Case Report

Combination of robot-assisted laparoscopic pyeloplasty for lower moiety ureteropelvic junction obstruction in a partial duplex system and percutaneous endoscopic surgery for renal calculi reusing the port for robotic pyeloplasty

Hidenori Nishio,[1] Kentaro Mizuno,[1] Daisuke Matsumoto,[2] Keiichi Tozawa,[3] Takahiro Yasui[2] and Yutaro Hayashi[1]

Departments of [1]Pediatric Urology, [2]Nephro-Urology, and [3]Medical Safety Management, Nagoya City University Graduate School of Medical Sciences, Nagoya, Japan

Abbreviations & Acronyms
CT = computed tomography
DRF = differential renal function
LP = laparoscopic pyeloplasty
RALP = robot-assisted laparoscopic pyeloplasty
UPJ = ureteropelvic junction
UPJO = ureteropelvic junction obstruction

Correspondence: Kentaro Mizuno M.D., Department of Pediatric Urology, Nagoya City University Graduate School of Medical Sciences, 1, Kawasumi, Mizuho-cho, Mizuho-ku, Nagoya 467-8601, Japan.
Email: kmizuno@med.nagoya-cu.ac.jp

How to cite this article: Nishio H, Mizuno K, Matsumoto D *et al*. Combination of robot-assisted laparoscopic pyeloplasty for lower moiety ureteropelvic junction obstruction in a partial duplex system and percutaneous endoscopic surgery for renal calculi reusing the port for robotic pyeloplasty. *IJU Case Rep*. 2023; 6: 390–393.

Received 24 May 2023; accepted 19 August 2023.
Online publication 3 September 2023

Introduction: Ureteropelvic junction obstruction is often associated with renal calculus formation. However, there is no report of using robot-assisted laparoscopic pyeloplasty combined with percutaneous endoscopic surgery for ureteropelvic junction obstruction and renal calculi in a partial duplex system.
Case presentation: A 19-year-old female patient with lower moiety ureteropelvic junction obstruction and renal calculi in a partial duplex system was referred to our hospital because of left lumbar pain, left acute pyelonephritis, and an increase in left renal calculi during follow-up at the referral hospital. To prevent the complication of percutaneous nephrolithotripsy following pyeloplasty, robot-assisted laparoscopic pyeloplasty combined with percutaneous endoscopic surgery was performed. Two years after surgery, the patient reported no left lumbar pain.
Conclusion: The combination of robot-assisted laparoscopic pyeloplasty and percutaneous endoscopic surgery can be proposed as a safe and less-invasive treatment option for ureteropelvic junction obstruction and renal calculi in a partial duplex system.

Key words: duplex system, percutaneous endoscopic surgery, pyeloplasty, renal calculi, ureteropelvic junction obstruction.

Keynote message

The simultaneous treatment of ureteropelvic junction obstruction and renal calculi in a partial duplex system is challenging. However, we safely performed robot-assisted laparoscopic pyeloplasty combined with percutaneous endoscopic surgery because of robotic superiority over conventional laparoscopic pyeloplasty owing to the delicate nature of the procedure. We believe the simultaneous treatment can be proposed as a safe and less-invasive treatment option for ureteropelvic junction obstruction and renal calculi in a partial duplex system.

Introduction

UPJO is the common obstructive pathology of the upper urinary tract.[1] Patients with UPJO have a 16–30% chance of concomitant calculus.[2] Because UPJO in a duplex system is an uncommon anomaly, reported in 2–7% of patients with UPJO,[3] UPJO complicated with renal calculi in a duplex system is extremely rare.

Herein, we report a case of lower moiety UPJO and renal calculi in a partial duplex system in a 19-year-old female patient who was successfully treated using a combination of RALP and percutaneous endoscopic surgery.

Case presentation

A 19-year-old female patient was referred to our hospital with left lower moiety UPJO and left renal calculi in a partial duplex system due to left lumbar pain, left acute pyelonephritis, and an increase in left renal calculi.

