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Forgotten/retained double J ureteric stents: A source of severe morbidity in children

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ABSTRACT

Background: The increase in the usage of double J (DJ) ureteral stents in the management of a variety of urinary tract disease processes mandates familiarity with these devices, their consequences and their potential complications, which at times can be devastating. We retrospectively reviewed our series of children with forgotten/retained DJ ureteric stents. **Materials and Methods:** Hospital records of all patients' <18 years old who underwent removal of forgotten/retained DJ ureteral stent at our hospital were reviewed for age, gender, indication for insertion of DJ stent, duration of stent insertion, radiological images and surgical procedures performed. **Results:** During the study period, January 2000 to December 2014 (a 15-year period), a total of 14 children underwent removal of forgotten/retained DJ ureteral stent. A combination of extracorporeal shock wave lithotripsy, cystolitholapaxy and percutaneous nephrolithotomy was done to free the DJ stent and extract it. **Conclusions:** Forgotten/retained stents in children are a source of severe morbidity, additional/unnecessary hospitalisation and definitely financial strain.

Key words: Double J stents, postoperative complications, risk management, ureter

INTRODUCTION

Since their introduction into clinical use, double J (DJ) ureteral stents have been widely used in urological practice.[1] DJ ureteral stents have been used to establish or improve drainage in cases of extrinsic or intrinsic obstruction of urinary passage. They have also been placed after iatrogenic injuries to the ureter and prophylactically in complex urinary tract reconstructive surgeries.[2] Over the September 10, 2015 decades, technological improvements in stent design and stent biomaterials have greatly minimised patient discomfort. As a result, DJ stents have been left in place for a longer duration of time, and it is possible that the patient and the treating physician may forget their presence. These forgotten or retained ureteral stents could lead to various complications such as stent migration, stent occlusion, breakage, encrustation and stone formation.[3,4] In spite of improved design and biomaterial used, encrustation remains one of the most important side effects. Encrustations [Figure 1] are most frequently noted in forgotten/retained DJ's, which remain indwelling for a long period of time. El-Faqih *et al*.[5] reported encrustation rate of 9.2% if the DJ was kept for <6 weeks; however, encrustation rate rose to 76.3% if the DJ was left in place for up to 12 weeks. Several urologic procedures are often necessary so as to remove the severely encrusted DJ stent. The methodology depends on the clinical status and often comprises extracorporeal shock wave lithotripsy (ESWL), ureteroscopy, cystolithotripsy and even percutaneous nephrolithotomy (PCNL).[6,7] We report our experience in the management of retained/forgotten DJ stents in children.

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MATERIALS AND METHODS

Hospital records of all patients <18 years old who underwent removal of forgotten/retained DJ ureteral stent at our hospital were reviewed following the permission obtained from hospital/University Ethical Committee. Age, gender, indication for insertion of DJ stent, duration of stent insertion, radiological images and surgical procedures performed to extract the DJ stents were noted. Post-operative stay, complications of the procedures and morbidity were also recorded.

RESULTS

During the study period, January 2000 to December 2014 (a 15-year period), five children from our own series and nine referred from other centres underwent removal of forgotten/retained DJ ureteral stent. The mean age of the children was 12.46 (median 14 ± 4.44) years and included 8 boys and 6 girls. The indication for insertion of DJ stents was as shown in Table 1.

Six children had urolithiasis and had undergone DJ stenting prior to ESWL (2), post-ureteroscopy (3) and post-PCNL (1). Two of these children had delayed the removal of their DJ stent as they were school going and waited for the next holidays to undergo the procedure. Four other children with urolithiasis underwent their treatment under government sponsored schemes and had to wait for approval for DJ stent removal (again under government sponsored schemes). During this waiting period, the DJ stent was left indwelling for a period of 3-15 months. Plain X-ray kidney, ureter and bladder region revealed encrustation only in three children, vesical calculi around the lower end of DJ stent in one [Figure 2] and both vesical and renal calculi around the two ends of DJ stent in two. A combination of ESWL, cystolitholapaxy and PCNL was done to free the DJ stent and extract it.

