# Efficacy and safety of the use of infant feeding tubes as internal ureteral stents at Muhimbili National Hospital, Tanzania

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## Abstract

*Background: Infant feeding tubes are inexpensive, readily available, and have been used as urinary tract stents with some uncertainty about their effectiveness and safety. Double J ureteral stents are available on the market, but among other factors, availability and affordability limit their use in developing countries, including in our hospital. We aimed to compare the efficacy of infant feeding tubes compared to standard double J ureteral stents in patients undergoing open ureteral stenting at Muhimbili National Hospital in Dar es Salaam, Tanzania.*

*Methods: We conducted a hospital-based cross-sectional analytical study over 12 months. Patients included in the study required open ureteral stenting for different indications and were divided into 2 groups: those for whom infant feeding tubes were inserted during surgery (study group) and those whose surgery used double J stents (control group). After surgery, patients were recruited and observed to ascertain the duration of hospital stay, as well as the presence of haematuria, dysuria, urinary frequency, flank and suprapubic pain, stent migration, and stent encrustation. Observations continued until the day of discharge, after which patients were followed up to the day of stent removal.*

*Results: A total of 44 patients were enrolled in the study. The mean age of participants was 40 years (range 1 to 75). The majority of participants were female (n = 26; 60%). Among the 44 operations, 19 (43.2%) used the infant feeding tube as a stent whereas the remainder (n = 25; 56.8%) used the standard double J ureteral stent. The mean hospital stay among patients who underwent surgery with the infant feeding tube as a stent was 9.6 days, whereas those who used the standard double J stent stayed for 8.8 days (P = 0.37). Postoperatively, haematuria was observed in 19 (43.2%) of the patients; among these, 15 (79%) of them received infant feeding tube stents and 4 (4.3%) received standard double J stents ($X^2$ = 17.4; P = 0.001). The postoperative prevalences of dysuria, flank pain, and suprapubic pain were 6.8%, 20.4%, and 9.1%, respectively. These outcomes did not show association with the type of surgical stent used. None of our study patients experienced postoperative urinary frequency. Imaging studies showed that 57.8% of the infant feeding tube stents were in the normal position postsurgery, whereas all of the standard double J stents were in the normal position ($X^2$ = 12.86; P = 0.005). Further, we found that among the 44 patients, only 1 patient (who underwent surgery that used double J stenting) had postoperative stent encrustation ($X^2$ = 0.7; P = 0.4).*

*Conclusions: Despite producing significantly higher incidences of haematuria and malposition, infant feeding tube as ureteral stents were comparable to double J stents in terms of hospital stay post-stenting, dysuria, flank pain, suprapubic pain and encrustation. Future larger prospective studies are needed to confirm these findings.*

**Keywords:** infant feeding tube, double J stent, ureteral stenting complications

## Introduction

Double J ureteral stents have become an integral part of the urological armamentarium. They allow good urinary drainage from the kidneys to the bladder and usually are safe and well tolerated. However, different complications may occur with short- or long-term use of indwelling stents. These complications have varied from minor side effects, such as haematuria, dysuria, frequency, flank pain and suprapubic pain, to major complications, such as vesicoureteral reflux, migration, encrustation, urinary infection, stent fracture, necrosis, and ureteroarterial fistula. Stents should be monitored while in place and promptly removed when no longer needed. They also must be changed periodically if they are to be left in place for long periods.[1]

Ureteral injury or lesions that may require ureteral stenting can occur as a consequence of external trauma, open surgical procedures, laparoscopy, or ureteroscopic procedures. Lesions caused by external trauma are rare. Iatrogenic damage is the most frequent cause of ureteral injury. In 1 review of 13 series, hysterectomy was responsible for the majority (54%), followed by colorectal surgery (14%), pelvic surgery (8%), and abdominal vascular surgery (6%).[2]

