CASE REPORT

Supine Endoscopically-Combined Intrarenal Surgery (ECIRS) for Encrusted Ureteral Stent with Staghorn Calculi, Ureterolithiasis and Cystolithiasis

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A forgotten and encrusted ureteral stent poses as a management dilemma especially when the encrustations are so severe that they involve the entire length of the ureteral stent. These can lead to staghorn formation, high volume ureterolithiasis and giant cystolithiasis which are all encasing the ureteral stent, This may lead to significant morbidity and mortality as a result of chronic urinary obstruction, recurrent urinary tract infection, and renal dysfunction and renal failure.

During the acute phase of the pandemic, a 31-year-old pregnant female, with 9 weeks age of gestation, underwent insertion of an indwelling ureteral stent for an obstructing renal pelvic calculus. She was lost to follow-up only to return two years later, with right flank and lower abdominal pains. Non-contrast CT showed encasement of the ureteral stent with a staghorn calculus on the proximal coil, extensive encrustations on the upper and middle segments, and a giant cystolithiasis at the distal coil of the ureteral stent. She underwent a supine endoscopically-combined intrarenal surgery (ECIRS), allowing retrograde retrieval of the ureteral stent after all the encrustations had been removed. There was minimal blood loss and no intraoperative and postoperative complications.

Encrusted ureteral stents with large stone burden may be treated effectively and safely with an endoscopically-combined intrarenal surgery. This combined antegrade and retrograde approaches to the urinary tract allows synchronous treatment of all calcifications around the forgotten ureteral stent, without resorting to open surgery.

Key words: encrusted ureteral stent, Endoscopically combined intrarenal surgery (ECIRS)

Introduction

An indwelling ureteral stent is usually inserted to drain an obstructed collecting system. It may be done acutely to recover renal function or as a means to empty infected urine, or as a terminal step at the consummation of an endourological procedure. It is not a permanent retention device and may not be retained for a protracted period. If forgotten and unremoved for a prolonged duration, its presence may lead to calcifications which may range from minor encrustations to large volume calculus formation which involve the proximal and distal coils or the entire length of the ureteral stent. This clinical condition is complicated by gross hematuria, obstruction, recurrent urinary tract infection, urosepsis, renal compromise and renal failure.[7]

Presented here is a case of a forgotten and encrusted ureteral stent which was managed successfully with a single-session supine endoscopically-combined intrarenal surgery

(ECIRS). The authors' experience in this case highlights that forgotten stents with high volume encrustations may be treated through a minimally invasive approach and should not necessarily be managed via open surgery. The authors describe their technique and the short-term outcome.

The Case

A 31-year-old female underwent emergent insertion of an indwelling ureteral stent for obstructive renal calculus during the acute phase of the COVID-19 pandemic. Two years later, she began to experience intermittent colicky right flank and hypogastric pains with a pain scale of 6-7/10, associated with urinary frequency, strangury and straining. There was no fever and gross hematuria. Unenhanced CT of the KUB revealed complete encasement of the proximal and distal ends of the indwelling ureteral stent by a 4cm x 3.5cm staghorn calculus (HU 1356) and a 5.2cm x 4.3cm cystolithiasis (HU 1356), respectively. There were also evident heavy calcifications in the upper and middle segments of the ureteral stent (Figure 1). After a thorough preoperative evaluation, she was given prophylactic antibiotic therapy with a third generation cephalosporin and was scheduled for supine ECIRS.

Figure 1. 3D reconstruction of the CT scan of the abdomen. Note the heavy calcifications surrounding both proximal and distal coils of the ureteral stent as well as the encasement of the ureteral segment of the stent.

Operative Technique

The patient was placed in a Galdakao-modified supine Valvidia position, with sandbags placed beneath the right scapular and pelvic areas respectively (Figure 2.) Fluoroscopic imaging confirmed the presence of radioopacities in the areas of the right kidney, the pelvic region, and along the course of the ureteral stent pertaining to the formation of staghorn, cystolithiasis and ureteral calculi, respectively.