Eight other children had an insertion of DJ stent following Anderson Hynes's pyeloplasty for ureteropelvic junction (UPJ) obstruction (5), ureteric reimplantation for vesicoureteral reflux (2) and ileal conduit for urinary diversion (1). Five children underwent pyeloplasty for UPJ obstruction, the youngest being 3 months of age at the time of surgery. In three children, upwards migration of the stent was noticed at around 12 weeks after surgery. In two of these three children, it was possible to extract the DJ stent by performing ureteroscopy and holding the DJ with 3 Fr tripong forceps. In one infant, the DJ stent had migrated completely into [Figure 3] the renal collecting system, and percutaneous surgery was performed to extract the stent. Two other children who had undergone pyeloplasty had retained/forgotten stents of more than 10 months duration. Small vesical calculi with encrustation of the upper end of DJ were noticed in both. A combination of ESWL/cystolitholapaxy was

Table 1: Indications and duration of the indwelling DJ stent

Indication	Number of patients	Duration of forgotten/ retained DJ stent (months)
Pre-ESWL	2	12-14
Post-ureteroscopy	3	11-15
Post-PCNL	1	6
Post-pyeloplasty	5	3-14
Post-ureteric reimplantation	2	3
Ileal conduit	1	3
Total	14	3-15

PCNL: Percutaneous nephrolithotomy; ESWL: Extracorporeal shock wave lithotripsy; DJ: Double J

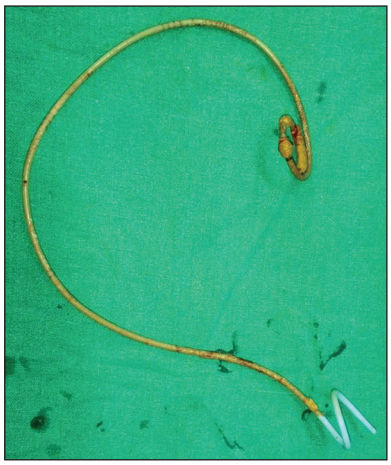


Figure 1: Retrieved double J stent showing severe encrustation



Figure 2: (a) Plain X-ray kidney, ureter and bladder showing downwards migration of stent with vesical stone formed around the lower end of double J stent. (b) Retrieved double J stent by percutaneous cystolitholapaxy showing stone at the lower end of double J stent

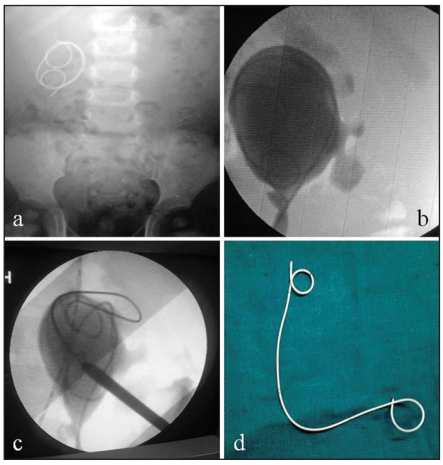


Figure 3: (a) Plain X-ray kidney, ureter and bladder showing complete retrograde migration of double J stent. (b) Retrograde pyelogram showing the double J stent in dilated pelvicalyceal system. (c) Percutaneous surgery in progress. (d) Retrieved double J stent

necessary to remove the DJ stents.

Two children who had undergone ureteric reimplantation and one child with exstrophy bladder who had undergone ileal conduit had developed calculi over the lower end of the DJ stent. The calculi were fragmented, and the DJ stents were extracted. During the post-DJ stent removal period, three children had fever. All these children needed additional hospitalisation and use of antibiotics for a minimum of 7-10 days.

The additional hospitalisation period ranged between 4 and 8 days (median 5 ± 1.69 days). During the hospitalisation, the financial burden ranged between rupees 34,900 (US $ 581.66) and 96,300 (US$ 1,605) (median rupees 74,640 ± 21,554).

