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Case Report

Encrustation, Biodegradation and Fracture of Double-J Ureteral Stents -

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ABSTRACT

The double J stent is a crucial internal bypass tool and is commonly used in urology both in an emergency and in a planned manner. It was used for the first time in 1978 by Finney. it aims to drain the upper excretory route, relieve an obstruction, allow healing of the ureter and manage urinary leaks. Its placement can be accompanied by significant long-term complications.

INTRODUCTION

The double J stent is a crucial internal bypass tool and is commonly used in urology both in an emergency and in a planned manner. It was used for the first time in 1978 by Finney [1], it aims to drain the upper excretory route, relieve an obstruction, allow healing of the ureter and manage urinary leaks [2]. Its placement can be accompanied by significant long-term complications, the most common is encrustation followed by rupture [3,4]. Various means of treatment are used to extract these ureteral catheters: extra corporeal lithotripsy ECL, laser ureterorenoscopy URS, percutaneous nephrolithotomy PCLC, or open surgery [5-7]. The objective of this study is to describe the long-term complications of double J ureteral stents as well as their management in our context.

PATIENTS AND METHOD

This is a uni-centric retrospective study from January 2016 to February 15, 2020, at the Ibn Rochd University Hospital in Casablanca, including all the patients using double pigtail ureteral stent who gave their oral consent. Were included: patient with a forgotten or neglected one, encrusted, calcified, or and or ruptured. The symptoms of the lower urinary tract. All the patients had received KUB X-RAY (Figure 1) supplemented by CT without injection (Figure 2). Serum creatinine, urine culture, phosphocalcic balance, uremia, and kalaemia, as well as the complete blood count CBC have been done. The variables analyzed were: sex, age, time of carrying the stent, information on JJ stent (biomaterial used), the indication of placement, the field, the long-term complication, the clinical data, the paraclinical examinations, the type of and the treatment.

We used three types of biomaterials according to the operative indication:

PU-R / PU polyurethane: for which the required wearing time is one month



Figure 1: AUSP objectivizing incrustation-biodegradation and fracture of SU(a), biodegradation and proximal and distal incrustation.

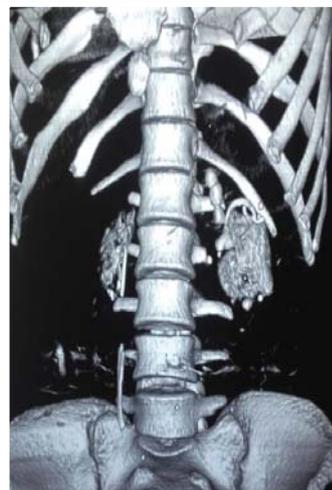


Figure 2: Bilateral grade III associated fracture incrustation and bilateral biodegradation of the JJ.

- PU-S: three months
- Silicon: from 06 months to one year.

After placing the ureteral double J stent, a KUB X-RAY was carried out and the following information was delivered to the patients: Mr or Mrs you have urinary tract lithiasis, for example, we have provisionally placed one or two ureteral catheters that should be removed after one, three or six months depending on the longevity of the stent and or the surgical indication. Complications such as infection, kidney failure, and encrustation are explained to patients. The KUB X-RAY performed is shown to the patient and then the appointment book for JJ stent ablation or change on which the date is mentioned and issued to the patient on discharge.

The degree of encrustation of JJ ureteral stents was assessed using the FE Cal (forgotten-encrusted-calcified) classification described by Acosta-Miranda and AL [8]:

We defined by:

- Encrustation: insertion, adhesion, or fixation of the JJ probe or a fragment of it in the excretory pathway making ablationim possible and requiring treatment,
- JJ stent fracture: Break or rupture or fragmentation or solution of continuity
- Biodegradation: deterioration, alteration, or loss of a fragment of JJ by decomposition of the latter.

We considered as:

- Patient Well informed, all those who have received from the doctor the information that he was wearing a JJ as well as its duration and the date of ablation

- Under informed, all patients knowing that he was wearing a JJ but not knowing either the

Duration of the stent, either the date of removal or change

- Not informed, all patients who have not heard of either its JJ or the duration
- Negligent patient: all patients who have received the correct information but who did not come forward voluntarily for personal reasons
- Forgetful: all patients who have received the correct information but who did not come for a consultation for reasons of complications
- Conscientious: well informed having presented with calcification within the required time of the appointment.

Data processing and analysis were done using Excel software 2016.

RESULTS

15 cases listed meaning 0.007 of patients operated on for JJ ureteral stent, including 12 men and 3 women with an F / M ratio of 0.25. The mean age 54.5 years (31-79 years). The main indication for placement was lithiasis pathology in 86.7% of patients (Table 1). Table 2 summarizes the comorbidities.

