

# A Pandemic of Retained Forgotten Stents

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## ABSTRACT

**Purpose:** To review the management of a forgotten/retained double J stent and attempt to suggest protocols to prevent this scenario.

**Materials & methods:** We included 12 patients with forgotten DJ stents who had their primary surgery done at our hospital between September 2019 and March 2021 and were unable to follow up due to the lockdown imposed for the COVID19 pandemic.

**Results:** Twelve patients underwent their forgotten DJ stent removal by a combination of ESWL, cystolithotripsy, and percutaneous nephrolithotomy. All the patients achieved complete clearance of the encrustations/stone and removal of forgotten DJ stent in a single sitting.

**Conclusion:** A forgotten DJ stent with encrustations and stone formation is a serious urological problem for the patient and the treating doctor. A stent is usually said to be forgotten if the indwelling time period is more than 3-6 months which was not intended by the treating doctor. In our series, the management and intervention depended on the patients' preop status, the severity of the encrustations, location, and the size of the stone. In patients with moderate-to-severe encrustations and stone presence, procedures such as CLT, ureteroscopy, and PCNL were performed.

Forgotten/retained stents are a source of severe morbidity and additional/unnecessary hospitalization. In our series, we suggested a few protocols that could be followed in order to prevent a forgotten DJ stent.

## 1. Introduction

Double-J (DJ) stent use is a common place in urology. They help in draining, diverting and preventing/identifying injuries to the urinary tract. They are usually kept in place for a few weeks to a few months depending on the indication for stent placement. It is very commonly used in daily urologic practice [1]. But when retained for a longer period of time, these stents are subject to encrustations and stone formation. Complications associated with a forgotten stent includes,

haematuria, stent occlusion, migration, fragmentation, encrustation, and stone formation [2]. They can also cause more serious complications like recurrent UTIs, obstruction of the urinary tract, renal failure, fistula formation to the iliac arteries and even mortality. Attempting to extract a stent with encrustations, with excessive force risks breaking the stent or ureteric avulsion. Furthermore, a forgotten stent also poses a management and legal dilemma. The reason for a forgotten stent may stem from poor patient compliance, lack of proper counselling, and follow-up [3]. Although advancing technology and recall systems have improved the success of these procedures, there are still several cases that are being reported in the literature. There are still no definite guidelines for the most effective management of this challenging situation. Various procedures have been used to make the patients stent-free [4]. Extracorporeal shockwave lithotripsy (ESWL) has also been used with varied success [5]. Most of the data regarding management of forgotten stents are with in small case series or single case reports.

**2. Materials and Methods**

Between September 2019 and March 2021, we retrospectively analysed a prospective database which included 12 patients with forgotten DJ stents who had their primary procedure done at our institute. A detailed history with a thorough blood workup included a complete blood count, renal function test, serum electrolytes, urine routine and culture and pre-op X-ray and Non contrast computed tomography (NCCT) of the kidney, ureter and urinary bladder were in all 12 patients before the primary procedure and repeated again before the removal of the forgotten stent. Pre-anaesthetic fitness was obtained for all the patients prior to, both, their primary procedure and the procedure they underwent for their forgotten stent removal.

In our study, in the 5 patients who underwent Percutaneous nephrolithotripsy (PCNL) for their stent removal, 3 of them had been stented primarily for renal calculi larger than 1cm with hydroureteronephrosis (HUN). 1 patient was stented for 1.2 cm upper ureteric calculus and 1 patient was stented for pyelonephritis with HUN and a 1 cm renal calculus. 3 patients underwent PCNL + Cystolithotripsy (CLT) to remove their forgotten stent. 2 of these patients were stented post their primary procedure of Ureterorenoscopic lithotripsy (URSL). 1 patient was stented post-vesico vaginal fistula (VVF) repair. In the 2 patients who underwent URSL for their stent removal, both were stented primarily for ureteric calculi with HUN, 1 patient underwent CLT for her stent removal and she was stented primarily

for a distal ureteric calculus with HUN and 1 patient who was stented for pyelonephritis with an 8mm renal calculus and HUN, received extra-corporeal shock wave lithotripsy (ESWL) to fragment the encrusted stent.

**3. Results**

The mean indwelling time was 7.58 months (5-10 months). The mean age was 54.3 years (42-70). The male- to-female ratio in our study was 3:1. Most of the patients in our study were from a low socio-economic background. Large renal and ureteric calculi with HUN were the most common reasons for stenting in our series. Nine patients reported being unable to travel because of the lockdown imposed due to the COVID-19 pandemic as the reason for forgetting the indwelling DJ stent, while two patients reported forgetting about the presence of the stent as they felt the intermittent lion pain was due to muscle strain (Table 1).

