VOLUME - 14, ISSUE - 04, APRIL - 2025 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Urology

COMPLICATIONS OF DOUBLE J STENTING IN UROLOGICAL PRACTICE: A SINGLE-CENTRE EXPERIENCE

Dr Kamran Hassan Bhatti	Assistant Professor Urology, Qatar University, Qatar, Master's in Surgery Urology, Urology Section, Al-Khor Hospital P.O.Box 3050, Hamad Medical Corporation Doha, Qatar
Dr. Anas Albudairat	Urology Section, Al-Khor Hospital P.O.Box 3050, Hamad Medical Corporation Doha, Qatar
Dr. Aftab Ahmed Channa	Assistant Professor, Department of Urology, Islamia Medical College Sialkot-Pakistan
Dr. Hasan Mohammad Ali	Urology Section, Al-Khor Hospital P.O.Box 3050, Hamad Medical Corporation Doha, Qatar
Dr. Ahmed Tarig Mahmoud Haroon	Clinical Fellow, Hamad Medical Corporation Doha, Qatar
Dr. Jamil Ahmad	Clinical Fellow, Hamad Medical Corporation Doha, Qatar
Dr. Nadeem Sohail	Fellow of the College of Physicians and Surgeons (Pakistan) Urology Section, Alkhor Hospital, P.O. Box 3050, Hamad Medical Corporation Doha, Qatar
Ahmed H A Shaat	Urology Section, Al-Khor Hospital P.O.Box 3050, Hamad Medical Corporation Doha, Qatar
Dr Faaz Gomha	Consultant Urology, Al-Khor Hospital, Hamad Medical Corporation, P.O. Box 3050, Doha, Qatar
DR. Barbara Miladis Depestre Rabi	Consultant Urology Section, Aisha Hospital, P.O. Box 3050, Hamad Medical Corporation, Doha, Qatar
Dr . Khalid Mohammed Abdelrahman	Urology Section, Al-Khor Hospital P.O.Box 3050, Hamad Medical Corporation Doha, Qatar
DR. Amjad Albodour	Urology Section, Al-Khor Hospital P.O.Box 3050, Hamad Medical Corporation Doha, Qatar

ABSTRACT **Background:** The double J stents are an important part of many urological procedures, such as endoscopic or open surgery for retroperitoneal tumors of fibrosis, ureteral strictures, or treatment of urinary stones. A double-J stent is never without potential complications, which may range from minor in the form of hematuria, dysuria, frequency, flank, and suprapubic pain to major complications such as vesicoureteric reflux, migration, malposition, encrustation, and stent fracture. **Methods:** Patients were taken from the 3000 urological patients who had undergone double-J ureteral stenting attending the Urology Department. Data regarding patients' complications were recorded as soon as a double-J ureteral stent was placed till it was removed. **Results:** Complications of double J ureteral stenting in the majority of patients in our study were flank or suprapubic pain, dysuria, hematuria, and urgency, which were managed conservatively. Stent migration and encrustation are major complications managed by the removal of the stent. **Conclusions:** The double J stents are a great tool for the urologist to prevent and help bypass blockage. Unfortunately, these are not without risks. As soon as possible, complications of the Double J stent should be assessed and treated.

KEYWORDS : Double J Stent, Complications, Urinary Tract Infection, Stent Encrustation, Stent Migration, Hematuria.

INTRODUCTION

In 1967, Zimskind et al.. first reported that a double J (DJ) ureteral stent was an important endourology therapeutic tool. In 1976, Gibbons described the auto-retention ureteral stent, and after that, in 1978, Finney introduced the term "double J stent.". Double J stents are important components of many urological procedures, including endoscopic or open surgery of retroperitoneal tumors of fibrosis, ureteral strictures, or treatment of urinary stones [1]. The stents can also be placed following iatrogenic injuries of the ureter to protect and expose the ureter in complex abdominal and pelvic surgery [2].

A double-J (D-J) stent is a common urological procedure that is commonly used to prevent ureteric obstruction and stricture formation after urological procedures [3]. Prolonged indwelling of D-J stents can lead to encrustation, urinary tract infection (UTI), hematuria, irritative bladder symptoms, and stent-related problems, i.e., malposition, migration, or fragmentation [4].

