Case Report

Robot-assisted laparoscopic pyeloplasty in the management of lower pole ureteropelvic junction obstruction in a patient with an incomplete duplicated collecting system

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Abbreviations & Acronyms
A-H = Anderson–Hynes
RALP = robot-assisted laparoscopic pyeloplasty
UPJO = ureteropelvic junction obstruction

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Introduction: The performance of robot-assisted laparoscopic pyeloplasty has recently been increasing in frequency. However, patients with duplicated renal pelvises and ureters can present challenges.

Case presentation: A 71-year-old woman presented with flank pain and was diagnosed with ureteropelvic junction obstruction with an incomplete duplicated collecting system. Preoperative imaging did not reveal the details of the stenosis. Therefore, three reconstructive procedures were prepared: The Anderson–Hynes procedure, end-to-side pyeloureterostomy, and upper pole ureter to lower pole pyeloplasty with the Anderson–Hynes procedure for the lower pole. These procedures were determined by the length of the intact ureter and the presence of crossed vessels. During the surgery, the crossing vein was severed, allowing successful reconstruction with Anderson–Hynes anastomosis.

Conclusion: Preoperative evaluation and preparation of multiple surgical techniques are crucial in robot-assisted laparoscopic pyeloplasty for incomplete duplicated collecting systems.

Key words: Anderson–Hynes anastomosis, incomplete duplicated systems, lower pole ureter, robot-assisted laparoscopic pyeloplasty, ureteropelvic junction obstruction.

Keynote message

When treating ureteropelvic junction obstruction in patients with duplex collecting systems, a good understanding of the advantages of robot-assisted laparoscopic pyeloplasty and keeping in mind several surgical techniques will increase the chance of achieving a favorable outcome.

Introduction

RALP has been widely performed since Gettman *et al*.[1] first reported it in 2002. Many cases of UPJO have been accumulated to date, and the safety and efficacy of RALP have been demonstrated.[2] Although the most commonly performed procedure at present is the A-H dismembered technique, the A-H technique is not always effective in patients with abnormal anatomy.[3] Other techniques, such as end-to-side pyeloureterostomy, are sometimes helpful for UPJO in patients with incomplete duplicated collecting systems. An extensive case series reported a 2–7% incidence of UPJO in patients with incomplete duplicated systems.[2,4,5] When duplicated systems exist in patients with UPJO, it is unclear whether RALP can be performed safely because of the many anatomical variations compared with typical UPJO. Moreover, treatment is often challenging because there is no clear evidence regarding which anastomosis technique should be chosen for which pattern of incomplete duplicated collecting systems in UPJO.

We herein report a successful case of RALP for a lower pole UPJO with incomplete duplicated systems in which we prepared three different reconstructive plans preoperatively.

Case

Patient

A 71-year-old woman presented with right flank pain. Computed tomography showed hydronephrosis of the right kidney and an incomplete duplicated collecting system. Computed tomography suggested possible crossing of the vein from the lower moiety of the kidney draining into the gonadal vein. Retrograde pyelography revealed significant narrowing of the right lower pole ureter, preventing guidewire passage. The right lower pole ureter was highly constricted approximately 1 cm from the confluence with the upper pole ureter (Fig. 1a–c). A preoperative Tc-99m MAG3 scan showed an obstructive pattern in the right lower pole (Fig. 1d). After excluding malignant diseases, Surgical intervention was planned based on persistent flank pain and evidence of urinary obstruction on MAG3 renography.

Three surgical options

Deciding on the best surgical procedure was challenging due to preoperative imaging ambiguities, specifically concerning the length of the ureter from the kidney's lower moiety, adhesions between the extrarenal pelvis and lower pole ureter, and presence of crossing vessels. Therefore, our approach was decided based on intraoperative findings (Fig. 2): A-H procedure if adequate distance existed between the UPJ and the ureteral crossing point of the lower and upper pole segments, end-to-side pyeloureterostomy if said distance was insufficient, or an upper pole ureter to lower pole pyeloplasty with the A-H procedure if stenosis was due to crossing vessels.

