

Original Research Article

Management of forgotten double J stent and its complications: a single center experience

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Received: 10 September 2023

Revised: 08 October 2023

Accepted: 11 October 2023

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ABSTRACT

Background: The objective of this study is to elaborate presenting symptoms related to forgotten ureteric double J stent, various complications related to it, its management and possible preventive measures by which morbidity related to forgotten double j stent can be avoided

Methods: Total 30 patients admitted in our institution from January 2018 to December 2022 with double j stent in situ with more than 6 months without any indication of prolonged stenting have been included. Retrospectively analysed the collected data from the institutional records.

Results: Mean age was 42.9 ± 12.4 yrs (18-70 yrs), mean indwelling time was 41 ± 12.4 months (9 months to 11 yrs), Post ureterorenoscopic lithotripsy stenting was most common indication in 10 (33.3%) and most common presenting symptom was flank pain with storage lower urinary tract symptoms in 18 (60%) patients. The 22 (73.3%) patients had moderate to severe encrustation, 6 (20%) patients had fragmentation of stent and 1 (3.33%) patient had ipsilateral non-functioning kidney as one of the most feared complications. Per-cutaneous nephrolithotomy was single most employed modality of management in 15 (50%) patients, while 8 (26.67%) patients required multimodality treatment. The indwelling time and degree of encrustation showed positive strong correlation with parson correlation coefficient 0.973 which was statistically significant ($p=0.014$).

Conclusions: With prolonged indwelling double J stents may produces some serious complications which may require multimodality approach to treat. Such conditions can be reduced via proper patient's education and counselling.

Keywords: Forgotten Dj stent, Lithotripsy, Ureterorenoscopy, Cystolithotripsy, Endourology

INTRODUCTION

Double J (Dj) stent has been introduced in 1967 by Zimskind, since then it has been an indispensable pillar in endourological armamentarium.¹ In general Dj stent facilitates the unobstructed drainage, maintain urethral patency, protects the upper tract and act as scaffold over which healing can occur. Therefore it is mainly used following any endourological or open urinary tract surgery as well as to overcome the extrinsic or intrinsic obstruction

in ureter. DJ stent is made of various materials like, silicone, polyurethane, silitek, C-Flex, Percuflex. Most commonly used stent is polyurethane, while silitek and C-Flex are silicon based co-polymer stent, and percuflex is quite biodegradable as well as biocompatible stent with impressive tensile and coil strength.² Overall the Dj stent is safe and well-tolerable. Mild stent related symptoms can be managed effectively with anticholinergic medications. Although despite many improvisation in stent material and design problems related to long term indwelling urethral

stents such as encrustation, occlusion, migration, spontaneous fragmentation, stone formation, and renal impairment still persist. It has been reported that the stent encrustation rates are 9.2%, 47.5% and 76.3% if stent remains indwelling for 6 weeks, 6-12 weeks and more than 12 weeks, respectively.³ The DJ stent generally needs to be replaced or removed within 6 weeks to 6 months depends upon which material of stent used and for what purpose.⁴ The management of complicated stents is one of the most difficult endourological procedures as the loss of tensile strength due to neglected DJ stent and it may lead to its breakage as well as fragmentation. The various methods of treatment such as shock wave lithotripsy (SWL), cystolithotripsy (CLT), ureterorenoscopic lithotripsy (URSL), percutaneous nephrolithotomy (PCNL), and open surgical methods can be employed to manage it.⁵ So we have conducted this study to share our institutional experience in management of complicated forgotten DJ stent.

