Ureteroscopy Assisted Retrograde Nephrostomy for Complete Staghorn Renal Calculi

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Key Words

Ureteroscopy • Complete staghorn • Lawson catheter •
Retrograde nephrostomy • Percutaneous nephrolithotomy

Abstract

Complete staghorn calculi are typically managed with percutaneous nephrolithotomy (PCNL). However, dilating nephrostomy and inserting a nephro access sheath can be difficult to perform without hydronephrosis. We reported the procedure of ureteroscopy-assisted retrograde nephrostomy (UARN) during PCNL. UARN is effective without dilating the renal collecting system in cases of complete staghorn calculi. A 63-year old female with a left complete staghorn renal calculus was referred to our hospital. Under general and epidural anesthesia, the patient was placed in a modified-Valdivia position. A flexible ureteroscope was inserted and a Lawson retrograde nephrostomy puncture wire was advanced into the flexible ureteroscope. The puncture wire was forwarded along the route from the renal pelvis to the exit skin. Calculus fragmentation was done using a pneumatic lithotripter and the Ho: YAG laser. UARN during PCNL was effective for the treatment of a complete staghorn calculus.

Introduction

Staghorn calculi are branched and generally infected stones that occupy a large portion of the renal collecting system [1] and complete staghorn calculi occupy the entire collecting system. Complete staghorn calculi are typically managed with percutaneous nephrolithotomy (PCNL) [2]. However, dilating nephrostomy and inserting a nephro access sheath (NAS) can be difficult when there is no hydronephrosis even when using an occlusion balloon catheter and ureteral catheter to create hydronephrosis. We previously reported on the procedure of ureteroscopy-assisted retrograde nephrostomy (UARN) during PCNL [3]. UARN is effective without dilating the renal collecting system in cases of complete staghorn calculi.

Case Presentation

A 63-year-old female was referred to our department for treatment of a left complete staghorn renal calculus (fig. 1a). She had no remarkable previous or family history. Her laboratory data showed no remarkable findings except for microhematuria on urinary analysis. In April 2011, the patient was admitted to our department for PCNL to treat the left complete staghorn calculus. We previously reported the technique of UARN and performed this technique in the present case as described below.

Under general and epidural anesthesia, the patient was placed in a modified-Valdivia position (Galdakao-modified Valdivia position). A flexible ureteroscope (Flex-X2, Karl Storz, Germany) was inserted through an inserted ureteral access sheath (Flexor®

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Fig. 1. Preoperative (a) and postoperative (b) kidney-ureter-bladder films.

Fig. 2. Puncturing under ureteroscopy guidance.

Fig. 3. "Tents" sign was seen at the posterior axillary line.

12 Fr, 35 cm, Cook Urological, USA) into the ureter. We imaged the target calculus and defined the appropriate position to puncture. Because the renal collecting system was occupied by the stone, the ureteroscope could not be advanced to the target calyx (fig. 2). We determined the target at the dorsal side of the renal collecting system. A Lawson retrograde nephrostomy puncture wire (Cook Urological) was then advanced into the flexible ureteroscope. The ureteroscope was advanced to the desired location in the renal pelvis again and the puncture wire was forwarded along the route from the renal pelvis to the exit skin. To avoid injury to the spleen, intestines, and pleural cavity, the puncture was performed after ultrasonography. The puncture wire easily passed through the muscle and tented the skin at the posterior axillary line (fig. 3; another case). The skin was incised and the needle delivered. Next, the dilator was placed over the puncture wire, which was advanced through the skin, subcutaneous fat, abdominal wall musculature, and perinephric fat until it reached the renal parenchyma under ureteroscopy. A 24 Fr percutaneous NAS (X-Force® Nephrostomy Balloon Dilation Catheter, BARD, USA) was passed over the balloon under continuous visualization with the URS. After inserting the NAS into the renal collecting system, calculus fragmentation was undertaken using the Swiss LithoClast pneumatic lithotripter (EMS, Switzerland) through a rigid nephroscope (percutaneous nephroscope, Karl Storz). Due to the large volume of the stone, we performed a second ureteroscopy-assisted PCNL on postoperative day 7 for residual stones of each renal calyx. Intracorporeal lithotripsy was performed using the Holmium:Yttrium Aluminum Garnet laser (using a 200 µm fiber, 1.0 J, 5 Hz) (Versa Pulse 30 W, Luminus Surgical, USA). A postoperative kidney-ureter-bladder film was taken and is shown in fig. 1b. Operation time was 186 min for the initial treatment and 176 min for the second treatment, and no major or minor complications were observed. The patient did not want an additional tract for the residual stone at the lower calyx. Stone analysis showed calcium phosphate monohydrate and struvite.

Discussion

During surgery for renal staghorn calculi with no hydronephrosis, PCNL is sometimes difficult even when a balloon occlusion catheter is used to dilate the renal collecting system [4]. In the present case, the calculus occupied the entire renal calyx, so we speculated that to get the guide-wire into the ureter before dilation would be difficult even if PCNL succeeded using ultrasonography or fluoroscopy. The present procedure of UARN during PCNL has a number of advantages: after the needle has exited through the skin, no further steps are required in preparation for dilation [5, 6], and it also involves less radiation exposure and less bleeding than other PCNL procedures [3].

In recent years, there have been major advances that have made the observation of the renal pelvis easier, making it now possible to perform a wide variety of intrarenal procedures using an ureteroscope [7]. Thus,

it is easier to approach the desired renal calyx using a flexible ureteroscope than was possible using previous fluoroscopic approaches [5, 8]. In our experience with UARN, the ureteroscope can continuously afford the ideal angle.

Our case was performed in the Galdakao-modified Valdivia position. In 1987, Valdivia-Uria described a PCNL with the patient in the supine position, with a 3 L serum bag below the flank [9]. In that position, both surgical and anesthesiological advantages were described. Thereafter, Ibarluzea et al. [10] reported a Galdakao-modified Valdivia position. This position has the advantages of allowing simultaneous percutaneous and retrograde access. In our case, we continuously visualized the motion of the ureteroscope under ultrasonography, and were easily able to detect the tent sign. This position did not need a position change from lithotomy to prone and vice versa, which reduced operating time.

Retrograde nephrostomy puncture usually requires a single movement, and since the needle passes from a posteriorly located calyx through the retroperitoneum, the possibility of damage to intra- and extra-renal vessels is less likely [6]. A potential disadvantage of the procedure is the danger of exiting the kidney in a cranial direction, with possible injury to the spleen, liver, or pleural cavity. In the ventral direction, possible injury to the intestines may occur [6]. We made the puncture under ultrasonographic and fluoroscopic guidance to avoid injury to the surrounding organs. Ultrasonography provided excellent visibility from the renal parenchyma to the skin (also along the puncture line route) and was also useful in avoiding injury, especially to the intestines.

The procedure has two limitations. The first is not to puncture the lower calyx. The ureteroscopy with puncture wire is so stiff that it cannot bend to the lower calyx. The second is difficulty approaching the target calyx. The inner cavity of the ureteroscope was occupied by the puncture wire, so a lower flow of irrigating solution left the visual field less clear.

Conclusion

UARN was effective for treatment of a complete staghorn calculus during PCNL. Further cases are needed to verify the safety and efficacy of the technique.

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