Abdominal CT revealed multiple left renal calculi (Fig. 1a) and left partial duplex system with lower moiety UPJO (Fig. 1b). A diethylenetriaminepentaacetic acid scan revealed obstructed drainage at the UPJ, although DRF assessed using a dimercaptosuccinic acid scan was 50.6% for the left kidney and 21.0% for the lower moiety. Therefore, we performed RALP combined with percutaneous endoscopic surgery.

RALP was performed with a retrocolic approach using an 8-mm camera port, two 8-mm working ports, and an additional 5-mm port for assistance. When Gerota's fascia was incised near the lower edge of the left kidney, a Y-shaped left ureter, which was the site of confluence of the upper and lower moiety ureter, was identified just below it (Fig. 2a). No crossing vessels were observed around the lower moiety UPJ. The left lower renal pelvis was lifted upward using a 2-0 Vicryl and the lower renal pelvis was incised, after which a 6-F flexible ureteroscope (Viper-M®, Richard Wolf, Tokyo, Japan) was inserted into the renal pelvis through the assistant port (Fig. 2b). The left renal calculi were retrieved using basket forceps (NCircle®, Cook Medical Japan, Tokyo, Japan) (Fig. 2c) and placed into the specimen retrieval bag (EZ PURSE®, Hakko Co., Nagano, Japan).

After spatulating on the common ureter where it was excised from the UPJ (Fig. 2d) and completely resecting the UPJ tissue, we performed an anastomosis of the dorsal side of the lower pole pelvis and common ureter using 6-0 monocryl. We then placed a 4.8-F 24-cm-long ureteral stent in an antegrade fashion and confirmed the appropriate stent positioning (Fig. 2e). Subsequently, the anastomosis of the ventral side of the lower pole pelvis was completed (Fig. 2f), and Gerota's fascia was sutured using 5-0 Vicryl. The bag was removed from the umbilical port wound. The ureteral stent was removed 4 weeks postoperatively. Postoperative CT revealed no lower moiety UPJO or dilatation of the upper

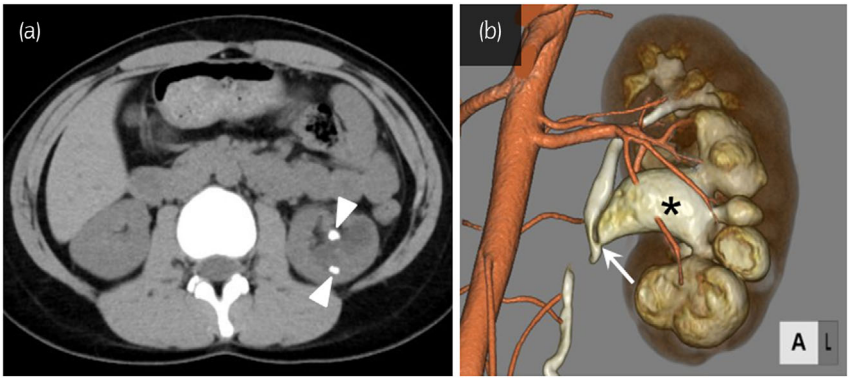

Fig. 1 CT findings at the time of referral to our hospital. (a) Plain CT in the transverse plane reveals left renal calculi (arrowheads) in the lower calyx and hydronephrosis of the left lower moiety. (b) Three-dimensional CT in the coronal plane revealing a UPJO (arrow) of the lower moiety. The asterisk indicates the renal pelvis of the lower moiety.