METHODS

A retrospective study was conducted at our department of urology and renal transplant, S. C. B. medical College and hospital, from January 2018 to December 2022. Patients who were admitted or referred to our department with double J stent indwelling time more than 6 months without indication of prolonged stenting have been included in this study. We excluded the patients with symptoms related to indwelling Dj stent less than 6 months. Total 30 patients were enrolled who met the inclusion criteria. Data from the institutional records were analysed retrospectively. Institutional ethical committee clearance has been obtained. The demography, educational/socioeconomic status, the indication of stenting, duration of stenting, presenting complaints were recorded. Renal function tests, urine routine microscopy with culture & sensitivity were done in all patients. Degree of stent encrustation evaluated by plain film radiography and non-contrast computed tomography of kidney ureter and bladder (NCCT KUB) as well as CT Urography to assess the renal function. In patients with non-visualized kidneys on CT Urography, Tc99m diethylene triamine penta acetic-acid (DTPA) renogram was done to estimate the renal function. Treatment decision was made based on clinical and radiological findings. As per institutional protocol the patients with minimal or no encrustation were planned for cystoscopy and gentle traction with stent removal forceps under C arm guidance. The procedure was abandoned if resistance was found during extraction and then procedure planned under anaesthesia. Initial treatment for encrustation involving the stent body was retrograde ureteroscopy using a 8Fr semirigid ureteroscope and intracorporeal lithotripsy with a pneumatic lithotripter or with holmium laser lithotripsy and then URS biprong or triprong forcep was used to remove the stent. if this technique failed, if encrustations involved the upper coil of the stent, percutaneous nephrolithotomy (PCNL) using a rigid 24Fr nephroscope was performed. If encrustations involved the lower coil of the stent, transurethral

cystolithotripsy or cystolithotripsy was performed. Post operatively resenting was done in selective cases based on intraoperative findings. In one patient with a history of indwelling Dj stent since last 11 yrs, suffered from formation of severely calcified encrustation throughout the length of Dj stent leads to ipsilateral hydronephrosis with non-functioning kidney underwent open nephroureterectomy with cystolithotomy. Postoperatively, plain-film radiography was obtained to confirm the stent-free status and for proper counseling in patients who were restented for timely removal of it.

Statistical analysis

Descriptive analysis was done for various clinical parameters. All data were expressed as a percentage, mean $\pm$ standard deviation. To test the correlation of stent duration with moderate to severe encrustation, the independent t test was used. A $p < 0.05$ was considered significant. For statistical analysis conducted using IBM SPSS v29.

RESULTS

Demographic data and base line characteristics described in (Table 1). Out of 30 patients 25 (83.33%) patients were from our institution and the remaining 5 (16.67%) were from other. In all cases, polyurethane stent was used. The mean age of the patients was 42.97 ± 12.4 years, and the age ranged from 18 to 70 years. There were 20 (66.67%) men and 10 (33.33%) were women. The mean indwelling duration of stent in situ was 41 ± 12 months and the duration ranged from 9 months to 11 years. 4 (13.33%) patients had higher secondary education, while 9 (30%) patients had education below higher secondary and 17 (56.67%) patients were illiterate. All belongs to rural and distant area with the poor socioeconomic background. Poor compliance was noted in 23 (76.67%) patients as they forgot or neglected their stent, and in 7 (23.33%) patients had a history of inadequate counselling by treating doctor was reported. The (Table 1) summarizes chief complaints for which patients visited hospital with forgotten DJ stent. Most common presenting complaint was flank pain with storage lower urinary tract symptoms (LUTS) in 18 (60%) patients. The indications of indwelling stents following intervention are shown in (Table 1). Most common intervention following which stent placed was URSL in 10 (33.33%) patients and 8 (26.67%) patients had PCNL. In 3 (10%) patients had history of bilateral (B/L) URS + Dj stenting for obstructive uropathy with B/L obstructing ureteric calculus, also 1 (3.33%) patient had history of Grade IV renal injury with urinary extravasation for which Dj stent was given, while 8 (26.67%) patients had a history of open surgeries. Regarding the late complications 6 (20%) patients had fragmented stent (Figure 1). There were 8 (26.67%) patients who had mild encrustation, whereas 22 (73.33%) patients had moderate to severe encrustations. One patient had severe encrustation with obstruction leads to ipsilateral severe hydronephrosis (HDUN) and non-functioning kidney (Figure 1).

Table 1: Characteristics of patients, patient's and stent's related parameter.

