


Case Report

Endoscopic laser treatment for urine leakage caused by an isolated calyx after robot-assisted partial nephrectomy

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Abbreviations & Acronyms

CT = computed tomography
eGFR = estimated glomerular filtration rate
LPN = laparoscopic partial nephrectomy
POD = postoperative day
RAPN = robot-assisted partial nephrectomy
RCC = renal cell carcinoma
RP = retrograde pyelography

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Introduction: An isolated calyx is a rare complication in which the renal calyx and pelvis are disconnected. The treatment is often complicated.

Case presentation: An 81-year-old man underwent robot-assisted partial nephrectomy for the treatment of renal cell carcinoma (cT1bN0M0). Postoperatively, urine leakage was observed and did not improve with conservative measures. Retrograde pyelography and computed tomography revealed that urine leakage originated from the isolated calyx caused by infundibular stenosis. Endoscopic treatment via the transurethral approach was selected to preserve renal function. Ureteroscopy showed that the upper calyx was completely obstructed by the sutures. Therefore, we cut the suture thread using laser, and a ureteral stent was placed in the upper renal calyx. Fluid drainage immediately disappeared after the procedure, and the patient did not lose renal function.

Conclusion: Endoscopic management might be an option for isolated calyx after robot-assisted partial nephrectomy.

Key words: endoscopic management, isolated calyx, robot-assisted partial nephrectomy.

Keynote message

An isolated calyx after robot-assisted partial nephrectomy is a rare complication. The treatment of this complication should be aimed at preserving renal function. Our technique is greatly useful for preserving renal function.

Introduction

LPN has been the standard option for the treatment of T1a RCC. RAPN using the da Vinci surgical system is increasingly used worldwide to overcome the technical difficulties of LPN with good visibility and multijoint forceps. However, the most common postoperative complications of RAPN, similar to LPN, have been reported, such as bleeding, urine leakage, acute kidney injury, arteriovenous fistula, and pseudo-aneurysm.¹ Among such complications, urinary leakage is a typical complication after partial nephrectomy with a frequency of approximately 3%–10%,² while the frequency of RAPN was 0.5%.³ Urine leakage is usually associated with larger sized or more complex tumors that are located near the renal collecting system.

RAPN has an advantage of renorrhaphy for closing the urinary tract, such as calyx opening and termination of bleeding. However, isolated calyx may cause surgical closure of the infundibulum even in robot-assisted suturing.

In this report, we present a case of an isolated calyx that was in the state of interruption between the distal calyx and renal pelvis by suturing for hemostasis during RAPN, and urine flowed out of the kidney for a long time from the isolated calyx. We successfully resolved the isolated calyx by cutting suture thread using the holmium:YAG laser. To the best of our knowledge, this is the first study to report that an isolated calyx after RAPN could be treated by cutting the suture with holmium:YAG laser via a transurethral approach.

Case presentation

An 81-year-old man was referred to our clinic for further examination and treatment of the right renal mass with a diameter of 42 mm on CT (Fig. 1). The diagnosis was right kidney cancer (cT1bN0M0) with RENAL nephrometry score of 10×4 . RAPN via the retroperitoneal approach was selected because of deteriorated renal function (serum creatinine level, 1.32 mg/dL; eGFR, 40.6 mL/min/1.73 m²). Tumor resection was performed following renal artery clamping. Since the urinary tract opened during tumor resection, the urinary tract was sutured closed using 3-0 V-Loc™ after tumor resection. The tumor was adjacent to the hilum of the kidney, and renal parenchymal suturing could not be performed. After declumping the artery, the perirenal fat was sutured to cover the excised part. The renal artery ischemia time was 19 min, and the intraoperative bleeding volume was 60 g. A drain was placed in the retroperitoneal space; then, a ureteral stent (6 Fr–26 cm) was placed. The pathological diagnosis was clear cell RCC, pT1b, Fuhrman classification grade 2, INFa, v0, ly0, eg, fc1, rc-inf1, rp-inf0, s-inf0, and margin (-). On POD 4, drainage amount increased to 500 mL/day, and the fluid was proved to be urine. Fluid retention was observed in the right retroperitoneum by CT on POD 5, while ureteral stent was observed in the right position. We decided to wait for spontaneous closure. However, the sustained subsequent drainage volume was approximately 300 mL/day. Retrograde pyelography (RP) on POD 20 demonstrated no urine leakage from the collecting system, while the upper renal calyx was not visualized (Fig. 2). CT and RP findings suggested that the isolated calyx resulting from infundibular stenosis between the upper calyx and renal pelvis by intraoperative suturing may cause urinary fistula. We attempted a flexible ureteroscopy on POD 27. Two sites of suture thread of V-Loc™ were confirmed on the cranial side of the renal pelvis (Fig. 3). After cutting the suture using holmium:YAG laser, the dilated calyx was observed (Fig. 4). To prevent urine leakage, additional ureteral stent was placed in the upper renal calyx, and the other was placed in the renal pelvis. Immediately after the procedure, urinary leakage disappeared, the drain was removed on POD 32 (fourth day after the procedure). Patient was discharged on POD 42 after the RAPN. The serum creatinine level at discharge was 1.22 mg/dL (eGFR, 44.2 mL/min/1.73 m²), and renal function was maintained.

