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A new method for effective use of the ClearPetra ureteral access sheath for a giant ureteral stone

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ABSTRACT

The ClearPetra (Well Lead Medical, Guangzhou, China) has recently entered the market, enabling continuous stone fragmentation and removal while maintaining a continuous perfusion field of view. The efficacy and safety of the ClearPetra renal access sheath (RAS) in percutaneous nephrolithotomy (PCNL) and endoscopic combined intrarenal surgery (ECIRS) have been reported. However, no reports have described the use of the ClearPetra ureteral access sheath (UAS). Here, we report a case of successful ureteroscopic lithotripsy (URSL) for a giant ureteral stone by effectively utilizing the ClearPetra UAS.

1. Introduction

In conventional stone treatment, the stone is crushed while saline is injected to maintain the visual field, with the crushed stone fragments then extracted using basket forceps or grasping forceps. Because fragmentation and extraction cannot be performed simultaneously, surgery tends to take a long time due to the inconvenience of changing equipment and the poor visibility due to bleeding, and the risk of postoperative complications such as urinary tract infection is high.

ClearPetra has been available in Japan since 2019. Our hospital introduced the ClearPetra in 2020. The ClearPetra RAS is designed for effective stone treatment using continuous perfusion urinary lithotripsy, primarily for kidney stones. The system uses negative pressure from suction to extract crushed stone fragments effectively and efficiently. Continuous perfusion prevents bleeding during fragmentation and also avoids obstruction of the visual field by crushed stone fragments. In addition, a very good field of view can be maintained because crushed stone fragments pass through the sides of the sheath without scattering and are removed. The ClearPetra RAS has been reported as safe and effective in PCNL and ECIRS[1,2]. In addition to the ClearPetra RAS, the ClearPetra UAS is designed for the treatment of ureteral stones. Although full utilization of the ClearPetra UAS in URSL is difficult, we have devised the Tamura method (named after its inventor) as a method that can be used effectively in a variety of cases.

2. Case presentation

The case involved a 72-year-old woman. A ring pessary had been placed for a prolapsed uterus at 50 years of age, then was left untreated for over 20 years. Computed tomography (CT) at the previous hospital revealed a 32-mm left ureteral stone (CT attenuation value: 1365 Hounsfield Unit (HU)) and a 27-mm right kidney stone (CT attenuation value: 1382 HU) and the patient was referred to our hospital for further investigation and treatment (Fig. 1A–C). Left nephrostomy and removal of the ring pessary were performed first, then URSL was performed using the ClearPetra UAS for the left ureteral stone.

The surgical technique (Fig. 2) was as follows: 1) the guidewire was inserted in an antegrade manner from the nephrostomy side and held in a through-and-through condition; 2) using the guidewire, a dual-lumen ureteral access catheter (COOK Medical, Bloomington, America) was inserted and placed from the nephrostomy to the target ureteral stone, and at the same time the ClearPetra UAS (12/14 Fr) was inserted through the urethra; 3) a rigid ureteroscope (6.0/7.5 Fr; WOLF, Knittlingen, Germany) was inserted through the UAS, and lithotripsy was performed using LithoClast 2 (E M S. Electro Medical Systems S.A, Nyon, Switzerland) during stone removal, saline was injected using the proximal lumen of the ureteral catheter, allowing efficient removal of fragments by negative-pressure suction. As a result, we performed URSL using a ClearPetra UAS twice and the left ureter became stone-free (Fig. 3A and B). Two months later, ECIRS was performed for the right kidney, which also became completely stone-free. At that time, left

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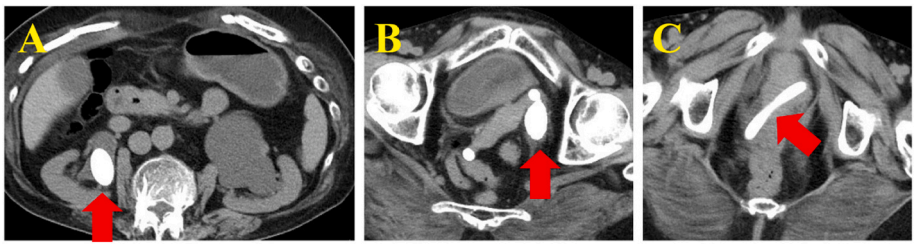

Fig. 1. Preoperative CT shows: A) a right renal stone (arrow) and left hydronephrosis; B) a left ureteral stone (arrow); and C) a ring pessary (arrow).