Parameters	N (%)
Mean age ($\pm$SD)	42.97 $\pm$ 12.4 yrs
Mean indwelling duration ($\pm$SD)	41 $\pm$ 12 months
Men/women	20 (66.67)/10 (33.33)
Patient related factors	
Above higher education/below higher education	4 (13.33) / 9 (30)
Illiteracy	17 (56.67)
Poor patient's compliance/Inadequate counselling to the patients	23 (76.67) / 7(23.33)
Presenting symptom	
Flank pain + storage LUTS	18 (60)
Storage LUTS + dysuria	11 (36.67)
Hematuria + flank pain	1 (3.33)
Previous indications of Dj stenting	
URSL	10 (33.33)
PCNL	8 (26.67)
B/L URS + Dj stent	3 (10)
Renal trauma grade IV	1 (3.33)
Open surgery (ureterolithotomy/pyelolithotomy)	8 (26.67) 4 (13.33) / 4 (13.33)
Complications of forgotten Dj Stent	
Fragmentation	6 (20)
Mild encrustation	8 (26.67)
Moderate to severe encrustation	22 (73.33)
Whole length /distal end /proximal end	12 (40)/2 (6.66)/8 (26.67)
Stent migration	1 (3.33)

Abbreviations: Dj: Double J, PCNL: Percutaneous nephrolithotomy, URSL: Ureterorenoscopic lithotripsy, CLT: Cystolithotripsy, B/L: Bilateral URS: Ureterorenoscopy, LUTS: Lower urinary tract symptoms.

Stent migration was also noted in 1(3.33%) patient (Figure 1). Management modalities of forgotten Dj stent are shown in (Table 2).

Table 2: Procedure done for Dj stent removal.

Procedure done	N (%)
PCNL + Dj stent removal	15 (50)
URSL +Dj stent removal	3 (10)
URSL + CLT + Dj stent removal	4 (13.3)
PCNL + CLT +Dj stent removal	3 (10)
Cystolithotripsy +Dj stent removal	4 (13.3)
Open nephroureterectomy + cystolithotomy	1 (3.4)

In 4 (13.3%) patients managed with cystolithotripsy (Figure 2), 15 (50%) patients PCNL was suffice (Figure 2) while 3(10%) patient was managed with PCNL + CLT. Whereas 3 (10%) patients were managed alone with URSL using holmium laser lithotripsy and 4 (13.3%) patients have undergone URSL+ CLT. In one case open nephroureterectomy with open cystolithotomy for forgotten Dj stent with non-functioning kidney (Figure 1). No patient had clavindindo class II or higher complications in post-operative period. The (Table 3) showed the relationship between the indwelling time and moderate to severe encrustation showed positive strong correlation with parson correlation coefficient 0.973 which was statistically significant (p value 0.014).

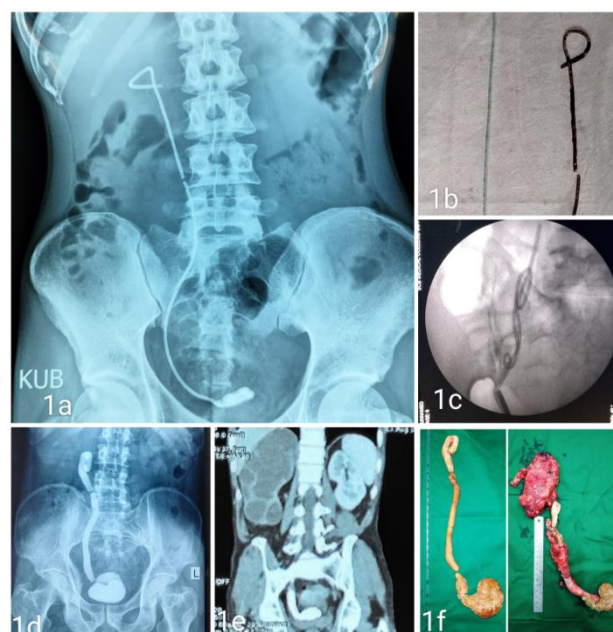


Figure 1: Complications of forgotten Dj stent, a-b) Fragmentation of stent, c) C-arm image showing proximal migration of Dj stent, d) Xray KUB showing severe encrustation throughout the stent, e) CT urography showing right hydronephrosis with thinned out parenchyma, f) Excised specimen of open right nephroureterectomy with cystolithotomy.

