Case Report

Multiple renal ruptures after flexible ureteroscopic lithotripsy with holmium laser

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Abstract: The authors present a case report of multiple renal ruptures after flexible ureteroscopic lithotripsy (FURL) with holmium laser. Multiple renal ruptures following flexible ureterorenoscopy have not been reported so far. The etiology remains unclear. We like to share this case to make urologists aware of this unusual complication and discuss possible causes and therapeutic approaches.

Keywords: Renal rupture; urolithiasis; flexible ureteroscopy; infection; diabetes mellitus

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Introduction

Flexible ureteroscopic lithotripsy (FURL) with holmium laser is becoming the most commonly preferred treatment for patients with ureteral and renal calculi. Although this treatment is minimally invasive and effective, it has the potential for significant postoperative complications, for example, bleeding and infection. Several case reports that involved the use of FURL with holmium laser have described bleeding resulting from the formation of pseudoaneurysm (1-3). However, multiple renal ruptures have not been reported as a complication of an uncomplicated furl. We would like to share our experience of this, to our knowledge, first case reported in the literature and discuss the possible causes and therapeutic outcome.

Case presentation

A 55-year-old Asian female first stone former with a 0.5×1.5 cm^2 calculus located in the right upper ureter (*Figure 1*) underwent an uncomplicated FURL and laser fragmentation of the stone. A Sensor guidewire (Boston Scientific, Natick, MA, USA) with a floppy hydrophilic tip was used to introduce the scope into the kidney. The stone was moved by water from the upper ureter to the renal pelvis through rigid ureteroscopy. Flexible ureteroscopy (Olympus P-5TM, Olympus, Tokyo, Japan) and laser fragmentation of the stone using a F12/14 ureteral access sheath (Cook Medical, Bloomington, IN, USA) was performed. The stone was fragmented with a 200-micron laser fiber at an energy of 0.8 J and a rate of 20 Hz. Fragments were extracted with a 2.2 Fr NGage nitinol basket (COOK MEDICAL, Bloomington, IN, USA), and a 6F × 26-cm Polaris Loop ureteric stent (Boston Scientific, Natick, MA, USA) was inserted at the end of the operation. During the procedure, intermittent active irrigation was performed by an assistant using a 50-mL syringe connected to the perfusion line.

Pre-operatively, the patient experienced no history of urinary abnormalities nor bleeding diathesis, aside from urinary tract infection (UTI) and diabetes mellitus. The urine routine test showed leukocyte esterase of 3+, and leukocyte count of 400/μL. The fasting blood glucose was 8.85 mmol/L. On the day of the operation, urine routine test results showed leukocyte esterase of 1+, and leukocyte count of 82.30/μL after three days of anti-infective therapy with third generation cephalosporin. Meanwhile, the fasting blood glucose was controlled at the normal level with hypoglycemic treatment of insulin and metformin. No intra-operative complication, renal injury, nor bleeding arose during the procedure, which was performed under good view following standard procedures. We observed no possible penetration of either the laser fiber or the

