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Research Article

Percutaneous nephrostomy or double J stenting, which is better modality for obstructive uropathy-a descriptive study

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ABSTRACT

Background: Percutaneous Nephrostomy or Ureteric Stenting is indicated in patients with Acute Renal Failure following urinary tract obstruction. The purpose of this study was to evaluate the better treatment modality in terms of S. Creatinine level.
Methods: Total 50 patients with Creatinine level of >2 mg/dl and hydronephrosis due to upper urinary tract obstruction were grouped into either percutaneous nephrostomy or stent insertion groups. These patients were then evaluated by overall trend of S. creatinine and urine output levels postoperatively.
Results: Two comparable groups of PCN and DJS were formed with a mean age of 45.5 years and 47.9 years. Male to female ratio was 1.5:1 and 1.2:1 respectively. Pain with oliguria or anuria was the major presentation. The urine output levels showed a sudden increase postoperatively with a subsequent trend towards normal value in both the groups. Creatinine however showed a normalizing trend from a mean 6.46 mg/dl preoperatively to 1.01mg/dl postoperatively in PCN group whereas in DJS group 5.38mg/dl preoperatively to 2.75mg/dl with a rising trend from POD 15 requiring conversion to PCN in 20% of patients with subsequent normalization of creatinine levels to 0.95 mg/dl. Statistically we found no difference in the outcome when both the groups were compared in view of serum creatinine and urine output levels whereas there is a significant difference in the pre and post operative outcome of both the groups.
Conclusions: Our results thus support that though there is no significant difference among both the procedures, ureteral stents are associated with intolerable lower urinary tract symptoms owing to conversion to secondary percutaneous Nephrostomy. Hence percutaneous nephrostomy is superior to ureteral stents for diversion of urine in patients with ARF due to obstructive uropathy.

Keywords: Nephrostomy, Percutaneous, Ureter, Stents, Hydronephrosis, Urinary calculi, Renal failure, Acute renal failure

INTRODUCTION

Renal stone disease is one of the most common afflictions of modern society and has been described since antiquity. The high occurrence and substantial morbidity and mortality of Acute Renal Failure demand a logical approach to its early recognition and prevention, as well as prompt diagnosis and management of its complications.[1] Revolutionary advances in the minimally invasive and noninvasive management of stone disease over the past 2 decades have greatly facilitated the ease with which stones are removed. However, surgical treatments, although they remove the offending stone, do little to alter the course of the disease. As the limitations of ESWL were recognized, percutaneous surgery once again rose in popularity with a redefined role in stone management. The most common methods in these situations are insertion of double-J catheter or placement

of percutaneous nephrostomy.[2] The present study thus aims at evaluating the better mode of diversion among the two most popular modalities in management of ARF due to obstructive causes i.e. DJ Stenting and PCN.

METHODS

The study was conducted in the Department of Surgery, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, Uttarakhand, India from 15th October 2011 to 15th October 2012. 50 patients with a primary diagnosis of Obstructive Acute Renal Failure were recruited in the study and based on the patients preference for the procedure were grouped into either Group A (patients who underwent PCN) and Group B (patients who underwent DJS).

A malecots catheter or a Pig tail stent was used as a percutaneous nephrostomy tube. The 'Seldinger' technique was used for minimally or non-dilated collecting systems and cases. Polyethylene or silicon double J (coiled at both ends) stent were used. In an operation theatre (OT) under spinal anaesthesia with C arm guidance, the ureteric orifice was visualized and guidewire inserted upto the renal pelvis over which the stent was inserted.

Inclusion criteria

Patient with stone induced hydronephrosis and diagnosed as acute renal failure with a serum creatinine level of greater than 2 mg/dl were included in the study.

Exclusion criteria

Criteria included patient with non-obstructive cause of ARF and obstruction other than in the upper urinary tract. Chronic renal failure patients having serum creatinine levels greater than 2 mg/dl even after 1 month of the procedure were excluded from the study.

Evaluation parameters were related to the postoperatively serum creatinine and Urine output levels. Follow up for 15 days for Urine Output and 30 days for creatinine levels was done and findings recorded. Individual serum creatinine and urine output levels were subjected to paired Student t test was performed for statistical analyses with $p>0.005$ considered significant and Repeated measure ANOVA.