Currently, surgeons are more inclined towards internal drainage than external drainage.[3,4] There are many ways to divert urine, and different types of drainage methods have been described in the literature, including nephrostomy tube drainage, internal ureteral stenting (such as with the double J stent), external stenting, and a combination of these modalities.[5,6] Several favourable reports on the use of internal stents have been published in recent years showing their several advantages.[7] The advantages of a double J stent compared with a nephrostomy tube include a shorter hospital stay and a lower morbidity rate.[8,9] Furthermore, double J stents prevent adhesion to the suture site by splinting the suture line, help to maintain an appropriate diameter and alignment of the ureter, and limit ureteral kinking. Woo and Farnsworth used only internal ureteral stents rather than both a stent and a nephrostomy tube because the former showed a low rate of postoperative complications and a decreased postoperative hospital stay.[5] Ninan et al. reported a review of the records of 60 patients who underwent pyeloplasty in 2008 and strongly recommended double J stenting, claiming that it was the safest mode of drainage in paediatric pyeloplasty. The disadvantages of the double J stent include stent-related complications, such as urinary tract infection (UTI) and potential obstruction of the ureter by irritation of the mucosa of the ureter or the renal pelvis. Furthermore, leaving a double J stent in neonates or paediatric patients requires additional general anaesthesia for removal. Moreover, the double J stent may act as a foreign body and incite stone formation.

Infant feeding tubes have been currently reported in few centres to be used as internal ureteral stents for different indications. A recent study done by Singh et al. in India—where infant feeding tubes were used in children following pyeloplasty due to ureteropelvic junction obstruction (UJO)—reported a complication rate of 7.5%. Infection was seen in 1.5% of cases managed, and non-drainage was seen in 1.5% of cases, which required cystoscopy and retrograde double J stent placement. Urinary leak was seen in 2.2% of cases and subsided with Foley catheterisation only; renal dynamic scans at 3 and 9 months' follow-up depicted improved drainage in 124 cases (92.5%) and preserved renal function in 10 cases (7.5%). The overall success rate was 92.5%. Singh et al. concluded that use of infant feeding tubes as ureteral stents was inexpensive, easy to use, and patient-friendly with added comforts and cosmesis without jeopardising an effective anastomosis and risk of a non-intubated approach. Infant feeding tubes also avoided the complications usually encountered with the use of nephrostomies, or double J stents.[10]

A study done in Nigeria by Ekeke et al. reported experiences with infant feeding tubes as stents in the urinary tract. In their study of 33 patients, 19 patients (57.6%) used feeding tubes as

urethral stents while in 14 (42.4%) as ureteral stents. Operations requiring stents included: dismembered pyeloplasty (n = 3; 9.1%), ureteral re-implantation (n = 8; 24.3%), ureterolithotomy (n = 3; 9.1%), and urethroplasty (n = 19; 57.6%). The stents were left in situ for 2 to 3 weeks depending on the indication. Ureteral stents were left for 3 weeks, while urethral stents were usually left for 2 weeks. However, where a significant complication was noted, the stent was removed. Complications that were likely stent-related were noted in 4 patients (12.1%); these included bladder spasm, infection, and wound dehiscence. He concluded that infant feeding tubes can be used as suitable urinary tract stents.[11]

A study done at Sultan Qaboos University Hospital, Oman, on complications and outcomes of double J stenting of the ureter in urological practice found that loin pain (10.9%) and urinary tract infection (10.9%) were the most common complications, followed by dysuria (7.7%). There were significant complications requiring treatment in 29% of patients, and 71.4% of patients improved after stenting.[12] There are numerous theoretic advantages to routine stenting after the urothelium has been opened and multiple types of ureteral stents are available on the market, but cost and availability are two important aspects that hinder access to such ureteral stents in our national hospital and many other hospitals in developing countries. Therefore, this study enabled us to make an informed decision on the use of infant feeding tubes in our setting.

