

Obstructive Uropathy: Double-J (DJ) Stenting or Percutaneous Nephrostomy

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ABSTRACT

Objective: To compare the efficacy percutaneous nephrostomy and double-J stent in patients of ureteric obstruction.

Study Design: Randomized controlled trial

Place and Duration of Study: This study was conducted at the Department of Urology, Bakhtawar Amin Medical and Dental Collage, Multan, Pakistan from July 2022 to December 2023.

Methods: In Group A, double-J ureteral stent was inserted retrograde using aseptic cystoscopy technique under mild sedation or local anesthesia, which involved instilling 2% xylocaine gel into the urethra. In Group B, an ultrasound-guided percutaneous nephrostomy tube was inserted at the puncture site subcutaneously. Complications such as bleeding, hematuria, and septicemia in both groups were documented immediately post-operatively and during follow-up sessions on the 15th and 30th days using KUB sonography. Patients experiencing complications were managed according to hospital protocols.

Results: In phase 1 of outcome, both the groups had high success rates, but Group B 87.9% had a slightly higher success rate compared to Group A 76.6%. However, the difference is not statistically significant ($p=0.176$). In phase 2 of outcome, both the groups had very high success rates, Group B 98.9% again having a slightly higher success rate compared to Group A 97.4%.

Conclusion: Percutaneous nephrostomy (PCN) demonstrated superior efficacy compared to double J stenting (DJS) in managing postoperative complications associated with the definitive treatment of ureteral obstruction, regardless of whether the obstruction was due to extrinsic or intrinsic malignancy.

Key Words: Double-J stent, Nephrostomy, Ureteral obstruction, post-operative complications,

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INTRODUCTION

Ureteral obstruction, which involves any blockage in the ureters, significantly threatens renal function by impeding the drainage of urine and can lead to severe complications such as uremia, water-electrolyte imbalances, and urinary tract infections¹. Patients experiencing reduced alertness due to these conditions face serious health risks and financial burdens². Unfortunately, Pakistan ranks 53rd globally in terms of mortality rates related to kidney diseases, including ureteral obstruction, with a rate of 23.62 deaths per 100,000 population³.

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Ureteral obstruction can be classified as either malignant or benign in origin⁴. Malignant obstructions are often due to intrinsic urologic malignancies, such as prostate cancer. In contrast, benign ureteral obstructions are typically caused by luminal pathologies, such as ureteral stones⁵. To provide symptomatic relief from urine obstruction and to restore normal renal function, clinicians usually choose an optimal definitive emergency procedure, such as percutaneous nephrostomy or double J stenting⁶.

Moreover, measures are taken to minimize further urologic interventions, hospitalization, and adverse impacts on quality of life (QoL)⁷. Percutaneous nephrostomy (PCN) is a minimally invasive procedure guided by ultrasonography, while double-J ureteral stenting (DJS) is the preferred choice for addressing obstruction caused by large-sized ureteral stones⁸. In all interventional procedures, there is a risk of post-operative complications. For instance, hematuria and septicemia are well-known complications associated with double-J stents⁹. Additionally, complications such as ureteral perforation and stent migration can occur¹⁰. Another common issue is PCN blockage. Each of these complications is addressed appropriately based on the specific issue encountered¹¹.

In the management of ureteral obstruction, there is no strong evidence indicating that one method, whether

stenting or nephrostomy, is superior to the other in terms of post-operative complications¹². There is currently no existing research on this issue within the study setting of the present research. To address this gap, the present study was conducted with the aim of comparing the efficacy of double J stenting and percutaneous nephrostomy for ureteral obstruction in terms of postoperative complications. The results of this study will pave the way for further investigations into the validity of the optimal procedure.

METHODS

This randomized controlled trial was conducted at the Department of Urology, Bakhtawar Amin Medical and Dental Collage, Multan, Pakistan, over the course of one year from July 2022 to December 2023. The study employed a consecutive sampling technique, resulting in a total sample size of 110 participants, with 55 individuals assigned to each of the two groups. The sample size was determined using an online WHO calculator based on the anticipated incidence of hematuria or bleeding with double-J ureteral stenting (37%) and percutaneous nephrostomy tube insertion (11%), power of study 80% and confidence interval 95%.

Inclusion criteria for the study included male and female patients aged 19 to 63 years presenting with benign or malignant ureteral obstruction and hydronephrosis in the outpatient department. Patients with bleeding diathesis, sepsis, anesthetic drug allergies, or uremia were excluded from the study.