RESULTS

In the present Study, overall male to female ratio was 1.5:1. Both the groups also had a male to female ratio of 1.5:1. This is similar to the study done by Mokhmalji et al in which the patients who underwent ureteric stenting had a 9:11 male to female ratio and the patients who underwent Percutaneous nephrostomy had a 12:8 male to female ratio.[3] The sex ratio is also similar to the study conducted by Abdul Ghaffar et al which showed a 1.4:1 male to female ratio.[4] The mean age of patients included in Group A (PCN group) in our study was 45.5±15.83 years and in Group B (DJ Stenting Group) was 50.4±14.45 years. Mokhmalji et al showed a mean age of 55 years in PCN group and a mean age of 49 years in DJS Group. More than half (56%) patients in our study were in the range of 30-60 years. In present study all the patients had a urinary tract obstruction due to renal lithiasis.

Table 1: Age and sex ratio comparison.

	Present study		Mokhmalji	
	PCN	DJS	PCN	DJS
Age	45.5± 15.83	50.4±14.45	55	49
M:F	1.5:1	1.5:1	12:8	9:11

Out of 50 patients included in the study pain in the flank region was the major symptom occurring in 90% (45) patients whereas fever was present in 52% (26) patients and hematuria in 22%.[2]

This was in contrast to study by Abdul Ghaffar et al which showed the most frequent presentation was pain and oliguria and anuria in 51.5%.[4] Kenan et al however showed comparable result of presenting symptom of pain in 100%. Hematuria (94.4%) and Fever (11.1%) were in contrast to our study.[5]

Oligoanuria as a presenting symptom was present in 66% of the patients in present study in contrast to 55.8% reported by Tazi k et al.[6] Past history of urinary calculi was present in 16 (32%) of the patients in our study, quite comparable to 25% in the study conducted by Kenan et al.[5]

Table 2: Symptoms comparison.

Symptoms	Present Study	Kenan
Pain	90%	100%
Fever	52%	11.1%
Hematuria	22%	94.4%
Past H/O urinary calculi	32%	25%

In this study, ureteric stents were placed under analgesic sedation. Percutaneous Nephrostomy was performed as an outpatient procedure after infiltration of adequate local anaesthesia. Ureteric stenting was done in the operating theatre with the guidance of fluoroscopy and C-arm. Nephrostomy on the other hand was done under USG guidance on a dilated pelvic system. Percutaneous Nephrostomy was successfully placed in 100 % (n=25) of the patients with a single puncture.

Ureteric Stenting was also successfully performed in 100% (n=25) of the patients. Mokhmalji et al showed a success rate of 100% in PCN group but only 80% rate was achieved in the DJS group.[3] Yagci et al also show a

similar pattern in Solely Ultrasound guided nephrostomy to have a comparable success rate and complication rate ranging from 90 to 100% and 1-4% respectively.[7] A stent insertion failure rate of approximately 20% was reported in 1999 by Van Glabecke et al who similarly detected stone location in the lumbar ureter in all failed cases.[8] In 1975 Fowler et al asserted that failure in ureteral stenting is attributed to the impacted stones.[9] Both Stables and Stanley et al reported in 1982 and 1983, respectively, a percutaneous nephrostomy success rate of about 98% in adults and children.[10,11]

Total Leukocyte count was normal in 44% of the patients in our study and raised in 56%. Out of these 32% patients underwent percutaneous nephrostomy and 16% underwent ureteric stenting. Remaining 8% initially underwent ureteric stenting but was not relieved hence a secondary percutaneous nephrostomy was carried out in these patients. UTI was present in 44 (88%) of the patients in our study.

In a study conducted on Diagnosis and management of ureteric stones during pregnancy, Urinary tract infection was present in 27.7% patients.[5] Out of these 44 patients, 20 (40%) underwent PCN and 24 (48%) underwent DJS. Rest patients had a normal Urinary WBC levels. In present study the main inclusion criteria was Serum Creatinine levels at the time of admission. Overall Creatinine levels ranged from 2- 23mg/dl. 34 (68%) of the patients had a creatinine level between 2-7 mg/dl. Only 2 (4%) of the patients had a creatinine level >12 mg /dl.

In a study conducted by Abdul Ghaffar in 2007 preoperative creatinine ranged from Minimum of 5.2 mg/dl to Maximum of 27mg/dl. Fifteen patients (45.4%) had creatinine more than 10 mg/dl. Four had range of 5-9 mg/dl and rest 14 had creatinine of <05 mg/dl. Five patients had creatinine >15 mg/dl.[4]

All the patients included in the study required admission for post-operative care and for assessment of creatinine levels. Following the procedure a strict urine output charting was done in all patients.