In 40% of cases, our patients said they were under-informed and 20% said they were not informed (Table 3). The mean time to wearing a stent in situ was 12.9 months (4-). Low back pain was present in 26.7% of cases (Table 4) and 40% of patients had an infected urine culture. The scanner objectified the complication in all cases. The kidney was reduced in size in 33% of patients. Encrustation represented 100% of complications, of which 53.3% was grade III (Table 5). Encrustation-calcification represented 66.7% of cases followed by the encrustation-fragmentation-calcification association in 20% of cases. In 53.3% these calcifications involved the polyurethane stent (PU-R / PU, PU-S) and 13.3% of these were observed in patients with a stent for 8 months. Two cases (13.4%) of encrustation-biodegradation of PU-R / PU stent were found 36 months from the placement. The combination of encrustation- calcification and fracture was the second complication and accounted for 20%. Fractures were observed in 13.3% of cases at 14 months of the respective placement of the PU-R / PU stent and in 6.7% of cases at 13 months of placement of the silicone ureteral stent. The association encrustation-calcification and biodegradation

Table 1: General characteristics of the patients.

	Effectifs	%
Sex		
Masculin	12	80%
féminine	3	20%
Indications for ueteral catheter		
lithiasis	13	86,7%
Retroperitoneal fibrosis	2	13,3%
Side derived by theueteral catheter		
left	8	53,3
right	6	40%
bilatéral	1	6,7%

Table 2: Distribution of patients according to the level of information.

	n	%
knowledgeable	6	40
not informed	3	20
under informed	6	40
Total	15	100

Table 3: Distribution of patients according to the degree of calcificaion of the ureteral catheter.

Degree of calcification	n	%
Grade II	5	33,3
Grade III	8	53,4
Grade V	2	13,3
Total	15	100

Table 4: Complications of the ureteral catheter.

complications	n	%
Encrustation-calcification et biodegradation	2	13,3%
Encrustation-Calcification	10	66,7%
Encrustation-Calcification et Fracture	3	20%
Total général	15	100%

Table 5: Distribution of complications according to the bio material used.

Complications /bio material used	PU-R/PU	PU-S	Silicone	Total général
Biodégradions	6,7%	6,7%		13,3%
Encrustation-calcification	40%	13,3%	13,3%	66,7%
calcification et fracture	13,3%		6,7%	20%
Total	60%	20%	20%	100%

of PU-R / PU stent was found 36 months after placement in 6.7% of our diabetic patients. Ablation of the stent was performed by laser ureterorenoscopy in 83% (Figures 1-3) cases, 13.3% of open surgery, and 6.7% combination of URS and ECL (Graph 1), The postoperative effects were simple. In 33% of cases, the kidney was reduced in size on abdominopelvic CT scan.

DISCUSSION

The double j ureteral catheter was used for the first time in 1978 by Finney [1], several complications can be observed when it is placed for a long time [4]. These complications have medico-legal consequences which are the responsibility of the treating surgeon although patients are informed of their stent [9]. In our study, one woman for four men was concerned by these long-term complications of double J stents. Ulker V, et al. [10], and Kusuma V, et al. [11] respectively reported a male-dominated ratio of 0.5 and 0.2. The main indication for the establishment of the ureteral stent in our study was lithiasis pathology in 86.7% of cases and that urolithiasis affects one woman for three men [12] would explain this male predominance. The average stent-wearing time in our series was 12.9 months, this time is variable in the literature. This very long stent wearing time is explained on the one hand by the fact that 60% of our patients said they were not sufficiently informed about ureteral stenting and forgot to ask the

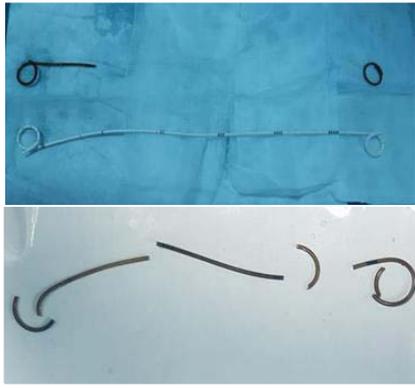


Figure 3: 15 cm biodegradation of SU(a), multiple fracture of SU(b).



Figure 4: Grade III inlay of the treated distal tip by bladder size.

doctor to remove the stent and among the 40% who received the correct information, 13.3% were neglectful and 6.6% were forgetful and the use of simple stories notebooks. Ulker V, et al. [7] on a study of 90 patients, compare the follow-up of two patient groups derived by double J stent, one of which followed by smart phone application Ureteral Stent Tracker (UST) and the other strand by appointment book, have found that patients followed by the UST smart phone app have less time lag compared to the basic appointment book system.