Data collection commenced after obtaining permission from the Institutional Review Board, and written informed consent was obtained from all participants before group allocation. Participants were randomly assigned to either Group A or Group B by a biostatistician. Clinical manifestations were recorded prior to kidney, ureter, and bladder (KUB) sonography. A single dose of prophylactic antibiotics was administered intravenously before the intervention.

Patients were enrolled in two groups (A and B) by lottery method. In Group A, a double-J ureteral stent was inserted retrograde using aseptic cystoscopy technique under mild sedation or local anesthesia, which involved instilling 2% xylocaine gel into the urethra. In Group B, an ultrasound-guided percutaneous nephrostomy tube was inserted at the puncture site subcutaneously.

Complications such as bleeding, hematuria, and septicemia in both groups were documented immediately post-operatively and during follow-up sessions on the 15th and 30th days using KUB sonography. Patients experiencing complications were managed according to hospital protocols.

Data analysis was performed using SPSS version 23.0, with quantitative or qualitative data processed for mean and standard deviation (SD) or percentage, respectively.

The association between success rates and interventional procedures was evaluated using the chi-square test, with statistical significance set at $P < 0.05$.

RESULTS

One hundred & ten patients, who met the inclusion criteria, were included in this study. There were 77 (70.0%) patients were included in Group A whereas 33 (30.0%) patients were included in Group B. Table. 1 showed the demographics and causes of ureteric obstruction between two groups. Group A and Group B did not significantly differ in terms of age and sex distribution. Causes of ureteric obstruction were also almost similar between Group A and Group B. ($p > 0.050$). (Table. 1).

Various complications between the two study groups were compared in table. 2. Group A showed notable complications such as trigone irritation with pain (23.4%), ureteral perforation (11.7%), and stent migration (27.3%). Group A also had a higher rate of procedural failure (9.1%) compared to Group B (3.0%). Whereas Group B showed the complications like PCN dislodgement/blockage (27.3%), injuries to adjacent organs (27.3%), and a slightly higher incidence of hematuria (54.5%) and septicemia and fever (24.2%) compared to Group A. Each group had certain complications that were uniquely reported for them, indicating different profiles of complications between the two groups. Both the groups were not statistically significant. ($p > 0.050$). (Figure. 1).

In phase 1 of outcome, both the groups had high success rates, but Group B (87.9%) had a slightly higher success rate compared to Group A (76.6%). However, the difference is not statistically significant ($p = 0.176$). In phase 2 of outcome, both the groups had very high success rates, Group B (98.9%) again having a slightly higher success rate compared to Group A (97.4%). This difference is also not statistically significant ($p = 0.134$). (Table. 2).

Table No. 1: Demographics and causes of ureteric obstruction among the groups

Variable	Group A 77 (70.0%)	Group B 33 (30.0)	p-value
Demographics			
Age (years)	52.61±8.03	54.91±9.92	0.203
Sex			
Male	47 (61.0)	19 (57.6)	0.734
Female	30 (39.0)	14 (42.4)	
Cause of ureteric obstruction			
Ureteral stone(s)	25 (32.5)	10 (30.3)	0.823
PUJ obstruction	19 (24.7)	5 (15.2)	0.268
Tumor or retroperitoneal fibrosis in	12 (15.6)	3 (9.1)	0.363

abdomen			
Endometriosis (females)	7 (9.1)	2 (6.1)	0.595
BPH (males)	1 (1.3)	1 (3.0)	0.533
N (%), Mean ± S.D			

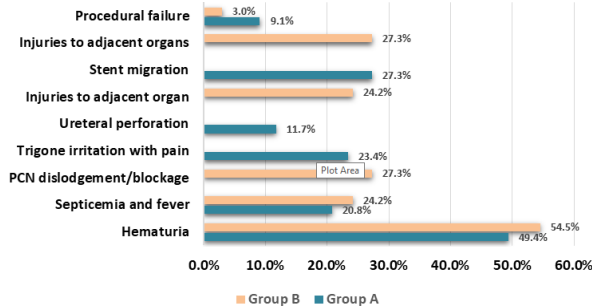


Figure No. 1: Complications among the groups

Table No. 2: Therapies' success rate for ureteric obstruction among the groups in two phases of outcome

Success rate	Group A	Group B	p-value
1 st phase of outcome	77 (70.0%)	33 (30.0)	
Success rate	59 (76.6)	29 (87.9)	0.176
2 nd phase of outcome			
Success rate	75 (97.4)	30 (98.9)	0.134
N (%)			

DISCUSSION

Kidney stones are a major cause of ureteral obstruction, with an incidence rate of 40 to 50%¹³, which aligns with our findings as observed ureteric stones in 30-32% of population. In contrast, the pelvic ureteral junction (PUJ) disorder, which holds the second highest position as a cause of obstruction, is particularly concerning due to its genetic background¹⁴. In our study we observed PUJ in 24% patients approximately.