Treatment with antibiotics lasted for 7 days in 60 % of the patients who underwent Percutaneous Nephrostomy (Group A) whereas 55% (n=20) patients who underwent Ureteric Stenting needed a longer antibiotic coverage than 7 days. Although suggestive, but this finding was not significant owing to the longer use of antibiotics in patients with a higher leukocyte count and presence of WBC in urine thus was evident in those patients with fever, urinary tract infection and urosepsis.[3]

Post operatively a strict urine output charting was done in all the patients on POD 1, POD 3, POD 5, POD 7, POD 9, POD 11, POD 13, POD 15. The urine output levels included the urine in the drainage bag as well as the nephrostomy bag. The urine output levels did not show a significant difference among the two procedures when compared on each post-operative day but when the urine output was compared pre and postoperatively, we found a significant change in both the groups (p value <0.005).

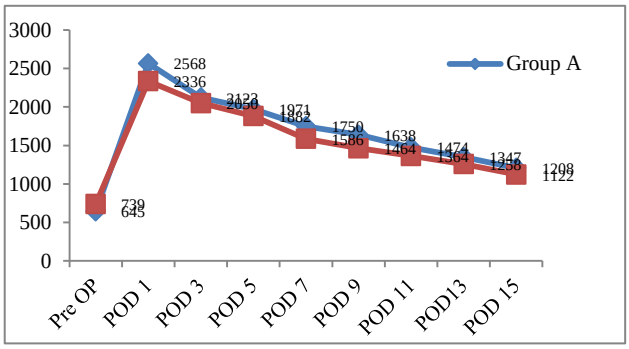

Figure 1: Comparison between PCN and DJ Stenting in respect to urine output levels

This change was more pronounced in the patients who underwent PCN (p value=0.001) when compared to patients who underwent DJ Stenting (p value=0.003) thus implying a better response in urine output levels in Group A patients to Group B patients. By repeated measure ANOVA (p<0.001) also we found a significant difference in the pre and post-operative outcome of the patients undergoing PCN.

In Patients undergoing DJ stenting also repeated measure ANOVA (p <0.001) showed a significant difference in the pre and post opearive urine output characteristics. Our results are in acceptance to a study conducted by Mokhmalji et al which showed a 100% success in placement of PCN and subsequent impoving of renal functions.[3] Along with the urine output level, the patients underwent a serial serum creatinine level on each post-operative day.

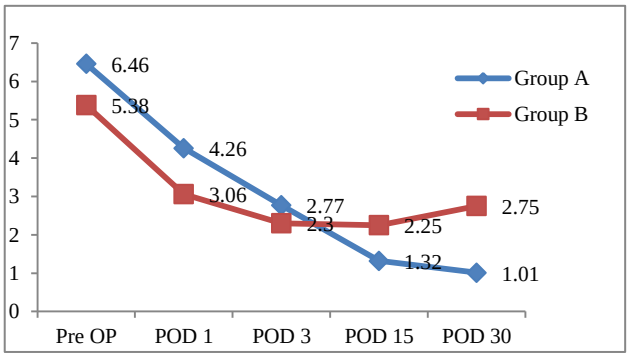

Figure 2: Comparison between PCN and DJ Stenting in respect to serum creatinine levels.

On POD 3 the serum creatinine levels are nearly the same in both the groups (p value = 0.376). But on POD 15 an increase in the creatinine levels is found in patients who underwent DJS whereas the patients of Group A continued to show an improving trend. The mean

creatinine level on POD 15 is 1.32 and 2.25 in each group respectively (p value = 0.053).

On evaluating the cause for this rise in the creatinine level , it was found that five patients who underwent DJ stenting and initially showed an improving response in urine output levels as well as serum creatinine started complaining of dysuria and lower abdominal pain, flank pain and increased frequency of urine from POD 1 only. These symptoms were only found in 5 (20%) of the patients of Group B selectively. It was also noticed that these patients also showed a decrease in their urine output level along with a declining trend in their serum creatinine levels. These patients were observed thereafter till POD 30 but when their serum creatinine levels increased to 9.54 mg/dl compared to 0.96 mg / dl in rest of the group and intolerability in their symptom, these patients were taken up for an emergency Secondary percutaneous Nephrostomy and their DJ stents were removed after POD 30.

Post-secondary PCN these patients dramatically improved similar to the patients who underwent primary PCN. The s. creatinine levels did not show a significant difference among the two procedures when compared on each post-operative day but when the creatinine levels were compared pre and postoperatively, we found a significant change in both the groups (p value <0.005).

