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

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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.

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.
after inserting a 10/12-Fr 35 cm ureteral access sheath (Proxi-
ism™ 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 postopera-
tive drainage stent to worsen the patient’s quality of life.11 
The operative time was 70 min, and the stones were com-
posed 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 com-
binations of PCNL, ureteroscopy with laser lithotripsy, cy-
solitholapaxy, and ESWL.1 
The rate of ureteral stent encrustation is dependent on the 
composition of the patient’s urine, the patient’s infection sta-
tus, a history of urolithiasis, infections, and the duration of 
stenting are regarded as important risk factors for encrusta-
tion.12 However, it is unclear how long stent encrustation 
takes. In 2009, Acosta-Miranda et al. classified covered ure-
teral stents and proposed a treatment algorithm. This classifi-
cation is defined as grade I: minimal linear encrustations 
along either of the pigtail portions; grade II: circular encrusta-
tion 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 pre-
cent 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 equip-
ment, such as a monitor and a laser generator. For this rea-
son, 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 con-
sider 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 ure-
teral 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.

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The encrusted stent removal retrogradely

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 endourological 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 endourological approach was reported more than before with developments of surgical devices including new endoscopy, laser technology, and accessories. The endourological 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 endourological 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 approach 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.

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Conflict of interest

The author declares no conflict of interest.