Figure 2. Galdakao-modified supine Valvidia position. The patient was placed slightly laterally in Valvidia position, with the contralateral leg flexed.

The patient was prepared and draped in the usual sterile manner. A 36Fr nephroscope was then inserted transurethrally, visualizing a 60 cm ovoid cystolithiasis which formed around the distal end of the ureteral stent (Figure 3). This was fragmented with an ultrasonic lithotripter until it completely unraveled the distal loop of the ureteral stent. The bladder stones were evacuated completely using an Ellik bladder evacuator.

Upon visualizing the distal loop of the ureteral stent, the authors then proceeded to insert 0.889cm x 150cm Sensor® guidewire alongside it, until its tip was seen coiled within the renal collecting system. A 9.5Fr semi-rigid ureteroscope was advanced through the ureter, thus visualizing encrustations of the ureteral stent up to the renal pelvis. Ultrasonic intracorporeal lithotripsy was again utilized to clear the encrustations off the entire length of the ureteral stent. After completion, the guidewire was replaced with an open-ended ureteral catheter followed by retrograde pyelography, which revealed the staghorn calculus encasing the proximal coil (Figure 4).

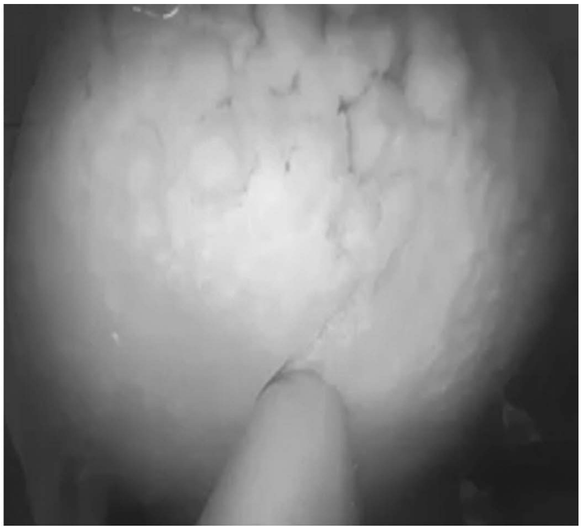

Figure 3. Cystolithiasis encasing the distal end of the ureteral stent pointed by the ultrasonic lithotripter.

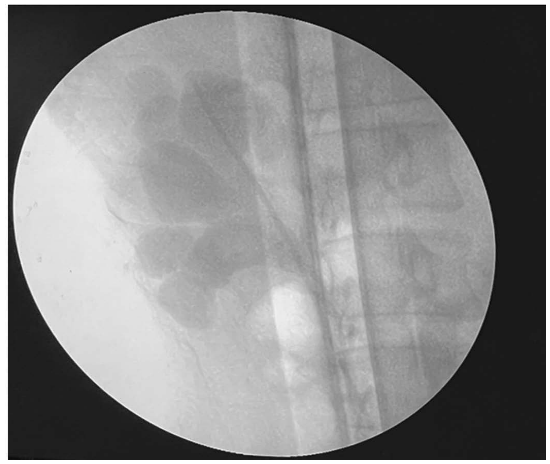

Figure 4. Open-ended ureteral stent was placed at the superior calyx followed by retrograde pyelography showing the staghorn calculus encrusting the proximal coil.

Under ultrasound guidance (Figure 5), an 18G diamond-tip percutaneous renal access needle was introduced to enter the inferior calyx followed by antegrade placement of a Sensor® guidewire into the ureter and down the urinary bladder (Figure 6). This was then replaced with an Amplatz super stiff guidewire, followed by sequential renal tract dilation Amplatz fascial dilators up to 30Fr followed by insertion of the Amplatz sheath. A 26Fr nephroscope was introduced into the sheath to visualize the staghorn calculi which encased the proximal coil of the ureteral stent (Figure 7). Ultrasonic lithotripsy was again performed fragmenting the stones and detaching all of it from the ureteral stent (Figure 8). A tri-prong stone grasper was also used to evacuate all stone fragments. The ureteral stent was then extracted with ease from the urinary bladder using a 21Fr cystoscope. Two 16Fr Foley catheters were used as nephrostomy tube and bladder drainage.