The most common complication that may require surgery is the encrustation of the stent. It represented 100% of the complications in our series. The encrustation of forgotten stents associated with calcification is a serious problem due to complications such as intercurrent urinary tract infection, hematuria and obstruction, and renal failure [4,13]. Encrustation-calcification of the JJ was the most represented phenomenon in 66.7% of cases and 53.30% of cases.

Involving polyurethane stent (PU-R / PU and PU-S). These results converge with those of Kusuma and Al in India in 2010 [11] on a series of 14 cases that reported 64.3% cases of encrustation-calcification. Deposition of encrusted material on retained ureteral stents can occur in both infected and sterile urine. Encrustation in infected urine results from the crystallization of organic components in the urine on the surface of the biomaterial and their incorporation into the bacterial biofilm layer [14-16]. In 40% of the patients had an infected urine culture, the lithiasis site which represented 86.7% of cases, the very long stent stay at 12.9 months and the biomaterial (Polyurethane in 80% of cases) used would explain the encrustation-calcification in our context. Thus, although frequently used

polyurethane pigtail stents often have a hydrophilic coating which appears to increase the risk of encrustation [17]. The combination of Encrustation-Calcification and Fracture was the second complication and accounted for 20% of encrustation. Fractures were observed in 13.3% of cases 14 months after the respective placement of the PU-R / PU stent and in 6.7% of cases of silicone stent. Ringel, et al. [18] out of 90 patients who had a ureteral stent for 3 to 12 months, reported that 10% of the patients had a fracture of the ureteral stents. The majority of spontaneous fractures are thought to be linked to a long period of intracorporeal stay, ie greater than 3 months. The material used is also an important factor as silicone stents are said to be more tensile resistant than polyurethane one [19,20]. This is how fractures of polyurethane endoprosthesis are four times more common than silicone [19]. The accelerated aging process in certain environments as demonstrated by Zisman, et al. [21] would however explain most of the spontaneous ruptures. In our context, polyurethane fractures were twice as frequent as silicone, and in half of the cases, they concerned chronic renal failure patients. The association encrustation-calcification and biodegradation of PU-R / PU stent was found 36 months after placement in 6.7% of our patients. This biodegradation occurred in a diabetic patient and involved 15 cm of the stent (Figure 1). Besides the same mechanisms as fracture, the biodegradation is not only the result of loss of tensile strength which is due to hardening and degeneration of the stent polymer but also, the interaction between urine and the extensive inflammatory response [22]. The degree of encrustation of ureteral stents was assessed using the FE Cal (forgotten-encrusted-calcified) classification described by Acosta-Miranda, et al. [8]. Grade III encrustation represented 53.3% including a complicated mute kidney, these results are similar to those of Ulker V et al who reported 66.6%. Various means are used for the ablation of an encrusted stent [6,7].

There is currently no consensus on the management of ureteral catheters. Thus Aravantinos, et al. [5] in a series of 09cases used PCNL in eight patients and URS was performed in a single patient.

Cystolithotripta is associated with PCNL or URS in two cases. On the other hand, Lam J and Gupta [23] on a series of 26 cases, PCNL was performed in 04 patients and URS in 9 patients. ECL in 7 patients Cystolitholapaxis was performed in 20 patients, 2 of which were isolated and 18 combined with either NLPC or URS. Recently Saha, et al. [6] on a series of 29 patients, ECL was performed preoperatively in 75.9% of these patients. All 29 cases had URS with intracorporeal lithotripsy including 16 cases (55%) combined with cystolitholapaxy. Cystolithotomy and NLPC have been rarely performed. In our study, we performed URS in 12 patients (83%) followed by surgery in two patients (13.3%). The surgery involved an open cystostomy and a simple nephrectomy. Open cystostomy was indicated in front of a large calcification of approximately 4 cm of the distal loop of the stent on prostatic hypertrophy with large prostatic lateral and a median lobe discovered incidentally on cystoscopy. This led to an adenomectomy and ablation of the stent. Regarding the nephrectomy, it had been indicated in front of a circular encrustation completely enveloping the proximal loop and complicated by a mute kidney on DMSA scintigraphy. The combination of URS and ECL is performed in a single patient. However, our study has some limitations. Its retrospective nature induces an exaggeration bias and cannot define the exact period of the occurrence of the encrustation event. Furthermore, tolerance of double J stent was not the subject of this study, although the main objectives of our study were achieved.

CONCLUSION

Urolithiasis, the lead time of carrying the double J stent and information about endoprosthesis are major factors implicated in the encrustation-calcification and biodegradation complications. Hence the interest on the one hand of developing methods of informing patients about the risks and the need for ablation or change. On the other hand, avoid long drainage time in patients with urolithiasis. Ureterorenoscopy works well.

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