Case Report

A case of retrocaval ureter with robot-assisted ureteral reconstruction

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Abbreviations & Acronyms
IVC = inferior vena cava
RCU = retrocaval ureter

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Introduction: Retrocaval ureter is a rare congenital anomaly that causes ureteral obstruction. Because of the rarity of retrocaval ureter, only a few cases of open, laparoscopic, or robot-assisted surgery have been reported. We herein report a case of retrocaval ureter that was successfully reconstructed with robot-assisted surgery.
Case presentation: A 24-year-old woman was incidentally diagnosed with right hydronephrosis on ultrasonography. Computed tomography revealed retrocaval ureter, and the right hydronephrosis was attributed to the retrocaval ureter. The patient underwent robot-assisted right ureteral reconstruction in the left lateral decubitus position. No intraoperative or postoperative complications occurred, and no right hydronephrosis was observed 6 months after the operation.
Conclusion: The present case demonstrated the feasibility and efficacy of robot-assisted ureteral reconstruction for retrocaval ureter.

Key words: hydronephrosis, retrocaval ureter, robot-assisted ureteral reconstruction, robotic surgery, ureteroureteral anastomosis.

Keynote message

Retrocaval ureter is a rare congenital anomaly that causes ureteral obstruction. This case report demonstrated the feasibility and efficacy of robot-assisted ureteral reconstruction for retrocaval ureter.

Introduction

RCU is a rare congenital disorder.[1] RCU almost always affects the right ureter, resulting in right hydronephrosis. This condition requires treatment because it causes pain, urinary tract infection, urolithiasis, and renal dysfunction. Urinary tract reconstruction by laparotomy has conventionally been performed for treatment of RCU. After Matsuda *et al*.[2] reported laparoscopic urinary tract reconstruction in 1996, laparoscopic surgery for RCU became popular.

Surgical treatment of RCU includes transecting the ureter, repositioning it anterior to the IVC, and performing ureteroureteral anastomosis or pyeloplasty. Some recent reports have described robot-assisted urinary tract reconstruction for RCU.[1] We herein report a case of RCU treated by transperitoneal robot-assisted right urinary reconstruction.

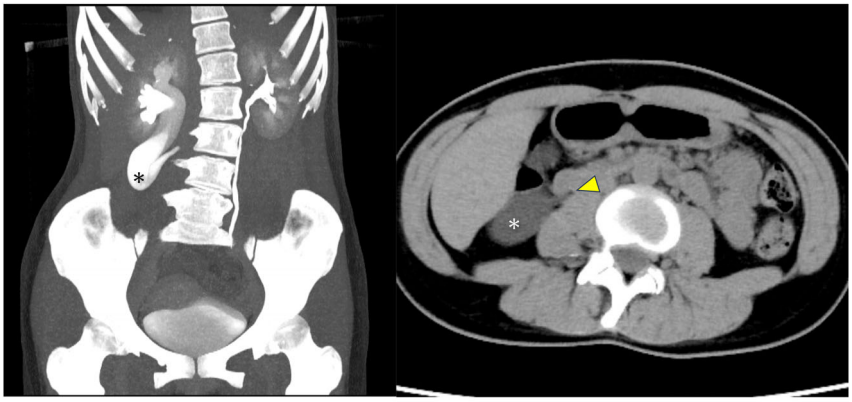
Case presentation

History

A 24-year-old woman was incidentally diagnosed with right hydronephrosis on ultrasonography and visited our institution. She was mostly asymptomatic, but noticed discomfort in her right lower back. She was a clinical laboratory technician and performed an abdominal ultrasound herself, which revealed right hydronephrosis. She had no history of strong right abdominal pain or urinary tract infection. She also had no known congenital anomalies.

