Endourologic Management of Severely Encrusted Ureteral Stents

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Background: *Ureteral stents are in common use in urologic practice. Even though the stent is a valuable urological tool, its use has two widely encountered complications, namely, stent encrustation and stone formation. These complications are difficult to manage; but endourologic surgery, which is minimally invasive, has become the first choice in the treatment for encrustation and stone formation.*

Material and Method: *Eight patients with severely encrusted ureteral stents were treated by endourologic techniques. One patient had severe encrustation at all sites of the stent and was treated by percutaneuos nephrolithotomy, ureteroscopy with intracorporeal lithotripsy and cystolitholapaxy. Five patients with severe encrustation at both ends of the stent were treated with percutaneous nephrolithotomy and cystolitholapaxy(4 cases) and with extracorporeal shock wave lithotripsy (ESWL) and cystolitholapaxy. The last two patients with severely encrusted ureteral stents at the bladder end were treated with percutaneous cystolithotomy with intracorporeal lithotripsy and by optical lithotrite,respectively.*

Results: *All cases were stone free and stent free in one session without complication. The average approaches were 1.9 (range 1-3). All stents were removed intact and no subsequent stent was required following the removal of the problematic stent.*

Conclusion: *Endourologic surgery which is minimally invasive surgery, is the first choice of treatment for the management of severely encrusted ureteral stents with good results in one session without complications and no subsequent stent is necessary.The authors recommend removing the stent as soon as possible or change the new stent every 3 months for decreasing the incidence of these complications.*

Keywords: *Severely encrusted ureteral stent, Endourologic management.*

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Ureteral stents are commonly used in urologic practice. The indications for the ureteral stent placement are conjunction with extracorporeal shock wave lithotripsy (ESWL)of large renal calculi, management of ureteral obstruction, including obstruction of ureteral calculi, ureteral stricture or ureteropelvic junction obstruction from congenital or iatrogenic causes[1-3]. Although the stent is demonstrably valuable, it also has complications, the major ones being double J stent symptom, pyelonephritis, stent obstruction, stent migration, stent fragmentation, stent encrustation and stone formation[1-5]. Stent encrustation and stone formation are one of the most difficult complications to manage and they can lead to obstruction and renal impairment. Herein,the authors report the use of minimally invasive treatment of 8 severely encrusted ureteral stents.

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Material and Method

Eight patients (3 male and 5 female aged 32-60 years;mean age years) were managed for severely encrusted ureteral stent. All patients were accessed for stent encrustation and renal function by plain KUB, renal ultrasound, intravenous urogram and renal scan. One patient had severe encrustation on the whole ureteral stent; five patients had encrustation at both renal and bladder ends. Two had severe encrustation only at the bladder end. The average indwelling time of ureteral stents was an 28.3 months (range 9-62 months). All patients presented with frank pain and urinary tract

infection. Two patients had solitary kidney. In seven cases, severe encrustations at the bladder ends were treated first and these responded successfully with cystolitholapaxy by the optical lithotrite (Storz, Karl Storz). In one case where the encrustation at the bladder end was too large for cystolitholapaxy, percutaneous cystolithotomy with ultrasonic lithotripsy was the method of treatment employed. After removal of encrustation at the bladder end, gentle traction of ureteral stent via cystoscopy was done until resistance was met and then stopped to avoid injuring the ureter. If this situation was met, other procedures may be considered.

One patient who had severely encrustation on the whole stent, the ureteral calcification was managed with antegrade ureteroscopy (Storz, rigid ureteroscope 9.5 F) and eletrohydraulic lithotripsy (EHL) after cystolitholapaxy of the calcification at the bladder and percutaneous nephrolithotomy of the calcification of the renal end.

For management of the calcification at the renal end, if the calcification was less than 2.0 cm, SWL (Storz Modulith-SL 20) was the first management. Encrustations of more than 2.0 cm were managed with percutaneous nephrolithotomy and ultrasonic lithotripsy via the middle or upper posterior calix under ultrasonic guidance. The ureteral stents were removed intact with forceps via nephroscope. The 20 F nephrostomy tube was placed for 48 hours after the procedure.

Results

All patients were stent and stone free after 1.9 (range 1-3) approaches in one session. Six patients needed multiple approaches in one session. Cystolitholapaxy, percutaneous cystolithotomy with ultrasonic lithotripsy, antegrade ureteroscopy with electrohydraulic lithotripsy, extracorporeal shock wave lithotripsy and percutaneous nephrolithotomy with ultrasonic lithotripsy were done without intraoperative and postoperative complications. All cases were managed with one anesthesia.The stents were removed completely (5 via nephroscopy, 3 via cystoscopy). No new stents were inserted after the stent removal.The mean length of hospital stay was 3.5 (range 1-5) days.

