

Spontaneous rupture of the renal pelvis caused by upper urinary tract obstruction

A case report and review of the literature

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Abstract

Rationale: Spontaneous renal rupture is rupture of the renal parenchyma, collecting system, or renal blood vessel, which often occurs in pathological kidney and is clinically less common. Postoperative long-term renal rupture is rarely reported in flexible ureteroscopy treatment of calculus in the upper urinary tract.

Patient concerns: A 58-year-old man complained of right lower abdominal pain with hematuria for 3 hours after flexible ureteroscopy, combined with holmium laser lithotripsy of right renal calculi was performed 1 month ago. The urinary B-mode ultrasonogram suggested calculi and dilatation at the end of the right ureter, and moderate hydronephrosis of the right kidney. On the second day, the urinary system computed tomography (CT) examination suggested right renal rupture.

Diagnosis: Spontaneous rupture of the right renal pelvis.

Intervention: The patient underwent conservative treatment after the optimal treatment strategy was reviewed and discussed.

Outcomes: Urinary system CT re-examination suggested complete absorption of the hematoma and urinary extravasation 3 months later.

Lessons: Calculi obstruction is the most important cause of spontaneous renal rupture. CT is a valuable diagnostic modality, and spontaneous renal rupture should receive tailored treatment.

Abbreviation: CT = computed tomography.

Keywords: flexible ureteroscopy, holmium laser lithotripsy, spontaneous renal rupture, upper urinary obstruction

1. Introduction

Spontaneous renal rupture is rupture of the renal parenchyma, collecting system, or renal blood vessel, which often occurs in pathological kidney and is clinically less common. At our hospital, we admitted a returning patient because of sudden lower back pain with hematuria at 1 month after holmium laser lithotripsy of right renal calculi was performed under flexible ureteroscopy; rupture of the renal pelvis occurred in the patient during diagnosis and treatment. We perform a retrospective analysis of this case to improve our understanding of the disease.

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HZ and GZ contributed equally to this paper.

The authors report no conflicts of interest.

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2. Case report

A 58-year old male patient underwent flexible ureteroscopy-assisted holmium laser lithotripsy of right renal calculi 1 month ago at our hospital. An abdominal plain film radiograph on day 2 after the operation showed good position of the double J ureteral catheter, and the patient was discharged to recuperate on day 4 postoperatively. However, the patient visited the emergency room and was admitted to the hospital at night because of sudden lower abdominal pain within 3 hours of hematuria. The physical examination showed the following findings: temperature 37°C; pulse 98 beats/min; and blood pressure 131/84 mm Hg. There was no swelling and percussion pain in both renal areas, the abdomen was flat with obvious tenderness in the lower right abdomen, and bladder was not full and tender. Routine blood test results showed the following: white blood cell counts, $12.20 \times 10^9/L$; percentage of neutrophilic granulocytes, 89.7%; and hemoglobin concentration, 111 g/L. The urinary system ultrasonogram indicated the following: the maximum depth of separation in the right renal collecting system was about 4.3 cm; inner diameter of the upper segment of the right ureter was enlarged by 1.7 cm; and strong echo spots within the range of 2.3×0.6 cm were seen at the end of the right ureter close to the orifice of the bladder, with rear acoustic shadow. The ultrasonographic diagnoses were calculi and dilatation at the end of the right ureter; and moderate hydronephrosis of the right kidney (Figs. 1 and 2). The patient was treated with an anti-inflammatory drug, hemostasis, and analgesic therapies; additionally, he was scheduled for a urinary system computed tomography (CT) examination on the second day of admission to



Figure 1. Ultrasound indicated moderate hydronephrosis in the right kidney.



Figure 3. Computed tomography (CT) scan showed rupture of right renal pelvis.

understand the incarceration of calculi at the end of the right ureter, and we planned to perform extracorporeal shock wave lithotripsy or holmium laser lithotripsy under ureteroscopy. During the CT examination, the patient suddenly felt severe pain in the right lower back and abdomen with palpitation and sweating. The CT examination showed abnormal density shadows in the right renal pelvis, calyx, ureter, and regions surrounding the hilum, with full-course right ureteral dilatation. Calculus was not seen at the end of the right ureter, so the pain was considered due to rupture of the right renal pelvis (Fig. 3). The patient was advised to lie in bed without consuming any food or water. Three indwelling cavity catheters were placed to observe the color change of the urine; an electrocardioscanner was used to monitor the patient's vital signs, including blood pressure, respiratory rate, and pulse rate; the patient underwent therapies for anti-infection, hemostasis, blood transfusion, analgesia, fluid support, and so on, and we re-examined routine blood results and liver and renal functions regularly.

Computed tomography re-examination was performed 1 week later, and showed that the original abnormal density shadows in the right renal pelvis, calyx, ureter, and regions surrounding the hilum were markedly shrunk (Fig. 4). Urinary system CT

re-examination in the outpatient department 3 months later suggested complete absorption of hematoma and urinary extravasation (Figs. 5 and 6).

