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Original Research Article

Ureteric double-J stent related complications: a single tertiary care center experience from South India

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ABSTRACT

Background: The double-J (DJ) ureteral stents is most commonly used urological procedure and is associated with complications. This study was done to analyse the complications of ureteral DJ stents, modalities of management and outcomes.
Methods: The present study is a prospective observational study of patients who presented with DJ stent related complications between February 2016 and November 2017. Patients were evaluated by history, examination, urine analysis, cultures, KUB ultrasonography, abdominal roentgenogram, CT-KUB, intravenous urogram and DTPA renogram. Complications like fever, hematuria and irritable bladder symptoms were managed conservatively. Patients with stent migration underwent endoscopic removal. Combined endourological procedures were performed in single or staged manner in cases with retained DJS with encrustation.
Results: Total 120 patients presented with DJ stent complications during the study period. Males were 63.3% and females 36.7%. The mean age was 31.5 years. The majority 65.33% of the stents were placed for postsurgical prophylaxis. Irritable bladder symptoms 42.5% was most common complication, followed by retained stent with encrustation 17.5%, fever 15.9%, hematuria 13.3%, stent migration 5.8% and retained sent with minimal and no encrustation 5%. Stent removal was done in 47 (39.16%) patients; all patients with retained stent, stent migration, 5 (26.3%) patients with fever and 8 (15.6%) patients with irritable bladder symptoms. Common site of encrustation was bladder alone and kidney with bladder in 5 (23.80%) patients each. The mean stent indwelling time was 3.2 years. Twenty-one (17.5%) patients required combined endourological procedures such as cystolithotripsy (CLT), ureteroscopic lithotripsy (URSL), percutaneous nephrolithotomy (PCNL) with intracorporal lithotripsy. One (4.76%) patient required nephrectomy.
Conclusions: Double-J stent is an important tool to prevent and relieve obstruction. Their use must be strictly restricted to selected cases with proper documentation, counseling and close tracking. Encrustation in forgotten stents should be managed with stent removal with combined endourologic techniques.

Keywords: Cystolithotripsy, DJ stent, Encrustation, Irritable bladder symptoms, Retained stent

INTRODUCTION

The double J (DJ) ureteral stents have become one of the most basic and valuable tools in the urological practice. Indwelling ureteral stents provide direct drainage of the upper urinary tract to the bladder without the need for external diversion. The indications for insertion of stents into the urinary tract have expanded significantly. DJ

stents now are inserted routinely in patients with ureteral obstruction and for the prevention of complications following open or endoscopic urological or gynecological procedures.[1] However, their use is not free of complications; various intra and post-operative complications related to double J stent have been described.

Indwelling ureteral DJ (DJS) stents can cause lower abdominal pain, dysuria, fever and hematuria. Complications associated with the use of ureteral stents can be mechanical; stent occlusion, migration, break or even encrustation of forgotten stents. Regardless of the initial indication for stent placement, transurethral cystoscopic exchange is usually a simple and effective therapy for occlusion.[2] More complex stent complications, such as encrusted stents and calculus formation, represent a challenge for urologists and require a multimodal endourologic approach such as cystolithotripsy (CLT), ureteroscopic lithotripsy (URSL), percutaneous nephrolithotomy (PCNL) with intracorporal lithotripsy and extracorporeal shock wave lithotripsy (ESWL) in single or staged manner. Although, algorithms for the management of retained indwelling ureteral stents have been introduced, practitioners are still debating on which method is the best for managing these encrusted stents.[3,4] Hence, this study was done to analyze the complications associated with ureteral double J stents, and different modalities of management of complications of ureteric DJ stents and its outcomes.