Adherence to therapy among all study subjects, with a response rate of above 90%, is a positive outcome as it ensures a speedy, cost-effective recovery and enhances quality of life, such as after the placement of an indwelling stent for ureteral obstruction. The mean age of the participants in this study is 52.61±8.03 years in group A and 54.91±9.92 years in group B, which is slightly higher than the 45.0 years reported in a published study¹⁵. This age difference may be attributed to chance sampling or moderating factors such as genetics and lifestyle.

In a study conducted by Saeed et al¹⁶ on Pakistani population male dominance was observed regarding ureteral obstruction and like our study nephrostomy procedure for management of ureteral obstructions found better option.

In this study the occurrence of tumors or retroperitoneal fibrosis 15.6% in group A and 9.1% in group B. In a study Sahu et al¹⁷ reported 3-5% of cases with tumor and retroperitoneal disease, is significant in the

management of ureteral obstruction. However, precise expertise is needed for accurate identification, as primary retroperitoneal paragangliomas can mimic ureteral tumors.

Despite the equal effectiveness of Double J stents (DJS) and percutaneous nephrostomy (PCN) in normalizing kidney function in patients with ureteral stones, there is a significant risk of postoperative complications associated with the interventional management of ureteral obstruction, Shoshany et al¹⁸ reported hematuria being a common issue among these complications. In our study incidence of hematuria was found in 49.4% of cases in DJ shunt group and 54.5% in nephrostomy group.

In this study stent migration was observed in 27.3% of patients and procedure failure was observed in 9.1% in DJ stent group and 3% in nephrostomy group. Weltings et al¹⁹ reported finding of a higher incidence rate of septicemia in percutaneous nephrostomy (PCN) compared to double-J stent (DJS) is consistent with previous studies, which highlight some vulnerabilities associated with PCN. In another study conducted by Shafique et al²⁰ reported stent migration or encrustation can occur with DJS used for ureteral obstruction, total failure of this procedure is rare. However, advanced stages of the causative condition, such as malignancy, cannot be ruled out.

The success rate, measured as the inverse of the complication rate, was higher for nephrostomy (98.99%) compared to stenting (97.4%), which aligns with trends observed in a previous study conducted by Ahmad et al²¹ on Pakistani population. Stent migration, encrustation, and ureteral perforation are specific complications associated with double J stents, in addition to painful trigone irritation.

