

Case Report

Removal of an encrusted ureteral stent by cutting the stent with a holmium laser using 4.5-Fr semi-rigid and flexible ureteroscopes

Satoshi Imai,¹  Takaaki Inoue,²  Mototsugu Muramaki,¹ Yuji Yamada¹ and Masato Fujisawa³

¹Department of Urology, Amagasaki General Medical Center, Amagasaki, ²Department of Urology, Hara Genitourinary Hospital, and ³Division of Urology, Department of Surgery Related, Kobe University Graduate School of Medicine, Kobe, Hyogo, Japan

Abbreviations & Acronyms

CT = computed tomography
 ECIRS = endoscopic combined intrarenal surgery
 ESWL = extracorporeal shock wave lithotripsy
 KUB = kidney ureter bladder
 PCNL = percutaneous nephrolithotomy
 RIRS = retrograde intrarenal surgery
 URL = ureteroscope lithotripsy
 URS = ureteroscope

Introduction: Ureteral stents (double-J stents) are widely used in urology to prevent or relieve ureteral obstruction and have become an integral part of urological practice. We have often experienced cases in which a stent cannot be removed due to encrustation.

Case presentation: We describe the case of a 54-year-old male, who presented with a severely encrusted ureteral stent, which had only been inserted for one month until second surgery for renal stones. The ureteral stent could not be removed as it had become encrusted with renal stones. The encrusted ureteral stent was successfully removed by cutting it with a Ho:YAG laser using 4.5/6.5-Fr semi-rigid and flexible ureteroscopes retrogradely. The patient subsequently remained stone-free without any complication.

Conclusion: We experienced a case in which an encrusted ureteral stent was successfully removed retrogradely. Technological advancements in endourology will hopefully make the treatment of such cases safer and less invasive.

Key words: encrusted ureteral stent, flexible ureteroscope, retrograde approach.

Correspondence: Satoshi Imai M.D., Ph.D., Department of Urology, Amagasaki General Medical Center, 2-17-77 Higashinaniwa, Amagasaki, Hyogo 660-8550, Japan. Email: untouchable3104@yahoo.co.jp

How to cite this article: Imai S, Inoue T, Muramaki M, Yamada Y, Fujisawa M. Removal of an encrusted ureteral stent by cutting the stent with a holmium laser using 4.5-Fr semi-rigid and flexible ureteroscopes. *IJU Case Rep.* 2020; 3: 224–227.

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

Received 18 March 2020; accepted 14 June 2020.
 Online publication 1 August 2020

Keynote message

There are various management strategies for encrusted stents. Advances in medical equipment have resulted in the development of less invasive treatments. We successfully removed the stent by cutting it with a Ho:YAG laser using 4.5/6.5-Fr semi-rigid and flexible URS.

Introduction

Many urologists have experienced cases in which an encrusted ureteral stent cannot be removed. The encrusted stent can have potentially lethal complications, such as recurrent urinary tract infections, hematuria, obstruction, and renal failure.^{1,2}

Previous studies have reported various management strategies for encrusted stents, such as ESWL, URL, PCNL, and open surgery.^{3–8}

Advances in medical equipment have resulted in the development of less invasive treatments. Recently, Thomas *et al.* reported a retrograde ureteroscopic approach performed with a Ho:YAG laser, which made it possible to remove almost all encrusted and retained ureteral stents.⁹

He *et al.* reported that they could reduce the need for PCNL by using a 4.5/6.5-Fr semi-rigid URS for retrieving retained encrusted ureteral stents.¹⁰ 4.5/6.5-Fr semi-rigid URS is made up of 4.5-Fr tip and 6.5 shaft.

We report a case in which endoscopic treatment was successfully performed for treatment of encrusted ureteral stent via a retrograde approach using semi-rigid and flexible URS.

Case presentation

We present the case of a 54-year-old male, who underwent RIRS and ESWL several times for ureteral stones.

