



Endourology

Laparoscopy-assisted ultrasound-guiding percutaneous nephrolithotomy for the treatment of stones in pelvic ectopic kidney: A case report

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ARTICLE INFO

Keywords:

Kidney stones
Pelvic ectopic kidney
Laparoscopy
Percutaneous nephrolithotomy

ABSTRACT

Background: Pelvic ectopic kidney is a kind of congenital malformations of urinary system due to the failure of ascent from the pelvis to the abdomen during development.

Case presentation: A 39-year-old man was referred to the urology department of our hospital for abdominal pain for half a month. Radiographic studies revealed stones in pelvic ectopic left kidney. Laparoscopy-assisted ultrasound-guiding percutaneous nephrolithotomy (PCNL) was performed. Postoperative plain film revealed that the patient achieved a stone-free status.

Conclusions: Laparoscopy-assisted ultrasound-guiding PCNL is a safe alternative for the treatment of stones in pelvic ectopic kidney with a high stone-free clearance.

1. Introduction

Ectopic kidney is a kind of congenital malformations of urinary system, including pelvic ectopic kidney, thoracic ectopic kidney and cross ectopic kidney, of which pelvic ectopic kidney is the most common. Pelvic ectopic kidney occurs when the kidney failed to ascend from the pelvis to the abdomen during development, and lies opposite the sacrum and below the aortic bifurcation, with an incidence of 1/2200 to 1/3000.^{1,2} Due to the abnormal position and malrotation of pelvic ectopic kidney, high insertion of the ureter, the renal vasculature, or both can partially predispose them to urine drainage obstruction, causing urinary tract infection, hydronephrosis, and kidney stones.^{2,3}

Herein, we described a case of stones in pelvic ectopic kidney treated with laparoscopy-assisted ultrasound-guiding percutaneous nephrolithotomy (PCNL).

2. Case presentation

A 39-year-old man was referred to the urology department of our hospital for abdominal pain for half a month. The pain located on left lower quadrant of his abdomen. He also complained a history of passing stones during urination. The patient had a history of extracorporeal shock wave lithotripsy for ureteral stones and a history of pelvic ectopic kidney for 2 years.

The patient's creatinine level was 96 $\mu\text{mol/L}$, uric acid level was 439

$\mu\text{mol/L}$. Blood routine examination showed that the level of white blood cells, red blood cells, hemoglobin and neutrophils was normal. Urinalysis showed urinary blood test positive (1+), while red blood count was 17.3/ μL and bacteria level was 148.3/ μL . An abdominal computed tomography (CT) scan indicated that he had a pelvic ectopic left kidney, and stones was located at lower calyces of his left kidney (Fig. 1).

The patient then underwent laparoscopy-assisted ultrasound-guiding PCNL for the treatment of stones in his pelvic ectopic left kidney. Under general anesthesia, a 5Fr ureteral catheter was placed retrogradely to the renal pelvis of left kidney in the lithotomy position before 18Fr urinary catheter inserted. After pressed deep into the abdomen using ultrasound probe and pushed the overlapping intestines aside in the supine split-leg position, the percutaneous renal access was obtained under an ultrasound-guiding 6.5Fr needle-perc. After the trocar was inserted from the incision in the upper edge of the umbilical skin and the pneumoperitoneum was made, laparoscope was introduced to avoid intestines damaged under direct vision. The bowel loops displaced out as the patient was placed in head-down-tilt position and the pelvic ectopic kidney with needle-perc punctured became visible (Fig. 2A). The percutaneous tract was then dilated with a high-pressure balloon dilator (X Force® N30 balloon dilator, Bard Urological, Covington, GA, USA) to standard 24Fr with the working sheath placed under laparoscopic monitoring (Fig. 2B and C). Stones were fragmented by Lithoclast Master system (EMS Medical, Nyon, Switzerland) (Fig. 2D). Monopolar electrocoagulation was performed (Fig. 2E). Finally, a 6Fr antegrade