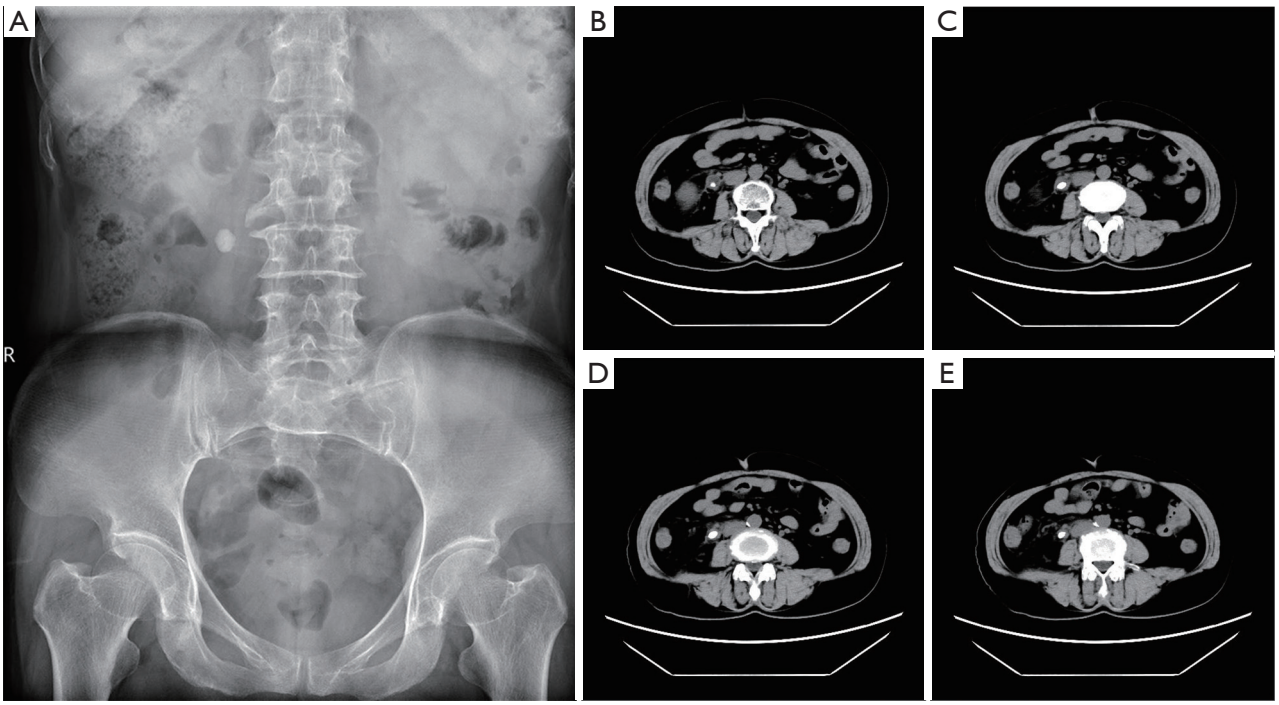

Figure 1 The preoperative images of the patient. (A) Plain film of the abdomen of the patient; (B,C,D,E) a 0.5×1.5 cm^2 calculus located in the right upper ureter prior to surgery.

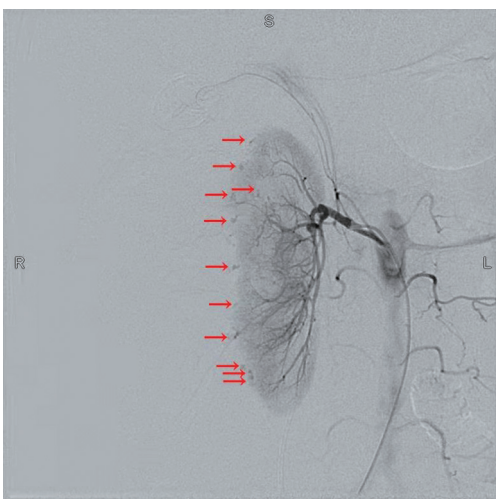

Figure 2 Angiogram showing multiple ruptures of the right renal (arrows).

guidewire into the renal parenchyma.

After the procedure, the patient was sent to the post-anesthetic care unit. About half an hour later, the patient developed persistent right flank pain after recovery from anesthesia, and her blood pressure declined progressively. The arterial blood gas tests showed that her hemoglobin significantly dropped from 112 to 21 g/L, and an emergency examination by abdominal B-ultrasound showed a huge hematoma in the right renal region. Based on clinical suspicion, the patient quickly underwent a right renal angiography, which revealed more than 10 ruptures in the right kidney with active extravasation of the contrast medium (*Figure 2*). Selective catheterization and embolization of the bleeding branch were conducted using microcoils (*Figure 3*). Good hemostasis was achieved after the procedure and the hemoglobin level of the patient tended to be stable and normal with blood transfusion. The patient was discharged 9 days later and her stent was removed after a month. Further follow-up was unremarkable.