Discussion

An isolated calyx is a rare complication in RAPN.^{2,3} Generally, complications are less likely to occur in robot-assisted surgery because fine suturing can be performed in close proximity and in a high-resolution field of view. Recently, the number of RAPN surgeries has increased, and urologists are likely to be challenged even in difficult cases. When tumor is close to the urinary tract, the complication rate of postoperative urinary fistula is reportedly high, and intractable urinary fistula may occur.⁵ Matsuda et al.⁶ reported that the following four points are important for preventing infundibular stenosis



Fig. 1 CT showed right renal cell carcinoma (white arrow).

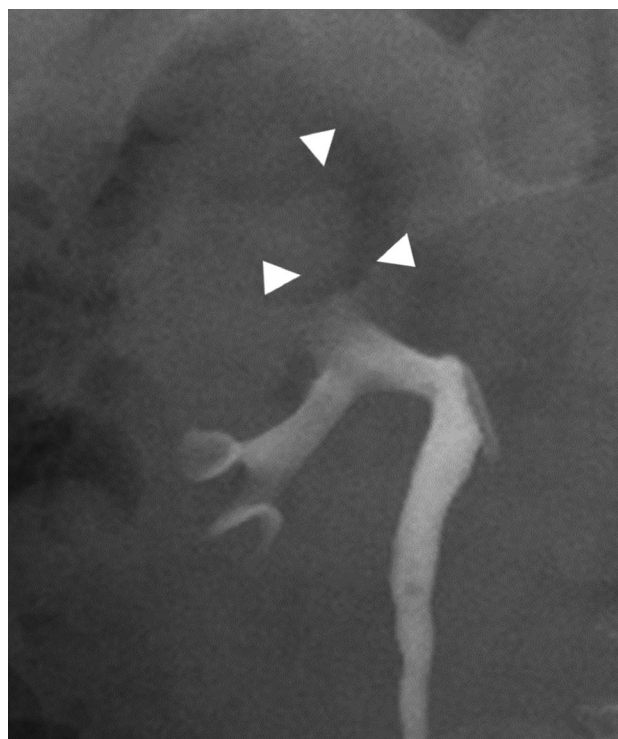


Fig. 2 The right upper calyx was defected in retrograde pyelography (white arrowhead).

associated with intraoperative suturing: (i) maintaining a good visual field and correctly recognizing the calyx mucosa and renal pelvis mucosa, (ii) meticulous prevention of the urinary tract mucosa during tumor resection, (iii) minimum depth of the needle movement when suturing the mucosa of the urinary tract, and (iv) use of sealing device at the time of tumor

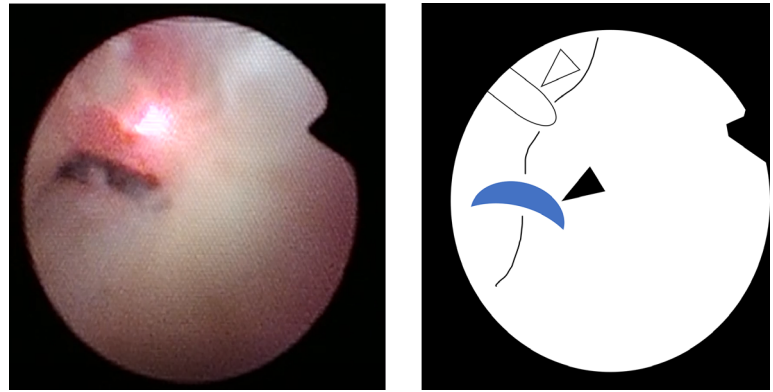


Fig. 3 The V-Loc™ was visible with a ureteroscope (black arrowhead: V-Loc™, white arrowhead: laser probe).

