

# Double-J Stenting Versus Percutaneous Nephrostomy; Postoperative Complications in Management of Ureteral Obstruction

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## ABSTRACT

**Background:** Ureteral obstruction is a common surgical problem and managed by stent insertion or percutaneous nephrostomy. However, there is still confusion that which procedure is better in terms of the complications. **Objective:** To compare the efficacy of double J stenting and percutaneous nephrostomy for ureteral obstruction in terms of post-operative complications. **Study Design:** Randomized Clinical Trial. **Settings:** Urology Department, Shaikh Zayed Hospital, Rahim Yar Khan-Pakistan. **Duration:** One years from January through December 2016. **Methodology:** Male/female patients (aged: 19-63 years) presenting in the OPD of the hospital with ureteral obstruction were registered during study period. Either of the groups i.e. A (double J stenting, n = 55) or B (percutaneous nephrostomy, n = 55) was allotted to the subjects, randomly. The procedures and subsequent complications were addressed as per hospital protocols. **Results:** Most of the patients i.e., 75 (68.2% of 110) were male whereas age statistics were, as:  $M = 49.47$ ,  $SD = 8.2$  (range 19-62) years. Ureteral stone(s) was found as the most prevalent cause of ureteral obstruction in group A (49.1%, n = 27) and B (40.0%, n = 22). Hematuria was seen as a common complication: 33.3 (n = 5) and 42.9% (n = 3) in group A and B, respectively. The rate of complications was significantly lower in group B than A [12.7% (n = 7) vs. 27.3% (n = 15), respectively] ( $p = .04$ ). **Conclusion:** Percutaneous nephrostomy is a better procedure (in terms of post-operative complications) than double J stenting in management of ureteral obstruction.

**Keywords:** Ureteral obstruction, Percutaneous nephrostomy, Stents, Postoperative complication.

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## INTRODUCTION

Ureteral obstruction<sup>1</sup> i.e. any obstruction in the ureter(s) poses considerable threats for renal functions by painful blockage of urinary drainage. Uremia, water-electrolyte imbalance and urinary tract infections are amongst the most common clinical findings. The patient with reduced alertness is under consistent fatal consequences and financial pressures. Unluckily, Pakistan positioned 53<sup>rd</sup> in the world with kidney diseases-based (including ureteral obstruction) mortality rate of 23.62 per 100, 000 population.<sup>2</sup>

Ureteral obstruction is either malignant or benign in origin. Mostly, malignant obstruction is the resultant of intrinsic urologic malignancy<sup>3</sup> e.g., prostate cancer. Similarly, the etiology of benign ureteral obstruction is generally a consequence of luminal pathology e.g., ureteral stones. Any clinician opts an optimal definitive emergency procedure of decompression (percutaneous nephrostomy/double J stenting) for symptomatic relief

from urine obstruction and reversal of renal physiology. Moreover, measures are also taken to minimize further urologic intervention, hospitalization and adverse impacts of quality of life (QoL).<sup>4,5</sup> Percutaneous nephrostomy (PCN) is minimally invasive ultrasonography-guided procedure<sup>6</sup> while double-J ureteral stenting (DJS) becomes choice for obstruction on large-sized ureteral stone.

Like any other interventional procedure, there are chances of post-operative complications. Hematuria<sup>7</sup> and septicemia are well-known complications of double-J stents. Similarly, ureteral perforation or stent migration can also be expected. Similarly, PCN blockage<sup>8</sup> is a common issue. The complications are then addressed, accordingly.

In case of management of ureteral obstruction, there is no strong evidence to support the superiority of one methodology (with respect to post-operative complications) over other between stenting and

nephrostomy.<sup>9,10</sup> Similarly, there is no paper on such issue at study setting of present research. To fill the gap, present work was conducted with the aim: "To compare the efficacy of double J stenting and percutaneous nephrostomy for ureteral obstruction in term of post-operative complications". The results will open gates for further investigations towards validity of the optimal procedure.

## METHODOLOGY

**Study Design:** Randomized controlled trial.

**Settings:** Department of Urology, Sheikh Zayed Hospital, Rahim Yar Khan Pakistan.

**Duration:** One year i.e., January through December 2016.

**Sample Technique:** Consecutive sampling technique.

**Sample Size:** The total sample size of 110 (i.e., 55 for each of the two groups) emerged when values of Group A (anticipated incidence of hematuria/bleeding against double-J ureteral stenting) = 37%,<sup>11</sup> and Group B (anticipated ... percutaneous nephrostomy tube insertion) = 11%,<sup>1</sup>  $\alpha = 0.05$ ,  $\beta = 0.1$ , and power of test = 90% were inserted in the online sample size calculator.

**Inclusion Criteria:** All the male/female patients (aged: 19-63 years) presenting in the outdoor patient department of the study setting with benign/ malignant ureteral obstruction and hydronephrosis were registered.