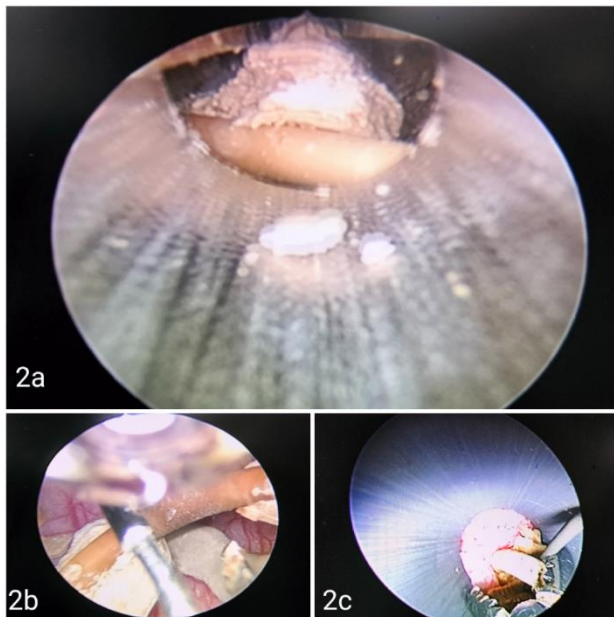


Figure 2: Endourological modalities of management, a-b) Cystolithotripsy, c) Percutaneous nephrolithotomy.

DISCUSSION

DJ stenting is a routine urological practice in endourology. To define Forgotten DJ stent there is no strict criteria but various studies has considered > 6 months of duration of stent in situ. While retained DJ stent is the one that is irretrievable endoscopically requiring further auxiliary intervention.⁶ For forgotten stent low education status and

low socioeconomic back ground may be one of the patient related factors. In present study 17 (56.67%) patients were illiterate. Ali et al in their study reported illiteracy rate was 68.75%.⁷ Another factors that can be responsible for forgotten Dj stent are lack of adequate counselling to the patient or patient's attendant and poor compliance of the patients. In our study 23 (73.67%) patients have found with poor compliance whereas 7 (23.33%) patients had history of inadequate counselling. The forgotten DJ stent has a variable presentation, which includes storage LUTS, dysuria, flank pain, hematuria & UTI. In our study flank pain with storage LUTS (60%) was most common complaints at the time of presentation. Damiano et al also observed flank pain in 25.3%, storage LUTS in 18.8%, hematuria in 18.1%, and fever in 12.3%, of the patients.⁸ Whereas Patil et al found dysuria was most common presenting symptoms in 80%, while flank pain in 30% patients in their study.⁹

Urine culture was done in all patients in our study and 76.7% (23/30) patients had positive urine culture with most common organism was *E. Coli* 53.3% followed by *Pseudomonas* (13.3%), *Klebsiella* (3.3%), *Enterococcus* (3.3%), *Acinetobacter* (3.3%). Rahul et al also found 85.7% had urine culture positive and also most common organism was *E. coli*.¹⁰ During the management of forgotten DJ stent with prolonged indwelling time one should be planned considering the late complications of forgotten Dj stent like degree of stent encrustation, integrity of stent or fragmentation, migration of stent or not, obstruction in form of obstructive uropathy, as well as function of ipsilateral kidney.¹¹

Table 3: Correlation between duration of indwelling and degree of encrustation (n=22).

Duration of Indwelling (months)	Moderate to sever encrustation N (%)	Pearson correlation coefficient	P value
12	2/22 (9.09)	0.973	0.014
24	3/22 (13.63)		
36	5/22 (22.72)		
48	5/22 (22.72)		
≥60	7/22 (31.81)		

There is multifactorial etiology for encrustation like indwelling time, bacterial colonisation and formation of biofilm on the stent, pregnancy, metabolic and congenital disorders etc.¹² The degree of encrustation is directly proportional to the indwelling time.¹³ The maximum duration of indwelling stent till recorded is 23 years.¹⁴ In our study mean dwelling time was 41±12 months and maximum was 11yrs. The most common indication for stenting in our study was post-URSL in 10(33.3%) patients. The exact mechanism of the encrustation is still debatable although various in vitro studies have shown that hydrophilic - coated polyurethane stents encrust faster and to a larger extent compared to the silicone or non-hydrophilic counterpart. The encrustation is the product of the crystallization of organic compounds of the urine produced by the bacterial biofilm. The urease formed by