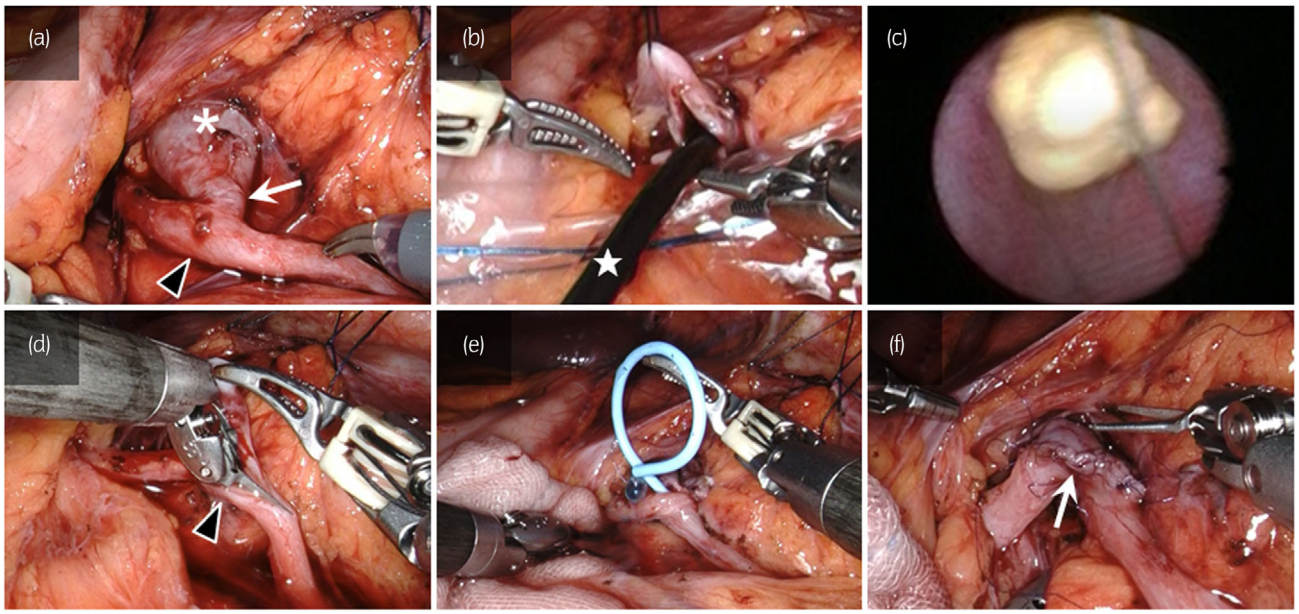

Fig. 2 RALP (a, d–f) and percutaneous endoscopic surgery findings (b, c). (a) A Y-shaped left ureter, which is the site of the confluence (arrowhead) of upper and lower ureters, is identified near the lower edge of the left kidney. The arrow indicates a lower moiety UPJO. The asterisk indicates the renal pelvis of the lower moiety. (b) A 6-F flexible ureteroscope (star) is inserted into the incision of the renal pelvis through the assistant port. (c) The left renal calculus of the lower calyx is retrieved using basket forceps. (d) The common ureter (arrowhead) is spatulated longitudinally beyond the UPJ by grasping the tissue of UPJ to be excised. (e) A dilute methylene blue solution injected into the bladder through the Foley catheter flows out from the renal pelvic end of the ureteral stent. (f) The anastomosis is completed. The arrow indicates the ventral sutured line between the lower pole pelvis and the common ureter.

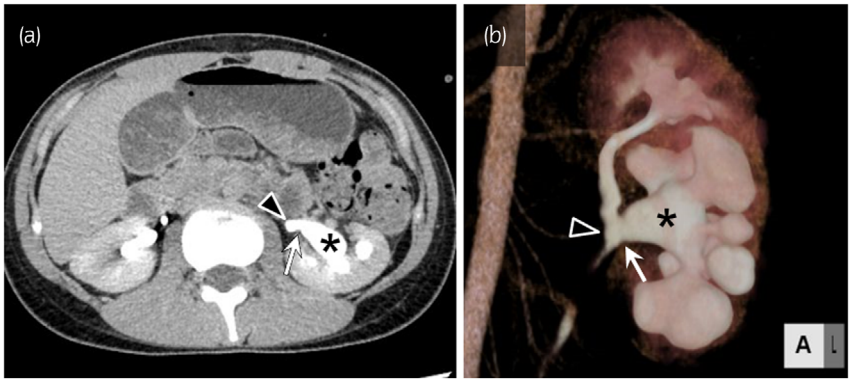

Fig. 3 Postoperative CT findings. CT-delayed urography in the transverse plane (a) and three-dimensional CT in the coronal plane (b) revealing no lower moiety UPJO. The arrowhead indicates the common ureter where the upper and lower moiety ureter meet. There is no stricture at the anastomosis (arrow) and no dilatation of the upper moiety ureter. Asterisks indicate the renal pelvis of the lower moiety.

moiety ureter (Fig. 3a,b). Two years after the operation, the left DRF was preserved, and the patient had no left lumbar pain.