However, although materials and design have made progress, some problems develop when they are used. As the stent is a foreign body, there may be patient discomfort,

bacterial colonization, hematuria, irritative voiding symptoms, and deposition of urine constituents. However, these issues have a profound impact on the therapeutic outcome and the patient's quality of life. Mechanical complications of the use of ureteral stents include stent occlusion, migration, breakage, and encrustation of forgotten stents. Although algorithms for the management of complications of ureteral stents have been proposed, they are still debated among practitioners as to which method is best for the management of complications of stents. Therefore, the aim of this study was to analyze the complications related to ureteral double J stents and different modalities of management of complications of ureteric DJ stents and their outcomes.

Methods

The present study evaluated 3000 procedures from 2014 to 2022 at HMC, Alkhor, after obtaining ethical clearance from the Ethical Committee. Inclusion criteria: patients who had undergone double j stenting postoperatively by endourology, Exclusion criteria as patient under the age of 18 Co-existing renal anomalies, Correctable bleeding disorders, Patients with febrile urinary tract infection, patients with a single functioning kidney, Musculoskeletal deformities; Patients with ureteral stones or ureteral obstruction.

These included 2600 of the procedures that were unilateral and 400 that were bilateral; 53% of the patients were male and 47% female. The cases were separated according to stenting duration as short-term and long-term stenting. Short-term stenting was considered the indwelling catheters for up to 6 weeks, and long-term stenting was double J for longer than 6 weeks. Using these criteria, 2800 procedures were done for short-term drainage. Stenting post urethroscopy for lithiasis, conservative treatment for upper urinary tract carcinomas, caliceal diverticula, endopyelotomy, or after open surgery, such as pyeloplasty or ureteral segmental resection, are represented by the procedures. The double J stent was placed in 58 cases before gynecological or abdominal surgery to avoid ureteral trauma. A complete urine examination was done in all the patients who complained of dysuria to rule out urinary tract infection. Before the removal of the stent, an X-ray of the kidney, ureter, and bladder (KUB) was done to look for stent malposition or migration, stent fracture, or stent encrustation. The major objective of the study was to enumerate and study complications of DJ ureteral stenting in urological patients.

Statistical Analysis

Logistic regression analysis of the risk factors for forgotten DJSs was done using SPSS for Windows (version 22.0; IBM SPSS Statistics, IBM Corporation, Chicago, IL, USA). Correlations between the period of time overdue and complications from forgotten DJSs were explored using an independent sample t-test. The p values of all tests were two-sided, and p values < 0.05 were statistically significant.

RESULTS

Stent malposition, migration, irritative bladder symptoms, lumbar pain, haematuria, urinary tract infections, encrustation, and stent fragmentation were represented as ureteral stent complications. We encountered complications.
Between 2014 and 2022, we evaluated 3000 procedures. The cases were divided into short-term (less than 6 weeks – 2600 procedures) and long-term stenting (more than 6 weeks – 400 procedures) according to the stenting duration. (Tables 1& 2) The stenting indications for both groups were noted. The number of complications was 1000 in total. (Table 3) We had 05 cases of JJ stent malposition, two cases with parenchymal perforation and hematoma. We considered the double J migration, and in 30 cases, proximal migration and in 40 cases distal double J migrations. In 35 cases, the obstruction of the ureteral stent caused inefficient drainage, and irritative bladder symptoms were observed in 980 cases. 322 cases showed haematuria, and in 2 cases, a blood transfusion was necessary. In 29, urinary tract infection was diagnosed. In 12 cases, stent encrustation and calcification were observed, and in 02 cases, stent fragmentation was observed. Double J stent complications must be promptly evaluated and treated. The serious complications that may occur due to encrustation and stone formation in forgotten stents are prevented by stent removal and combined endourological techniques.

Table 1. Indications for Short-term Stenting.

Indications	Procedures
Post-operative	2550
Pre-ureteroscopy	350
Pregnant women	50
Prevention of ureteral trauma	05
Obstructive pyelonephritis	20
Ureteral lesions	05
Others	20

Table 2. Indications for Long-term Stenting

Indications	Procedures
Benign extrinsic fibrosis	30
Malignant extrinsic fibrosis	10
Ureteral stenosis	05
Lithiasis	03
Other	02

Table 3. Double-J Ureteral Stent Complications.