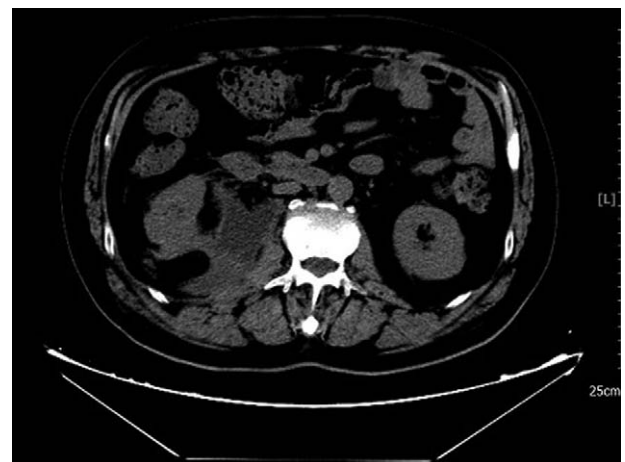


Figure 4. The range of hematoma and urinary extravasation was shrunk (after 1 week).



Figure 2. Calculi and dilatation at the end of the right ureter.



Figure 5. Complete absorption of the hematoma and urinary extravasation in the regions surrounding the renal hilum (after 3 months).



Figures 6. Complete absorption of the hematoma and urinary extravasation in the regions surrounding the renal hilum (after 3 months).

The patient provided informed consent.

2.1. Ethics statement

This research was approved by the ethics committee of The 107th Hospital of the People's Liberation Army (Ethics Committee members: ZJ, JF, ZD, DZ, ZL, and CH).

3. Discussion

With the rapid development of technology in ureteroscopy and lithotripsy, the application of these procedures in the treatment of calculus in the upper urinary tract, especially renal calculus, has been increasing because the operation is totally a natural orifice transluminal endoscopic surgery, which is less traumatic and allows quicker recovery compared with percutaneous nephrolithotomy and open surgery. However, the incidence of severe complications, such as postoperative hemorrhage, urosepsis, and ureteral steinstrasse formation, is increasing. Spontaneous rupture of the renal parenchyma or renal pelvis is 1 of the most severe complications of ureteroscopy. It has been reported to occur within a short period after ureteroscopy combined holmium laser lithotripsy treatment of the calculus in the lower ureter.^[1] Iatrogenic operations are performed for intraoperative mucous injury of the renal pelvis, continued high pressure reperfusion, sudden relief of a high pressure state in the kidney after lithotripsy, and the potential presence of some pathology in the kidney, such as renal tuberculosis and renal tumor,^[2] which are all risk factors that could cause renal rupture.

Postoperative long-term renal rupture is rarely reported in flexible ureteroscopy treatment of calculus in the upper urinary tract. Our patient returned to the hospital because of sudden pain in the lower back and abdomen, and also macroscopic hematuria at 1 month after flexible ureteroscopy-assisted lithotripsy was performed, and the urinary system ultrasonogram suggested calculi and dilatation at the end of the right ureter, and moderate hydronephrosis in the right kidney. On the second day of admission, urinary system CT examination was performed because the patient experienced sudden severe pain on the right side of his lower back with palpitation and sweating. The CT scan suggested right renal rupture, and no calculus residue was seen at the end of the right ureter. It was considered that the calculus residue was incarcerated at the end of the ureter during discharge of the calculus pieces in flexible ureteroscopy-assisted lithotripsy,

which led to continued aggravation of the upper urinary tract obstruction and pressure increase inside the renal pelvis. Calculus pieces were discharging from the end of the ureter during the examination, so the upper urinary tract obstruction was suddenly relieved, inner pressure of the renal pelvis was rapidly decreased, and kidney and surrounding tissue were retracted, thus inducing rupture of the kidney. In combined consideration of the patient's symptoms, vital signs, and urinary system CT findings, we think that the continued aggravation of the upper urinary tract obstruction and effect of decreased renal pressure may be the main reasons why spontaneous renal rupture was induced in our patient.

Spontaneous renal rupture should receive tailored treatment, and for patients with simple spontaneous rupture of the renal pelvis combined with slight urinary extravasation, conservative treatment, such as anti-infection therapy and symptomatic treatment, should be provided with double J catheter placement under cystoscopy, if necessary, to fully drain the urine and prevent the progression of urinary extravasation. If conservative treatment is ineffective in the patient, selective/super-selective renal artery embolization should be performed for hemostasis, and the kidney should be protected as much as possible. For a huge renal subcapsular hematoma, percutaneous hematoma puncture for drainage, topical injection of urokinase, and laparoscopic evacuation of the hematoma should be applied.^[3,4] In addition, open surgery, including renal repair and nephrectomy, has been reported.^[5,6] The patient recovered from conservative therapies, including bed rest, anti-infection, hemostasis, blood transfusion, and fluid support.

4. Conclusions

Considering the diagnosis and treatment experience from this case, we think that during operation with flexible ureteroscopy combined with holmium laser treatment of upper urinary tract calculi, one should adjust the power used in holmium laser lithotripsy according to the hardness and size of the calculus, and try to pulverize the calculus as much as possible to minimize the incidence of steinstrasse during discharging of the calculus pieces. For hydronephrosis caused by upper urinary tract obstruction resulting from postoperative ureteral calculus, surgeons should be cautious of the possibility of renal rupture due to the increase of inner renal pressure, change of normal morphological structure of the kidney, and attenuation of renal parenchyma.

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