Diagnosis

Contrast-enhanced computed tomography revealed right hydronephrosis and dilatation of the upper right ureter. In addition, part of the right ureter was suspected to be positioned posterior



(a) **Coronal plane** (b) **Axial plane**

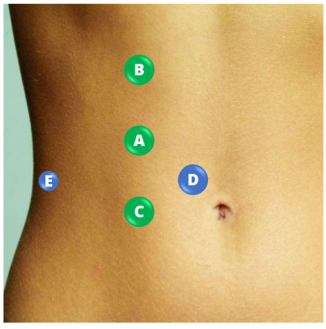
Fig. 1 Contrast-enhanced computed tomography revealed right hydronephrosis and dilatation of the upper right ureter. In addition, part of the right ureter was suspected to be positioned posterior to the inferior vena cava and to detour from the medial to lateral aspect of the inferior vena cava (yellow allow). (a) Coronal plane. (b) Axial plane. *Same site as the intraoperative findings.

to the IVC, detouring from the medial to lateral aspect of the IVC (Fig. 1a,b). Blood chemistry examination revealed no renal dysfunction or other abnormal findings. Serum creatinine was 0.55 mg/dL, and the estimated glomerular filtration rate was 115.3.

We explained the condition of RCU to her and her parents and presented the options of conservative and surgical treatment. Although she understood that aggressive surgical treatment was not indicated, she strongly preferred surgical treatment, considering the risk of future frank pain and urinary tract infection. After careful shared decision-making, we opted for surgical treatment. Ethical surgical procedures were considered, we selected robot-assisted surgery, which is the least invasive option.

Operation

Robot-assisted surgery was performed with the patient in the left lateral decubitus position. The port placement was similar to that in intraperitoneal robot-assisted right pyeloplasty (Fig. 2); that is, the camera port was placed in the right abdomen lateral to the navel, and the right- and left-hand ports were arranged linearly at 6-cm intervals. Monopolar curved scissors were placed in the surgeon's right hand, fenestrated bipolar forceps were placed in the left hand, and the scissors in the right hand were then changed to a large needle driver for suturing. An additional liver elevation port was installed during the operation.



(a) **DaVinci, Camera port**
(b) **DaVinci, Right hand**
(c) **DaVinci, Left hand**
(d) **AirSeal®**
(e) **Liver elevation port**

Fig. 2 Schema of port placement.

On intraperitoneal observation, the dilated right renal pelvis and right upper ureter were visible through the peritoneum. After peritoneal incision, the right renal pelvis and right ureter were dissected, taking care to maintain blood flow. Continuing dissection revealed that the right ureter was positioned posterior to the IVC. In addition, the ureter descended from the medial to lateral aspect of the IVC (Fig. 3a).

When dissection of the ureter was sufficiently completed, the portion of the ureter running behind the IVC was transected. Although no obvious ureteral stricture or blood flow failure was present, the superfluous ureter was excised. After repositioning the ureter to run anterior to the IVC, the opposite sides of the ureter were spatulated.

Ureteroureteral anastomosis was performed with 4-0 Vicryl®. Careful manipulation was ensured during the operation, avoiding direct grasping of the ureteral wall or ureteral mucosa. A double-J catheter was placed in the right ureter when half the anastomosis was completed; the other half of the ureter was then anastomosed (Fig. 3b).

The operation time was 144 min, the console time was 100 min, the estimated blood loss was 2 mL, and no complications were observed.

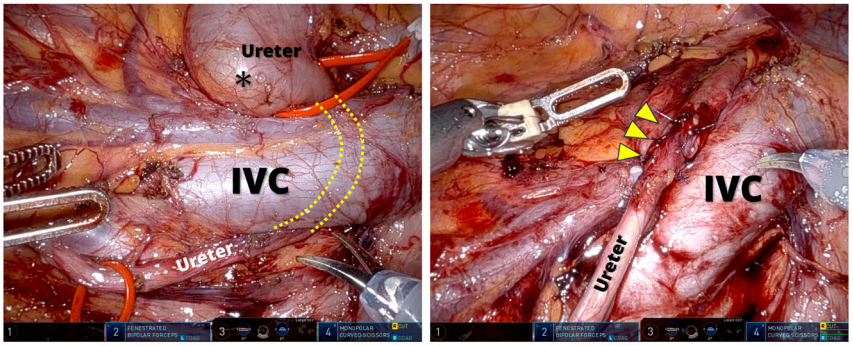
Outcome

The double-J catheter was removed 1 month after surgery. No obvious hydronephrosis or urinary tract infection was observed 6 months after the operation. Postoperative serum creatinine was 0.53 mg/dL, and the estimated glomerular filtration rate was 110.8.