Complication	Total	
Stent malpositioning	05	0.166%
Proximal stent migration	30	1.00%
Distal stent migration	40	1.33%
Stent obstruction	35	1.16%
Irritative bladder symptoms	980	32.66%
Lumbar pain	489	16.3%
Hematuria	322	10.73%
Urinary tract infection	29	0.96%
Encrustation and calcification	12	0.40%
Stent fragmentation	02	0.06%

DISCUSSION

Double J ureteral stents are a valuable tool in urological practice. The stent may or may not be left permanently, depending on the indication. Despite that, for long-term stenting, regular replacements are needed to avoid complications of long-term indwelling. For this reason, stents are usually replaced after 3 to 6 months [5]. The increasing use of indwelling ureteral stents for urine diversion, ureteral blockage relief, and postoperative drainage has created more difficult problems in their use [6]. There are no known best practices for this type of issue. Because the stent is not perfect, we have the problems of stent migration, stent blockage, encrustation, stent fragmentation, and stent stone formation [6]. Recently, different types of ureteral stents and biomaterials have been developed to reduce these negative effects. The ideal stent should be easy to insert, open the passage, provide enough urine flow, resist incrustation and infection, be chemically stable, and not have side effects. Less than four weeks after the insertion, early complications like dysuria, stomach pain, and hematuria may occur, while late complications such as migration, blockage, calcification, and urinary tract infection (UTI) may occur more than four weeks after the insertion [7].

Malpositioning

Double J malposition is an important intraoperative complication that is responsible for further incidents. The most common in our study was placement of the proximal end into the ureter, but we had 3 cases of placement into the retroperitoneum and 1 case of parenchymal perforation and hematoma. Renal parenchymal perforation is an uncommon

but life-threatening disease [8]. A very rare complication of malpositoning has been reported as intravascular migration of double J stent, ureter arterial fistula, hemoperitoneum, and knotted stent [9].

Migration

The complication of migration of double J stents is a known complication, which can occur proximally into the pyelocaliceal system or ureter and distally towards the bladder. Similar to literature data, proximal double J migration was encountered in 30 patients (0.6–3.5% of all cases) in our study.

Other authors reported the incidence of stent migration as 5.8% [11]. The literature suggests that increased stone diameter and severity of hydronephrosis may help migration by decreasing stent attachment [12].

On the other hand, proximal migration occurs when the stent is too short for the ureter; hence, an appropriate selection of the stent length is recommended.

In the series of Breau et al., proximal stent migration was reported in 2% of patients, which they attributed to the use of a stent too short for the ureter or to prolonged indwelling time. If the migration has occurred, stenting a ureter, they concluded that a longer stent should be placed [13]. Furthermore, placement of the proximal curl into the renal pelvis instead of the calyx reduces the risk of stent migration. They found that a double J (DJ) stent of short length, inadequate distal curl, and proximal curl of the DJ stent in the upper calyx, not in the renal pelvis, may be a significant factor introducing proximal migration of the stent [14]. Stents with a full coil are less prone to migrate than stents with a J shape, and polyurethane stents have a greater memory and less propensity to migrate than silicone DJ stents with less memory. Several other theories have been proposed to explain the proximal migration of double J stent, such as prolonged stent indwelling time, movement of stent in association with movement of kidney during respiration, hydronephrosis, and combination of stent with a ureteric calculus acting as a jack, allowing only proximal migration of stent in respiration [15, 16]. DJ stents proximally migrated rarely present symptoms, but they may obstruct urine outflow. Therefore, it needs to be repositioned or removed.

Irritative Symptoms

Stent placement is associated with very common irritating symptoms such as increased urinary urgency or frequency, incontinence, hematuria, bladder pain, and renal colic, which significantly decrease the quality of life [17]. In a study published by M. Gurram et al., irritative bladder symptoms were the most common (42.5%) stent-related complication, similar to our data [9]. Previous literature data also reported that 32.5% of patients with double J stents have important irritative bladder symptoms [18]. Sixty percent of patients have urinary symptoms and pain in relation to double J ureteral stents that can interfere with daily activities and compromise quality of life [19].