METHODS

The present study is a prospective observational study of patients who presented to the outpatient department at Gandhi Medical College Hospital, Secunderabad, with DJ stent related complications between February 2016 and November 2017. All the patients who underwent DJ stenting either at authors' centre or other hospital and present with stent related complications during the study period were included in the study. Patients who had recurrent urolithiasis were excluded from the study

All the patients were evaluated by detailed history with emphasis on urologic and stent symptoms, examination, urine analysis and cultures, KUB ultrasonography, a plain abdominal roentgenogram and CT-KUB scan as required to show the stent position and integrity. Patients who presented with retained DJ stent of indwelling time longer than 6months were evaluated for stent encrustation and associated stone burden by plain x-ray KUB, intravenous urogram and non-contrast CT (NCCT). In patients with non-visualized kidneys on intravenous urogram, Tc^{99m} diethylene triamine penta acetic acid (DTPA) renogram was done to estimate the renal function.

Treatment decision was made on clinical and radiological findings. Complications like fever, was conservatively with injectable antibiotics and antipyretics. Those who didn't improve with conservative management underwent stent removal. Patients who presented with hematuria were given intravenous fluids along with blood transfusion and hemostatic agents as required. Those patients with irritative bladder symptoms not settled by anti-cholinergic had to undergo DJ stent removal early. Patients showing distal stent migration underwent endoscopic removal of the stent.

Patients with retained DJ stent and a positive urine culture were treated preoperatively, according to the culture antibiogram. Before any urological intervention, urine culture negativity was obtained for the all patients. Antibiotic prophylaxis with single dose intravenous amikacin was given.

Combined endourological procedures such as cystolithotripsy (CLT), ureteroscopic lithotripsy (URSL), percutaneous nephrolithotomy (PCNL) with intracorporeal lithotripsy were performed in single stage or staged manner in cases with retained DJS with encrustation and calculus formation.

In stents with minimal encrustation on plain X-ray KUB, a gentle attempt was made to remove the stent with the help of grasping forceps passed through the cystoscope under local anesthesia and fluoroscopic guidance. Retrograde ureteroscopy was performed using 6/7.5 and 8/9.8 Fr semi-rigid ureteroscope, under fluoroscopic guidance. Intracorporeal lithotripsy was performed with a pneumatic lithotripter. PCNL was carried out using a rigid 24Fr nephroscope.

For patients with encrustation and stone burden involving the lower coil, ureteric body or whole of the stent, initially, CLT, retrograde ureteroscopy and intracorporeal lithotripsy were performed in the dorsal lithotomy position. Following this, a gentle attempt was made to retrieve the stent with the help of an ureteroscopic grasper. If the stent failed to uncoil, a ureteric catheter was placed adjacent to the encrusted stent for injection of radio-contrast material to delineate the renal pelvis and calyces. Then the patient was placed in the prone position and PCNL for the upper coil of the encrusted stent along with calculus was done.

The approach to the collecting system was through the lower calyx and middle calyx and no patient required upper pole or supracostal access. A 14Fr nephrostomy was kept indwelling for 48 hours, in patients who required PCNL. Postoperatively, plain film radiography was done to confirm the stone free status.

RESULTS

A total of 120 patients presented to our outpatient department with DJ stent related complications during the study period. Males were 76 (63.3%) and females 44 (36.7%) patients. The mean age was 31.5 years ranging from 4 years to 63 years. Majority (39.2%) of the patients

were between 20-34 years of age (Table 1). The majority (65.33%) of the stents were placed for stone disease postsurgical intervention. Patients with unknown indications for DJ stenting were referred form outside hospitals with no available details (Table 2).

Table 1: Age group distribution of patients.

Age group (years)	No. of patients (%)
4-20	11 (9.2)
20-34	47 (39.2)
35-49	37 (30.8)
50-63	25 (20.8)
Total	120 (100)

Table 2: Indications for stenting.

Indications of DJ stent	No. of patients (%)
Post-surgery for stone disease	79 (65.33)
VVF repair	9 (7.5)
Pyeloplasty	13 (10.83)
Malignancy	6 (5)
Pregnancy	9 (7.5)
Unknown	4 (3.33)
Total	120 (100)

Figure 1: X-RAY KUB Showing distally migrated right DJS.

