Double J stenting compared with ureteral catheterization in Percutaneous Nephrolithotomy

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Abstract

Background: Nephrolithiasis represents a large portion in the field of Urological pathology. Minimal invasive and non-invasive therapies have become more accessible and efficient in the treatment of nephrolithiasis. Percutaneous nephrolithotomy (PCNL) is an effective minimal invasive modality of treating kidney stones.

Objectives: To evaluate the outcome of standard percutaneous nephrolithotomy (PCNL) using two different stenting techniques i.e. externalized ureteral catheter placement compared with Double-J stent placement.

Methods: This is a prospective study conducted from January 2012 to June 2013 at Kathmandu Medical College Teaching Hospital among patients undergoing percutaneous nephrolithotomy (PCNL). Fifty patients who underwent PCNL were divided into two equal groups: Group 1 (PCNL with Double-J stent placement) and Group 2 (PCNL with externalized ureteral catheter placement). Factors evaluated included stent-related symptoms, postoperative morbidity, and the cost. Morbidity was classified according to the Modified Clavien classification. SPSS 20 was used for statistical evaluation. P value less than 0.05 was considered significant.

Results: Stent related morbidity were fever, dysuria, hematuria, burning micturition. Total of 16 stent related complications were seen in group 1 with four of the patients needing early surgical intervention to remove the Double J stent and injectable antibiotics for urinary tract complication due to indwelling stent. In Group 2, seven patients experienced postoperative complications, out of which six were managed conservatively and one patient had grade III A dysuria and hematuria, who underwent immediate stent removal and received injectable antibiotics. There was no reported sepsis and mortality in both groups. Stent was removed in 3-4 weeks' time in group 1 and 3-4 days in group 2. In Group 1, patients had to come one day prior for stent removal. Cost for DJ stent was significantly higher in group I than group II.

Conclusion: Standard PCNL with externalized ureteral catheter is as feasible as Double-J stenting. Less cost can be a huge relief to the patients in the third world developing country.

Key words: Double J stent, Percutaneous Nephrolithotomy, Ultra-mini percutaneous nephrolithotomy

INTRODUCTION

Nephrolithiasis represents a large portion in the field of urological pathology. Advances have been made in the treatment of urolithiasis and its complications. The recent advances like minimal invasive and non-invasive therapies have been more common practice among uro-surgeons and efficient as well. Urosurgeons have embraced endourological procedures more than open surgery except in special circumstances. Percutaneous nephrolithotomy (PCNL) is an effective modality of treating kidney stones and is now widely accepted. PCNL has lower morbidity and less patient discomfort than conventional open surgery due to its minimally invasive nature[1]. PCNL is now replacing open surgery due to patients' tolerance and lower complication rate[2]. PCNL can also be done safely in both children and elderly except for special circumstances like morbidly obese cases, solitary kidney, renal failure patients[3,4]. Minimally invasive percutaneous nephrolithotomy (MIPCNL) has shown high efficacy and safety comparable to conventional PCNL in many studies even for the treatment of stone 20 mm including staghorn stone[5]. There has been many modifications

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to this technique. Many comparative studies on total tubeless, small tube versus large tube, stentless PCNL have been published. Total tubeless PCNL has reduced the hospital stay, analgesics requirements and decreased morbidity[6,7].

In Standard PCNL tract dilatation is made up to 22-24 Fr for retrieval of stone and placement of nephrostomy tube. It has been modified to use small diameter tubes, 'tubeless' PCNL, and even 'totally tubeless' PCNL. Similarly in PCNL, a double-J stent or ureteric catheter can be used for internal drainage with a favorable outcome in selected patients with the advantage of decreased postoperative pain, analgesia requirement, and hospitalization days. In our study we have performed standard PCNL with either a Double J stent or a ureteric catheter for internal drainage.

In our study we have compared standard PCNL with a double J stent versus externalized ureteric catheter in terms of their related complications, outcome and the cost of each procedure.

METHODS

This is prospective comparative study done for a period of 18 months from January 2012 to June 2013 at Kathmandu Medical College Teaching Hospital. Informed and written consent was taken regarding the type of procedure and need of conversion to open surgery if required. Sixty patients were enrolled for the study. Ten patients who underwent conversion to open surgery were excluded. Fifty patients underwent standard PCNL in which PCNL tract was dilated up to 24 Fr and nephrostomy tube with either Double J (DJ) stent or externalized ureteric catheter was used. Patients with DJ stent and externalized ureteric catheter were grouped in Group 1 and Group 2 respectively, 25 patients in each group. Patients were evaluated for stent-related symptoms, postoperative morbidity, and the cost. Morbidities were classified according to the modified Clavien classification[8]. Group 1 patients were advised to remove stents after 3-4 weeks and group II patients had their ureteric catheter removed on the day of discharge on second or third day.

In patients with fever, urinary tract infection with plenty pus cells, positive urine culture, surgery was postponed. They were prescribed antibiotic according to culture sensitivity and posted for surgery on later dates. Patients with blood coagulation disorders, complete staghorn calculus were also excluded from the study.

SPSS 20 was used for statistical analysis and P value less than 0.05 was taken as significant.

