

Risk Factor Analysis and Management of Ureteral Double-J Stent Complications

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Double-J ureteral stents are commonly used to manage urinary obstructions. Pain, bladder irritative symptoms, and fever are usually signs of early complications related to double-J stents; late complications are more troublesome. We review 4 cases that highlight a variety of late complications with double-J stents (encrustation, migration, and fragmentation). Following a review of the literature, guidelines are established for monitoring potential risk factors as well as management strategies for prevention of possible complications when using double-J stents.

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Ureteral stent placement is a common procedure performed in daily urologic practice. With the widespread use of indwelling ureteral stents by urologists for urinary diversion, ureteral obstruction relief, and postoperative drainage, issues related to their use have also increased. No guidelines exist for successful management of these potentially serious problems. As no ideal stent has been described, we are confronted with problems of stent migration, occlusion, encrustation, fragmentation, and stone formation.

Following are 4 case review observations of double-J stent complications including migration, fragmentation, and encrustation. Through a review of the literature, this article aims to establish guidelines for the management and prevention of such complications.

Case Reports

Case 1

A 70-year-old man had 2 ureteral stents placed to relieve an obstruction due to bilateral distal ureteral calculi 2 years prior to first presenting. An extracorporeal shock wave lithotripsy (ESWL) had been performed on the patient. Only the left ureteral calculus was disintegrated. The patient did not return for follow-up. Fifteen months later, he presented with a 2-month history of right lumbar pain, hematuria, and lower urinary tract symptoms. Physical examination revealed right costovertebral angle and paraspinous muscle tenderness. Pertinent laboratory study findings included normal serum creatinine and white blood cell count. An abdominal radiograph demonstrated proximal curl encrustations 2 mm to 3 mm in depth with a renal calculus attached to the calcifications. It also showed severe encrustation along the distal course of the ureteral stent (Figure 1). The first part of the treatment was performed by ureteroscopy using pneumatic lithotripsy; the second part consisted of percutaneous

nephrolithotripsy (PCNL) and an antegrade change of the ureteral stent.

Case 2

A 46-year-old man had previously undergone an open nephrolithotomy to treat a left staghorn calculus. A double J-stent had been inserted at that time to provide postoperative drainage. The patient never returned for follow-up or removal of the ureteral stent. One year later, the patient presented with a 2-week history of left lumbar pain, hematuria, and lower urinary tract symptoms. Physical examination was normal. Although routine biochemical parameters were anomaly free, urinalysis revealed urinary tract infection and microscopic hematuria. An attempt to remove the stent was not successful because the distal part of the stent broke after a smooth stretching on the stent (Figure 2). Therefore, a PCNL was successfully performed to remove the stent.

Case 3

A 60-year-old woman presented with a 6-year history of bilateral lumbar

pain and lower urinary tract symptoms. Ultrasonography and an abdominal radiograph demonstrated a bilateral hydronephrosis in association with a left pelvic calculus and a right ureteral calculus. Because her serum creatinine level was elevated, a right nephrostomy was performed and a left double-J stent was inserted. An abdominal film revealed the distal end of the ureteral stent to be within the ureter (Figure 3). After normalization of the kidney function test (clearance), the patient underwent a PCNL to remove the left pelvic calculus and the left double-J stent. Afterward, a right ureteroscopy was performed with the Lithoclast to disintegrate the ureteral stone. The patient was stone free thanks to this treatment. A 6-month follow-up examination showed that renal function remained equal and no new stone has been diagnosed since.

Case 4

An 80-year-old woman presented with a 15-day history of right lumbar pain, fever, and lower urinary tract symptoms. Ultrasonography demonstrated

Figure 1. Abdominal radiograph showing a right double-J stent encrustation.



Figure 2. Abdominal radiograph showing a break of a left double-J stent after a smooth stretching to remove it.



Figure 3. Abdominal radiograph showing a proximal migration of the left double-J stent.





Figure 4. Abdominal radiograph showing a proximal migration of the right double-J stent.

an isolated right ureterohydronephrosis related to a ureteral stone. A double J-stent was inserted to relieve the ureteral obstruction. An abdominal film showed that the distal end of the ureteral stent migrated from the bladder to the ureter (Figure 4). A ureteroscopy was performed to remove the stent and to disintegrate the calculus.

