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ORIGINAL RESEARCH ARTICLE

Observational Analysis of A Retrospective Cohort on Indications and Complications of Double-J Ureteral Stents

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Abstract

Objectives: To report the indications for double J ureteral stents, the complications associated with them, and their management.

Patients and Methods: This was a cross-sectional prospective study conducted over twelve months in the urology department of the Ibn Rochd University Hospital in Casablanca, Morocco. Included in the study were patients who were hospitalized for complications related to double J ureteral stents. The parameters studied were age, sex, indication for JJ placement, duration of stent placement, diagnosis, renal function, urine microscopic analysis, imaging (plain abdominal radiograph or uro-CT), and therapeutic approach. Data was compiled and analyzed using Excel.

Results: A total of 39 patients were included in the study, 69% of whom were male. The average age of the patients was 41 years. A low socio-economic status was noted in 54% of cases. The main indication for JJ stent placement was lithiasis-related pathology. JJ stent placement was unilateral in 33 patients (14 on the right and 19 on the left) and bilateral in 6 patients. The average duration of JJ stent placement was 11 months, with a range from 4 months to 5 years. Reported complications were either infectious or mechanical. Infectious complications were the main reason for hospitalization. Treatment depended on the specific complication and included antibiotic therapy, simple stent removal or replacement, laser or lithoclast surgery (ureteroscopy or percutaneous nephrolithotomy), or open surgery. In some cases, treatment combined two different techniques. No deaths were recorded.

Conclusion: With the advancement of endourology, indications for double J ureteral stents have broadened, leading to a proportional increase in reported complications. Due to the lack of clearly defined guidelines and the nature of their complications, severe JJ stent complications pose a real management challenge, requiring adaptation based on available and mastered techniques. The best therapeutic approach remains prevention. Thus, institutions—especially surgeons and patients—each have a role to play.

Keywords: Double J ureteral stent, Indication, Complications, Management

Introduction

Double J ureteral stents are commonly used in many urological procedures. Since their deployment over four decades ago, their indications have expanded widely [1]. As a result, the complications attributed to them are just as frequent as before [2]. In the short term, double J ureteral stents are associated with mild complications, whereas long-term complications are serious, particularly when the duration exceeds 6 months [3]. Complications associated with long-term ureteral stenting are essentially mechanical: stent migration, encrustation, stone formation and rupture. By acting as a foreign body, stents can cause urinary tract infection, which can be simple or severe [4]. There are no guidelines defining the consensual management of the various complications of ureteral stents. The

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aim of this study is to report on the main indications and complications of double J ureteral stents and their management in our practice, and to compare our data with those in the literature.

Patients and Methods

This is a prospective cross-sectional study spread over fifteen months (spread over two periods: June to November 2021 and November 2022 to July 2023) carried out in the Urology Department of the Ibn Rochd University Hospital in Casablanca/Morocco. Patients were included in the study if they had received hospital care for complications of double-J ureteral stents. Patients were admitted via the emergency department or consultation. The parameters studied were age, sex, indication for JJ insertion, duration of JJ, diagnosis, renal function, microbiological analysis of urine, imaging (no-preparation urinary tree or CT-scan) and therapeutic attitude. Data was compiled and analyzed using Excel. Calculations were purely arithmetical, and results are expressed as mean and percentage.

In our practice, we define:

- Multidrug-resistant urinary tract infection: Any basic urinary tract infection in which the uropathogen in question is resistant to the usual antibiotics, requiring the use of monitored antibiotic therapy, usually administered parenterally.
- Pyelonephritis on JJ: Any patient with a JJ stent with febrile back pain associated with an inflammatory syndrome, in the absence of any other focus of infection.
- Calcification: Any formation due to a deposit of crystals along the entire length or part of the double J stent
- Rupture: Any deterioration leading to a break in the continuity of the double J probe.

Results

During the study period, 39 patients were treated for complications related to the double J stent, representing a frequency of 2.6 cases/month. The mean age was 41 (range 27-52). Males were most represented (69%). Socioeconomic status was considered low in 54% of cases.