**Exclusion Criteria:** The patients with bleeding diathesis, sepsis, anesthetic drug allergy, or uremia were excluded.

**Data Collection Procedure:** It was initiated getting permission from the Institutional Review Board.

Written participation consent was taken before group allotment. Either of the groups i.e. A or B was allotted randomly to each of the recruiters by a biostatistician.

Clinical manifestations were collected before KUB (kidney, ureter, bladder) sonography. Single dose of prophylactic antibiotics was administered before intervention, intravenously. In group A, the double-J ureteral stent (6F with side holes) was inserted retrograde using aseptic cystoscopy technique under mild sedation/local anesthesia (instilling 2% xylocaine gel in urethra). In group B, the ultrasound-guided percutaneous nephrostomy tube was inserted at the puncture site, subcutaneously. The complications e.g. bleeding, hematuria and septicemia of both the groups were documented in immediate post-operative and follow up sessions (15<sup>th</sup> and 30<sup>th</sup> day) using the KUB sonography. Patients with complications were immediately managed as per hospital's protocols.

The data was analyzed in SPSS version 23.0. Quantitative or qualitative data were processed for mean (SD) or percentage (n), respectively. The success rate (in terms of complications) was associated with interventional procedure using chi-square test. Statistical significance was accepted at  $P < 0.05$ .

## RESULTS

All the 110 subjects of both the groups i.e., group A (double-J stenting) and B (percutaneous nephrostomy) adhered with the therapies (response rate = 100%). Most of the patients i.e., 75 (68.2%) were male by gender. The SPSS-mediated processing of the data on biological age (confirmed by CNIC) of the patients at the time of registration revealed statistics, as:  $M = 49.47$ ,  $SD = 8.2$  (range 19-62) years. Most of the patients (i.e.,  $n = 102$ , 92.7%) were aged: 41 – 63 years.

Data presented in Table 1 show the incidence rate of different causes of the ureteric obstruction against the two study groups i.e. A and B. Ureteral stone(s) was found as the most prevalent cause in group A (49.1%,  $n = 27$ ) and B (40.0%,  $n = 22$ ) followed by PUJ – a genetic disorder obstruction (18.2 vs. 21.8%, respectively). Endometriosis-mediated ureteral obstruction was seen in four (7.3%) subjects of the group A patients. Contrary to it, incidence rate of the benign prostatic hyperplasia -based obstruction was comparatively higher in group B than A (12.7 vs. 7.3%, respectively). Schistosomiasis (parasitic infection) caused obstruction in two and three patients of group A and B, respectively.

**Table 1: Causes of ureteric obstruction**

Cause	Study group; % (n)	
	A (n = 55)	B (n = 55)
PUJ obstruction	18.2 (10)	21.8 (12)
Ureteral stone(s)	49.1 (27)	40.0 (22)
Ureteral blood clot(s)	3.6 (2)	7.3 (4)
Tumor or retroperitoneal fibrosis in abdomen	9.1 (5)	5.5 (3)
Endometriosis (in females)	7.3 (4)	0.0 (0)
Swollen ureteric wall due to:		
i. Tuberculosis	1.8 (1)	7.3 (4)
ii. Schistosomiasis	3.6 (2)	5.5 (3)
BPH (in males)	7.3 (4)	12.7 (7)

PUJ (pelvic ureteric junction), BPH (benign prostatic hyperplasia), No case with biofilm and bacterial (other than *Mycoplasma* spp.) colonization on DJ stent

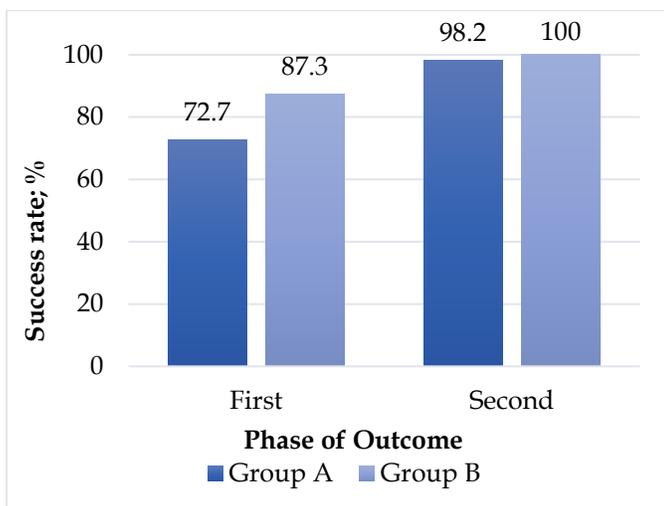
Hematuria – blood in urine was found as the most prevalent post-operative complication with 33.3 ( $n = 5$ ) and 42.9% ( $n = 3$ ) rate in group A and B, respectively as displayed in Table 2. It was followed by septicemia along with fever (26.7% against A group while 28.6% in B). In group A, procedural failure emerged in one (6.7%) of the subject patients. There were some group-specific outcomes as trigone irritation with pain, ureteral perforation or stent migration were seen in only group A while PCN dislodgement/blockage or injuries to adjacent organs confined to group B.