In July 2019, a staghorn calculus was detected on a CT scan. ECIRS was performed for the staghorn calculus. A ureteral stent was also inserted after the surgery. One month later, we decided to perform RIRS for the residual stones.

An imaging study including KUB and CT revealed a residual stone in the lower pole, measuring 0.8×0.7 cm, beside the ureteral stent without hydronephrosis (Fig. 1a). The preoperative imaging did not show that stones had formed on the stent (Fig. 1b).

The patient was administered prophylactic antibiotics before the operation, and was oriented in the lithotomy position under general anesthesia.

We noticed the distal end of the encrusted ureteral stent when we inserted a cystoscope into the bladder (Fig. 2a).

We could not pull out to outside external urethral meatus the encrusted stent by using forceps.

Therefore, we inserted a 0.035-inch guidewire with a hydrophilic coating beside the retained ureteral stent and confirmed that the proximal side of the guidewire had been placed in the collecting system, under fluoroscopic guidance.

Then, we crushed the encrusted part of the distal end of the ureteral stent in the bladder using a laser, before creating a space beside the ureteral ostium, and inserted a 4.5/6.5-Fr semi-rigid URS.

4.5/6.5-Fr semi-rigid URS could be inserted up to U2 (L5 level), due to the resistance for ureteral stricture, and the stent was cut in the middle portion by using a laser on the 1.0×5 Hz setting (Fig. 2b).

However, the URS could not advance into the ureter due to the resistance for ureteral stricture (Fig. 2b).

Subsequently, we switched from a semi-rigid URS to a flexible URS (Flex-X2; Karl Storz, Culver City, CA, USA)

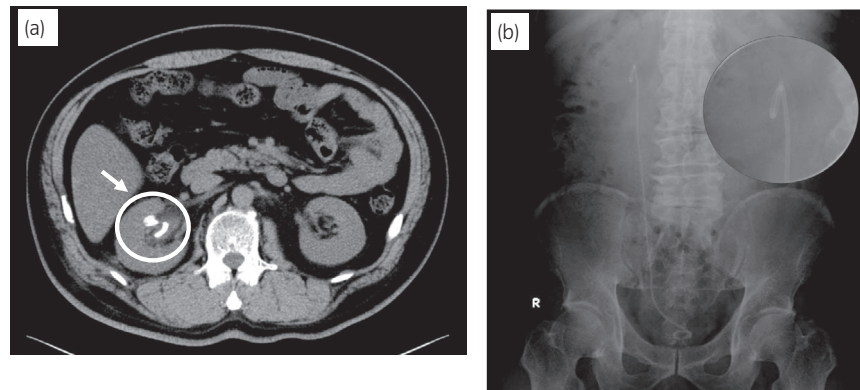


Fig. 1 (a) Plain CT showing residual stone. (b) The preoperative imaging that X-ray KUB did not show encrusted ureteral stent.