The main indication for JJ stent was lithiasis, as shown in (Table 1). JJ stent was unilateral in 33 patients (14 on the right and 19 on the left) and bilateral in 6. The mean duration of JJ stent use was 11 months (range: 4 months to 5 years). Complications were either infectious or mechanical. Infectious complications were the main reason for hospitalization. Infectious complications were dominated by multidrug-resistant urinary tract infections, and mechanical complications by calcifications of the double J stent. Figure 1 and Figure 2 show an iconography of complications and intraoperative images.

Renal function (plasma creatinine) was impaired in 14 patients (35, 8%). Cyto Bacteriological examination was carried out in all patients. Culture was positive in 27 cases (69.2%). Escherichia. Coli. Antibiotic resistance was noted in 21 cases (53.8%). The antibiotic with the highest sensitivity was impenem.

All patients underwent radiography (unprepared urinary tree). The CT scan was completed in all patients presenting a mechanical complication of JJ on standard radiography: 30, 8%.

Treatment depended on the complication encountered:

- Multi-resistant urinary tract infections: Antibiotic therapy +/- removal or change of JJ
- Pyelonephritis on stents: Antibiotic therapy +/- removal or change of day-code
- Calcification: Treatment was endoscopic (laser fragmentation) and multimodal, combining endoscopy (ureteroscopic lithotripsy or percutaneous nephrolithotomy) and surgery
- Rupture + fragmentation: Treatment was endoscopic (laser ablation and fragmentation)
- Rupture: treatment was endoscopic: Removal of fragments under cystoscopy and ureteroscopy
- Renal perforation: JJ replacement

In 36 cases (92.3%), surgery was performed. In 3 cases (7.7%), no procedure was performed. The table below summarizes the different types of intervention and the specific procedures performed (Table 2).

Discussion

The JJ ureteral stent has become an essential tool in current urology practice. With the increase in its indications, it is necessary to know their complications and management. There are several types of stent, each with its own physical characteristics. If forgotten or neglected, stents lose their characteristics, become defective and can cause serious complications [5]. Stents are considered to be forgotten or neglected if they are worn for more than 3 to 6 months without indication [6]. The average duration of wear in our series was 11 months.

In our series, the average age of patients was 41-years (27-52 years). Males were the most represented (69%). Lin, et al. [7] and Shorab, et al. [8] respectively found a mean age of 56, 69 and 37.7 years, and a sex ratio in favor of males (51.1% and 89.3%). This disparity in mean age is linked to the fact that the indication for double J ureteral stentization is not correlated with age.

Table 1: Distribution of patients according to indications and complications.

	Indications and complications	Effectifs (n)	Percentage (%)
Indications	**Lithiasis**	18	46.2
	Trauma	1	2.6
	Post-surgery	6	15.4
	Urogenital cancer	9	23.1
	Extrinsic compression	5	12.8
	Total	39	100
Complications	Pyelonephritis	8	20.5
	Lower urinary tract infection	19	48.7
	Calcification	7	17.9
	Rupture	4	10.3
	Rupture + calcification	1	2.6
	Total	39	100

Table 2: Different types of procedure performed.

Type of intervention	Gestes	Effectif (n)	Percentage (%)
Endoscopy only	Direct removal (complete or ruptured probe)	19	52.8
	Change	7	19.4
	Ureteroscopy + laser	8	22.2
	Percutaneous nephrolithotomy	1	2.8
Surgery only	Incision	0	0
Endoscopy and surgery	Laser ureteroscopy + lumbotomy pyelotomy	1	2.8

