

Comparison of percutaneous nephrostomy and double j stent in early normalization of renal function tests in patients with obstructive uropathy due to urolithiasis

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Author's Contribution

^{1,2}Drafting the work or revising it critically for important intellectual content ³Acquisition, analysis, or interpretation of data for the work ⁴Final approval of the version to be published

Funding Source: None

Conflict of Interest: None

Received: Dec 24, 2019

Accepted: April 11, 2020

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ABSTRACT

Objective: To compare the mean normalization period of serum levels of urea and creatinine after placement of PCN tube or a DJ stent as emergency management for obstructive uropathy due to urolithiasis.

Methodology: A randomized controlled trial study is conducted in the Institute of Kidney Diseases, Hayatabad Medical Complex Peshawar from March 2018 - March 2019. The total sample of 416 was divided into two groups by the lottery method. Group A comprising of 208 patients who underwent Percutaneous Nephrostomy (PCN) and Group B comprising of 208 in who underwent Double J Stenting for the relief of the obstructive uropathy respectively. Serum levels of urea and creatinine were recorded at 24, 96 and 144 hours post-operatively.

Results: The mean age of Group A 35.6 ± 8.4 years and the Mean age in Group B was 38.2 ± 10.4 years. The majority (76.6%) participants were male, including 70% were from PCN group and 79% were from DJ group. The time taken for normalization of serum urea level was 97.654 hours (4.068 days) and 106.453 hours (4.435 days) in the PCN and DJ stenting groups respectively. The normalization time of serum creatinine level was 95.4375 hours (3.98 days) and 104.8125 hours (4.36 days) in the patients undergoing PCN and DJ stenting respectively. The differences of normalization time in both groups were not statistically significant with p-values of 0.064 and 0.061 for normalization of serum urea and creatinine levels respectively.

Conclusion: Both the PCN and DJ stenting methods were equally effective in stone management in obstructive uropathy patients for normalization of elevated serum urea and creatinine levels.

Keywords: Double J Stent, Obstructive Uropathy, Renal Stone, Renal Function Test, Urolithiasis, Percutaneous Nephrostomy.

Cite this article as: Ali L, Khan S, Hayat F, Orakzai N. Comparison of percutaneous nephrostomy and double j stent in early normalization of renal function tests in patients with obstructive uropathy due to urolithiasis. *Ann Pak Inst Med Sci.* 2020; 16(1): 10-14.

Introduction

Obstructive Uropathy is a structural or functional hindrance of normal urine flow sometimes leading to severe complications, even renal dysfunction.^{1,2,3} The cause of obstruction uropathy can be intra- or extra luminal or intramural. Among the causes, renal calculi

are the main etiological factors of obstruction uropathy.⁴ Obstructive uropathy may result a variety of problems in which the main problem is altered blood chemistry with severe uraemia, electrolyte disturbances sepsis and related symptoms.^{5,6} All this can contribute towards decreased Glomerular Filtration Rate, hydronephrosis, acute renal failure, renal fibrosis, chronic renal failure.⁷

It may be a serious, life threatening condition, considered as a urological emergency requiring urgent intervention like relieving obstruction or dialysis.⁸ Urinary diversion or bypassing obstruction is commonly employed methods for emergency management of such obstructions when the underlying cause of obstruction needs time to be treated.⁹

Double J (or DJ) stenting and percutaneous nephrostomy (PCN) are the two frequently used approaches for emergency bypassing of obstruction and urinary divergence respectively. Both these procedures aim to save a life by providing relief of the obstruction and restoration of blood chemistry to or close to the normal range. When the patient recovers from the emergency condition, the underlying cause of obstruction can be properly treated,^{10,11,12} The efficacy, morbidities and complications of DJ stenting and PCN have been widely studied and compared in the management of obstructive uropathy. Both these procedures have been reported to present a different kind of short- and long-term complications and so has been their effectiveness and usefulness in urine drainage of these procedures differs.¹³

According to one of the studies by Chang et al, the residual hydronephrosis after decompression was found to be more common in the DJ stent group (65.2%) with mean duration of diversion of 16.8+8 months, than in the PCN group (27.2 %) with mean duration of diversion 14.1 + 6.7 months indicating better preservation of renal functions by a PCN tube.⁹ Similarly, another study by Ahmed et al revealed a significant decline in the mean values of serum Creatinine by 71.1% and blood urea nitrogen by 56.08% after a mean duration of 6 days (148+24 hours) of PCN tube placement.¹⁴ Whereas in a study conducted by Ghaffar, within 7-8 days (168+24 hours) Creatinine level was restored between 1.2 to 2 mg/dL after DJ stent placement in 54.54% patients studied.¹⁵

Currently, it was not clearly established that which of the two procedures is more efficient in the early restoration of normal renal function tests (RFTs). In obstructive uropathy management, it is important to state that early restoration of elevated urea and Creatinine level is crucial to avoid further complications. Moreover, such patients with early normalization of renal function get better chances to go through the definitive treatment of urolithiasis e.g., Extracorporeal Shock-wave Lithotripsy, Percutaneous Nephrolithotomy, open stone surgery etc. and less prone to develop renal dysfunction. The current

study is, therefore, designed to investigate which of the two techniques, PCN or DJ stenting, is more effective in the early normalization of RFTs, specifically urea and Creatinine levels in patients' blood.