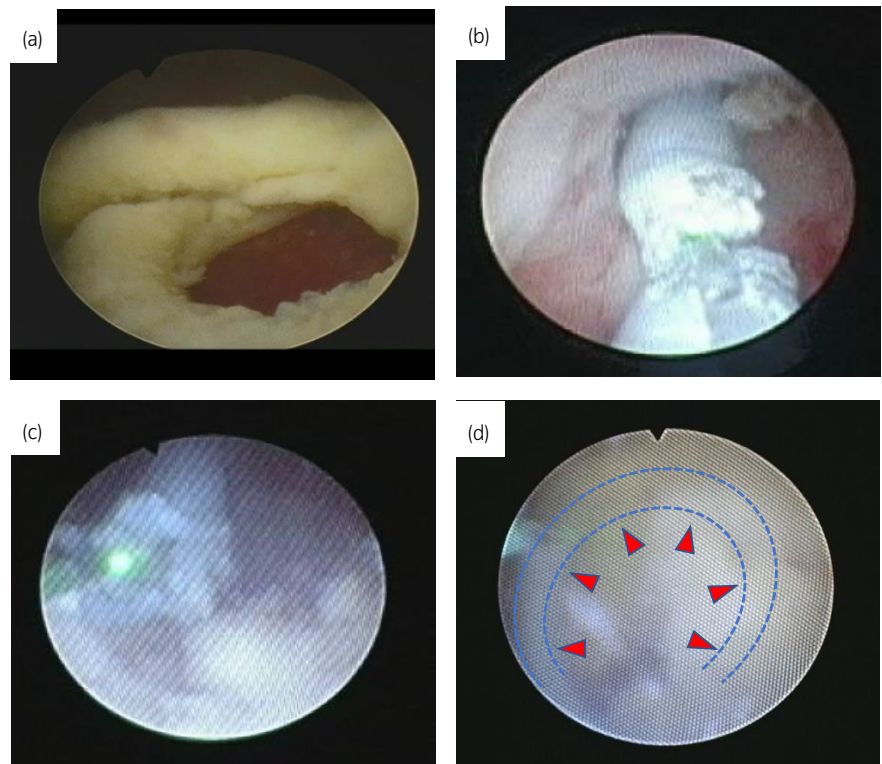


Fig. 2 (a) Cystoscopic view showing the distal end of ureteral stent. (b) The stent was cut by the Ho:YAG laser by using 4.5-Fr semi-rigid URS. (c) The stent was cut by the Ho:YAG laser by using flexible URS. (d) The flexible URS view showing the proximal end of ureteral stent.

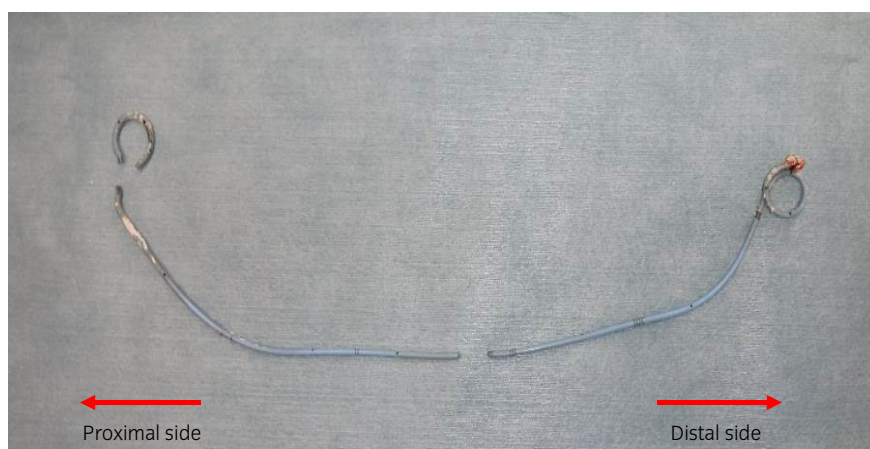


Fig. 3 Ureteral stent separated and removed in three parts.

after inserting a 10/12-Fr 35 cm ureteral access sheath (Proxis™ Ureteral Access Sheath; BARD Medical, West Sussex, UK) into the ureter in front of the stricture portion.

Then, the flexible URS was advanced into the ureter through the ureteral access sheath.

After cutting the stent, the remaining encrusted upper curl was pushed back into the renal pelvis. We were able to remove all of the stent using basket forceps (N-Circle Stone Extractor; Cook Medical, Bloomington, IN, USA) (Fig. 2c).

Surgical findings indicated that diffuse encrustations completely encasing both of the pigtail and ureteral portions (Fig. 3).

After that, the remaining stones were subjected to RIRS as usual and lithotripsy. The operation was completed without a postoperative drainage stent after confirming that there were no remaining stones. We avoided placement of a postoperative drainage stent to worsen the patient's quality of life.¹¹ The operative time was 70 min, and the stones were composed of 97% calcium phosphate and 3% calcium oxalate.

The patient did not have any postoperative complications and was discharged on postoperative day 1.