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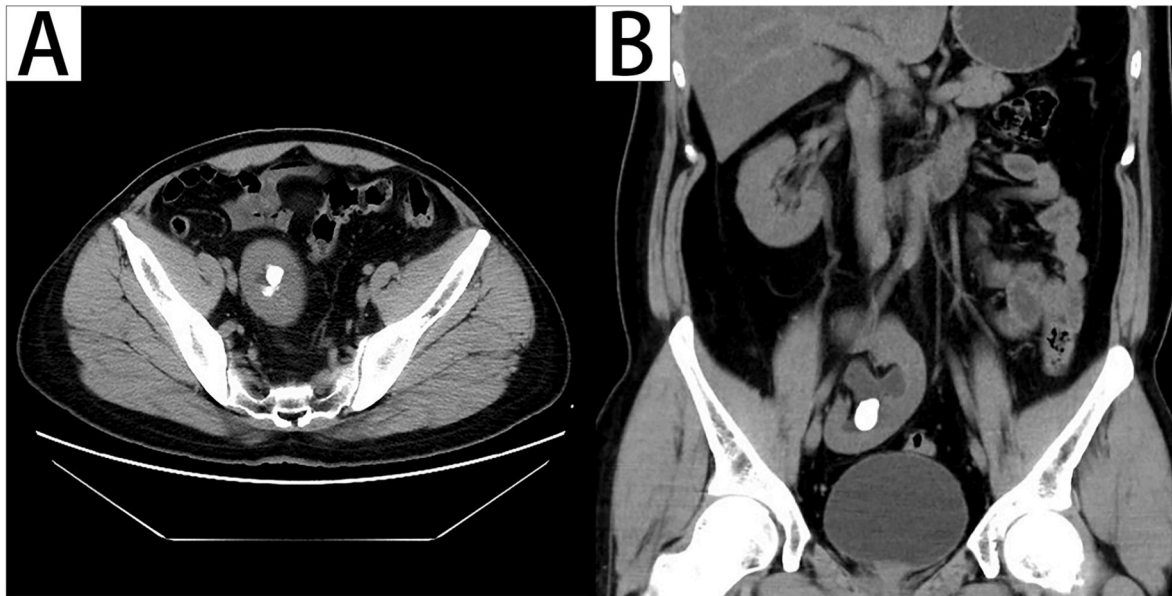


Fig. 1. Abdominal CT scan of the patient indicates stones in pelvic ectopic left kidney. A: Axial scanning shows stones in ectopic left kidney in pelvic cavity; B: Coronal scanning shows stones located in lower calyces of the pelvic ectopic kidney.