Symptom severity is influenced by position and completeness of the lower loop, and stents passing the midline in the bladder with incomplete loops at the ends of the lower have higher morbidity [20]. Gurram's research indicates that the stent removal rate for fever was 26.3% and 15.6% for irritative bladder symptoms, while Pansota et al. reported a stent removal rate of 23.1% and 37.5% for fever [23]. In the study of Richter et al., the stent removal rate for fever was very high (55.8%) [21]. But in our study, there is improvement in patient symptoms after stent removal.

Flank pain

This complication is also frequent, with 23.9% of the patients complaining of lumbar pain in our study, as reported in other data from the literature (19–32%), and seems to arise from urine reflux to the kidney caused by an excessive rise in intrapelvic pressure that ends up in pain [22, 23]. Lumbar pain of ureteral stented patients occurs during bladder voiding but not during vesical filling [24]. The proximal coil is usually placed in the upper calyx or renal pelvis, and it is not influenced by the position of the proximal coil, and according to Smedley et al., it is usually mild to moderate [22].

Hematuria

An immediate postoperative complication, hematuria, may result from surgical management of existing disease and the stent placement itself [25]. Our data regarding hematuria revealed a 15.4% incidence compared with the incidence found in literature of 13.3%–27.5% [18]. Moreover, hematuria could be secondary to ureteroscopy.

Encrustation

A major problem is the encrustation of forgotten stents with a large stone burden. Stent encrustation is more likely in long-term stenting, urinary tract infection, a history of stone disease, oncologic treatment, chronic kidney failure, or metabolic or congenital defects [26]. However, it is associated with the presence of urease-producing bacteria. The bacteria cause an increase in urine pH, which promotes crystal formation. In addition, urine composition and pH, stent's material and surface properties, indwelling time, and urine flow dynamics affect stent encrustation. The best time to remove an indwelling ureteral stent is not known; however, long-term ureteral stent placement may increase the risk of stent encrustation or stone formation [2, 22]. In 76.3% of patients, encrustation increased directly to the stent indwelling time, and this was attributed to El-Faqih et al. [27]. Like Kawahara et al. found, similarly, in 75.9% of patients, these effects were found after the third month [28]. Bultitude MF et al. report that the rates of stent encrustation are 9.2 percent, 47.5 percent, and 76.3 percent when a stent is left in place for 6 weeks, 6-12 weeks, or greater than 12 weeks, respectively.

Stent Fragmentation

A major consequence of forgotten double J stents is fragmentation [29]. When the polymers degrade and the stent hardens, this occurs when the stent loses its tensile strength [29, 30]. In 2 patients, the ureteral stent fragmented. In the literature, 3–10% is mentioned [29].

Sometimes, encrustation in forgotten stents is associated with stent breakage. Stents may spontaneously fracture due to hardening and loss of tensile strength after a long time in place [31].

Limitations

The data that we obtain in this study is a retrospective study. Other risk factors, such as the patient's occupation, geographic location, and residual stones, were not included. The model is improved and applied in clinical practice, and multi-center application promotion is conducted in the following research direction.

CONCLUSION

The Double J stent should be assessed and treated for complications as soon as possible. Chronic indwelling patients should be advised to remove their devices as soon as possible and, if required, to change them frequently. Life-threatening problems from encrustation and stone formation in forgotten stents can occur, so they should be removed with a combination of endourologic methods. However, due to the importance of close monitoring and follow-up, these patients may prevent complications. The main reasons of D-J stent negligence were patient factors such as lack of information on their condition, poor economic status, poor compliance,

negligence towards the importance of their procedure, and lower educational status. Nowadays, the use of technology has advanced so much that there are several platforms one can use for a postoperative follow-up.

Declaration

Financing. The study was not sponsored.

Conflict of Interest. The authors declare no conflicts of interest.

Ethical Approval. The study was approved by the MRC.

Authors' Contribution: All authors contribute equally in study design development, data analysis, drafting the manuscript. study concept, scientific editing, iterature review,data acquisition and data analysis.

