

# Indications and Complications of Indwelling Ureteral Stents (DJS)\*

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## SUMMARY

Ureteral obstruction no longer requires open surgical drainage. The term double "J" has become a generic label in urology. Use of Double J stents is now routine in urological practice. This study evaluated the indications and complications of indwelling ureteral stents. A total of fifty patients had stents passed. These patients were divided into 2 groups of 25 each (Polyurethane and silicone). The most common indications were renal and ureteric calculi 35 patients (70%), non functioning kidneys 3 patients (6%), strictures of ureter 3 patients (6%), ureteric fistula 2 patients (4%) malignant obstruction 3 patients (6%) and ureteropelvic junction obstruction 4 patients (8%). Complications were seen in 5 patients (10%). We conclude that stents are an effective, easy and cheap method of relieving obstruction, with a low complication rate. We recommend that ureteral stent should be used to relieve renal obstructive disease, and patients undergoing ureteropelvic surgery.

## INTRODUCTION

Indwelling ureteric stents are tubes that allow urine to drain unimpeded from the renal pelvis to the urinary bladder. They may also be used to maintain alignment, ureteral caliber or for diversion of urine.

Probably the first reported case of use of a ureteric stent was by Simon in 1851 after a ureteral anastomosis.<sup>1</sup> But those stents were made of rubber tubes, which were inappropriate for long term use and also required external drainage. The use of infant feeding tubes to stent the ureters in patients during ureteral reimplantation and various other procedures on the ureter is still being practised, especially in children<sup>2</sup>. Zimskind et al<sup>3</sup> were the first to report long term use of indwelling ureteral stents of silicone rubber in 13 patients. Hepperlen et al<sup>4</sup> gave the idea of multiple holes in the shaft of the stent and pigtail modification at the proximal end to reduce downward migration and holes to reduce the pressure transmission to the kidney during voiding.

In his series of 22 patient, no expulsion was reported.

Finney<sup>5</sup> was the first to modify proximal and distal ends of a silicone tube coiled in the shape of J. These tips were malleable and could be straightened and strengthened by an internal guide wire, which was utilized for stent passage. Once the wire was removed the J memory would prevent stent migration.

A wide variety of stents are available. It might be expected that differences in configuration and composition would have an effect on the patient's symptomatology. This was the basis of our study. We compared double J stents made of silicone and a new synthetic material, polyurethane.

We compare the efficacy of these stents in clinical use and their complications.

## MATERIAL AND METHODS

This prospective study was conducted in the Urology Department at Shaikh Zayed Hospital, Federal Postgraduate Medical Institute, Lahore.

A total number of 50 patients of either sex, between the ages of 16 to 80 years were included in the study. Those with diabetes mellitus, immunosuppression and pregnant females, were

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excluded from the study. Polyurethane multilength and double J silicone stents were used in alternate patients who were divided into the following two groups.

#### **Study group I (n=25)**

In these patients polyurethane multilength 6Fr stents were passed (Cook Urological, U.S.A).

#### **Study group II (n=25)**

In these patients silicone double J 6Fr were passed (Sugitek Medical Engineering Corporation).

Stents were placed endoscopically or during open procedures. (Stent was placed via pyelotomy or ureterotomy. A guide wire was inserted through one of the side holes to straighten the proximal and distal coils intum). Only those patients were included in the study in whom the stent was passed successfully.

All the patients were evaluated for loin pain, urinary frequency, urgency, hesitancy, pain on voiding, history of fever and haematuria. These were graded as mild, moderate and severe. Urgency was either present or absent. Past history of operations was also noted. All the patients had routine urine examination and culture, complete blood picture, blood counts, serum urea, creatinine and electrolytes. Ultrasound seen of the kidneys ureters and bladder, and a plain X-Ray abdominal, were done in patients with renal failure (Serum creatinine more than 2mg/dl). Intravenous urography was performed in all the patients having serum creatinine less than 2mg/dl. 99m Technetium radionuclide renal scan and dialysis was done in selected cases. At the time of stent placement, the type of anaesthesia used was also noted.

The patients were followed up initially one week post operatively then every month till the stent were removed and finally 1 week after remove of stent.

The following parameters were noted and graded.

#### **Subjective Parameters**

1. Flank Pain
2. Frequency of micturition (day time)
3. Nocturia
4. Urgency

5. Pain on voiding of dysuria
6. Haematuria

#### **Objective Parameters**

1. Blood urea and creatinine estimation.
2. Microscopic haematuria (Urine RBC/HPF)
3. Microscopic Pyuria (Urine WBC/HPF)
4. Ultrasound to see the degree of hydronephrosis.
5. X-Ray abdomen and pelvis to see the position of the stents.
6. Intravenous urogram and renal scan in selected cases.
7. On removal of the stent, colour change was noted.
8. After removal of the stent, the degree of encrustation was noted and graded.

#### **STATISTICAL ANALYSIS**

Numerical data was recorded as frequency and percentages while numerical variables were separated as mean $\pm$ SD. Complication rates for stenting were analysed with Chi-square test. A p value of 0.05 was considered significant for all analysis. SPSS version 10.0 for Windows were used for data analyses.

#### **RESULTS**

In group I (Polyurethane stent), 13 (52%) patients were male and 12 (48%) female. The age of patients were between 18 to 70 years, mean age of 44.32 $\pm$ 15.540 years. In group II (silicone sent), 16 patients (64%) were male and 9 (36%) female. Age was between 21 to 65 years, mean age 38.68 $\pm$ 13.225 years. Indication, of stents are listed in Table 1.