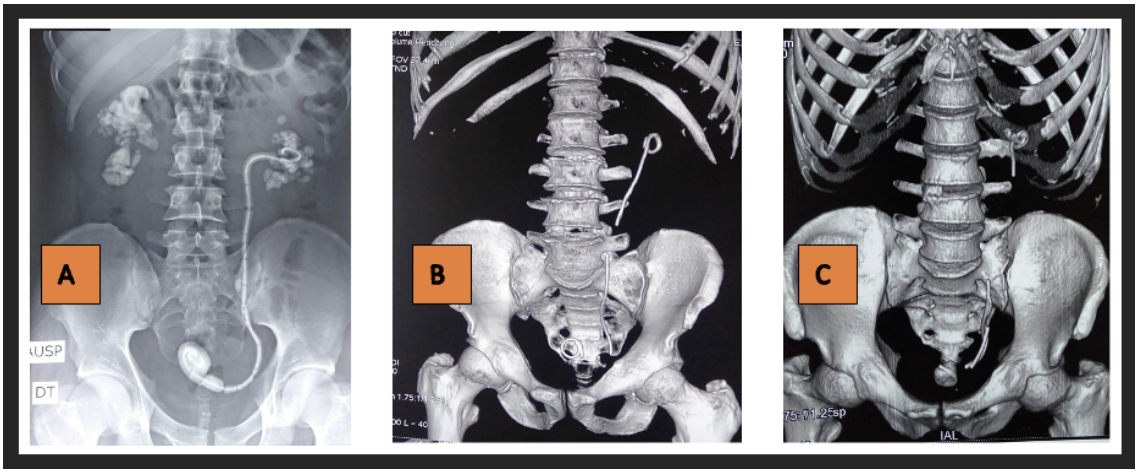

Figure 1: A: Scan image of a calcified JJ lead; B: Scan image of a ruptured JJ lead; C: Scan image of a ruptured JJ lead + calcification of the lower loop.

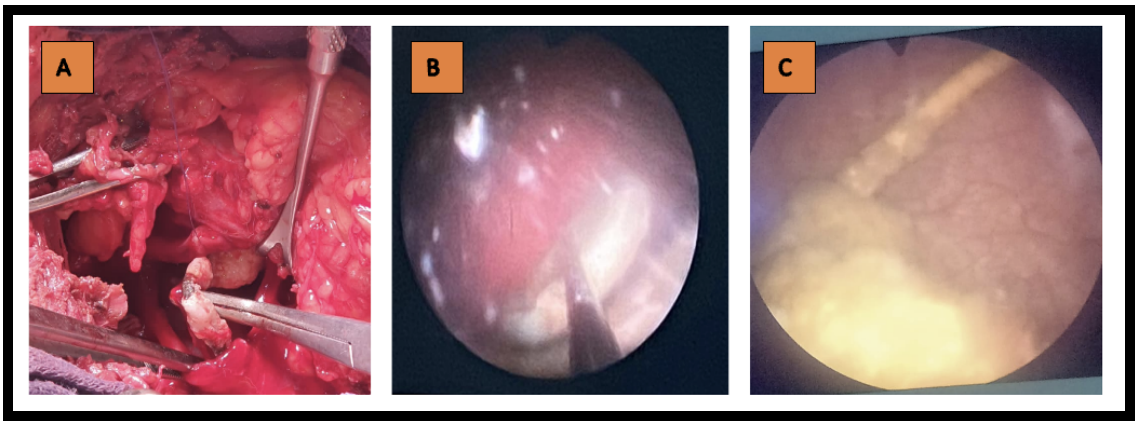

Figure 2: A: Extraction of calcified JJ after open surgery (lumbotomy pyelotomy); B: View of calcified proximal loop of the during percutaneous nephrolithotomy with lithoclast; C: Endoscopic view of calcified distal loop of JJ.

The main risk factors for JJ stent complications are low level of education, prolonged JJ wear, infections, chronic kidney disease, lithiasis, congenital and metabolic abnormalities [9]. Added to this is the information given to patients. Gallouo, et al. [10] reported in their study that in 40% of cases, patients said they had been under-informed, and in 20% of cases, they had not been informed about the double J stent and its complications.

In previous studies [7,11], the main reason for insertion of a JJ ureteral stent was lithiasis. But other indications have been reported: extrinsic compression, malignant genitourinary pathology, trauma, endoscopic or conventional surgery and renal transplantation. In this series, lithiasis was also the main indication for JJ placement.