Ten months was the longest indwelling stent time in our study. Of the 5 patients who underwent PCNL for their stent removal, 3 of them had been stented primarily for renal calculi larger than 1cm with HUN. 1 patient was stented for 1.2 cm upper ureteric calculus and 1 patient was stented for pyelonephritis with HUN and a 1 cm renal calculus. 3 patients underwent PCNL + CLT to remove their forgotten stent. 2 of these patients were stented post their primary procedure of URSL. 1 patient was stented post-VVF repair. In the 2 patients who underwent URSL for their stent removal, both were stented primarily for ureteric calculi with HUN 1 patient underwent CLT for her stent removal and she was stented primarily for a distal ureteric calculus with HUN 1 patient who was stented for pyelonephritis with an 8mm renal calculus and HUN, received ESWL to fragment the encrusted stent (Tables 2 and 3) (Figures 1-3).

**Table 1:** Reason for Prolonged Indwelling Time.

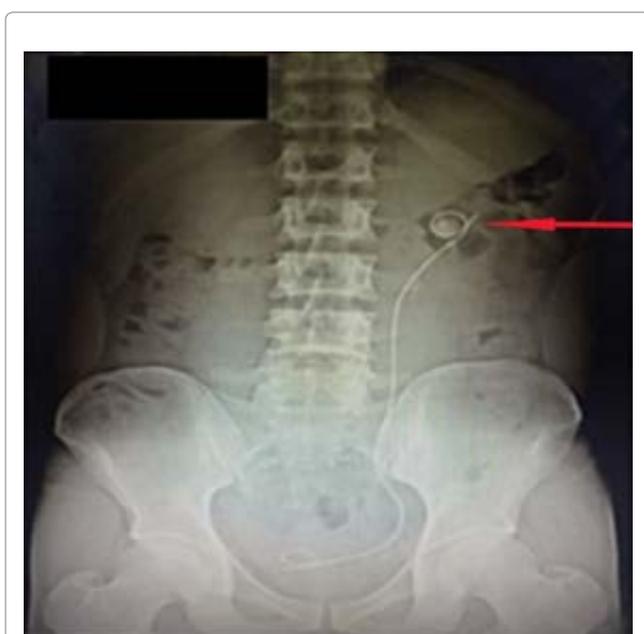
Lockdown restrictions	9
Patient forgotten	3

**Table 2:** Primary Procedure Done [HUN- Hydroureteronephrosis; URSL- Ureterorenoscopic lithotripsy; VVF- Vesico-vaginal fistula]

Reason for primary stenting	No. of Cases
Large renal Calculi with HUN	3
1.2 cm upper Ureteric calculi	1
Renal calculi with Pyelonephritis and HUN	2
URSL	2
VVF repair	1
Ureteric calculi with HUN	3

**Table 3:** Management of Forgotten Stent [PCNL- Percutaneous cystolithotripsy; CLTCystolithotripsy; URSL- Uretero-rensoscopic lithotripsy; ESWL- Extracorporeal shockwave lithotripsy; NCCT- Non contrast computed tomography; VVF- Vesio-vaginal fistula; DJ- Double-J; B/L- Bilateral].

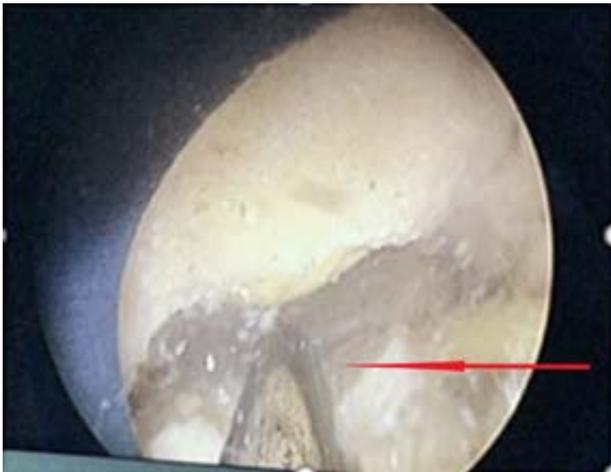
S.NO	Primary Procedure	Type of encrustations	Treatment given	Intra-op difficulties	Management of complications
1	Right DJ stenting	Moderate encrustations and calcifications along whole of the stent	Right PCNL with stent removal	none	-
2	Left DJ stenting	Large stone at the upper end + fever	Left PCNL with stent removal	none	-
3	Right DJ stenting	severe encrustations and calcifications at the upper end	Right PCNL with stent removal	Long operative time	-
4	Right DJ stenting	Moderate encrustations and calcifications along whole of the stent	Right PCNL with stent removal	none	-
5	Left DJ stenting	1.3cm stone at the upper end + renal failure	Right PCNL with stent removal	Stent fragmentation	Fragment removed and confirmed by NCCT, Post op fever, managed conservatively
6	Right URSL+ DJ stenting	Moderate Encrustations and calcifications along the entire stent	CLT + right PCNL	none	-
7	Left URSL + DJ stenting	Encrustations at lower end and upper end of stent	CLT + Left PCNL	none	-
8	VVF repair + B/l DJ stenting	Moderate Encrustations and calcifications along the entire stent	CLT+ right URSL + Left PCNL	Long operative time	-
9	Right DJ stenting	Moderate encrustations along lower end of stent	Right URSL	none	-
10	Right DJ stenting	Moderate encrustations along lower end of stent	Right URSL	none	-
11	Right DJ stenting	Large calculus along lower curl of stent	CLT	none	-
12	Left DJ stenting	1cm calculus within upper end of stent curl	Left ESWL	none	-