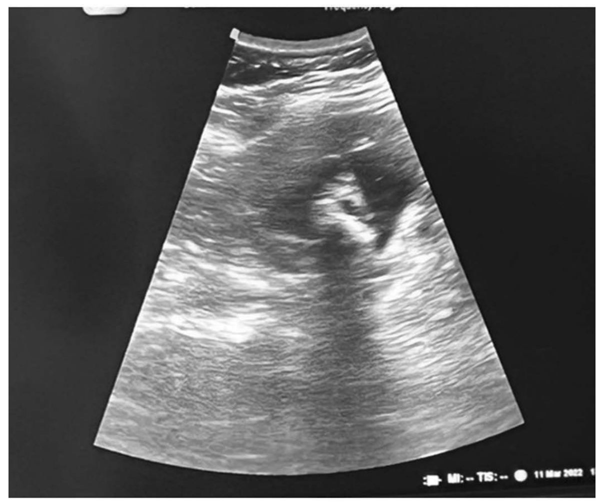

Figure 5. Kidney and Urinary Bladder Ultrasound showing a hyperechoic structure representing the staghorn calculi.

Clinical Outcome

The total operative time was around 300 minutes and the estimated blood loss was minimal. The post operative course was unremarkable. Repeat KUB X-ray revealed no radio-opacity along the urinary tract (Figure 9.) The nephrostomy tube and the ureteral catheters were removed on post operative day. At one-month follow-up, repeat non-contrast CT KUB showed no residual stone fragments.

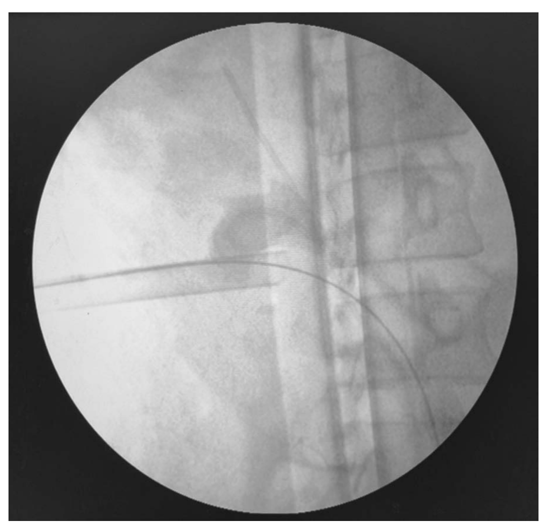

Figure 6. Antegrade placement of guidewire followed by renal tract dilatation and then insertion of Amplatz sheath.

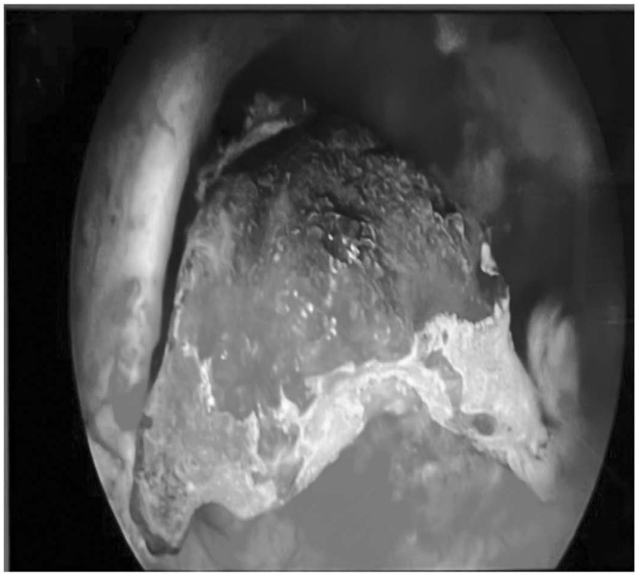

Figure 7. Staghorn calculi encasing the proximal end of the ureteral stent.