Irritable bladder symptoms were most common complication of DJ stent seen in 51 (42.5%) patients, followed by retained stent with encrustation in 21 (17.5%), fever in 19 (15.9%), hematuria in 16 (13.3%) patients, stent migration (Figure 1) in 7 (5.8%) and retained stent with minimal and no encrustation in 6 (5%) patients. Stent removal was done in 47 (39.16%) patients; all patients with retained stent, and stent migration required stent removal, 5 (26.3%) patients with fever and 8 (15.6%) patients with irritable bladder syndrome required early stent removal and none of the patients with hematuria required stent removal (Table 3).

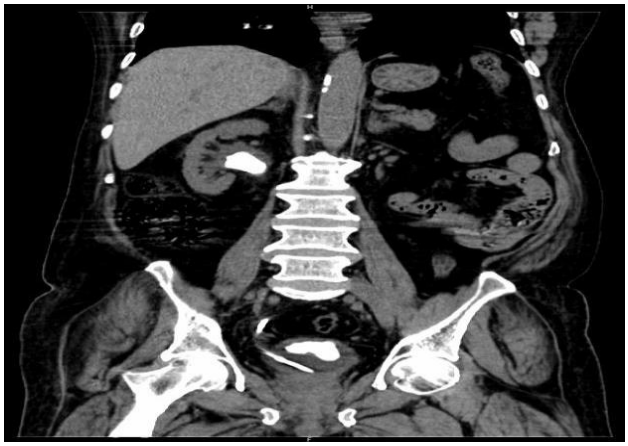

Figure 2: Coronal view of CT-KUB showing right DJS with encrustation in kidney and bladder.

Table 3: Complications of DJ stent and its removal.

Complications		No. of patients n (%)	Stent removal n (%)
Fever		19 (15.9)	5 (26.3)
Irritative bladder symptoms		51 (42.5)	8 (15.6)
Hematuria		16 (13.3)	0 (0)
Stent migration		7 (5.8)	7 (100)
Retained DJ stent	Minimal / no encrustation	6 (5)	6 (100)
	Stone formation	21 (17.5)	21 (100)
Total		120 (100)	47 (39.16)

Total 27 (22.5%) patients had retained stents, of whom, 6 had minimal or no encrustation and among 21 patients, who had encrustation, the common site of encrustation was bladder alone and kidney with bladder (Figure 2) in 5 (23.80%) patients each, kidney alone (Figure 3) in 4 (19.04%), ureter with bladder (Figure 4) and kidney with ureter and bladder in 3 (14.28%) and kidney with ureter was seen in only 1 (4.76%) patient (Table 4).

Table 4: Site of encrustation in retained the patients with retained stent.

Site of encrustation	No. of Patients (%)
Bladder	5 (23.89)
Kidney	4 (19.04)
Kidney, ureter	1 (4.76)
Kidney, bladder	5 (23.80)
Ureter, bladder	3 (14.28)
Kidney, ureter and bladder	3 (14.28)
Total number of patients with retained DJS	21 (100)

The mean (range) stent indwelling time in patients with retained DJ stent was 3.2 years (6 months to 9 years) The

most common time period was 1-3years seen in 11(40.74%) patients followed by 3-5years seen in 9 (33.33%), more than 5 years in 4 (14.81%) and 6 months to 1 year in 3 (11.11%) patients.

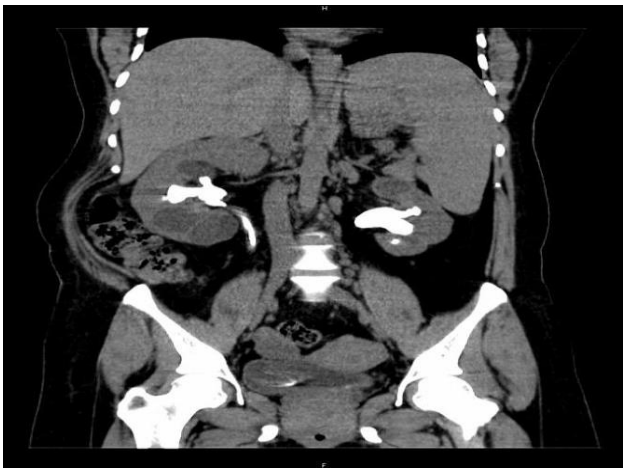

Figure 3: Coronal view of CT-KUB showing left renal calculus and right retained DJS with stone formation in kidney.