This change was again more pronounced in the patients who underwent PCN (p value = 0.001) when compared to patients who underwent DJ Stenting (p value=0.004) thus implying a better response in serum creatinine levels in Group A patients to Group B patients. By repeated measure ANOVA (p<0.001) also we found a significant difference in the pre and post-operative serum creatinine levels of the patients undergoing PCN. In Patients undergoing DJ stenting also repeated measure ANOVA (p <0.001) showed a significant difference in the pre and post operative serum creatinine levels

DISCUSSION

This is in accordance with a study conducted by Tazi et al who showed a 100 % success in PCN placement and resulting improvement in their renal functions.[6] Mokhmalji et al also showed a failure rate of 20 % in patients who underwent DJ stenting resulting in their conversion to secondary PCN.[3]

Hussain et al also showed an improvement in the renal function with serum creatinine below 2 mg/dl in 72% of calculus anuria and 49.5% of calculus renal failure patients at two year follow up following percutaneous nephrostomy.[12] A Successful PCN placement with improvement in renal failure and treatment of initial infectious syndrome was also found in 93% of the patients in a study conducted by Fournier G et al.[13] Abber et al reported an obstruction of the ureteral stent resulting from the early onset of incrustation in 5% of cases with accompanying urinary tract infection and subsequent pyelonephritis.[14]

Pollard and Macfarlane evaluated symptoms, including irritative bladder complaints, and suprapubic and flank pain, associated with ureteral stents in 20 patients and confirmed that the symptoms disappeared after stent removal.[15]

They found no association between the degree of symptoms and stent composition, style or length. Bregg et al noted flank pain in 38%, symptoms of bladder irritation in 26% and macrohematuria in 42% of patients with stones after ureteral stenting.[16]

The majority of their patients complained of frequency, dysuria and flank discomfort, especially during voiding, walking or strenuous activities. The complaints were classified as intolerable in 6% of patients. Pryor et al reported urinary dysfunction after ureteral stenting with 4 different types of stents.[17]

They also found no differences among the 4 types of stents in terms of incidence and severity of irritative symptoms. In 1988 Mardis and Kroeger observed erosion and bullous edema of the bladder mucosa caused by the lower tip of the stent, which explained the development of macrohematuria and pyuria after ureteral stenting without urinary tract infection.[18]

Danilovic et al evaluated the urgent ureteral decompression in patients with ureteral obstruction due to intrinsic and extrinsic pathologies and found that Retrograde double-J stenting failed in 9% (2/22) of intrinsic obstruction and in 52% (13/25) of extrinsic obstruction (p<0.001).[2]

Mokhmalji et al evaluated the quality of life of patients undergoing diversion procedure and showed that retrograde ureteral stenting was more problematic and negatively affects the quality of life more than percutaneous nephrostomy.[3] Similarly Mays et al suggested that percutaneous nephrostomy only minimally affected quality of life.[5]

Although there is no significant difference in the improving trends among both the groups in regard to Urine output level in our study but there is a significant difference in the post-operative patient outcome in both the groups.

After removal of the diversion also the urine output levels remained the same and no variation was found among the patients before and after removal of the diversion as far as urine output was concerned.

All these patients also underwent a definitive procedure for removal of the obstructing cause. Similarly there is no significant difference in the improving trends among both the groups when the postoperative creatinine levels are

considered. But a significant difference is found in the pre and post-operative creatinine levels of the patients.

When the creatinine levels of patients undergoing PCN and ureteric stenting was compared to the patients who required conversion, the trend of PCN and DJS was shown to be similar also signifying no significant difference among the two procedures but a rising trend is seen in the patients undergoing conversion.

Thus patients undergoing DJ stent may initially show improvement but may develop irritative and intolerable lower urinary tract symptoms which may hamper their renal function and cause a deteriorating effect in their outcome. These patients when underwent secondary PCN with removal of the DJ stents subsequently showed a better response.

Although Joshi and colleagues accessed the impact in quality of life caused by temporary urinary diversion and reported no functional or psychosocial difference between double-J catheter and percutaneous nephrostomy in ureteral decompression and it is often presumed that diversion with the ureteral stent is the most suitable method and is more agreeable to the patient present results suggest that though both the procedures are equally efficient for diverting an obstructive urinary tract as shown by urine output and serum creatinine levels on each post-operative day and a significant improvement is seen in patients when urine output and serum creatinine levels are compared pre and postoperatively, patients undergoing PCN have comparatively shown a better outcome and tolerability than patients who underwent DJ stenting.[20] Thus in our opinion the due to the better effectiveness of percutaneous nephrostomy over DJ stenting, PCN should be given preference over ureteral stents.

CONCLUSION

Diverting an obstructed urinary system improves the overall renal function of the patient. Percutaneous nephrostomy and DJ stenting are the two modalities of treatment. DJ Stenting is associated with 20 % failure rate. Intolerable complications post DJ Stenting may require emergent conversion to secondary Percutaneous nephrostomy.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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