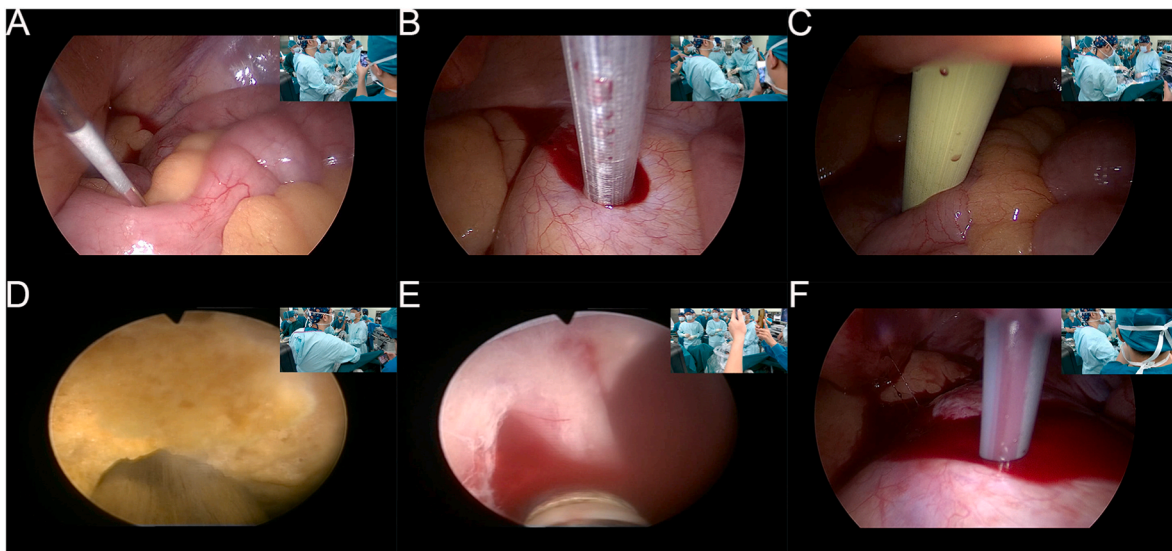


Fig. 2. Images of the operation of laparoscopy-assisted percutaneous nephrolithotomy for the treatment of stones in pelvic ectopic kidney. A: After pressed deep into the abdomen using ultrasound probe and pushed the intestines aside in the supine position, the percutaneous renal access was obtained under an ultrasound-guiding 6.5Fr needle-perc. Laparoscope was inserted to ensure that the intestines were not injured under direct vision; B: The tract was dilated with a high-pressure balloon dilator (X Force® N30 balloon dilator, Bard Urological, Covington, GA, USA) under laparoscopy monitoring; C: The tract was dilated to standard 24Fr with the working sheath placed; D: Stones were fragmented by Lithoclast Master system (EMS Medical, Nyon, Switzerland); E: Monopolar electrocoagulation was performed; F: Finally, a 14Fr nephrostomy tube was inserted.

double-J stent was placed with a 14Fr nephrostomy tube and a 14Fr abdominal drainage tube inserted (Fig. 2F).

The patient was fine with white blood cell counts, neutrophil counts, interleukin-6 and C-reaction protein slightly elevated 2 days postoperatively. Postoperative plain film revealed that the patient achieved a stone-free status (Fig. 3A). The drainage of urinary catheter, nephrostomy tube and abdominal drainage tube were all unobstructed before the nephrostomy tube was clipped 7 days postoperatively. However, the patient complained continuous urine leakage with abdominal pain. Nephrostomy tube was unclipped and CT showed that the distal end of double-J stent was displaced into posterior urethra (Fig. 3B). The patient then underwent a cystoscope to correct the place of double-J stent. The

nephrostomy tube, urinary catheter and abdominal drainage tube were removed in sequence before the patient discharged.

3. Discussion

The treatment of pelvic ectopic kidney complicated with kidney stones is challenging and often requires surgical intervention, including extracorporeal shockwave lithotripsy (ESWL), retrograde intrarenal surgery (RIRS), PCNL, and laparoscopic pyelolithotomy.³ Ureteropelvic junction (UPJ) obstruction should be excluded prior to initiating ESWL as it would have consequences on stone fragment passage after ESWL. Stone-free clearance ranges from 25 % to 92 % in previous literatures.³