Discussion

Double-J stents have been widely used for more than 2 decades for different indications. The widespread use of ureteral stents has corresponded to

The widespread use of ureteral stents has corresponded to the increase in possible complications, including stent migration, encrustation, stone formation, and fragmentation.

the increase in possible complications, including stent migration, encrustation, stone formation, and fragmentation. Complications associated with the use of ureteral stents are primarily mechanical. Stent occlusion may be frequent and requires simple catheter exchange. Regardless of the

initial indication for stent placement, transurethral cystoscopic exchange is usually a simple and effective therapy for occlusion.¹

More complex stent complications, such as encrusted stents, represent a challenge for urologists and require a multimodal endourologic approach. The cause of encrustation is multifactorial. Common risk factors for stent

Common risk factors for stent encrustation are long indwelling time, urinary sepsis, history of stone disease, chemotherapy, pregnancy, chronic renal failure, and metabolic or congenital abnormalities.

encrustation are long indwelling time, urinary sepsis, history of stone disease, chemotherapy, pregnancy, chronic renal failure, and metabolic or congenital abnormalities. Very few studies have introduced algorithms for the management of retained indwelling ureteral stents,^{2,3} and practitioners are still debating on which method is the best for managing these encrusted stents. Ecker and colleagues' approach included a thorough preoperative imaging evaluation to decide on the treatment strategy. The size of the stone burden and the site of encrustation determined the specific endourologic management.⁴ They recommended removal of the distal part of the stone burden first with Lithoclast. PCNL would then be used for the stone-covered proximal end of

sense only for stones remaining after PCNL therapy, as has been cited in previous studies.^{6,7}

Although endourology can provide all necessary solutions for the management of forgotten indwelling stents, the best treatment remains prevention. In order to avoid encrustation, it has been reported that a time period of between 2 and 4 months is

considered optimal for double-J stent removal or replacement.^{3,8}

Migration is an uncommon complication. It can occur proximally toward the kidney or distally toward the bladder. Factors related to distal stent migration include shape and stent material. Stents with a full coil are less prone to migrate than those with a J-shape, and stent materials with great memory, such as polyurethane, are less prone to migrate than those with less memory, such as silicone.⁹ Conversely, proximal migration occurs when the stent is too short for the ureter; an adequate choice of the stent length is therefore recommended.¹⁰ Simple dislodgment or migration of silicone stents up into the kidney above a lower ureteral hindrance can be managed with extraction under fluoroscopic control and local anesthesia.¹ The distal dislocation can be managed by transurethral extraction of the stent.

Spontaneous fracture of an indwelling double-J stent is rare but can occur, so stent exchange every 6 months is recommended by the manufacturer.¹ The diagnosis for the patient who presented with this complication was revealed by the smooth stretching on the stent. The clinical presentation of a fragmented ureteral stent may vary, with septic, irritative,

and hemorrhagic symptoms.¹¹ Various explanations were proposed to explain the stent breakage: fragmentation of a stent has been attributed to the hostility of the urine. Interaction with urine and extensive inflammatory reaction in situ may play an important role in the initiation and promotion of degradation.¹² Several studies showed that long-indwelling stents mostly appear in a fragmented state; however, Mardis and Kroeger¹³ suggested that fragmentation occurs at a site previously allowed to kink during stent insertion. Kinking during stent insertion must therefore be avoided. In a study conducted by Zisman and colleagues,¹⁴ all breakage lines passed through the side holes, suggesting that this area is a weak point conducive to kinking and may lead to fragmentation. Another factor associated with stent fragmentation is stent composition. There is no consensus on what the ideal material is for ureteral stents. Silicone stents may be more advantageous than polyurethane stents due to the lower risk of calcification and prolonged maintenance of tensile strength for up to 20 months.¹⁵ However, these theories cannot explain why some stent fragmentations occur early following stent insertion. In the study by Kumar

and associates,¹⁶ stents had fragmented into multiple pieces over a mean indwelling time of only 3.5 months.

Retrieval of a proximally fragmented double-J ureteral stent can be frustrating and technically challenging. Generally, transurethral intervention is enough for the removal of bladder stents; however, various methods such as ureterorenoscopy and percutaneous procedures have been described for the removal of fragmented stent in a renal pelvis.¹⁷⁻²¹

Conclusions

These cases show the possible complications that can arise with the use of ureteral stents as well as with the multimodal options available for their management. Close monitoring and follow-up is very important and may contribute to the prevention of complications in these patients. ■

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Main Points

- Double J-stents have been widely used for more than 2 decades, although widespread use of ureteral stents has corresponded to an increase in potential complications (eg, stent migration, encrustation, stone formation, and fragmentation). Regardless of the initial indication for stent placement, transurethral cystoscopic exchange is an effective therapy for occlusion.
- Practitioners are still debating the best method for managing complicated encrusted stents. Extracorporeal shock wave lithotripsy (ESWL) is indicated only for localized, low-volume encrustations in kidneys that have reasonably good function to allow spontaneous clearance of fragments. It is believed that ESWL is appropriate only for stones remaining after PCNL therapy.
- Spontaneous fracture of an indwelling double-J stent is rare but can occur, so stent exchange every 6 months is recommended by the manufacturer. Retrieval of fragmented stents can be a challenge. Generally, transurethral intervention is enough for the removal of bladder stents; however, various methods such as ureterorenoscopy and percutaneous procedures have been described for the removal of fragmented stent in a renal pelvis.
- The best treatment for indwelling stents is prevention. Complications can arise with the use of ureteral stents, as well as with the multimodal options available for their management. Follow-up and patient monitoring is key and may contribute to the prevention of complications seen in these patients.

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