The reported mean duration of JJ ureteral stent placement varied from study to study: it was 29.89 months for Ray, et al. [4], 36.5 months for Sancaktutar, et al. [12] and 102.9 months for Sohrab, et al. [8]. In our study, the mean duration of JJ stent use was 11 months. All reported durations were over 6 months, confirming the definition of a forgotten or neglected JJ stent. This explains the multiple complications.

A urinary tract infection on a ureteral stent should be suspected when lower urinary tract disorders, back pain and general signs including fever appear or worsen [13]. Endoureteral colonization is defined as bacteriuria in the absence of the elements defining a urinary tract infection [14]. The detection of bacteria in the urine can no longer be considered pathognomonic of a urinary tract infection [15]. The presence of lower urinary tract disorders or lumbar pain is not synonymous with UTI either, as they are present in patients with JJ stents without true infection [16]. It is advisable to rule out another cause of infection when a urinary tract infection is suspected in a patient with a double J stent. Changing the JJ stent is not systematic in the case of any urinary tract infection. It is recommended to change the JJ stent in the event of unknown or increased dilatation of the upper excretory tract, clinical failure to improve after 72 hours of well-administered antibiotic therapy, or relapse or recurrence of the infection [13]. In our series, infectious complications were the most common. These were lower urinary tract infections and pyelonephritis on JJ. This finding is similar to that made by Geavlete, et al. [17] in a series studying complications of JJ ureteral stents.

Calcification is a frequent complication reported in many series with variable rates [4,6,8]. Factors that may predispose to calcification include a history of calculi, uricosuria, chronic renal failure, congenital anomalies, urinary tract infection, urinary stasis, dehydration and prolonged wear [18]. The management of calcified stents poses a complex and challenging problem for urologists [19]. In cases of heavy lithiasis, a multimodal approach is often required for total decalcification and removal of the JJ stent [20]. In their series, Geavlete, et al. [17] used several techniques: simple removal of the double J stent, lithotripsy for calcifications, lithotripsy of calcifications in distal loops of the double J stent combined with percutaneous nephrolithotomy, lithotripsy of calcifications in distal loops of the double J stent and retrograde ureteroscopy. They indicated that the choice of one technique over another was dictated by the volume and location of the incrustation/calcification. In our series, calcification was the second most common complication. No calcified stent was extracted by cystoscopy alone.

Double-J stent rupture is a major consequence of forgotten double-J stents. Over time, the double J ureteral stent loses its tensile strength as the polymers degrade. The stent loses its maneuverability, hardens and breaks [21]. This is a rare complication, considered to be the most feared [22]. It occurred in 0.3% of cases in a series of 290 patients published by El-Faqih, et al. [23]. In contrast, in the series reported by Ray, et al. [4], stent rupture was the most frequent complication (11 patients or 57.89%). It may manifest as lumbar pain or even stenturia [24].

Apart from the morbidities that can be attributed to them, forgotten stents entail significant healthcare costs [25]. Complications have medico-legal conseetquences which are the responsibility of the treating surgeon, even though patients are informed of the nature of their stent [26,27]. Therefore, the best way to avoid complications associated with prolonged JJ stent use is based on prevention. Stenting requires follow-up. In the case of a provisional indication, it must be removed when no longer required, and changed regularly in the case of a definitive indication. Patients should also be informed of the JJ stent and its complications [4,10].

Conclusion

The use of ureteral stents is increasing with the development of endo-urology, and this correlates well with the complications encountered and reported. Severe complications associated with the use of JJs may be mechanical or infectious. There is no clear consensus on the specific nature of these complications. This explains the complexity of their management. Moreover, these complications totally alter the initial therapeutic project that led to the insertion of the double J stent.

To reduce this urological problem, the responsibilities of the surgeon and the patient are recalled:

- For the urologist: Place a double J stent only if necessary, explain and draw the patient's attention to it, and remove it as soon as possible.
- For the patient: Be aware of the complications that can arise from the presence of a double stent, and follow the surgeon's instructions.
- Management centers (especially high-volume ones) may be asked to set up a reminder system for patients and surgeons, with automatic message distribution.

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