Discussion

UPJO can be accompanied by nephrolithiasis because of obstruction of the renal collecting system, with resultant urinary stasis and delayed washout of crystalline aggregates, thus promoting calculus formation.[2] Open pyeloplasty and pyelolithotomy have long been the gold standard therapy for UPJO and renal calculi.[2] However, minimally invasive laparoscopic or robot-assisted techniques have recently been used as alternatives for therapy.[4–6] To our knowledge, this is the first report of combining RALP and percutaneous endoscopic surgery for lower moiety UPJO and renal calculi in a partial duplex system.

Surgical methods for UPJO in a duplex system are dismembered pyeloplasty or ureteropyelostomy/pyelopyelostomy, depending on the site of ureteral confluence.[3] We chose end-to-side pyeloureterostomy because the length of the lower moiety ureter was short in the present case.

LP for UPJO in a duplex system has been successfully performed.[7] However, it is challenging for several reasons. First, effective visual development for the surgical site around the UPJ is difficult because the pelvis of the lower moiety is not sufficiently lifted. Second, when the lower moiety ureter is short, the UPJ tissue has to be resected delicately. Third, it is difficult to spatulate the common ureter longitudinally because the mobility of the sparing common ureter is poor. Although only five cases of RALP for UPJO in a duplex system have been reported,[8–11] we performed RALP successfully because of its superiority over conventional LP owing to the delicate nature of the procedure. However, the operator has no sense of touch in robotic surgery contrary to open surgery and laparoscopic surgery. Therefore, it is crucial not to force and tear the renal pelvis based on visual information when the incision site of the renal pelvis is close to the renal parenchyma especially in the case with a partial duplex system.

Percutaneous endoscopic surgery combined with LP or RALP has recently been performed and can prevent complications of percutaneous nephrolithotripsy, including nephrostomy tract bleeding, because the endoscope can reach the renal calculi through trocars and renal pelvic incisions without puncturing the renal parenchyma.[4–6] Concerning endoscopic equipment, a rigid nephroscope is easy to manipulate and can readily enter almost all calyces in a fully dissociated kidney.[4] However, a flexible endoscope may also be used for easy access to inferior calyx stones because the infundibulopelvic angle is sufficiently large when the endoscope passes through the renal pelvis incision.[5,6] It appears preferable to extract renal calculi without lithotripsy because lithotripsy carries the risk of outflow of calculus fragments and bacteria in the calculus into the abdominal cavity; moreover, its impact is unclear.[4,5] Therefore, it is desirable to perform simultaneous surgery when renal calculi are small enough to be extracted through a renal pelvic incision without lithotripsy.

Conclusion

The combination of RALP and percutaneous endoscopic surgery can be proposed as a safe and less-invasive treatment option, although surgical management should be fully considered based on individual anatomy of the UPJO and condition of the renal calculi in a partial duplex system.

Author contributions

Hidenori Nishio: Conceptualization; data curation; writing – original draft. Kentaro Mizuno: Writing – review and editing. Daisuke Matsumoto: Data curation. Keiichi Tozawa: Supervision. Takahiro Yasui: Supervision. Yutaro Hayashi: Supervision.

Conflict of interest

The authors declare no conflict of interest.

Approval of the research protocol by an Institutional Reviewer Board

The protocol for this research project has been approved by the Institutional Review Board of Nagoya City University Hospital, Nagoya, Japan, and it conforms to the provisions of the Declaration of Helsinki (approval no. 60-22-0032).

Informed consent

Not applicable.

Registry and the Registration No. of the study/trial

Not applicable.

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