**Figure 1:** Retained stent with encrustations on over its upper end.



**Figure 1:** Bilateral DJ stents- right migrated DJ stent and a left DJ stent, both having extensive encrustations.



**Figure 1:** Encrustations around the stent being fragmented by Lithotripsy.

#### 4. Discussion

Encrusted DJ stents represent a major challenge for urologists and often require a multimodality endourologic approach. Although some studies have suggested algorithms for the management of retained ureteral stents, a proper definition for a forgotten stent does not exist [6]. After a time duration of 3 to 6 months, a stent is deemed forgotten. A retained stent differs from a forgotten stent, as a forgotten stent may require further intervention to facilitate its removal. We defined a forgotten DJ stent as a stent which was present in the system for a period of four months or longer, without indication. One major cause we noted, that corroborated with the literature, was poor compliance of the patient. Hence, the need for patient education regarding stent removal.

Characteristics of the Ideal Ureteral Stent are as follows:

- Easily inserted from any access
- Resistant to migration
- Optimal flow characteristics
- Well tolerated by the patient
- Biocompatible
- Bio durable
- Resistant to encrustation
- Non-refluxing
- Radiopaque
- Visible on USG
- Easily exchanged and removed 6 of 9

- Versatile
- Affordable.

There is a multitude of factors that predispose encrustation and stone formation including, urinary sepsis, previous stone formers and prolonged indwelling time. The presentation of forgotten stents varies widely. A total complication rate of up to 32.7 %, in one hundred and ten patients, was reported in literature [7]. Damiano et al. noticed flank tenderness in 25.3 %, irritative bladder symptoms in 18.8 % and encrustations in 21.6 % of the patients [8]. In this study, patients who complained of flank pain were less while those with irritative bladder symptoms, suprapubic pain and haematuria were more in number.

The management strategy should include thorough preoperative imaging which will help to decide the treatment plan. The most widely used imaging technique being used today is the 3D reconstructed NCCT of the urinary tract. A functional study of the affected kidney is necessary. We suggest performing a NCCT scan in all the cases with prolonged indwelling time.

The plan of treatment is then decided based on findings such as location and amount of the stone burden. In case of minimal encrustations, cystoscopy and DJ stent removal have proved to be successful most of the time. The procedure should be abandoned if the surgeon feels the need to be forceful or if he feels any resistance at any point during the removal. Singh et al. primarily used ESWL for all the cases with minimal encrustations [9]. Fragmented stents encountered in their study were then removed by ureteroscopy later according to the report. El Faqih et al found that the stent encrustation rate increased from 9% at 6 weeks to 47.5% at 6 to 12 weeks to 76.3% at 12 weeks [10]. In this study, the two cases that had minimal encrustations were successfully treated with ESWL. According to the reported literature, ESWL may be tried for minimal and/or moderate, localized encrustations in a kidney with good function. It is also used in cases with residual fragments after PCNL.

The severely encrusted DJ stent possesses more of a challenge and may require a multimodal approach. In our study, all twelve cases were managed endoscopically. In our study all the patients had their forgotten DJ stents removed in a single sitting, but it should be done with caution for those with severely encrusted stents. The ideal duration for changing or removing a stent has not yet clearly been determined. Literature suggests that a period of 2 weeks to 3 months may be considered as an optimal stent indwelling time [11].