Methodology

This Randomized Controlled Trial was conducted in Institute of Kidney Diseases, Hayatabad Medical Complex Peshawar from March 2018 till March 2019. The total sample size of 416 patients was calculated using WHO calculator mean normalization period of urea and serum creatinine in patients with Percutaneous Nephrostomy i.e. P1=71.1% whereas improvement of renal functions tests with mean normalization period with double J Stent i.e. P2=54.54%. keeping the power of test 80% and level of significance 5%.

The total sample was divided into two groups of 208 each by lottery method. Group "A" comprising of 208 patients who underwent Percutaneous Nephrostomy (PCN) and Group "B" comprising of 208 in who underwent Double J Stenting for the relief of the obstructive uropathy respectively.

All the patients with age between 13 to 80 years, suffering from obstructive uropathy due to urolithiasis and having serum creatinine level equal to or above 2 mg/dL and serum urea level equal to or above 50 mg/dL were included in the study. Patients with obstructive Uropathy due to bladder outflow obstruction, mild hydronephrosis and severe uncorrectable coagulopathies were excluded from the study.

The study was conducted after approval hospital ethical review board. All the patients, who full filled the above mentioned criteria and given informed consent were included in the study, a detailed history, physical examination, PT/APTT, Ultrasound Abdomen Pelvis, Non Contrast CT KUB and other relevant investigations were performed in all the patients. Both of the procedures were carried out in operation theatre under strict aseptic techniques by Qualified Urologist

Serum levels of urea and Creatinine were recorded preoperatively and at 24, 96, and 144 hours post-operatively. All the preoperative and postoperative data was collected on structured proforma and was analyzed on (SPSS) version 17.

Results

The mean age of Group A 35.6 ± 8.4 years and the Mean age in Group B was 38.2 ± 10.4 years. Majority (72.6%) participants were male, the detail of gender distribution is shown in (Figure 1).

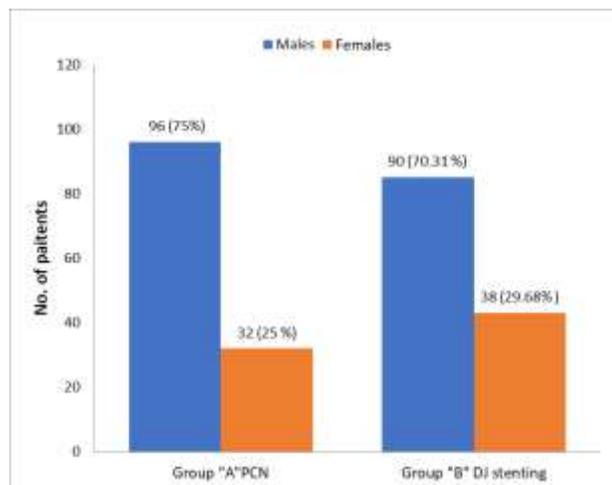


Figure 1. Percentage of Male and Female patients in two study groups.

The mean value of the urea was presented as 124.52 and mean creatinine was notified as 5.96. The results are shown in Table 1.

Table I: Pre-operative data summary (n=256)

Variable	Group "A" (PCN)	Group "B" (DJ Stent)
Symptoms and signs, n (%):		
Flank pain	195 (94%)	199 (96.5%)
Flank tenderness	153 (73.5%)	161 (77.4%)
Hydronephrosis n/N (%): On Ultrasonography		
Moderate	188 (90.3%)	180 (86.6%)
Gross	20 (9.6%)	28 (13.4%)

The mean preoperative detail of renal function tests is shown in Table II. Overall, both the groups had similar normalization time of RFTs independent of the intervention performed with a p-value of 0.061 (Table III).

Table IV: Post-operative means serum urea levels after 24, 96 and 144 hours in both of the study groups

Groups	Renal Function test (mg/dl)	24 hours	96 hours	144 hours	P value Anova
Group "A" PCN	Mean Urea	74.9391	44.3984	30.6250	> 0.05
	Mean Creatinine	3.63	1.77	1.14	> 0.05
Group "B" DJS	Mean Urea	79.0078	47.5270	34.5166	> 0.05
	Mean Creatinine	3.4876	1.7863	1.0744	> 0.05

Table II: The mean (SD) of Serum Urea and Creatinine in the Preoperative Period.