REFERENCES

1. Zimskind PD, Fetter TR, Wilkerson JL. Clinical use of long-term indwelling silicone rubber ureteral splints inserted cystoscopically. J Urol. 1967;97:840–844. doi: 10.1016/S0022-5347(17)63130-6. [DOI] [PubMed] [Google Scholar]
2. Kuno K, Menzin A, Kauder HH, Sison C, Gal D. Prophylactic ureteral catheterization in gynecologic surgery. Urology. 1998;52:1004–1008. doi: 10.1016/s0090-4295(98)00382-3. [DOI] [PubMed] [Google Scholar]
3. Damodaran V, Els B, Daras E, et al. The "ins and outs" of the magnetic ureteral stent: A novel innovation in Endourology. Curr Urol. 2023;17(2):92–99. doi: 10.1097/CU9.0000000000000104. [DOI] [PMC free article] [PubMed] [Google Scholar]
4. Geavlete P, Georgescu D, Multescu R, et al. Ureteral stent complications – experience on 50,000 procedures. J Med Life. 2021;14(6):769–75. doi: 10.25122/jml-2021-0352. [DOI] [PMC free article] [PubMed] [Google Scholar]
5. Dyer RB, Chen MY, Zagoria RJ, Regan JD, Hood CG, Kavanagh PV. Complications of Ureteral Stent Placement. RadioGraphics. 2002;22:1005–1022. doi: 10.1148/radiographics.22.5.g02se081005. [DOI] [PubMed] [Google Scholar]
6. Arshad M, Shah SS, Abbasi MH. Applications and complications of polyurethane stenting in urology. J Ayub Med Coll Abbottabad. 2006;18(2):69–72. [PubMed] [Google Scholar]
7. Alfredo ML. Catéter ureteral olvidado. Urol Colomb. 2007;16:139–148. [Google Scholar]
8. Gönülalan Umut, Akand Murat, Hasırcı Eray, Koşan Murat. An unusual complication of a double-J ureteral stent: renal parenchymal perforation in a solitary kidney. Turk J Urol. 2014 Dec;40(4):245–7. doi: 10.5152/tud.2014.76753. [DOI] [PMC free article] [PubMed] [Google Scholar]
9. Altay Bülent, Erkurt Bülent, Can Kiremit Murat, Güzelburç Vahit. A rare complication of ureteral double-J stenting after flexible ureteroscopy: renal parenchymal perforation. Turk J Urol. 2015 Jun;41(2):96–8. doi: 10.5152/tud.2015.53367. [DOI] [PMC free article] [PubMed] [Google Scholar]
10. Smith M.J.V. Ureteral stent: their use and miss use. Monogr. Urol. 1993;14:1. [Google Scholar]
11. Gurram Mallikarjuna, Ravichander G, Jagirdhar Ravi, Chandra Praveen. Ureteric double-J stent related complications: a single tertiary care center experience from South India. Int J Res Med Sci. 2018 Dec;6(12):3846–3851. [Google Scholar]
12. Şendoğan Furkan, Turan Turgay, Efiloğlu zgür, Gökhan Atış Ramazan, Çaşkurlu Turhan, Yıldırım Asıf. An Exploration of Factors That Cause the Spontaneous Migration of Double-J Stents After Retrograde Intrarenal Surgery. Erciyes Med J. 2019;41(4):398–40. [Google Scholar]
13. Breau RH, Norman RW. Optimal prevention and management of proximal ureteral stent migration and remigration. J Urol. 2001;166:890–3. [PubMed] [Google Scholar]
14. Slaton JW, Kropp KA. Proximal ureteral stent migration: an avoidable complication? J Urol. 1996;155:58–61. [PubMed] [Google Scholar]
15. Sarkar D, Dutta A, PAL D.K. Proximal migration of ureteric DJ stent: A case series. APSP J Case Rep. 2019;10:6. [Google Scholar]
16. Ko W, Lee W, Jung J, Lee M. Spontaneous proximal double pigtail ureteral stent migration after shockwave lithotripsy: "Jack" phenomena. J Urol. 2001;166:1387. [PubMed] [Google Scholar]
17. Joshi HB, Stainthorpe A, Keeley FX, Jr, MacDonagh R, Timoney AG. Indwelling ureteral stents: evaluation of quality of life to aid outcome analysis. J Endourol. 2001;15(2):151–4. doi: 10.1089/089277901750134421. [DOI] [PubMed] [Google Scholar]