DISCUSSION

Zimskind *et al*. in 1967[8] first reported the use of DJ ureteral catheter and since then has become one of the most commonly used treatment modalities for internal drainage after endourological/reconstructive procedures. Although the use of DJ stents has been a proven and effective method in a number of clinical situations, one should always keep in mind the associated complications of an indwelling DJ stent. Complications include retrograde migration, breakage, encrustations, stone formation and occlusion. A forgotten/retained ureteral DJ stent usually results in encrustations or stone formations. The rate of encrustation increases as the indwelling duration is prolonged.[5] The composition and the risk factors of encrustations have been studied extensively. Calcium oxalate (43.8%), especially in its monohydrate form, constitutes most of the encrustation.[9] Silicone DJ stents have significantly less incidence of encrustation than polyurethane stents.[9,10] However, prolongation of indwelling time would eliminate this difference. Other risk factors include lithogenic urine and urinary tract infections.[7] However, pregnancy does not predispose to significant encrustation. Poor compliance is the most important risk factor.

DJ stent migration is another well-documented complication. Migration can occur in an upwards or downwards direction due to ureteral peristalsis, improper placement or improper design of the stent.[11] A double-pigtail catheter as opposed to one with a J-ending is less likely to migrate. DJ stent fragmentation/breakage is also a well-known complication. Severe complications such as loss of renal function or a pyonephrotic kidney leading to nephrectomy have also been reported. Aihole *et al*.[12] reported a case of a 15-year old child who presented with fever and had a history of undergoing pyeloplasty for UPJ obstruction 5 years earlier. His/her mother had defaulted on the removal of DJ stent due to family issues. Radionuclide studies revealed a split renal function of 12%. The child continued to have fever following removal of the DJ stent and underwent nephrectomy for pyonephrosis.

A forgotten or retained ureteric stent is a preventable event, and literature is abundant with reports of forgotten DJ stents. The reason for the forgotten ureteral stents is due to failure on the part of treating surgeon to counsel the patient or the parents in the case of children. To overcome the issues of forgotten stents, maintenance of stent registry has been suggested. Such a registry would help in maintaining data relating to the insertion and lifespan of ureteric stents. It could also be used to send automatic E-mail/mobile SMS reminders when the stents have reached a user defined 'end of life'. It could also help to track all the forgotten or lost stent electronically. Lynch *et al*.[13] described and analysed a unique computerised system that tracked ureteral stents and automatically sent a notice by E-mail to clinical staff if a stent became overdue for removal. A total of 293 episodes were created within 2.4 years. Of the 241 (86%) episodes that were closed, 123 (51%) went beyond the mandatory maximal stent life (MSL). The mean delay from designated MSL to stent removal was 20.89 days (standard deviation SD 19.71). 7 months before barcode data acquisition, 43 of 71 stents were entered into the electronic stent register (data capture rate 61%). 7 months after barcode data acquisition, 52 of 60 stents were entered (data capture rate 87%; $P = 0.0009$). The

system ensured improved patient safety with an element of protection from potential litigation.

Sabharwal *et al.*[14] evaluated the feasibility of a computer-based stent registry with patient-directed automated information system to prevent retained DJ stents and reported that it was feasible in a clinical setting. A prospective study was, however, needed for the evaluation of its efficacy in preventing retained stents. Patil *et al.*[15] reported their experience in the management of forgotten stents and the role of stent registry in preventing DJ stent-related morbidity. They opined that forgotten/retained DJ stent was a source of severe morbidity and also financial strain.

CONCLUSIONS

Ureteric stents have been used in urology for over five decades and for several clinical situations. The use of ureteric stents is still evolving, and their use is not complication free. Complication/risk management has become an integral part of every clinician's practice, and the spectre of a retained or forgotten ureteric stent remains a challenge to all urologists. Complications of ureteric stents are many and varied, which include stent syndrome, urinary tract infection, stent migration, breakage, encrustation, haematuria, stent blockage, hydronephrosis and bladder erosion. Forgotten/retained stents in children are a source of severe morbidity, prolonged hospitalisation and definitely financial strain.

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Conflicts of interest
There are no conflicts of interest.

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