Discussion

The most challenging complications and the most difficult management of retaining double J ureteral stents, and the most difficult to manage, are stent encrustation and stone formation[1-6]. Successful management means achieving a stent-free and stone-free status, with recovery of renal function. In the past, open surgery was done to overcome this complication with morbidity.

Recently, minimally invasive surgery such as endourologic surgery is the first choice in the management of severely encrusted ureteral stents. Mohan-Pillai[1] reported 4 patients with severely encrusted ureteral stents that were managed with either retrograde ureteroscopy or a combination of percutaneous and ureteroscopic procedures that required an average 2.5 endourological approaches. The treatment of 4 cases were rendered stone-free and stent-free and had recovery of their renal function after the period of obstruction by the encrusted stents. Borboroglu[2] also reported the endourologic treatment of 4 patients with severely encrusted ureteral stents with a large stone burden. They required an average of 4.2 endourological approaches at 1 or multiple sessions to achieve stone-free and stent-free status.They managed the encrustation at the renal end which less than 1.5 cm with SWL. If the encrustation was larger than 1.5 cm, they managed with percutaneous nephrolithotomy and intracorporeal lithotripsy.

The etiology of the encrustation of stents is multifactorial, resulting from urinary tract infection[7], chronic stone formers[3,6,8,9], duration of the stent and pregnancy[1]. Bacteriuria has been a strong factor of stent encrustation[7]. Encrustations can form in the presence of infected or sterile urine. In infected urine, magnesium and calcium are precipitated in the form of magnesium ammonium phosphate hexahydrate (struvite) and calcium apatite. In sterile urine, the encrustations are composed of calcium oxalate. The incidence of stent encrustation is increased among those who are chronic stone formers. El–Faquih et al[10] reported that the incidence of encrustation correlates with the duration of stenting. The incidence is 76.3% if the duration of stenting is more than 12 weeks. Mohan-Pillai[1] et al reported a higher incidence of encrustation in pregnant women due to an increased incidence of underlying urinary tract infection or asymptomatic bacteriuria during pregnancy.

The choice of endourological treatment depends on the location of the encrustation of the stent, burden of the encrustation and the function of the affected kidney. One patient may need multiple approaches in one or multiple sessions[1,2]. The severely encrusted stent is diagnosed by plain KUB and ultrasound. The authors used the intravenous urogram and renal scan for evaluation of the function of the affected kidney. Combined extracorporeal shock wave lithotri-

psy, antegrade ureteroscopic stone manipulation and percutaneous nephrolithotomy with intracorporeal lithotripsy were performed to render patients stone-free and stent-free. If the calcification was only on the bladder end of the stent that was less than 2.5 cm, it was generally treated with cystolitholapaxy by optical lithotrite. One of the present patients, who had severe encrustation of 8 cm in diameter at bladder end, was managed with percutaneous cystolithotomy and ultrasonic lithotripsy.If the stent could not be removed at this point,the authors thought it was not necessary to cut the stent (that needed laser or a special instrument). For treatment of calcification on the renal end of the stent, if the calcification is less than 2.0 cm, SWL is the first choice[1,2]. Severely encrusted stents at the upper ureter pelvis are best managed with percutaneous nephrolithotomy and ultrasonic lithotripsy via the middle or upper posterior calix to complete clearance of the stone. The technique of percutanous nephrolithotomy is the same as the percutanous nephrolithotomy in the general stone patients. In this particular condition, all patients need to have the access under ultrasound guidance due to the inability to have the ureteral catheter for retrograde pyelogram. Retrograde and antegrade rigid or flexible ureteroscopy with intracorporeal lithotripsy is used for the management of encrustation in the ureter. Nephrectomy is reserved if the function of the affected kidney is extremely poor.

In the present series,the authors could completely remove the stent after the treatment of severe encrustation (5 via nephroscopy, 3 via cystoscopy). In the authors' experience, no subsequent ureteral stent was required after removal of the old stent and there was no complication.In case of percutaneous nephrolithotomy, percutaneous nephrostomy tube was needed for 48 hours only.