18. Pansota MS, Rasool M, Saleem MS, Tabassum SA, Hussain A. Indications and complications of double J ureteral stenting: our experience. Gomal J Med Sci. 2013 Jul 2;11(1) [Google Scholar]
19. Vega Vega A, García Alonso D, García Alonso CJ. Evaluación de clínica y calidad de vida con catéteres ureterales de tipo doble pigtail [Characterization of urinary tract symptoms and quality of life in patients with double-pig-tailed ureteral stents]. Actas Urol Esp. 2007 Jul-Aug;31(7):738–42. doi: 10.1016/s0210-4806(07)73714-2. [DOI] [PubMed] [Google Scholar]
20. Rane A, Saleemi A, Cahill D, Sriprasad S, Shrotri N, Tiptaft R. Have stent-related symptoms anything to do with placement technique? J Endourol. 2001 Sep;15(7):741–5. doi: 10.1089/08927790152596352. [DOI] [PubMed] [Google Scholar]
21. Richter S, Ringel A, Shalev M, Nissenkorn I. The indwelling ureteric stent: a "friendly" procedure with unfriendly high morbidity. BJU Int. 2000 Mar;85(4):408–11. doi: 10.1046/j.1464-410x.1998.00543.x-i1. [DOI] [PubMed] [Google Scholar]
22. Miyaoka Ricardo, Monga Manoj. Ureteral stent discomfort: Etiology and management. Indian J Urol. 2009 Oct-Dec;25(4):455–60. doi: 10.4103/0970-1591.57910. [DOI] [PMC free article] [PubMed] [Google Scholar]
23. Smedley F. H., Rimmer J., Taube M., Edwards L. 168 double J (pigtail) ureteric catheter insertions: a retrospective review. Ann R Coll Surg Engl. 1988 Nov;70(6):377–379. [PMC free article] [PubMed] [Google Scholar]
24. Mosli HA, Farsi HM, al-Zimaity MF, Saleh TR, al-Zamzami MM. Vesicoureteral reflux in patients with double pigtail stents. J Urol. 1991 Oct;146(4):966–9. doi: 10.1016/s0022-5347(17)37976-4.. [DOI] [PubMed] [Google Scholar]
25. Ho CH, Chen SC, Chung SD, Lee YJ, Chen J, Yu HJ, Huang KH. Determining the Apropriate Length of a Double-Pigtail Ureteral Stent by Both Stent Configurations and Related Symptoms. J Endourol. 2008;22:1427–31. doi: 10.1089/end.2008.0037. [DOI] [PubMed] [Google Scholar]
26. Singh V, Srinivastava A, Kapoor R, Kumar A. Can the complicated forgotten indwelling ureteric stents be lethal? Int Urol Nephrol. 2005;37:541–546. doi: 10.1007/s11255-004-4704-6. [DOI] [PubMed] [Google Scholar]
27. El-Faqih SR, Shamsuddin AB, Chakrabarti A Atassi R, Kardar AH, Osman MK, Husain I. Polyurethane internal ureteral stents in treatment of stone patients: morbidity related to indwelling times. J Urol. 1991;146:1487–91. doi: 10.1016/s0022-5347(17)38146-6. [DOI] [PubMed] [Google Scholar]
28. Kawahara T, Ito H, Terao H, Yoshida M, Matsuzaki J. Ureteral stent encrustation, incrustation, and coloring: morbidity related to indwelling times. J Endourol. 2012;26:178–82. doi: 10.1089/end.2011.0385. [DOI] [PubMed] [Google Scholar]
29. Memon NA, Talpur AA, Memon JM. Indications and complications of indwelling ureteral stenting at NMCH, Nawabshah. Pak J of Surg. 2007;23(3):187–91. [Google Scholar]
30. Zisman A, Siegel YI, Siegmann A, Lindner A. Spontaneous ureteral stent fragmentation. J Urol. 1995;153:718–721. doi: 10.1097/00005392-199503000-00049. [DOI] [PubMed] [Google Scholar]
31. Mursi K, Fayad A, Ghoneim I, El-Ghamrawy H. Stones on a forgotten double-J stent: a case report of multiple stones casting a multi-fractured ureteral stent. African Journal of Urology. 2005;11(3):247–9. [Google Scholar]