Surgical procedure

The da Vinci surgical system was used and the patient was placed in the lateral decubitus position. A total of five trocars

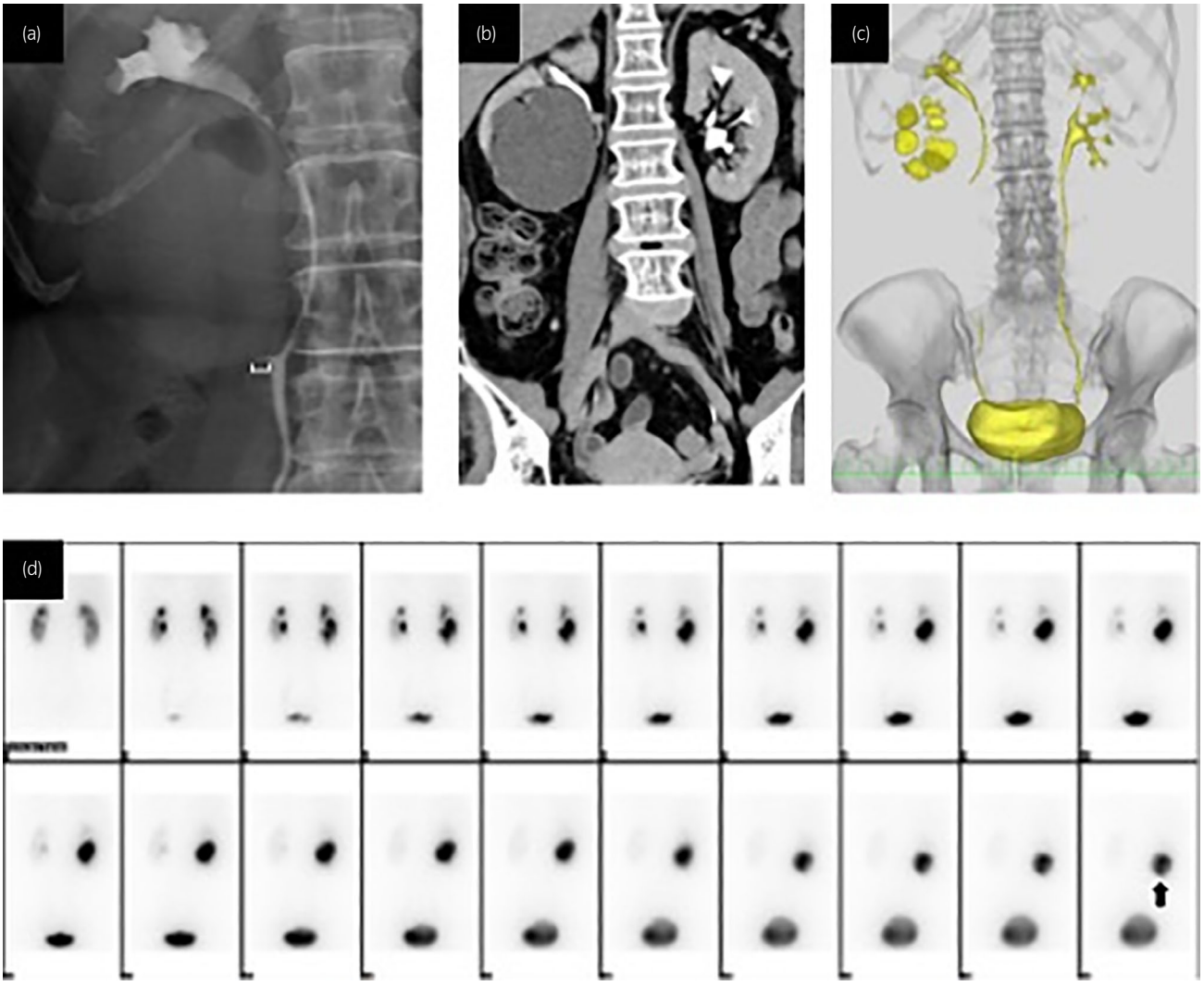

Fig. 1 Preoperative imaging evaluation. (a) Short and narrow ureter of the lower pole is identified by retrograde pyelography. The length of the ureter was 1 cm on imaging, but it was impossible to determine how much of the normal ureter was remaining. (b) Computed tomography showing hydronephrosis of the mid/lower calyx. (c) Computed tomography urography showing compression of the upper pole ureter due to the hydronephrosis of the mid/lower calyx. (d) Preoperative MAG3 scan showing an obstructive pattern in the right lower moiety in the late period (arrow).

