



## “FORGOTTEN DJ STENTS AND THEIR MANAGEMENT: A PERSPECTIVE FROM A TERTIARY CARE CENTRE.”

### Urology

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### ABSTRACT

**Objective :** To elaborate various factors, their presentation, complication and management of forgotten DJ stents

**Methods :** From August 2013 to August 2018, 47 patients were presented with forgotten DJ stent at our institute. Investigations including blood biochemistry, X-rays, ultrasonography, IVU and / or CT scan were done. According to site, size of stone burden, complications and functional status of ipsilateral kidney, standard treatment were given.

**Results :** All patients had DJ stent for > 6 months. In 25 patients DJ were encrusted, 6 were fragmented, 2 were migrated and 2 presented with pyonephrosis, one with non-functioning kidney and one with renal failure. Rest 10 patients presented with recurrent urinary tract infection. Standard procedures were done to make patient symptom free.

**Conclusion :** DJ stenting most commonly done procedure in urology. The best way to avoid forgotten DJ is prevention by means of standard protocol and preset reminders.

### KEYWORDS

Forgotten Dj Stent, Polyurethane, Encrustations, Migration

**INTRODUCTION:** The DJ stent placement is required in many endoscopic urological procedure and is accepted standard practice in the management of ureteric obstruction, post PCNL, post URSL, pre stenting in RIRS, post pyelolithotomy, post pyeloplasty etc.<sup>1</sup> DJ stent constitutes an important armamentarium in the hands of an urologist. It is used to drain urine from the kidney to the bladder and is usually well tolerated by the patient. DJ stent is made of various material like, silicone, polyurethane, silitek, C-Flex, Percuflex.

Silicone has low tensile strength which limits aperture of the sideholes, and thus the efficacy of the stent in restoration and maintenance of flow is reduced with time. Moreover, weak coil strength produces a significant risk of stent migration. Silicone has excellent biocompatibility and biocompatibility.<sup>2</sup>

Polyurethane is a highly versatile and inexpensive biomaterial and will continue to be utilized for stent fabrication. However, its biocompatibility and biocompatibility is questionable and that is why stents of this type are appropriate only for short-term utilization.<sup>2</sup>

Silitek is a silicone-based copolymer, has excellent tensile strength and yet provides this strength at the expense of small sidehole apertures and thus a relatively low flow capacity. Also, it shares the relatively weak coil retention strength and high unit cost of silicone rubber stents.<sup>2</sup>

C-Flex is a silicone-modified thermoplastic elastomer and was designed specifically as a biomaterial. It does not have the strength of polyurethane, Silitek, or Percuflex but is sufficiently strong to provide good flow rates and coil retention strength with proved biocompatibility and biocompatibility.<sup>3</sup>

Percuflex has impressive tensile and coil strength and sidehole efficiency with long-term biocompatibility and biocompatibility. Its surface characteristics are good, and it has a relatively low coefficient of friction even without a hydrogel graft. Percuflex may represent one of the most balanced stent materials.<sup>4</sup>

However, in spite of many innovations and improvements both in stent material and design, problems relating to long term indwelling ureteral

stents such as stent encrustation, occlusion, migration, spontaneous fragmentation, stone formation, renal impairment etc, persist. That is why there is a need to replace or remove the DJ stents within 6 weeks to 6 month.<sup>5</sup> In a series of 290 stone patients treated endourologically or with extracorporeal shock wave lithotripsy who were retrospectively reviewed, El Faqih et al reported encrustation occurred in 9.2% of the stents retrieved before 6 weeks, 47.5% indwelling 6 to 12 weeks and 76.3% thereafter.<sup>6</sup> Sometimes trial for forceful removal of encrusted stents results in stent fragmentation, ureteral avulsion and ureteral tear. No matter whatever the complication of a forgotten DJ stent is, it will require a more invasive procedure according to the complication for successful management. We have studied retrospectively 47 cases of retained DJ stent for more than 6 months presented to us from August 2013 to August 2018 with various clinical presentation and their management.