**Table 2: Post-operative complications in patients with ureteral obstruction**

Complication	Study group; % (n)	
	A (n = 15)	B (n = 7)
Septicemia and fever	26.7 (4)	28.6 (2)
Hematuria	33.3 (5)	42.9 (3)
Trigone irritation with pain	13.3 (2)	----
PCN dislodgement/blockage	---	14.3 (1)
Ureteral perforation	6.7 (1)	---
Stent migration	6.7 (1)	---
Injuries to adjacent organs	---	14.3 (1)
Stent encrustation	6.7 (1)	---
Procedural failure	6.7 (1)	0.0 (0)

--- (Not applicable)

Post-operative complications appeared in 15 (i.e., 27.3%) patients of group A (success rate = 72.7%) in 1<sup>st</sup> phase of the outcomes. It decreased to 7 (i.e., 12.7%) patients with success rate of 87.3% in B as shown in bar graph (Fig. 1) after 2x2 crosstabulation. There was significant difference between the two success rates ( $p = .04$ ) when data was processed in chi-square test. Management of the complications (as per hospital protocols) led to reporting of complicated cases, as: Group A = one (6.7%; success rate raised from 72.7 to 98.2%) while B = 0 (0.0%; success rate shifted from 87.3 to 100%) in 2<sup>nd</sup> phase of outcomes.

**Figure 1: Success rate of the therapies for ureteral obstruction in two phases of outcome**

n = 55 for each of the two study groups: A (DJ stenting) and B (PC nephrostomy)

## DISCUSSION

Adherence with therapy in all the study subjects (response rate = 100%) is a positive approach as it ensures

speed cost-effective recovery and improves quality of life e.g., after indwelling stent placement<sup>12</sup> on ureteral obstruction. The mean age of the participants (49.47 years) is slightly higher than a published study<sup>13</sup> (45.0 years). The age difference seems to be the consequent of chance sampling and/or moderating factors including genetics and life style.

Kidney stone is one of the major causes of ureteral obstruction.<sup>14</sup> Our findings are in accordance with perception as their incidence rate is between 40 to 50%. Whereas, 2<sup>nd</sup> highest positioning of pelvic ureter junction disorder is alarming one as it has genetic background. On the other side, ureteral infections like tuberculosis or schistosomiasis (parasitic infection) can be seen in many cases of ureteral obstruction as in present study (1 to 4 cases against any group). The unmanaged tuberculosis can cause death.<sup>15</sup> Opposite to a study,<sup>16</sup> no case of biofilm and bacterial (other than *Mycoplasma* spp.) colonization on DJ stent is plus point of the procedure. Accountable rate (3-5%) of tumor or retroperitoneal fibrosis in abdomen – a causative morbidity of ureteral obstruction is significant in management. However, precise expertise is expected in identification of the tumor as primary retroperitoneal paraganglioma can mimic a ureteral tumor.<sup>17</sup>

Despite of equal effective of the DJS and PCN for ureteral stones in normalizing urea and creatinine,<sup>18</sup> there is big chance of appearance of post-operative complications in the patients who underwent interventional management of ureteral obstruction. Unfortunately, hematuria is common one them.<sup>19</sup> Our results (33.3 vs. 42.9% against DCN and PCN groups, respectively) are in line with that perception. Infection-mediated septicemia and allied mild to severe fever ranked 2<sup>nd</sup> to hematuria because nonintentional mishandling in procedure is its root cause. Finding of higher incidence rate of septicemia in PCN than DJS is in accordance with a previous similar work<sup>20</sup> indicating some loopholes in the PCN. Stent migration<sup>21</sup> or encrustation can be expected in DJS for ureteral obstruction but total failure of this procedure is a rare one while advanced stage of the causative agent e.g., malignancy cannot be ruled out in the context. The failure needs readdress of the issue for complete relief otherwise patient shifts to bad experience of hemodialysis<sup>22</sup> using various devices. In case of small-sized stone, medical expulsive therapy can be tried, effectively.<sup>23</sup>

Comparatively higher success rate (inverse of complication rate) against nephrostomy (87.3%) than stenting (72.7%) have same trends as in an already reported Pakistani study<sup>24</sup> for the same objectives. Stent migration/encrustation and ureteral perforation are DJS-specific beside painful trigone irritation. Moreover, very slight difference (1.8%) in the success rate after management of the complications in 2<sup>nd</sup> phase of present study is attributed to the managerial skills of the healthcare professionals<sup>25</sup> of the study setting.

## CONCLUSION

Percutaneous nephrostomy (PCN) showed better efficacy than double J stenting (DJS) in terms of postoperative complications for definitive management of ureteral obstruction caused by different factors including extrinsic/intrinsic malignancy.

## LIMITATIONS

The study confined to pilot scale level on account of small sample size and certain constrains e.g. man power, and finances.

## SUGGESTIONS / RECOMMENDATIONS

Further studies should be conducted at large scale to revalid the results of present study before recommendation of a suitable procedure for clinicians.

## CONFLICT OF INTEREST / DISCLOSURE

None.

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