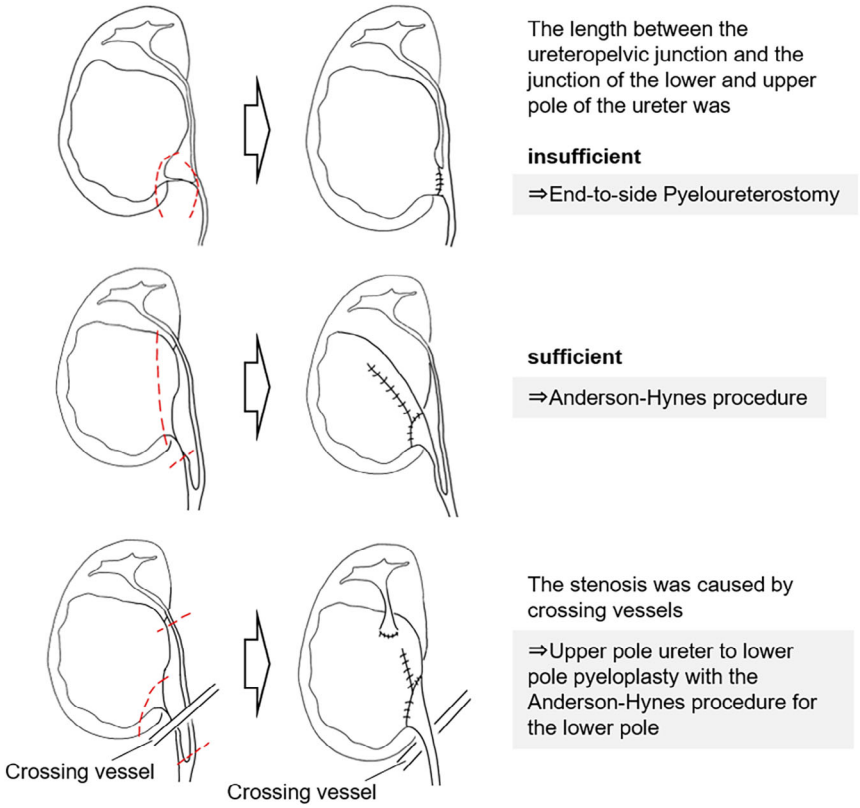

Fig. 2 Illustration of surgical techniques. Based on the preoperative images, it was impossible to identify the ureteral length between the ureteropelvic junction and the junction of the lower and upper poles of the ureter, the presence of adhesions, or the presence of crossing vessels. Therefore, three procedures were prepared for various situations.

were placed (Fig. 3) and transperitoneal approach was performed. The ureter was identified and traced up to the UPJ. The lower pole ureter was compressed anteriorly by the vein flowing from the kidney into the gonadal vein, and severe stenosis was observed at the same site. After severing the crossing vein, the ureter was separated from the surrounding tissue, which allowed us to secure a sufficient length of the lower pole ureter (Fig. 4a). Therefore, we performed dismembered pyeloplasty of the lower half of the kidney instead of end-to-side anastomosis. After placing a stay suture in the renal pelvis, an incision was performed in the anterior wall of the renal pelvis, and the stenotic segment of the lower moiety was excised (Fig. 4b). As a result, about 1 cm of the normal ureter was preserved from the junction of the lower and upper pole ureters. A 6Fr ureteral stent was antegradely inserted into the lower pole ureter (Fig. 4c). End-to-end anastomosis was performed with a running suture using 5-0 Monocryl (Fig. 4d). The operation time was 300 min, the console time was 193 min, and the blood loss was minimal.

Follow-up

The postoperative course was uneventful. The double-J stent was removed on day 15. On follow-up, the patient was pain-free, and the MAG3 scan showed improvement in the obstruction pattern.

Discussion

This case demonstrates two points: Lower pole UPJO in patients with incomplete duplicated collecting systems can be treated with RALP, and preparing several reconstructive plans for lower pole UPJO in advance is essential.

Few reports in the literature have addressed robot-assisted correction of UPJO in patients with a double collecting system.[4–6] When treating UPJO in duplex systems, it is crucial to ensure that the blood flow to the upper portion of the ureter is maintained and to prevent any narrowing. As a result, performing open or laparoscopic procedures in duplex systems can be technically demanding and necessitates proficiency in intracorporeal suturing techniques.[5] Robotic assistance is advantageous for intricate cases because it provides excellent dexterity, improved visualization, and faster and more accurate intracorporeal procedures. In this case, the benefits of RALP were evident during dissection and reconstruction of the lower pole ureter.

Preparing several reconstructive plans for lower pole UPJO in advance is essential. In lower pole UPJO, the length of the intact lower pole ureter is the primary determinant factor in selection of the surgical technique.[7] If the distance between the UPJ and the ureteral crossing point of the lower and upper pole segments is insufficient, end-to-side pyeloureterostomy is one option for managing duplex systems with lower pole UPJO.[8–10] To ensure appropriate intraoperative choices, the exact anatomy of the ureter and surrounding vessels must be understood. In this case, the distance from the ureteral bifurcation to the stenosis was sufficient, so the choice of the A-H procedure was correct. In most cases, it is crucial to determine the reconstructive procedure with retrograde pyelography immediately before reconstruction.[7] However, it is challenging to preoperatively determine whether the length of the lower pole ureter can be adequately