Discussion

In the absence of clear guidelines about the removal of retained stents, this problem has been managed with a variety of treatment modalities. These methods include various combinations of PCNL, ureteroscopy with laser lithotripsy, cystolitholapaxy, and ESWL.¹

The rate of ureteral stent encrustation is dependent on the composition of the patient's urine, the patient's infection status, a history of urolithiasis, infections, and the duration of stenting are regarded as important risk factors for encrustation.¹² However, it is unclear how long stent encrustation takes. In 2009, Acosta-Miranda *et al.* classified covered ureteral stents and proposed a treatment algorithm. This classification is defined as grade I: minimal linear encrustations along either of the pigtail portions; grade II: circular encrustation completely encasing either of the pigtail portions; grade III: circular encrustation completely encasing either of the pigtail portions as well as linear encrustation of the ureteral aspects of the indwelling ureteral stent; grade IV: circular encrustations completely encasing both of the pigtail portions;

and grade V: diffuse and bulky encrustations completely encasing both of the pigtail and ureteral portions.¹³ The present case is classified as grade IV.

According to the latter report, PCNL is recommended for cases in which stones form in the proximal curl of a stent.

However, PCNL requires two or three operators who are experienced in endoscopic surgery, and it also requires equipment, such as a monitor and a laser generator. For this reason, compared with endoscopic surgery much fewer facilities in Japan can perform PCNL. Conversely, our surgical method could be carried out at many facilities.

In 2019, Thomas *et al.* reported that both rigid and flexible URS were required to treat 46 (90%) of 51 encrusted stents.⁹ If the proximal tail of a stent is encrusted with stones, as was true in the present case, it might be difficult to treat with either type of URS alone. In addition, Thomas *et al.* used 12/14-Fr ureteral access sheath in 37 cases (72%), but we used 10/12-Fr to ensure that the ureter was treated gently. We consider that a thin sheath should be used whenever possible. Double-J stents were inserted for postoperative drainage in 40 of the 51 patients (78%) in the latter study. The authors did not disclose the reason for placing the stent, but if the ureter is in good condition after surgery, the stent placement can be avoided as in this case.

Conclusion

We experienced a case involving a grade IV encrusted ureteral stent, and successfully removed the stent by cutting it with a Ho:YAG laser using 4.5/6.5-Fr semi-rigid and flexible URS. Developments in endourological medical equipment make it possible to remove such stents via a retrograde approach alone.

Conflict of interest

The authors declare no conflict of interest.

References

- 1 Bostanci Y, Ozden E, Atac F, Yakupoglu YK, Yilmaz AF, Sarikaya S. Single session removal of forgotten encrusted ureteral stents: Combined endourological approach. *Urol. Res.* 2012; **40**: 523–9.

