horseshoe kidney, even in the presence of complex vascular anatomy. Careful preoperative imaging and meticulous surgical planning and execution remain essential for achieving optimal surgical outcomes.

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