**METHODS AND MATERIALS:** We have collected data retrospectively from departmental registry of Department of urology, NRS Medical College and hospital. A total of 47 patients presented with forgotten DJ stent for more than 6 months at our hospital from August 2013 to August 2018. Routine blood investigations (blood urea, serum creatinine, plain radiography, ultrasonography, intravenous pyelography and / or CT scan were done. According to site, size of stone burden, complications and functional status of ipsilateral kidney standard treatment were given.

**RESULTS:** In our study out of 47 patients 34 (72.34%) were male and 13 (27.66%) were female. The duration of retained DJ stent were 6 to 12 months for 26 (55.31%) patients, 1 to 2 year for 15 (31.91%) patients, and more than 2 year for 6 (12.78%) patients. Forty five patients had unilateral forgotten DJ and 2 patients had bilateral forgotten DJ. Out of 47 patients, in 25 (53.19%) patients DJ were encrusted, 6 (12.78%) were fragmented, 2 (4.25%) were migrated, and 2 (4.25%) patients presented with pyonephrosis, 1 (2.12%) patient presented with non-functioning kidney and another one (2.12%) with renal failure. Rest 10 (21.29%) patients were presented with recurrent lower urinary tract infection.

In our study we have found that majority of patients presented to us with flank pain (44.67%) followed by LUTS (21.29%) as depicted in Table 1.

**TABLE 1 :** Presenting symptoms

Presenting Symptoms	Number of Patients ( % )
Flank pain	21 (44.67%)
Hematuria	4 (8.50%)
Recurrent UTI	10 ( 21.29%)
Fever	2 (4.25%)
LUTS	10( 21.29%)

We have also seen that in majority of patients DJ stents were placed initially to relieve obstructive symptoms due to stone (53.19 %) as depicted in Table 2.

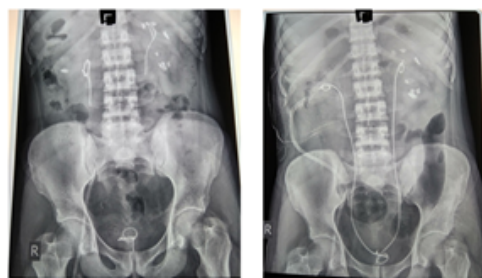
**TABLE 2** Initial indications of DJ stenting

Indication	Frequency ( % )
Post PCNL	9 ( 19.16%)
Post Ureterolithotomy	7(14.9%)
Post pyeloplasty	4(8.50%)
Ureteric reimplantation	2 ( 4.25%)
Obstructive uropathy with stones	25 (53.19%)

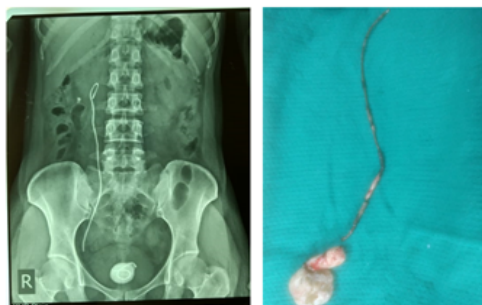
All patients were treated in accordance to the complication and majority of patients undergone stone related procedure out of which PCNL was the most common procedure being performed (23.40%). The average number of procedure done was 1.106 per patient as depicted in table 3.

**TABLE 3.** Treatment of all cases

Procedure performed	Number of patients	Percentage
PCNL	11	23.40
ESWL	8	17.04
CLT	3	6.39
PCCL	1	2.12
CLT followed by PCNL	2	4.25
PCN followed by PCNL	2	4.25
URS	7	14.9
URS Followed by Cystolithotomy	1	2.12
Nephrectomy	1	2.12
Perioperative HD + PCNL	1	2.12
DJ stent removal and conservative treatment	10	21.29



**FIG 1A** **FIG 1B**  
**Fig-1: (A) -Fragmented DJ stent with multiple B/L calculi (B)- Complete clearance of fragmented DJ on both side with complete stone clearance on right side with new bilateral DJ placement in same patient.**



**Fig 2 A** **Fig 2B**  
**Fig-2: (A)-Fragmented DJ Stent with right renal calculus and bladder calculus; (B)-DJ stent and bladder stone after removal in same patient.**

**DISCUSSION:**

Since Zimskind *et.al*<sup>7</sup> first reported an endoscopic placement of silicon ureteral splint in 1967 for the relief of ureteral obstruction, ureteric stents have become fundamental to many endoscopic and open urological procedures. Through the years there have been a number of modifications to reduce the stent related complication, however still there is a high chance of complication if a DJ stent is kept too long.