the adhered bacteria in biofilm hydrolyses the urea and generate ammonia. This raises urinary pH and encourages magnesium and calcium accumulation as struvite and hydroxyl apatite on the stent.^{15,16} so in our study there were 8 patients who had post operatively stone analysis available has shown that 6 (20%) patients had combination of calcium and magnesium phosphate deposits and 2 (6.67%) patients had calcium oxalate deposits. In present study out of 22 (73.33%) patients 12 (40%) patients had encrustation throughout the stent, while 2 (6.66%) patients distal end was encrusted and 8 (26.67%) patients had proximal end moderate to severe encrustation. Takashi et al observed that the proximal end was involved in 41.8% compared to 22.1% at the distal end.¹⁷ This phenomenon has been reported by others too.¹⁸ This was attributed to a more effective peristalsis at the lower part, and because the

intravesical portion of the stent is at an angle, which decreasing the deposits and minimizing the encrustation at the lower end. Another major problem is stent fragmentation as in harsh environment of urine stent material losses its flexibility and becomes brittle. In present study we found 6 (20%) patients had fragmented Dj stent, among those 2(6.67%) were diagnosed pre operatively on imagine and 4 (13.33%) intraoperatively. Kumar et al found that stents had fragmented into multiple pieces over a mean indwelling time of only 14 weeks.¹⁹ Fragmentation of polyurethane stent is 4 times as frequent as silicone stent, caused by repeated mechanical stress, especially along the side holes which are the most common sites of fragmentation.²⁰ If no encrustation is visible on plain radiography, removal of the stent can be attempted gently via cystoscopy under C-arm and if there is any resistance, one should stop immediately to prevent stent fragmentation and ureteric injury in form of the ureteric avulsion or perforation. Patients with severe encrustations, high stone burden, fragmentation as well as failed gentle attempt of stent retrieval can be managed via different treatment modalities like CLT, URSL, PCNL, and open surgical intervention depending upon the location, the stone burden and ipsilateral renal function.

The encrustation along the ureter can be managed with URSL. If ureteroscope is not easily negotiable either due to sever encrustations or extensive ureteric wall edema, better to adopt the other approaches. In such scenario PCNL is the preferred approach. Another approach is a two-stage bailout technique which has been described by Mistry et al In their experience, they observed that a placement of a new stent adjacent to the encrusted stent for 2-4 weeks facilitates the removal of primary stent by simple pull.²¹ In proximal moderate to severe encrustation PCNL is preferred approach. ESWL can be an option in cases where proximal mild encrustation, but as monotherapy may not be appropriate or recommended. In our study, we have not used ESWL as in our cases degree of encrustation was severe. It was reported in literature that more the indwelling time there is more possibilities to have complications in form of encrustation or stone formation. We also found a strong positive correlation between the stent indwelling time and moderate to severe encrustations or stone formation and it was statistically significant ($p=0.014$). Combination of multiple procedures for complete clearance is also required in such cases. In our study 8(26.67%) patients required the multimodal approaches like URSL + CLT in 4 (13.3%), PCNL + CLT in 3(10%), open nephroureterectomy + cystolithotomy in 1 (3.33%) patient. All the patients were discharged within due course of time with no mortality and satisfactory outcome. Management of forgotten DJS require proper thorough evaluation and selection of possible minimally invasive and less morbid treatment modality that can yield complete clearance is crucial. Although it's quite cumbersome and costly.²² Therefore it increases the financial burden and causes impaired quality of life specially to the people with low education and belonging to low socioeconomic status as they were most commonly

involved. So, to prevent or decrease the incidence of forgotten stents it is responsibility of the treating doctor to adequately counsel the patient or the patient party. Also, to overcome this problem there are options available like maintaining a web-based registry use of biodegradable stents, use of heparin coating with the aim to reduce encrustation.²³ We are now concentrating more on patient and their relative's counselling as well as taking patient's and relative's signature on discharge cards and showing them post-surgery X-ray KUB explaining them the presence of stent in situ which required to be removed on provided date in discharge. When patient is lost to follow-up, we communicate with them via telephone or mail to bring down incidence of forgotten DJ stent. The only limitation of the study was small sample size.

CONCLUSION

In conclusion forgotten DJ stents with complications can be a potential source of added morbidity to the patients, should be manage with the best possible minimally invasive single or multimodal approach to yield complete clearance. Patient and patient's relative's education as well as proper counselling regarding timely Dj stent removal is essential in reducing stent-related complications.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Manharlal TY, Panda S, Swain S, Tripathi A, Sharma S, Anshuman J, et al. Management of forgotten double J stent and its complications: a single center experience. *Int Surg J* 2023;10:1781-6.