- 2 Vanderbrink BA, Rastinehad AR, Ost MC, Smith AD. Encrusted urinary stents: Evaluation and endourologic management. *J. Endourol.* 2008; **22**: 905–12.
- 3 López-Huertas HL, Polcari AJ, Hugén CM, Farooq AV, Turk TMT. A novel technique for the removal of minimally encrusted ureteral stents. *J. Endourol.* 2010; **24**: 9–11.
- 4 Clark C, Bylund J, Paszek M, Lagrange C, Pais Jr VM. Novel approach for removal of heavily encrusted ureteral stent. *Can. J. Urol.* 2009; **16**: 4831–5.
- 5 Rabani SM. Combined percutaneous and transurethral lithotripsy for forgotten ureteral stents with giant encrustation. *Nephrourol. Mon.* 2012; **4**: 633–5.
- 6 Agarwal MM, Singh SK, Mandal AK, Bhalla V, Acharya NC, Kumar S. Endourologic management of forgotten encrusted ureteral stents: can ureteroscopic lithotripsy be avoided? *Surg. Laparosc. Endosc. Percutan. Tech.* 2009; **19**: 72–7.
- 7 Aravantinos E, Gravas S, Karatzas AD, Tzortzis V, Melekos M. Forgotten, encrusted ureteral stents: A challenging problem with an endourologic solution. *J. Endourol.* 2006; **20**: 1045–9.
- 8 Bhansali M, Patankar S, Dobhada S. Laparoscopic management of a retained heavily encrusted ureteral stent. *Int. J. Urol.* 2006; **13**: 1141–3.
- 9 Thomas A, Cloutier J, Villa L, Letendre J, Ploumidis A, Traxer O; on behalf of PetraUroGroup. Prospective analysis of a complete retrograde ureteroscopic technique with holmium laser stent cutting for management of encrusted ureteral stents. *J. Endourol.* 2017; **31**: 476–81.
- 10 He Z, Lei H, Zhang C, Wang H, Tang F, Zeng G. Experience of retaining encrusted ureteral stents: URL by 4.5/6.5F ureteroscope can reduce the possibility of PCNL. *Urolithiasis* 2018; **46**: 357–61.
- 11 Sabler IM, Isid A, Katafigiotis I *et al.* Does retrograde treatment of upper urinary tract stones necessitate postoperative upper urinary tract drainage? Conclusions from more than 500 single center consecutive cases. *J. Endourol.* 2018; **32**: 6.
- 12 Bidnur S, Huynh M, Hoag N, Chew B. An indwelling ureteral stent forgotten for over 12 years. *J. Endourol. Case Rep.* 2016; **2**: 135–7.
- 13 Acosta-Miranda AM, Milner J, Turk TMT. The FECal Double-J: a simplified approach in the management of encrusted and retained ureteral stents. *J. Endourol.* 2009; **23**: 409–15.

Editorial Comment

Editorial Comment from Dr Isotani to Removal of an encrusted ureteral stent by cutting the stent with a holmium laser using 4.5-Fr semi-rigid and flexible ureteroscopes

Stent encrustation constitutes one of the most difficult complications of ureteral stents. In this case report, Imai *et al.* presented the case of the encrusted ureteral stent that was successfully treated with an endoscopic procedure using retrograde approach.¹ The knowledge about this case is important for the endocrinologists to understand the endoscopic treatment option for the encrusted ureteral stent.

As the authors described in this report, various management strategies for encrusted stents were reported, including open surgery, laparoscopic procedure, percutaneous nephrolithotomy, the endurological approach, and extracorporeal shock wave lithotripsy. Most encrusted and retained ureteral stents can be removed using endoscopic techniques. This minimally invasive approach is recommended as first-line therapy. For the complete encrustation stent in the renal pelvis, the percutaneous nephrolithotomy approach is recommended. In their report, the authors reported their successful retrieval of the encrusted ureteral stents endoscopically by cutting twice it into three parts with a Ho:YAG laser using 4.5/6.5-Fr semi-rigid and flexible ureteroscope. Similar to this report, for the retaining encrusted ureteral stents, the endurological approach was reported more than before with developments of surgical devices including new endoscopy, laser technology, and accessories. The endurological approach can be a less invasive approach than others such as open,

laparoscopic surgery, or percutaneous nephrolithotomy. They demonstrated very well their detailed method in the report. Some other modification of endurological methods were reported. In one report, the distal end of encrusted ureteral stents was straightening in the bladder without and pull it out of the urethra, then crush calculi around the stent by the ureteroscope with laser, then pull out the double-J stent and remove whole double-J stent as one.² Another report demonstrated that they successfully removed encrusted ureteral stents by retrograde ureteroscopy and percutaneous nephrolithotripsy.³

It is important to know that now we have some options to manage encrustation stent, specially in minimum invasive endurological approach using a combination of ureteroscope and laser. We need to know these updated management methods including its limitation and consider what is the best clinical practice in our institution for encrustation stent. It may provide a real benefit for the patients.

Of course, we need to think it again, the best treatment is the prevention of this complication by providing detailed patient education and the development of a tracking system.

Shuji Isotani M.D., Ph.D. 

Department of Urology, Graduate School of Medicine,
Juntendo University, Tokyo, Japan
Shujiisotani@gmail.com

DOI: 10.1002/iju5.12204

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

Conflict of interest

The author declares no conflict of interest.