Ecke and colleagues proposed that the distal part be treated first following which a PCNL can be attempted for the proximal encrusted stent [12]. This will allow the placement of a ureteric catheter. We recommend the same approach. In our study, none of the stents had migration. Migration is usually related to stent length and quality. Risk factors for morbidity and mortality include renal failure, pyelonephritis and UTI [13]. Aron et al. recommended temporizing PCN and definite operation 2 to 4 weeks later [14]. We report 1 case of a forgotten DJ stent, who presented with renal failure, but he did not require dialysis after his intervention and complete clearance was achieved in a single sitting.

Acosta- Miranda and colleagues objectively evaluated encrusted stents by using a classification system named, "Forgotten, Encrusted, Calcified" (FECal) stents [15].

Encrustation was graded into five grades:

Grade 1- linear encrustation only.

Grade 2- upper or lower pigtail curl with bulky encrustations.

Grade 4- bulky encrustation in both pigtails.

Grade 2 is upgraded to grade 3 when the encrustation of the intra-ureteral portion of the stent accompanying grade 2 is linear, and.

Grade 4 becomes grade 5 when there are encrustations accompanying grade IV.

Our findings are corroborated in literature. Weedin and associates reported the management of fifty-five encrusted stents and suggested that the need for staged procedures is associated with increased proximal encrustations [16].

In our series, PCNL alone was used in 5 of the 12 patients. In 3 cases, one of whom had sepsis, PCNL was used to debulk the proximal stone burden, and CLT was performed for the debulking of distal curl allowing a free cystoscopic removal. In 2 patients URSL was performed with a pneumatic lithotripter after which stent removal was done. In 1 patient who only had encrustations on the distal curl, a CLT was done and the forgotten stent was removed. In the other case, with mild encrustations, ESWL was given and complete fragmentation was achieved. All of the 8 patients who had a PCNL done had a nephrostomy tube placed to 7 of 9 avoid the need for re-stenting. There were no major intraoperative complications, none of the patients required blood transfusions, and all the patients achieved complete clearance in a single sitting, which is another main and very important element in the treatment strategy as it aims to keep the number of interventions as low as possible and no postoperative complications were noted.

Postoperative imaging showed that all of the patients were stone free without any residual fragments.

Here, in our study, we used the strict criteria of "no residual stone fragments" to determine the success of the procedure. Here, we found that PCNL can suffice as the sole procedure for encrusted stent removal although the sample size is small in our case, with only 5 patients. The remaining 7 patients required a URSL or and endoscopic CLT.

In the 3 patients who required CLT +PCNL, we treated the distal curl stone burden first and the proximal stone burden next. Teichman et al, in their series of 11 patients, suggested beginning with cystolitholapaxy and then performing a PCNL [17]. Lam and Gupta also recommended first breaking the bladder component of the encrustation and passing a guidewire adjacent to the encrusted stent to ease ureteral access [18]. Bultitude and associates advised ureteroscopic removal under GA for the removal of the stents with mild encrustation [19].

All of the patients in our series were aware of their stent and were unable to follow up due to the restrictions imposed due to the COVID-19 pandemic. Lynch et al. suggested an electronic stent extraction reminder and register, to avoid loss during follow-up [20]. Sabharwal et al. suggested a computer-based stent registry with a patient-directed automated information system, that sends automated SMS initially, followed by letters in case they do not respond [21].

The limitations of this retrospective study must be noted. Thus, we realize that the DJ stent is a double-edged sword and, though widely used, cannot always be justified. The proper pre-procedure counselling of the patient and the patient's relatives about the need for timely removal, the consequences if it is not removed, and the complications that arise with forgotten stents. The use of the double J stent should be documented and a stent registry should be maintained.

## 5. Conclusions

A forgotten stent can not only be a serious complication for the patient but also a financial burden on them, especially those belonging to the lower socioeconomic classes. Ignorance of the patients, inadequate counselling, and a lack of proper follow-up play an important role in these cases. This study underlines the preventable complications of forgotten DJ stents, the multimodal approach needed for the management of such complex cases, and that a forgotten stent can be a potentially life-threatening condition. A stent register, an electronic stent extraction reminder, or a computer-based system for ureteral stent tracking should be made mandatory. Stents on strings have been used, but not widely. In patients with DJ stents in

situ, management may be considered complete only when the stent is removed. The old proverb “prevention is better than cure” best describes this scenario.

## 6. Additional Information

### 6.1 Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. As this was a retrospective analysis of 12 patients, And IRB was not mandatory. Privacy in all forms was completely maintained. issued approval NA. As this was a retrospective analysis of 12 patients, And IRB was not mandatory. Privacy in all forms was completely maintained. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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