### Methods

We conducted a prospective cross-sectional analytical study over 12 months in patients who required open ureteral stenting for different indications at Muhimbili National Hospital in Dar es Salaam, Tanzania. Patients who met inclusion criteria were divided into 2 groups: those who received infant feeding tubes as stents (study group) and those who received double J stents (control group). Postoperatively, patients were recruited and assessed on duration of hospital stay postsurgery, as well as presence or absence of haematuria, dysuria, urinary frequency, flank and suprapubic pain, stent migration, and stent encrustation. The observation continued until the day of discharge. Patient operative notes were checked during assessment and either intravenous urography (IVU) or plain KUB (kidneys, ureter, bladder) x-ray was done postoperatively or during follow-up visits to check the position of the ureteral stent. Postoperative urinalysis to check for infection was also carried out for some patients. Patients were followed up to the day of stent removal. Data were collected using interviewer-administered pretested questionnaires and entered into Microsoft Excel. Analysis was done using Stata version 10.0. Chi-square tests and Student's t-tests were used and P-values < 0.05 were considered significant. Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences Research Ethics Committee.

### Results

A total of 44 patients were enrolled into the study, with a mean age of 40 years (range 1 to 75), and the majority of the participants were female (n = 26;60%). Among the 44 participants, 19 (43.2%) used the infant feeding tube as a stent whereas the remainder (n = 25; 56.8%) used the standard double J stent.

Overall, patients stayed in the hospital for a mean of 9.1 days postsurgery. The mean stay among those who used the infant feeding tube as a stent was 9.6 days, whereas those who used the standard double J stent stayed for a mean of 8.8 days (P = 0.37). Following the procedure, haematuria was observed in 19 (43.2%) of the patients; among these, 15 (79%) of them received infant feeding tubes as a stent and 4 (4.3%) received standard double J stents ($X^2$ = 17.4; P = 0.001). Postoperatively, dysuria, flank pain, and suprapubic pain were documented in 6.8%,

20.4%, and 9.1% of the patients, respectively. These outcomes did not show association with the type of surgical stent used (Table 1). None of our study patients experienced postoperative urinary frequency.

| Table 1: Association between type of stent used and various outcomes | | | | |
|---|---|---|---|---|
| Outcome | Type of stent | | $X^2$ | P-value |
| | Infant Feeding Tube, n (%) | Standard Double J Stent, n (%) | | |
| **Haematuria** | | | | |
| Yes | 15 (79) | 4 (16) | 17.4 | 0.001 |
| No | 4 (21) | 21 (84) | | |
| **Dysuria** | | | | |
| Yes | 2 (10.5) | 1 (4) | 0.72 | 0.40 |
| No | 17 (89.5) | 24 (96) | | |
| **Suprapubic pain** | | | | |
| Yes | 3 (15.8) | 1 (4) | 1.81 | 0.18 |
| No | 16 (84.2) | 24 (96) | | |
| **Flank pain** | | | | |
| Yes | 6 (31.6) | 3 (12) | 2.54 | 0.11 |
| No | 13 (68.4) | 22 (88) | | |

Postoperative imaging showed that 57.8% of the infant feeding tube stents were in the normal position, compared to whereas all (100%) of the standard double J stents being found in the normal position ($X^2 = 12.86$; $P = 0.005$).

Overall, among the 44 patients, only 1 patient had stent encrustation postsurgery; this patient received a double J stent ($X^2 = 0.7$; $P = 0.4$) (Table 2).

| Table 2: Association between type of stent and postoperative position and encrustation | | | | |
|---|---|---|---|---|
| Outcome | Type of stent | | $X^2$ | P-value |
| | Infant Feeding Tube, n (%) | Standard Double J Stent, n (%) | | |
| **Stent position** | | | | |
| Normal | 11 (57.9) | 25 (100) | 12.86 | 0.005 |
| Migrated | 3 (15.8) | 0 (0) | | |
| Dislodged | 1 (5.3) | 0 (0) | | |
| Unknown | 4 (21.0) | 0 (0) | | |
| **Encrustation** | | | | |
| Yes | 0 (0) | 1 (4) | 0.69 | 0.40 |
| No | 17 (100) | 24 (96) | | |

## Discussion

Ureteral stenting following upper urinary tract surgery or obstruction is preferred by most urologists worldwide. For internal ureteral drainage, there are varieties of readymade ureteral stents, including double J stents, which are said to confer the advantages of shorter hospital stay and lower morbidity.[8] Double J stents can maintain appropriate alignment of the ureter.[8,9,11]

To date, infant feeding tubes have been widely used as an alternative to standard stents during internal ureteral stenting procedures, because of their low cost and easy availability in Tanzania.