Discussion

Furl with holmium is a well-established minimally invasive procedure for the treatment of renal and ureter lithiasis. This treatment is typically used in stones <2 cm within the pelvicalyceal system as an alternative to extracorporeal shockwave treatment. The overall complication rate reaches 9–25% after ureteroscopy (4-6). Most complications are

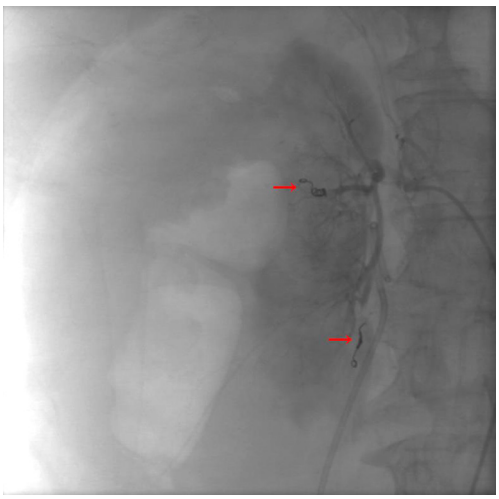

Figure 3 After embolization with microcoils (arrows).

minor and require no intervention. Traditionally, infection is one of the most serious post-operative complications after furl, and this problem is constant concern among urologists (7). Bleeding is a rare complication resulting from furl. In the literature, three case reports described single pseudoaneurysms formation after FURL with holmium (1-3). To our knowledge, the present paper is the first to report the formation of multiple renal ruptures after FURL with laser lithotripsy.

Numerous groups have reported the effectiveness and safety of FURL combined with holmium for elderly, obese, and infant patients, patients with large stones, and complex anatomical kidneys, patients on anticoagulants, and those with bleeding diathesis (8-15).

To our knowledge, multiple renal ruptures following FURL with holmium laser are virtually unheard of, and our paper is the first to report such a case. Yamasaki *et al.* reported a case of a 45-year-old female who experienced rupture of a right calyceal diverticulum caused by ureteroscopy (16). However, they did not insert a ureteral access sheath during the surgery or a postoperative double J stent which may have caused high pressure in the pelvis, resulting in the rupture of calyceal diverticulum. Moreover, the rupture may be related to the anatomical fragility of calyceal diverticulum. Three other case reports described single pseudoaneurysm formation after FURL with holmium laser. Tiplitsky *et al.* reported the first renal pseudoaneurysm formation after FURL with holmium laser in 2007 (1). Their patient presented with gross hematuria 10 days after furl. Work-up revealed a bleeding intrarenal pseudoaneurysm formation which was embolized. Durner *et al.* and Jubber *et al.* also reported a renal pseudoaneurysm after FURL and holmium laser which was confirmed by the renal angiography (2,3). However, the cause of the formation of pseudoaneurysm in these cases remain unclear; the formation may be related with the guidewire of laser trauma and high intrarenal pressure.

Nevertheless, the cause for the formation of multiple renal ruptures in our case report is unclear. The aforementioned guidewire with floppy-tip is especially designed to prevent injury to the kidney and to the scope. Holmium laser was not fired anywhere near the urothelium. The procedure was conducted by a senior surgeon who had more than 15 years of experience in FURL and who had performed more than 2,000 FURL operations. The senior surgeon observed no bleeding while inspecting the collecting system, and the operation time was within normal limits.

In our case, the formation of multiple renal ruptures may be attributed to several possible reasons. First, Schwalb *et al.* reported that high-pressure irrigation during ureteroscope in pigs could cause irreversible, deleterious effects on the kidney parenchyma (17). However, a common practice involves pressurizing the irrigation during FURL to provide a clear view for surgeons, and this backflow is almost inevitable. In our department, we attached an extension tube to the flexible ureteroscope and performed manual irrigation. Consequently, the intra-renal pressure could not be monitored in real time. Although an access sheath kept the pressure reasonably low to allow for backflow, the high intra-renal pressure from irrigating fluid could cause vessel damage. Therefore, a good irrigation system is crucial to maintaining proper irrigation flow. Second, several studies have also implicated the presence of diabetes mellitus and UTI as factors for increased post-percutaneous nephrolithotomy bleeding. In our case, the patient suffered from UTI and diabetes mellitus, which may be potential factors for the formation of multiple renal ruptures after FURL with holmium (18,19).

Multiple renal ruptures are unusual complications after furl. Nevertheless, this complication should be considered if there is repeated persistent postoperative flank pain and the progressively fall of blood pressure with no other obvious explanation at hand, and should be treated immediately. Therapy of choice is angiographic embolization.

Acknowledgments

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Written informed consent was obtained from the patient for publication of this Case report.

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