Conclusion

Minimal invasive treatments such as SWL, ureteroscopy, cystolitholapaxy, percutaneous cystolithotomy and percutaneous nephrolithotomy are among the first choices for the treatment of severely encrusted ureteral stents. The choice of treatments depends on the site of the encrustation,burden of the calcification and the function of the affected kidney. Multiple endourological approaches are always needed for rendering patients stone-free and stent-free in one

Table 1. Profiles and Patients

Pt.	Age & Sex	Duration of stenting (mo.)	Indication for stenting	Site of encrustation	Stone size (cm)	No. of Approach	Procedure	Result	Hospital stay (days)
1	35 M	23	PO. pyelolithotomy	renal ureter bladder	3.0 0.6 2.4	3	PCNL*, URS**, cystolitholapaxy	Stone free Stent free	5
2	32 M	15	Prior ESWL (solitary kidney)	renal bladder	2.6 2.6	2	PCNL, cystolitholapaxy	Stone free Stent free	5
3	54 F	17	PO. nephrolithotomy	renal bladder	3.0 2.5	2	PCNL cystolitholapaxy	Stone free Stent free	4
4	38 F	39	PO. reimplantation	renal bladder	2.0 2.4	2	SWL***, cystolitholapaxy	Stone free Stent free	3
5	54 F	18	PO. repair ureter	bladder	8.0	1	PCCL**** Stent free	Stone free	4
6	60 F	9	PO. pyeloplasty	bladder	2.5	1	cystolitholapaxy Stent free	Stone free	1
7	35 M	43	PO. nephrolithy	renal bladder	3.5 2.5	2	PCNL cystolitholapaxy	Stone free Stent free	3
8	57 F	62	PO. ureteroscopy	renal bladder	3.0 1.8	2	PCNL, cystolitholapaxy	Stone free Stent free	3

* Percutaneous nephrolithotomy
** Ureteroscopy
*** Shock Wave Lithotripsy
**** Percutaneous cystolithotomy

session during a single anesthesia.The stent can be removed completely intact without requirement of a e subsequent stent. The authors recommend removing the stent as soon as possible or change the new stent every 3 months to decrease the incidence of severe encrustation.

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การรักษาสายสวนท่อไตที่มีนิ่วเกาะอย่างรุนแรง โดยวิธีการผ่าตัดส่องกล้อง

บรรณกิจ โลจนาภิวัฒน์

สายสวนท่อไตเป็นอุปกรณ์ที่ใช้บ่อยในการรักษาโรคในระบบทางเดินปัสสาวะ ภาวะแทรกซ้อนที่รุนแรงที่พบร่วมกับการใส่สายสวนท่อไต คือภาวะมีหินปูนและมีนิ่วเกาะบริเวณสายสวนท่อไตอย่างรุนแรง ภาวะแทรกซ้อนเหล่านี้มีความยุ่งยากในการรักษา ในปัจจุบันมีการใช้การผ่าตัดส่องกล้องเป็นการผ่าตัดทางเลือกแรกในการรักษาภาวะแทรกซ้อนนี้

ผู้ป่วย 8 รายมาพบแพทย์ด้วยภาวะมีนิ่วเกาะบริเวณสายสวนท่อไตอย่างรุนแรง ซึ่งได้รับการรักษาโดยวิธีการผ่าตัดส่องกล้อง ผู้ป่วย 1 รายมีนิ่วเกาะอย่างรุนแรงบริเวณทุกส่วนของสายสวนท่อไต ผู้ป่วย 5 ราย มีนิ่วเกาะอย่างรุนแรงบริเวณปลายของสายสวนท่อไตทั้ง 2 ข้าง และมีผู้ป่วย 2 ราย ที่มีนิ่วเกาะอย่างรุนแรงบริเวณปลายสายสวนท่อไตส่วนล่าง ผู้ป่วยทุกรายได้รับการรักษาโดยการผ่าตัดส่องกล้อง ซึ่งพบว่าสามารถเอาสายสวนท่อไตและเอานิ่วออกได้ทุกรายในการผ่าตัดครั้งเดียว โดยใช้วิธีการผ่าตัดเฉลี่ย 1.9 อย่างต่อผู้ป่วยหนึ่งราย โดยสรุปพบว่าการรักษาสานสวนท่อไตที่มีนิ่วเกาะอย่างรุนแรงโดยวิธีการผ่าตัดส่องกล้อง เป็นวิธีการผ่าตัดทางเลือกแรกของการรักษาภาวะแทรกซ้อนนี้และแนะนำให้เอาสายสวนออกจากตัวผู้ป่วยให้เร็วที่สุดหรือเปลี่ยนสายสวนท่อไตทุก 3 เดือน เพื่อลดภาวะแทรกซ้อนที่รุนแรงนี้