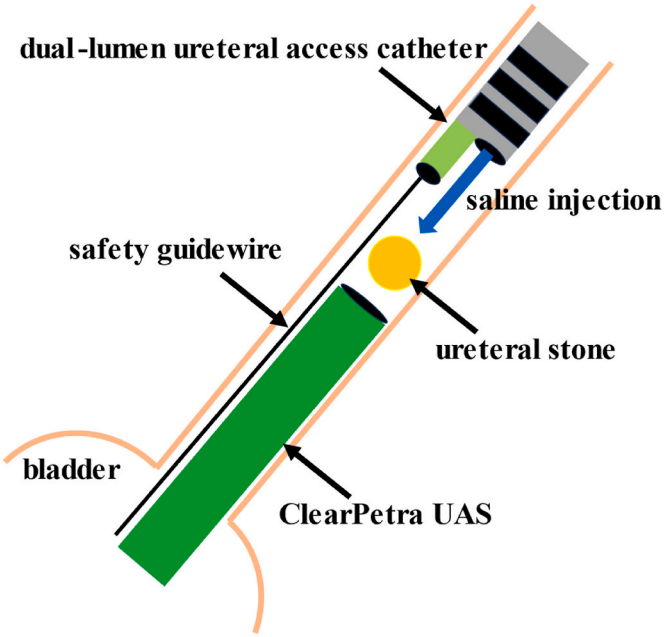

Fig. 2. Image of surgical method.

ureteroscopy revealed no abnormalities such as stricture in the left ureter.

3. Discussion

PCNL and ECIRS using the ClearPetra RAS are becoming more and more popular because it enables safer, more efficient crushing and removal of kidney stones than conventional treatments. According to previous reports, the postoperative stone-free rate is 71–94%, and the surgical time is significantly shorter than with conventional treatments[2–4]. On the other hand, when performing URSL in the normal manner, the ClearPetra UAS does not function properly with negative-pressure suction, so the device is not very popular and no reports have described its use.

In this study, we performed URSL using the ClearPetra UAS for a giant ureteral stone measuring 32 mm in diameter. To effectively utilize the ClearPetra UAS, a dual-lumen ureteral access catheter was inserted from the nephrostomy side using a safety guidewire in a through-and-through condition. This made it possible to: 1) prevent stone fragments from being pushed back to the kidney; 2) straighten the dual-lumen ureteral access catheter and ClearPetra UAS; and 3) inject saline using the proximal lumen of the dual-lumen ureteral access catheter. In other words, the negative-pressure suction system of the ClearPetra UAS, which did not work well in conventional URSL, proved successfully applicable with water flow from the saline injection, allowing removal of the stone fragments. Further, by maintaining a straight access, damage to the ureteral mucosa caused by water flow could be avoided.

As a point to keep in mind during surgery, when crushing the stones while injecting saline in the first URSL, stone fragments hit the tip of the rigid ureteroscope and damaged the lens (Fig. 3C). Therefore, in the second URSL, we stopped injecting saline during lithotripsy and took care to inject saline only when removing the stone fragments. As a result, we were able to removal the stone fragments without damaging the lens of the rigid ureteroscope.

4. Conclusion

We encountered a case in which URSL was safely and efficiently performed for a giant ureteral stone using the ClearPetra UAS. The ClearPetra UAS offers an important tool for treating giant ureteral stones, and what made it possible was the injection of saline through a dual-lumen ureteral access catheter inserted from the nephrostomy side. Once clinicians learn about this new method, it will likely be considered obvious in retrospect.

Financial conflict of interest

None.

Declaration of competing interest

None.

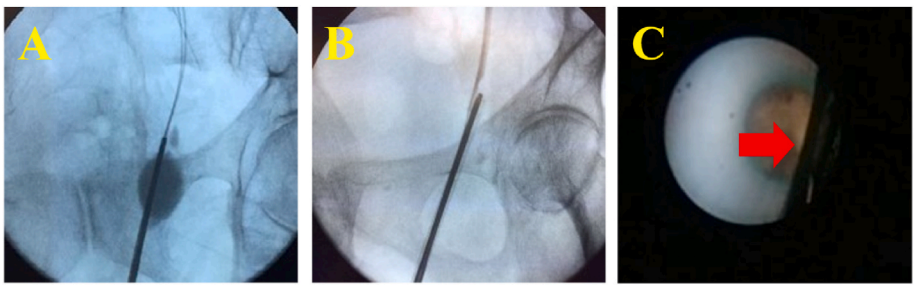

Fig. 3. A) Preoperative C-arm image. B) Postoperative C-arm image. C) Damaged lens (arrow).

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