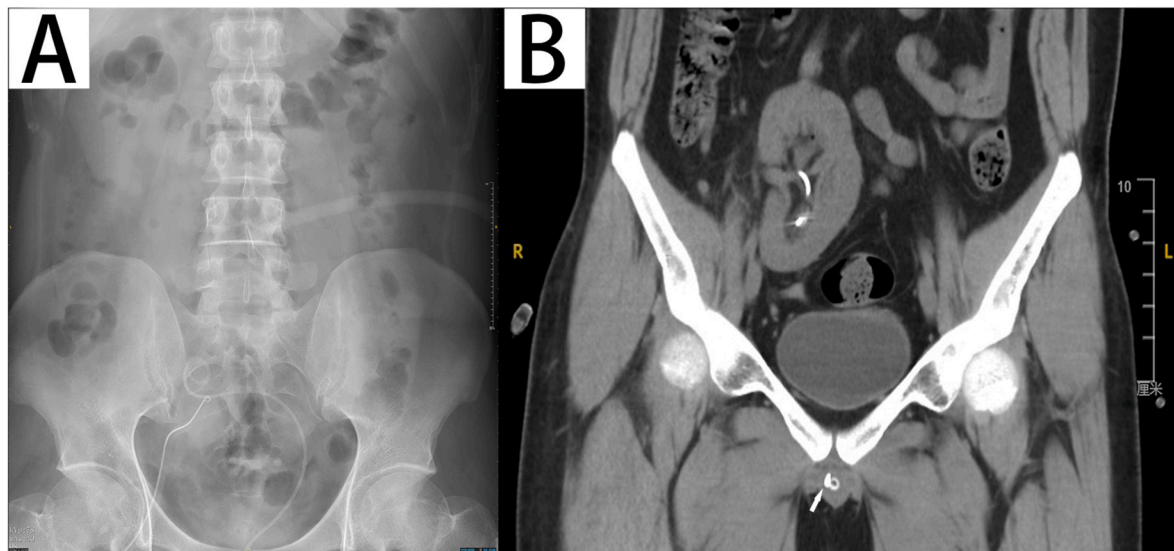


Fig. 3. Postoperative plain film and CT scanning. A: Postoperative plain film shows that the patient achieved a stone-free status; B: Coronal CT scanning shows that the distal end of double-J stent was displaced into posterior urethra (White arrow).

RIRS using flexible ureteroscopy with the use of access sheaths to help straighten the ureter can be an effort to achieve a stone-free status.^{4,5} Nevertheless, tortuous, anterior and tight ureters caused by the abnormal position and malrotation of pelvic ectopic kidneys may increase the risk of trauma. UPJ obstruction also should be ruled out as it may lead to a difficult scope negotiation during the procedure and impaired drainage postoperatively.⁵

For large solitary stone in the pelvis, laparoscopic pyelolithotomy can be performed. With the help of flexible nephroscopes, stones in the collecting system can be extracted by basket. Laparoscopic pyeloplasty is also allowed simultaneously if UPJ obstruction exists.^{6,7} In the era of robotic surgery, several cases of robot-assisted laparoscopic pyelolithotomy have been reported with the stone-free rates between 80 % and 100 %.⁸

PCNL is another alternative, but the ultimate challenge is to mitigate risks of intestinal damage. At this point, ultrasound localization is thought to have best visualization of the intestines around the pelvic ectopic kidney than X-ray localization with less radiation exposure. Moreover, the intestines can also be pushed away by pressing deep of the ultrasound probe to avoid intestinal damage during puncture. We at the meantime cooperated with the laparoscopy under direct vision to refrain from intestinal injury. In the process of tract establishment, we observed the balloon dilation and the position of the working sheath in the whole process with laparoscopic monitoring to ensure a safe establishment of the percutaneous tract. With the help of Lithoclast Master system, we could fully smash and remove the stones.

The utilization of ultrasound-guided supine transperitoneal PCNL introduced by Desai and Jasani achieved a 100 % stone-free status in 16 pelvic kidney patients with 1 conservatively managed bowel injury case.⁹ While Watterson and colleagues reported a posterior approach via the sciatic foramen for pelvic kidney stones which was associated with postoperative femoral neuropathy.¹⁰ Laparoscopy-assisted PCNL was initially introduced by Eshghi for pelvic ectopic kidney staghorn calculus in 1985. Later, several literatures reported different approaches or techniques of laparoscopy-assisted PCNL with stone-free rate ranged from 88.9 % to 100 %. Postoperative complications included adhesions between the intestinal loops and the peritoneum, or delayed urine leakage through the abdominal drain.^{11–13}

In our case, the distal end of double-J stent was incidentally displaced into posterior urethra through a guidewire in an antegrade way. We proposed that excessive placement of the zebra guidewire in the pelvic ectopic kidney of aberrant position might result in urine leakage

and colic pain of the patient, which was alleviated by adjusting the place of double-J stent via cystoscopy eventually. In addition, insufficient awareness of the migration of double-J stent through postoperative plain film which was to detect the remnant stone reminded us to be vigilant for patients with abnormal kidneys. However, we didn't see other major complications like hemorrhage, although we kept the abdominal drainage tube before removal of nephrostomy tube and urinary catheter to avoid delayed hemorrhage.

4. Conclusion

Laparoscopy-assisted ultrasound-guiding PCNL is a safe alternative for the treatment of stones in pelvic ectopic kidney with a high stone-free clearance.

CRediT authorship contribution statement

Zhichao Luo: Conceptualization, Writing – original draft. **Jianxing Li:** Resources. **Bo Xiao:** Conceptualization, Writing – review & editing.

Declaration of competing interest

None.

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