Of the procedures included in this study, 56.8% used double J stents and 43.2% used infant feeding tubes. This is in contrast to the findings of Ekeke et al. in Nigeria, wherein among 33 patients, infant feeding tubes were used for 19 (57.6%).[11] The explanation for having many patients stented with double J stents may be that, recently, the availability of double J stents in Dar es Salaam has been increasing, owing to an increase in the number of local suppliers. The recent inclusion of double J stents in the national health insurance package could be another likely explanation. Young urologists' preference for double J stents over infant feeding tubes could also be a contributing factor for seeing more cases stented with double J stents.

Unlike the finding by Woo et al., whereby the mean length of hospital stay for stented infants following pyeloplasty was 5.9 days,[5] our study found a mean postoperative hospital for those stented with double J to be 8.8 days. Patients stented with infant feeding tubes stayed in hospital for a mean of 9.6 days postsurgery, and the overall mean hospital stay was 9.1 days. The observed lack of significant difference in admission duration could be because of the small number of participants and may have been strongly influenced by the 2 participants who received double J stents and here hospitalised for 40 days.

The commonest complication following open ureteral stenting observed in this study was haematuria, which accounted for 43.2% (19 out of 44) of the complications. Haematuria in those stented with infant feeding tubes was found in 15 patients (79%) and only observed in 4 patients (16%) who had received double J stents; in other words, there was a strong association between type of stent and incidence of haematuria in our series. This is in contrast with findings from Al-Marhoon et al., who studied the complications and outcomes of double J stenting in Oman. They found the commonest complications of stenting to be loin pain (10.9%) and UTI (10.9%), followed by dysuria (7.7%); they did not document haematuria as a complication in their findings.[12] Elsewhere, the study by Singh et al. reported the incidence of UTI to be 1.5%, non-drainage as 1.5%, and urinary leak as 2.2%, in cases stented with infant feeding tubes; they also did not list haematuria as an observed complication.[10] Ekeke et al. observed a 12.1% complication rate in their Nigerian study, wherein infant feeding tubes were used as urinary stents and the complications mentioned were bladder spasm, infection, and wound dehiscence; here also haematuria was not included as a complication.[11] In our study, together with haematuria, dysuria was observed in 10.5% of those stented with infant feeding tubes and in 4% of those stented with double J stents. Flank pain, which some studies have attributed to non-drainage of stents or vesicoureteral reflux, was observed in 31.6% and 12% in those stented with infant feeding tube and double J stents, respectively. Suprapubic pain was in reported for 15.8% of those stented with infant feeding tubes and 4% in those who received double J stents. Even though this study suggests a higher incidence of complications in those stented with infant feeding tubes than in those stented with double J stents, the observed difference was not statistically significant and therefore no associations were made between dysuria, suprapubic pain, flank pain, and the type of stent used.

Among those patients who were stented with infant feeding tubes, only 57.9% of the stents were found to be in normal position upon KUB x-ray or IVU. All double J stents used during the study period were found to be in the normal position. Abnormal position in those stented with infant feeding tubes could be explained by the absence of proximal and distal loops or curves of the feeding tube (which are present in double J stents). Inappropriate stent length can also contribute to malpositioning.[1]

El Faqih et. al.[13] found that postoperative stent encrustation occurred in 9.2% of stents retrieved before 6 weeks, 47.5% of stents left in place for 6 to 12 weeks, and 76.3% of stents left in place for longer than 12 weeks. At Muhimbili, this study only observed encrustation in 1 patient (who received double J stent placement). None of those stented with infant feeding tubes were found with encrustation. Al-Marhoon et. al found encrustation around the stent in 5 patients (2.3%), with a mean (range) stenting duration of 71.4 (30 to 131) days.[12]

## Conclusions

This study showed that, despite the high incidence of haematuria and malposition with the use of infant feeding tubes as ureteral stents, postoperative length of hospital stay, dysuria, flank pain, suprapubic pain, and stent encrustation did not vary significantly with the type of ureteral stent used. Future larger prospective studies are needed to confirm our findings.

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