Pathological examination revealed no stricture or necrosis of the excised ureter.

Discussion

RCU is a congenital anomaly that requires treatment because it causes right hydronephrosis, which in turn causes pain, urinary tract infection, and renal dysfunction. Surgical treatment is recommended for symptomatic RCU. However, there are very few papers on conservative treatment for asymptomatic RCU, and the natural course of RCU is unknown.[3] Most RCUs are discovered when symptoms appear in people in their 30s and 40s. This suggests that if RCU is left untreated,



(a) **Before reconstruction** (b) **After reconstruction**

Fig. 3 Intraoperative findings. (a) Before reconstruction. The right ureter was positioned behind the IVC and descended medially to the IVC. (b) After reconstruction. After repositioning the ureter to run anterior to the IVC, ureteroureteral anastomosis was performed with 4-0 Vicryl®. IVC, inferior vena cava. *Same site as the computed tomography findings.

it may lead to frank pain or urinary tract infections in the future. Further accumulation of knowledge regarding the natural history of asymptomatic RCU is anticipated. Although our patient was almost asymptomatic, she strongly preferred surgery because the RCU and resultant hydronephrosis could eventually cause such problems.

In principle, treatment of RCU is surgical. Urinary tract reconstruction for RCU has conventionally been performed by laparotomy,[4] but after Matsuda *et al.*[2] reported laparoscopic urinary tract reconstruction in 1996, laparoscopic surgery became popular. The usefulness of urinary tract reconstruction using retroperitoneoscopy was subsequently reported.[5] Although retroperitoneal surgery was feasible, the working space during intracorporeal suturing was found to be narrow, and some authors preferred the transperitoneal approach.[6]

Robot-assisted urinary tract reconstruction for RCU has been reported in recent years, but only a few such cases have been reported because of the rarity of RCU. Temiz *et al.*[1] performed a comprehensive literature review comparing robot-assisted and laparoscopic surgery for RCU. They argued that both techniques are useful because there was no significant difference between the two except for the operation time (robotic-assisted surgery was significantly shorter). The authors speculated that the better intraoperative visualization and dexterity of robotic surgery led to shorter surgical times.[1] Although robot-assisted surgery for RCU is expected to become more widespread in the future, more cases must be accumulated to confirm its effectiveness.

Whether to excise a ureter that runs behind the IVC is controversial. In some authors' opinion, RCU is not a congenital anomaly of the ureter but a congenital anomaly related to the development of the IVC, and resection of the ureter is unnecessary.[7] In fact, no abnormality, such as stenosis, was observed in the resected ureter in our case. Although we understand that resection of the ureter is not essential, we believe that excess ureters should be resected because they cause flexion. In the present case, the surplus ureter was resected and good results were obtained by taking care to maintain natural positioning of the anastomosed ureter and the IVC. Obviously, tension-free suturing is essential in ureteroureteral anastomosis. In this case, the proximal and distal ureters were secured with vascular tape during surgery, and the ureters were dissected from both sides of the IVC. By dissecting in this way, the ureter was freed from its surroundings on the back side of the IVC, making it possible to transect it safely.

The main limitations of this article are that lack of split renal function by renogram, only one case was reported and that the follow-up period was short. However, with the accumulation of similar reports, we hope that a more appropriate treatment for RCU will be developed.

Conclusion

The present case report demonstrated the feasibility and efficacy of robot-assisted ureteral reconstruction for treatment of RCU.

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Author contributions

Tomoaki Hakariya: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; writing – original draft. Daiyu Aoki: Data curation; formal analysis; methodology; writing – review and editing. Naoki Nishimura: Project administration; writing – review and editing.

Conflict of interest

The authors declare no conflict of interest.

Approval of the research protocol by an Institutional Reviewer Board

This case report was approved by Ethics Committee for Japan Community Health Care Organization, Isahaya General Hospital (Ethics No. 82).

Informed consent

A written informed consent was obtained from the patient.

Registry and the Registration No. of the study/trial

Not applicable.

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