CONCLUSION

Percutaneous nephrostomy (PCN) demonstrated superior efficacy compared to double J stenting (DJS) in managing postoperative complications associated with the definitive treatment of ureteral obstruction, regardless of whether the obstruction was due to extrinsic or intrinsic malignancy.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ibrar Ahmad, Muhammad Adnan
Drafting or Revising Critically:	Saifullah, Muhammad Muzammil, Kiran Areej and Muhammad Arbaz Hanif Khan
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Cozma C, Georgescu D, Popescu R, Geavlete B, Geavlete P. Double-J stent versus percutaneous nephrostomy for emergency upper urinary tract decompression. *J Med Life* 2023;16(5):663.
2. Lim WS, Goh CH, Tan CK, Zainal R. Ureteric Stenting and Percutaneous Nephrostomy Insertion for Acute Ureteric Obstruction: A Multi-centered Prospective Study to Compare the Quality of Life between both Procedures. *Asian J Res Reports in Urol* 2023;6(1):11-20.
3. Singh S, Sabale V, Agarwal P, Ghotankar S. Outcomes of Percutaneous Nephrostomy vs. Double J Stenting in the Treatment of Infectious Hydronephrosis. *Ind J Surg* 2023;11:1-5.
4. Fugaru I, Bhojani N, Andonian S, Sameh W, Fahmy N. Management of infected indwelling ureteral stents: An international survey of urologists. *Can Urol Assoc J* 2022;17(3):E95.
5. Massella V, Juliebø-Jones P, Pietropaolo A, Beisland C, Somani BK. Outcomes Associated with the Endourological Management of Stent Encrustation: Findings from a Literature Review on Behalf of the EAU YAU Urolithiasis Group. *Curr Urol Rep* 2023;24(4):187-99.
6. Hori T, Makino T, Kawahara T, Urata S, Miyagi T. Effectiveness of double-J metallic mesh ureteral stents for malignant ureteral obstruction: a retrospective study. *In vivo* 2023;37(2):806-10.
7. Wang X, Li J, Fan S, Li Z, Yang Z, Liu P, Song H, Zhang W. Failure in Double-J stent inserting in laparoscopic pyeloplasty of ureteropelvic junction obstruction: the clinical features and outcomes. *BMC Urol* 2023;23(1):192.
8. Maguire PJ, Sobota A, Mulholland D, Ryan JM, Gleeson N. Incidence, management, and sequelae of ureteric obstruction in women with cervical cancer. *Support Care Cancer* 2020;28(2):725-30.
9. Al-Hajjaj M, Sabbagh AJ, Al-Hadid I, Anan MT, Aljool AA, Husein HA, et al. Comparison complications rate between double-J ureteral stent and percutaneous nephrostomy in obstructive uropathy due to stone disease: a randomized controlled trial. *Ann Med Surg* 2022;81:104474.
10. Qi Y, Kong H, Xing H, Zhang Z, Chen Y, Qi S. A randomized controlled study of ureteral stent extraction string on patient's quality of life and stent-related complications after percutaneous nephrolithotomy in the prone position. *Urolithiasis* 2023;51(1):79.
11. Anand S, Agarwala S, Dhua A, Jain V, Jana M, Kandasamy D, et al. Experience of management of bilateral pelvi-ureteric junction obstruction (PUJO) in children—Can surgery be avoided on one side?. *J Pediatr Urol* 2020;16:S2-3.
12. Ali ES, Dief HA, Ali WH. Neglected Double-J Ureteral Stents in Upper Egypt Patients. *The Egypt J Hospital Med* 2023;91(1):5232-7.
13. Uçar M, Özen O. The Relationship between ureteral obstruction time and secondary signs in computed tomography due to ureteral stone obstruction. *J Coll Physicians Surg Pak* 2020;30(7):678-82
14. Beaumier M, Roger H, Sauneuf B, Dugardin F, Camparo P, Queffeuilou G. Disseminated tuberculosis revealed by obstructive and prerenal acute kidney failure. *Nephrol Ther* 2019;15(3):169-73.
15. Saeed K, Hussain SA, Kanjoo SR, Ahmad B, Hussain M. Double-J stenting versus percutaneous nephrostomy; postoperative complications in management of ureteral obstruction. *Annals Punjab Med Coll* 2020;14(4):336-9.
16. Aghamir SMK, Heidari R, Bayesh S, Salavati A, Elmimehr R. Are Nephrostomy and ureteral stent necessary after multi-access percutaneous nephrolithotomy? *Current Urol* 2019;13(3):141-4.
17. Sahu P, Singh S, Ahuja A, Sharma U, Mattoo S, Bhardwaj M. Unusual and rare cause of PUJ obstruction with a brief review of the literature. *J Clin Urol* 2020;23(7):205141582095899.
18. Shoshany O, Erlich T, Golan S, Kleinmann N, Baniel J, Rosenzweig B, Eisner A, et al. Ureteric stent versus percutaneous nephrostomy for acute ureteral obstruction - clinical outcome and quality of life: a bi-center prospective study. *BMC Urol* 2019;19(1):79.
19. Weltings S, Schout BMA, Roshani H, Kamphuis GM, Pelger RCM. Lessons from Literature: Nephrostomy Versus Double J Ureteral Catheterization in Patients with Obstructive Urolithiasis - Which Method is Superior? *J Endourol* 2019;33(10):777-86.
20. Shafique MN, Akhtar SH, Mahnoor M, Hussain M. Hemodialysis Internal jugular vein versus Subclavian vein Catheters: Complications, patients' comfort, tolerance and cost-effectiveness. *Pak J Med Sci* 2019;35(1):124-8.
21. Ahmad I, Pansota MS, Tariq M, Shahzad MS, Ali ST, Hussain A. Comparison between double J (DJ) ureteral stenting and percutaneous nephrostomy (PCN) in obstructive uropathy. *Pak J Med Sci* 2013;29(3):725-9.