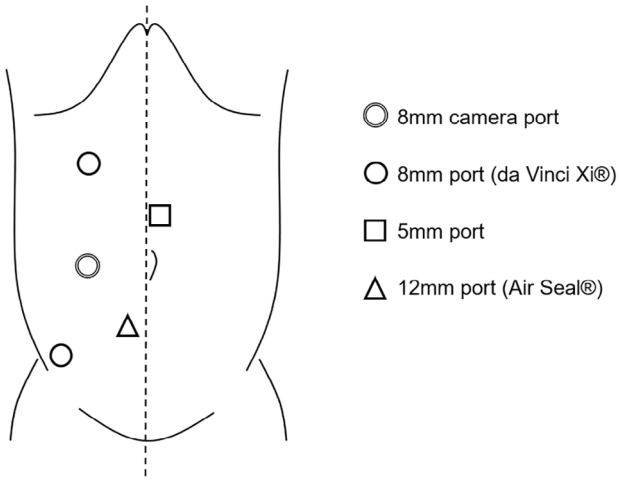

Fig. 3 Trocal placement. The camera port was positioned 6cm lateral to the navel. The DaVinci 8mm ports were placed 7cm caudally and 3.5cm laterally (for the left hand), and 8cm cranially (for the right hand) from the camera port. The 12mm port was positioned 5cm medially along the midline between the camera port and the DaVinci 8mm port (for the left hand). The 5mm port was placed 5cm medially on the midline between the camera port and the DaVinci 8mm port (for the right hand).

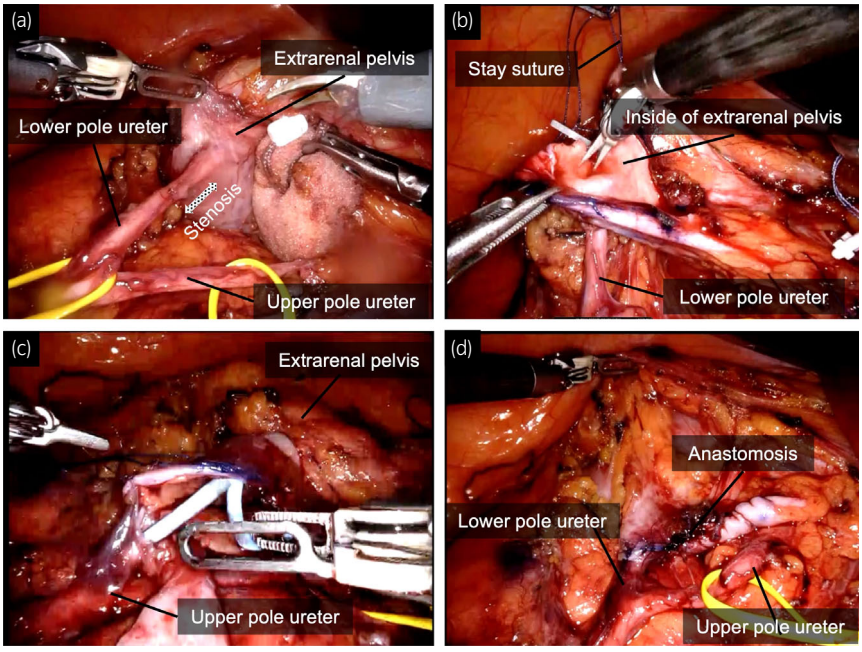

Fig. 4 Intraoperative procedure. (a) The crossing vessel was severed, and the stenotic site was identified. (b) An incision was made in the anterior wall of the extrarenal pelvis, and the stenotic site was excised along with it. (c) A 6Fr stent was antegradely placed in the ureter after the anastomosis of the posterior wall. (d) The excess renal pelvis wall was trimmed and anastomosed to the lower pole ureter.

preserved. Therefore, flexibility is required, including the utilization of techniques that have not been used before; additionally, the benefits of robotic surgery, with its high-resolution field of view and delicate workflow, could be significant. When treating UPJO in patients with duplex collecting systems, a good understanding of the advantages of RALP and keeping in mind the three surgical techniques mentioned in this article will increase the chance of favorable outcomes.

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Author contributions

Hideto Ueki: Data curation; formal analysis; investigation; writing – original draft; writing – review and editing. Tomoaki Terakawa: Conceptualization; supervision. Yasuyoshi Okamura: Supervision. Yukari Bando: Supervision. Takuto Hara: Supervision. Junya Furukawa: Project administration; supervision. Yuzo Nakano: Project administration; supervision. Masato Fujisawa: Project administration; supervision.

Conflict of interest

The authors declare no conflict of interest.

Approval of the research protocol by an Institutional Reviewer Board

This study was not subject to review by an institutional review board; therefore, no approval number was assigned.

Informed consent

Informed consent was not applicable to this study.

Registry and the Registration No. of the study/trial

The study was not registered in any registry; therefore, no registration number was assigned.

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