Stent was passed endoscopically in 16 patients (64%) in group I and group II, and in 9 patients (36%) during open surgical procedure in both groups.

General anaesthesia was used in 21 patients (84%) in group I and in 19 patients (54%) in group II. Local anaesthesia (2% Xylocaine Jelly with intravenous valium 5 to 10mg) was used in 4 patients (16%) in group I and in 6 patients (24%) in group II.

Frequency, nocturia, dysuria and urgency were

more marked in the younger age group and in polyurethane group. Encrustation was more on silicone stents, it had a direct relationship with the duration the stent stayed. This was statistically significant (P=0.02) (Table 2).

Stent failed to drain in one patient after 13 weeks of placement in group I Knot formation occur in one patient of group I. Stent migrated to bladder after 2 months in one patient of group II (silicone). Severe encrustation occurred in 2 patients in group II (Silicone) (Table 3).

Table 1: Indications for stents in 50 patients.

Indications	Polyurethane (Group I)	Silicone (Group II)
<b>A. Obstructions</b>		
I) With serum creatinine > 2mg/dl		
Bil. Renal calculi	4	4
Bil. Ureteric calculi	1	1
Malignant ureteric obstruction	3	0
II) With serum creatinine < 2mg/dl		
Renal and ureteric calculus	1	1
Unilateral staghorn or multiple renal calculi	3	5
Unilateral ureteric calculus	6	4
Bil. Renal calculi	0	2
Post ESWL stent strasse	0	1
Non functioning one kidney	2	1
<b>B. Prophylaxis after surgery</b>		
Ureteropelvic junction obstruction	2	2
Benign ureteric stricture (lower end)	2	1
Ureterovaginal fistula	0	1
Ureteric fistula	1	0
<b>Total</b>	<b>25</b>	<b>25</b>

Table 2: Encrustation of stent after removal.

	Polyurethane (Group I)	Silicone (Group II)	P-value
No encrustation	12 (48)	7 (28)	P=0.02
Mild	10 (40)	8 (32)	
Moderate	3 (12)	8 (32)	
Severe	Nil	2 (8)	
<b>Total</b>	<b>25</b>	<b>25</b>	

Chi Square test applied

Table 3: Major stent complications in 50 patients.

Complications	Group I n (%)	Group II n (%)
Stent obstruction	1 (4)	0
Knot in stent	1 (4)	0
Migration of stent (antegrade)	0	1 (4)
Severe encrustation	0	2 (8)

## DISCUSSION

Traditionally the drainage of the upper urinary tract was achieved by nephrostomy, ureterostomy and pyelostomy.<sup>6</sup> With the advent of percutaneous nephrostomy (PCN) and double J. stent ureteral obstruction no longer requires open surgical drainage.<sup>7</sup> Dilatation of ureter secondary to stenting is due to constriction around the foreign body (stent) and hyperperistalsis, which leads to fatigue and dilatation. This allows continual passage of urine initially through the stent and than later about a week mainly around the stent.<sup>8</sup> Ureteric stents also allowed free vesicorenal reflux at rest. Finney advised vesical drainage by catheter to minimize pressure. 75% of urologists do use stents for prophylaxis in ureteral anastomosis.<sup>9</sup> There has been substantial improvement in material and design since Zinsked et al induced the first stent (1967). From our study most beneficial effect was calculi renal failure. Thirty (70%) of our patients had calculus disease of kidney or ureter and 12 patients (24%) of patients were in calculus renal failure. 25% calculus renal failure has been reported by Khan.<sup>10</sup> Stents were helpful in these ill patients.

Minor complications were irritability of the lower urinary tract. Major complications was acceptable when compare with mortality and morbidity when stent was not used. When compare with percutaneous nephrostomy in malignant obstruction complication like dislodgement rate of 26% and perinephric abscess and infection are not acceptable.<sup>11</sup> Gulkin et al<sup>12</sup> reported 44.4% dislodgement rate. In our country most common operation for renal stone is still pyelolithotomy. Stenting in these complicated cases definitely reduces hospital stay and post operative complication.

In bilateral renal calculi we passed a stent on one side and operated upon the other side. After 6-8

week the stented side was operated, nine patients in our study had unilateral ureteric calculi. In 8 patients a stent was passed, ureteric dilatation facilitated subsequent ureteric instrumentation and relieved the obstruction. Stents also help to pass stones spontaneously, in 10%. A 70% rate of successful removal by ureteroscopy reported by Jones et al.<sup>13</sup> Bhatti et al<sup>14</sup> reported 21% rate of spontaneous passage and successful ureteroscopic removal in 63% of patients. In our study 12.5% of patients spontaneously passed the stone and ureteroscopic removal was done in 87.5% of patients. The reason was that the stones were in lower 3rd of the ureter in 85.7% of patients, and 14.3% in the middle 3rd.

Four patients had ureteropelvic junction obstruction in our study. Ureteropyeloplasty was done and stent placed in the ureter and the time of operation. The stent reduces post operative complications and hospital stay. 2 patients in our study had ureteric fistula, stent was passed to drain urine into the bladder for 7-10 days. We advise prophylactic use of stents in complicated pelvic surgery to decrease the chances of ureteral injury and easy identification of ureter.

### CONCLUSION

- In high operative risk patients, stent insertion should be the first intervention. In case of failure to pass the stent percutaneous nephrostomy should be procedure of choice.
- Due to shortage of hospital beds in our country stent diversion as day cases will be the procedure of choice.
- Stent are cost effective and in reconstructive surgery stenting reduces the postoperative complication and hospital stay.

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