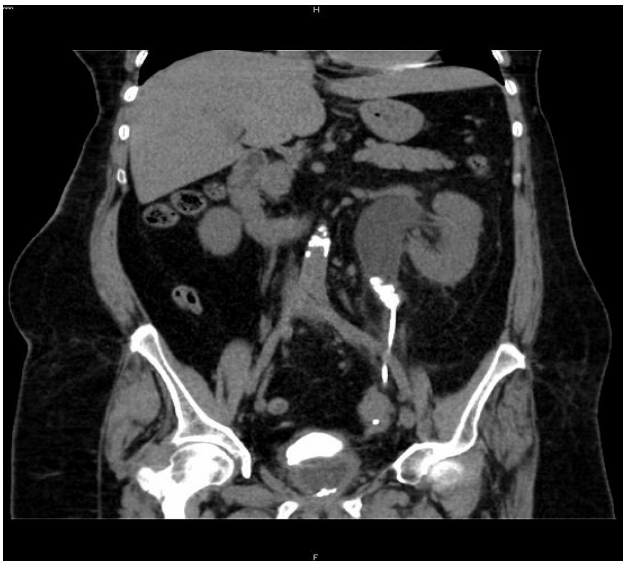

Figure 4: Coronal view of CT-KUB showing left migrated DJS with encrustation in ureter and bladder.

All the 6 patients who had retained stent with minimal or no encrustation had cystoscopic stent removal under local anaesthesia. Among 21 patients who had encrustation with retained stent, 5 (23.8%) patients each required CLT alone and CLT with PCNL, 6 (28.56%) patients required CLT with URSL of which 3 patients required additional PCNL. Two (9.53%) patients required only PCNL, 1(4.76%) patient required URSL with PCNL. One (4.76%) patient each required pyelolithotomy and nephrectomy (Table 5). Two patients (9.52%) had sepsis post operatively requiring intensive care management but there was no mortality.

Table 5: Procedure done in patients with retained DJ stent and encrustation.

Treatment procedure done	No. of patients (%)
CLT	5 (23.8)
CLT, PCNL	5 (23.8)
CLT, URSL	3 (14.28)
URSL, PCNL	1 (4.76)
PCNL	2 (9.52)
CLT, URSL, PCNL	3 (14.28)
Pyelolithotomy (PL)	1 (4.76)
Nephrectomy	1 (4.76)
Total	21 (100)

DISCUSSION

Ureteral stent placement is an important adjunct to many urologic procedures such as extra corporeal shock wave lithotripsy (ESWL), ureteroscopy and PCNL. Ureteral stents may also be useful for managing conditions such as hydronephrosis due to stone disease, pregnancy and due to a malignant neoplasm. The indications for stent insertion have increased and the patients with complications of stents are also encountered more frequent.

In present study, similar to Nawaz et al, the commonest indication for stenting was urological procedures for stone disease either renal or ureteric stones post PCNL/ESWL/URSL followed by pyeloplasty for pelviureteric junction obstruction (PUJO), post-op VVF repair and obstructive uropathy caused by pregnancy and carcinoma of pelvic organs.[5] This was in contrast to Saltzman et al, and Memon NA et al, where the commonest indication was obstructive uropathy followed by prophylactic stenting.[1,6]

Irritative bladder symptoms including frequency, urgency and dysuria was the most common (42.5%) DJ stent related complications in present study. Similarly, Pansota MS et al, also showed that 13 (32.5%) patients presenting with irritable bladder symptoms was the commonest complications of DJ stenting.[7] Incidence of fever and hematuria in our study (15.9% and 13.33% respectively) was much less comparable to Pansota MS et al, study (20% and 27.5% respectively).[7] The incidence of stent migration was also less in our study (5.8%) compared to Memon NA et al, (11.7%) and Arshad M et al, (16.3%).[6,8] The stent removal rate for irritable bladder symptoms and fever was less in present study (15.6% and 26.3% respectively) compared to Pansota MS et al, (23.1% and 37.5% respectively).[7] The rate of stent removal for fever was very high (55.8%) in Richter S et al, study.[9]