Renal Function	Group A (PCN)	Group B (DJ stenting)	P value
Mean (SD)			
Urea (mg/dL)	122 ± 48.4	129.2 ± 49.7	
Creatinine (mg/dL)	5.76 ± 3.3	6.3 ± 3.6	>0.05

Table III: Comparison in mean normalization time of RFTs

Groups	N	Mean RFTs Normalization time (Hours ±SD)	P-value
Group "A" PCN	128	95.4 ± 40.90	0.061
Group "B" DJ stenting	128	104.8 ± 38.78	

At 144 hours, all the patients in both groups have their RFTs restored to the normal range. An expected decline was observed in the serum levels of urea and Creatinine with time after intervention with no statistical difference. The details are shown in Table IV

Discussion

Obstructive Uropathy is one of the consequences of urinary tract obstruction the renal functions get deranged and the damage is caused to the urinary tract tissue. If not appropriately treated, this can become a potentially life threatening condition. immediate decompression of the kidney is necessary to prevent the patient's condition from further deterioration before proceeding for definitive stone management.¹⁶ The two most common methods used for this decompression or urinary drainage to prevent renal deterioration on the effected kidney, are the use of PCN tube or the Double J (DJ) stents. Both of these approaches are associated with certain merits and demerits on different parameters. We found them equally effective in management of obstructive uropathy.

The strength of study that its larger sample size randomized control study comparing both modalities for

the serious complication of obstructive uropathy.

In both the two groups of patients, with 128 patients in each group, no contraindication was encountered for any of the two interventions. The respective intervention was successfully performed in all the enrolled patients. In the current study, 73% of the patients were males, confirming the higher prevalence of renal stones in males. A higher ratio of male patients was also observed previously by other researchers including Naeem et al, Karim et al and Memon et al.^{4,17,18}

In the present study, the period for return of the RFTs to the normal levels was almost the same in both the PCN and DJ stenting groups. The normalization time of serum urea and creatinine levels was 95.4375 hours (3.98 days) and 104.8125 hours (4.36 days) in the patients undergoing PCN and DJ stenting respectively. Although these normalization times were slightly shorter in the PCN group as compared to the DJ stenting group, these differences were not statistically significant, i.e. p-values of 0.061 for normalization of serum urea and creatinine levels. These results were compared with some previous studies that have also compared the use of PCN to that of DJ stenting for the initial emergency urinary drainage in obstructive uropathy. The observations are in line with those made by Mokhmalji et al and ElSheemy et al.^{19,20} In a study by ElSheemy et al. in 2014, the PCN group restored their normal creatinine levels in 2.22 days whereas the DJ stent group returned to normal serum creatinine level in 2.18 days. The difference observed in this duration i.e., of 0.04 days, was not statistically significant having a p-value of 0.785.²⁰

Two groups of children were compared with obstructive uropathy, obstructive calcular anuria and acute renal failure due to renal calculi, undergoing either PCN or DJ stenting. They did not find any significant difference between the two groups in terms of return to normal creatinine levels in addition to the other parameters including operative time, imaging time and failure of insertion. However, they find a higher rate of complications in the PCN group. Based on their experience, ElSheemy et al. recommended DJ stenting as the first choice for emergency urine drainage in obstructive uropathy.²⁰ While for a stone size bigger than 2 cm, they recommended PCN. The same recommendation for use of PCN in management of large stones was given by Goldsmith et al.²¹ Whereas, the long term study experience by Goldsmith et al presented both the PCN and DJ stenting as equally effective in patients

of septic obstructive urolithiasis. The PCN catheter placement was suggested as the first choice for initial urinary drainage for the relief from ureteral obstruction.²² On the other hand, PCN group tend to have a longer hospital stay as compared to the DJ stent group because of their renal functions and overall health status become satisfactory enough to get discharged from hospital at slightly longer duration.^{21,23} The serum creatinine levels at the time of diagnosis of obstructive urolithiasis or other forms of obstructive hydronephrosis is suggested by some researchers as an important prognostic factor to predict the success rate of the stent. They recommended against the use of retrograde ureteral stent placement in obstructive hydronephrosis patients with a serum Creatinine level of 1.2 mg/dL^{24,25}

The limitation of the study is that yet we could not correlate the effectiveness in mean age, age range, gender, aetiology and any associated comorbidity.

Conclusion

The study concluded that PCN and DJ stenting methods are equally effective in the management of patients with obstructive Uropathy in the normalization of elevated serum urea and Creatinine levels to their normal range.

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