There is no strict definition for forgotten DJ stent but most of the previous studies consider a period of greater than 6 months to label it as a forgotten stent. Forgotten stent is different from a retained stent, one that is irretrievable endoscopically requiring further auxiliary intervention.<sup>8</sup>

In a recent observation made by Takashi K *et al* the stent encrustation occurred in 26.8% in < 6 weeks, 56.9% at 6 to 12 weeks, and 75.9% at more than 12 week.<sup>9</sup> Encrustations of the ureteral stents are associated with urinary infection.<sup>10</sup> Encrustations are often composed of calcium oxalate which is enhanced by rough surfaces, catheter holes and edges (major characteristics of polyurethane stents).<sup>11</sup> Singh and colleagues noted that the most dense and thickened encrustations were seen in the upper curl with minimal encrustation in the lower curl, which may be due to the effective peristalsis in the lower and intramural part of the stent.<sup>12</sup> Due to the encrustations, both ends of the stent were retained in situ and the central shaft may be degraded and vanished due to hostile urine environment cause by infections.<sup>13</sup>

In our retrospective study we found that majority of patients are male and presented with forgotten DJ stent for 6 months to 12 months. LUTS is found to be the second most common symptom after flank pain. The initial indication for stenting was obstructive uropathy followed by post PCNL stent placement to facilitate drainage from pelvi-calyceal system.

Kumar and colleagues; found that stents had fragmented into multiple pieces over a mean indwelling time of only 14 weeks.<sup>14</sup> The aging of the stent may lead to its mechanical failure. Zisman and colleagues demonstrated that stent material changed from ductile to brittle during exposure to a harsh urine environment.<sup>15</sup> The accelerated aging is an important factor leading to early mechanical failure of poor bio durable polymers, such as polyurethane biomaterials.<sup>16</sup> With continuous mechanical failure, stent fragmentation was also common in areas allowed to kink during stent insertion.<sup>17</sup> Fragmentation of polyurethane stent is 4 times as frequent as silicone and other biomaterial stents. Fracture of the polyurethane stents may also be caused by repeated mechanical stress, especially along the side holes.<sup>18</sup> It has been reported that most fracture points were also along the drainage holes; therefore, the incidence of ureteral stent fracture can be decreased by eliminating these holes.<sup>19</sup>

Stent migration was a recognized complication and generally occurred distal to the stricture. PUJ strictures had a higher migration rate when compared to strictures overall but the sample size was too small to draw statistically significant conclusions regarding possible predictive factors for migration.<sup>20</sup> Proximal migration is an unusual complication however, as this would result in movement of the stent against the natural peristalsis of the ureter.

Encrustation of DJ stent may lead to poor pelvicalyceal drainage and may result in hydronephrosis and/or pyonephrosis for which a percutaneous nephrostomy should be performed and functional assessment of kidney should be made.

In our study we have seen that most of forgotten stents were due to the poor compliance. While some patients gave the history of not being aware of the stent placement i.e communication gap between the operating surgeon and the patient was responsible in 35% of our patients.

So guidelines that can be followed for timely removal of DJ stents are as follows.

- Patient and responsible attendant should be informed about the in situ DJ stent and about the possible complications that may result if not removed in time.
- Signature of the patient or attendant below the written information in the discharge certificate should be made mandatory
- Xray KUB with visual demonstration of in situ DJ stent should be done to all patients and their responsible attendants.

- Proper Stent registry with name ,sex, age, mobile number, address should be maintained.

## CONCLUSION

Forgotten or retained DJ stent is a source of severe morbidity and also financial strain to the patient. Factors such as education level of patients and counseling before and after the procedure regarding DJ stent placement and its removal plays a vital role to avoid the retained/forgotten stent and in turn avoiding the morbidity associated with the stent. Maintaining the stent registry is simple and feasible

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