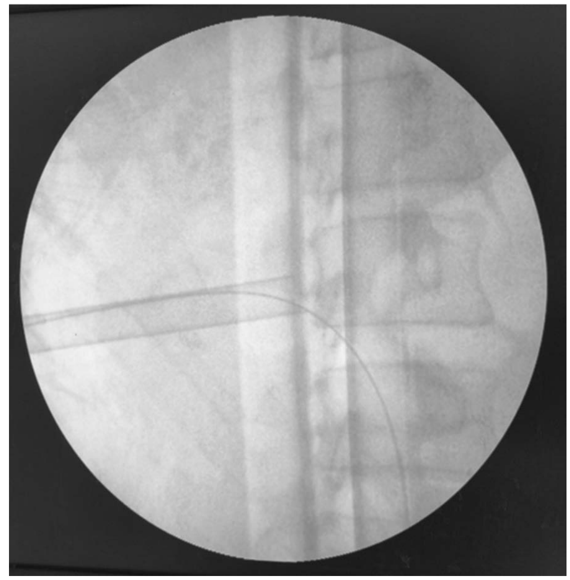

Figure 8. Repeat fluoroscopy after extraction of ureteral stent.

Figure 9. Repeat KUB X-ray showing absence of radio-opacity along the urinary tract, presence of Foley catheter balloon within the renal shadow and an open-ended ureteral stent.

Discussion

Forgotten and encrusted ureteral stents are serious health concerns. Considerable morbidity and mortality may occur as a result of gross hematuria, urinary tract obstruction, recurrent urinary tract infection, and renal compromise. The management options are variable and depend on the extent of calcifications. These may be monotherapy with, or a combination of, extracorporeal shock wave lithotripsy (ESWL), ureteroscopic intracorporeal lithotripsy (URS-ICL,) percutaneous nephrolithotripsy (PCNL) or open surgery. If a minimally invasive approach is favored, staged endourological procedures may be necessary to address the heavy stone burden that involves the bladder, ureter and the kidney. The choice of treatment is also influenced by the function of the affected kidney, the surgical expertise and the available technology.[9]

ESWL has played a role on encrusted stents depending on the severity and location of encrustation. Studies have shown successful treatment for proximal encrustations by ESWL monotherapy, while fully encrusted stent required multiple sessions of ESWL or open surgery. In this case, the authors utilized a single session of supine ECIRS. This allowed us to remove all the encrustations in a sequential manner using an exclusively endoscopic approach, followed by ureteral stent removal, without the need for repositioning into the prone position. Ideally, different energy sources are required to achieve maximal stone clearance. The authors are limited only to the use of ultrasonic lithotripsy because of the unavailability of the laser which produces smaller fragments and less stone upward migration. Pneumatic lithotripsy is an option since it has shown to have shorter removal time, however, its stone fragments are too large to pass spontaneously and has a higher incidence of retropulsion to the kidney and retained stones. In another study, Recidoro et al described their experience with an encrusted stent which was managed with laser cystolithotripsy followed by a staged PCNL within the same hospital stay. The stent was removed intact from the percutaneous tract and the patient was rendered stone-free. The main reason for a staged approach was the prolonged OR time during the initial cystolithotrispy for a 7cm bladder stone. In contrast, in this current case report, the cystolithotrispy was facilitated with the use of an ultrasonic lithotripter which was introduced using a nephroscope. Fragmentation of stone using a semirigid ureteroscopy at the ureteropelvic junction was a challenge, considering the angulation from the inferior calyx. Preferably, a flexible ureteroscope would have easily bypass the angle in this area. The authors also did not see the need to delay the treatment of the staghorn component because the patient was stable. For this reason, there was no need to stage the PCNL on another occasion. The main advantage of these synchronous bladder, ureteral and renal endoscopic procedures is a single anesthesia experience and immediate recovery from the procedure.

While the authors were able to demonstrate the effectiveness and safety of supine ECIRS for the management of encrusted ureteral stents, they still believe that the best way to avoid devastating and catastrophic complications resulting from encrusted stents is really to avoid them from being forgotten. For this purpose, the patient should be well-informed of the potential dire consequence of a prolonged ureteral stent placement. On top of that, the health professionals should maintain a database for patients with indwelling stents so that they may be constantly reminded of their timely removal.