Forgotten or retained ureteral stents are observed in urologic practice because of poor compliance of the patient or failure of the physician to adequately counsel the patient. These forgotten stents can produce considerable morbidity and mortality, due to extensive

encrustation with significant stone burden, knot formation, upward migration and fragmentation.[10,11] The degree of stent encrustation is dependent on the indwelling time. The mean indwelling time in present study was 38.4 months, much higher than compare to Lam JS et al, (10.7 months) and Aravantinos et al, (24.1 months).[4,12] In present study, 27 (22.5%) patients had retained DJS, of which, 6 (22.2%) had no or minimal encrustation. Of the 21 patients with significant encrustation of DJS, the most common sites of encrustation were bladder alone and kidney with bladder in 5 patients (23.8%) each.

Retained ureteral stents with encrustation is a challenging problem for urologists. Very often, multiple endourological approaches are needed because of encrustation and the associated stone burden that may involve the bladder, ureter and kidney. This may require single or multiple sessions or rarely open surgical removal of the encrusted stents and associated stone burden.[3] Using a combination of ESWL, PCNL, CLT and ureteroscopy with intracorporeal lithotripsy, clearance rates ranging from 75 to 100% have been reported.[12-14]

ESWL is the initial treatment of stents with minimal encrustation. However, in present series, no patient underwent ESWL in view of the extensive stone burden in majority of cases. In Mathew et al, study 14 (29.1%) patients required ESWL of whom 10 (20.8%) also required URSL.[15] In present series, all 6 (22.2%) patients of retained DJS, with minimal and no encrustation were managed by cystoscopic removal stent under local anesthesia. Other 21 patients with retained DJ stent with encrustation required some procedure single or in combinations. The mean number of procedures per patient was 1.71. Sixteen (76.19%) patients requited CLT; 5 patients (23.8%) CLT alone, 11 (68.75%) patients required additional PCNL or URSL or both. Total 7 patients (33.33%) require URSL in combination with other procedures, 9 (42.87%) patients required PCNL. One patient each required pyelolithotomy and nephrectomy. Matthew et al, 38 (79.1%) patients required URS, of whom 28 (58.3%) required URS alone, 5 (10.4%) patients required PCNL and 1 (2.1%) patient required open stent removal.[15] Laparoscopic management of a retained heavily encrusted ureteral stent has also been reported.[16]

Borboroglu et al, also reported the endourological treatment of four patients with severely encrusted ureteral stents with a large stone burden.[17] All patients required two to six endourological approaches (average 4.2) performed at one or multiple sessions, to achieve stone-free and stent-free status. Bukkapatnam R et al, have reported one stage removal of 12 encrusted retained ureteral stents, in ten patients.[18] Of these, 11 were managed by ureteroscopy alone; in one patient, the stone was treated through a percutaneous approach.

In present series, two patients (9.52%) had sepsis post operatively requiring intensive care management, and broad-spectrum antibiotics, however there were no mortality.

Although, complication of DJ stent and retained stents are managed successfully in the majority of the patients with minimal complications, it the best to prevent the complication. The treating surgeon should be very selective in placing and choosing the stents if required. Stents coatings with hydrophilic polymers, heparin, Pentosanpolysulfate, or oxalate-degrading enzymes reduce encrustation.[19-22] It is important to keep a record of stents inserted and track them very closely till removal. All patients should be counseled with respect to the complications of long-term use and advised when their stent should be changed for the reason that the degree of encrustation is dependent on the indwelling time.

CONCLUSION

Double-J stents are an important tool in a urologist's armamentarium to prevent and relieve obstruction. Routine use is not justified, as they are not free of complications. Their use must be strictly restricted to selected cases with proper documentation and closely tracking them till removal. Patients should be counseled regarding the prompt removal in time and to change periodically if required to be chronically indwelling. DJ stent complications should be promptly evaluated and aggressively treatment with antibiotics and/or stent removal. Encrustation and stone formation in forgotten stents often lead to life threatening complications and should be managed with stent removal with combined endourologic techniques.

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