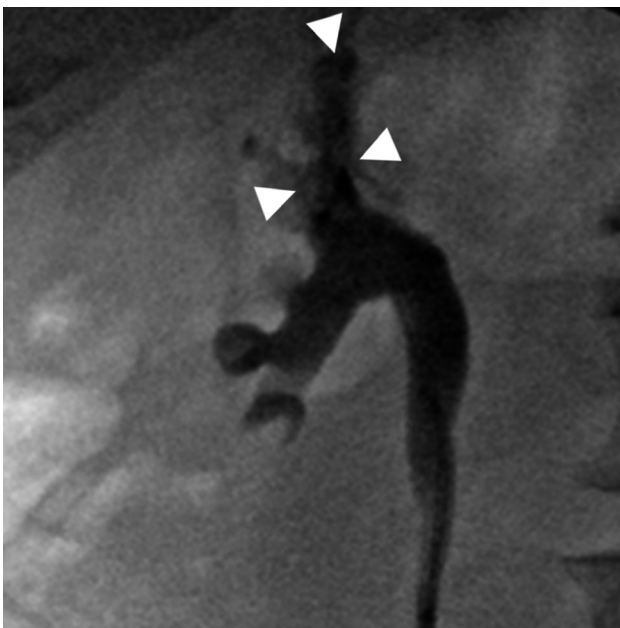


Fig. 4 The upper right renal calyx was visible in retrograde pyelography (white arrowhead)

resection so that hemostatic sutures are not required. There are three alternatives for treatment: (i) perform balloon dilatation if the guide wire passes through the stenosis percutaneously or transurethrally, (ii) open the stenosis by percutaneous or transurethral treatment, and (iii) perform selective renal artery embolization targeting isolated calyx, although this should be the last resort in case of unavoidable circumstances due to decreased renal function. To date, 12 cases of isolated calyx have been reported.^{6–12} Nine patients underwent percutaneous/transurethral treatment, and three underwent selective renal artery embolization. In patients with chronic kidney disease including our case, preservation of renal function should be prioritized and resolved by percutaneous or transurethral treatment. To the best of our knowledge, this is the first study to report that the isolated calyx after RAPN could be treated by cutting the suture with holmium:YAG laser via a transurethral approach.

Conclusion

Ureteroscopic management with laser was a useful treatment option for isolated calyx after RAPN. This technique is minimally invasive and might be attempted first for the resolution of isolated calyx because of prompt resolution and preservation of renal function.

Conflict of interest

The authors declare no conflict of interest.

Approval of the research protocol by an institutional reviewer board

Not applicable.

Informed consent

Not applicable.

Registry and the registration no. of the study/trial

Not applicable.

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Editorial Comment


Editorial Comment to Endoscopic laser treatment for urine leakage caused by an isolated calyx after robot-assisted partial nephrectomy

In this issue, Inoue *et al.* reported a case who was successfully treated with ureteroscopy using the holmium YAG laser to manage urinary leakage due to ligation of renal calyx during robot-assisted partial nephrectomy (RAPN) for T1b renal tumor.¹

RAPN for patient with T1b renal tumors has frequently been done without increasing the risk of complications.² Preoperative image-based assessment with R.E.N.A.L nephrometry score and PADUA nephrometry scores contribute to preventing complications.³ In addition, Mathieu *et al.* reported that surgeon's experience, blood loss, and opening urinary collecting system were important predictors of postoperative complications in RAPN.⁴ The frequency of urinary leakage after partial nephrectomy has been reported as between 0.8% and 5.2%.⁵ The resection with the renal calyx at the bottom of the tumor is inevitable to avoid positive surgical margins. Therefore, in RAPN for patients with the renal tumor close to collecting system, the risk of urinary leakage might increase due to defect of collecting system.

Ureteral stent, percutaneous nephrostomy, and percutaneous drainage should be considered for urinary leakage after RAPN refractory to conservative treatment. In this case, the 3-0 V-Loc™ thread penetrated the renal calyx was visible on ureteroscopy, which lead to successful intervention. However, if the thread is invisible on ureteroscopy, alternative approach would be required; an intervention from outside the kidney such as laparoscopic procedure is necessary to release the stenosis of the renal calyx. Taken together, transurethral approach by retrograde pyelography and ureteroscopy plays an important role in the management of urinary leakage after

partial nephrectomy, and should be considered as a first step when an intervention is required.

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Conflict of interest

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