Conclusion

Supine ECIRS is a reasonable minimally invasive management of severely encrusted ureteral stents. The combination of both antegrade and retrograde approaches provide the opportunity to manage all the encrustations involving the entire length of the ureteral stent without the need for repositioning. The authors' experience show that it may be done effectively and safely to remove the stent while rendering the patient stone-free. Surgical expertise in endourology is required to undertake this challenging task.

References

1. Abraham JBA. Supine PCNL (sPCNL): Challenging the "standard" prone (pPCNL). Philip J Urol 2020; 30(1): 1-6. Retrieved from https://pjuonline.com/index.php/pju/article/view/101
2. Cracco CM & Scoffone CM. ECIRS (Endoscopic Combined Intrarenal Surgery) in the Galdakao-modified supine Valdivia position: a new life for percutaneous surgery?. World J Urol 2011; 29(6): 821–7. https://doi.org/1.1007/s00345-011-0790-0
3. Cracco CM & Scoffone CM. Endoscopic combined intrarenal surgery (ECIRS) - Tips and tricks to improve outcomes: A systematic review. Turkish J Urol 2020; 46(Supp. 1): S46–S57. https://doi.org/10.5152/tud.2020.20282Gómez-Regalado F, Manzo BO, Figueroa-Garcia A, Sanchez-Lopez H, Basulto-Martinez M, Cracco CM & Scoffone CM. Efficacy of the endoscopic combined intrarenal surgery for the treatment of a staghorn calculus in crossed fused renal ectopia. J Endourol Case Rep 2020; 6(3): 205–8. https://doi.org/10.1089/cren.2019.0181
4. Lim EJ, Osther PJ, Valdivia Uría JG, Ibarluzea JG, Cracco CM, Scoffone CM & Gauhar V. Personalized stone approach: can endoscopic combined intrarenal surgery pave the way to tailored management of urolithiasis? Minerva Urol Nephrol 2021; 73(4): 428–30. https://doi.org/10.23736/S2724-6051.21.04443-8
5. Liu YH, Jhou HJ, Chou MH, Wu ST, Cha TL, Yu DS, Sun GH, Chen PH & Meng E. Endoscopic combined intrarenal surgery versus percutaneous nephrolithotomy for complex renal stones: A systematic review and meta-analysis. J Personalized Med 2022; 12(4): 532. https://doi.org/10.3390/jpm12040532
6. Murthy KV, Reddy SJ & Prasad DV. Endourological management of forgotten encrusted ureteral stents. Int Braz J Urol 2010; 36(4): 420–9. https://doi.org/10.1590/s1677-55382010000400005
7. Recidoro NZ & Abraham JB. Successful endoscopic management of a neglected and encrusted ureteral stent with giant cystolithiasis and nephrolithiasis using Ho-YAG Laser Lithotripsy. Philip J Urol 2020; 26(2): 76-9. Retrieved from https://pjuonline.com/index.php/pju/article/view/29

8. Wang D, Sun H, Chen L, Liu Z, Zhang D, Yu D & Ding D. Endoscopic combined intrarenal surgery in the prone-split leg position for successful single session removal of an encrusted ureteral stent: a case report. BMC Urol 2020; 20(1): 37. https://doi.org/10.1186/s12894-020-00606-5
9. Alnadhari I, Alwan MA, Salah MA, & Ghilan AM. Treatment of retained encrusted ureteral Double-J stent. Archivio Italiano Di Urologia e Andrologia 2019; 90(4): 265–9. https://doi.org/10.4081/aiua.2018.4.265
10. El-Tatawy H, El-Abd AS, Gameel TA, Ramadan AR, Abo Farha MO, Sabaa MA & El-Abd SA. Management of "forgotten" encrusted JJ stents using extracorporeal shockwave lithotripsy: A single-centre experience. Arab J Urol 2019; 17(2): 132–7. doi:10.1080/2090598x.2019.1595