RESULT

There were 60 patients in this study. Of those, there were 10 conversions to open surgery which were not included in this study. Twenty five underwent standard PCNL with DJ stenting (Group 1) and others had externalized ureteric catheter (Group 2). Age of the patients ranged from 19-65 years. The two groups were comparable in terms of age and gender distribution. Majority of the stones were 10 to 14 mm in size with a mean size of 12.24 mm and 13.6 mm in group 1 and 2 respectively. More than half of the stones in each group were located in renal pelvis (Table 1). A total of 16 stent related complications were seen in group 1 where four of the patients needed injectable antibiotics and early surgical intervention to remove them. In group 1, six (24%) patients had fever due to stent, five (20%) had dysuria with two requiring early stent removal for grade III A dysuria; five (20%) had haematuria with two requiring early removal due to grade III A haematuria. In Group 2, only seven patients experienced postoperative complications, six had grade I and II fever which was managed conservatively, one patient had dysuria and haematuria grade III A and had his Foley's catheter and ureteric catheter removed on second day.

Patients of Group 1 were advised to remove stent after 30 days of surgery but four (16%) had early removal due to grade III A morbidity. The complications resolved after removal of DJ stent. In group 2, Foley's and externalized ureteric catheter was removed on the day of discharge on third postoperative day along with PCN tube. Only one patient had his Foley's catheter and ureteric catheter removed on second day due to intense dysuria and some degrees of haematuria. Patient in Group 1 needed re-cystoscopy and antibiotic before removal of DJ stents which was not needed in Group 2 patients. The difference in cost in two groups was found to be highly significant (P value <0.001). Mean cost and median cost in group 1 were Rs 7788 and Rs 8000 respectively which seems expensive compared to group 2 patients where mean was Rs 2293 and median was Rs 2225.

Table 1: Characteristics of patients in two groups and morbidity grading of complications.

Variables	Group 1 (DJ stent) N=25	Group 2 (Ureteric catheter) N=25	p value*
Age (years)			
Mean ±SD	40.04±14.83	38.28±11.22	0.638
Median	36	37	
Sex			
Male	16	16	1.000
Female	9	9	
Stone size			
10-14 mm	22	16	
15-20 mm	3	9	
Mean ± SD (mm)	12.24±2.52	13.6±2.47	
Median (mm)	12	14	
Site of stone			
Renal pelvis	13	14	
Lower calyx	5	5	
Mid calyx	3	4	
Upper calyx	2	0	
Partial staghorn	2	2	
Fever			
Present	6	6	
Absent	19	19	
Grade of fever (n=6)			
Grade I	6	4	1.000
Grade II	0	2	
Grade IIIA	0	0	
Grade IIIB	0	0	
Grade IV	0	0	
Dysuria			
Present	5	1	
Absent	20	24	
Grade of Dysuria (n=5)			
Grade I	3	0	0.088
Grade II	0	0	
Grade IIIA	2	1	
Grade IIIB	0	0	
Grade IV	0	0	
Haematuria			
Present	5	1	
Absent	20	24	
Grade of Haematuria (n=5)			
Grade I	3	0	0.088
Grade II	0	0	
Grade IIIA	2	1	
Grade IIIB	0	0	
Grade IV	0	0	

*p value for age calculated by t test (using mean). For all other variables, p value calculated by chi-square test.

Table 2: Cost and need of early surgical intervention for stent-related complications.

Variables	Group 1 (DJ stent)	Group 2 (Ureteric catheter)	p value
Early Removal			
Required	4	1	
Not required	21	24	
Cost (Rupees)			
Mean± SD	7786±420.45	2293±179.90	<0.001
Median	8000	2225	

P value for mean calculated by t test.

DISCUSSION

Since the introduction of PCNL in 1976, it has been evolving and improving in technology and surgical techniques. There have also been advances in minimizing post-operative morbidity and complications. Placement of percutaneous drainage tube is an integral part of the standard PCNL as it provides homeostasis, avoids urinary extravasations and gives adequate drainage[9].

During the evolution of PCNL, there is growing consensus that tube PCNL causes post-operative pain with no other added advantage. Studies have been conducted using smaller tubes, 'tubeless' approach which places an external ureteral catheter or Double J (DJ) stent only and more recently to 'totally tubeless' wherein no stent or catheter are used. Ballmanet al[10] in1997 presented 'tubeless' PCNL keeping and internal ureteral stent for drainage, hospitalization time, analgesic requirement were significantly less.

A study by Singh et al[11] in 2005 reported 60 patients with tubeless PCNL and found less pain, shorter hospital stay with less morbidity compared to standard PCNL.

PCNL procedure is based on creation of proper renal access, dilatation and fragmentation and removal of stone without compromising patient's safety. As mentioned, there has been modification. Desai et al has developed "microperc" using 4.85 Fr working sheath and later devised ultra-mini percutaneous nephrolithotomy (UMP) using 11-13 Fr metal sheath to tackle the difficulties relates to miniperc[12,13].

Both micro PCNL and UMP necessitates complete fragmentation to size less than 3 mm as stone retrieval is not possible with these modification using Holmium: YAG laser lithotripsy. Miniaturization of the PCNL technique will decrease the need of transfusion and nephrostomy tube which contradicts the standard PCNL but has a higher stone free rate[14].

In our centre we use standard pneumatic lithotripsy and tract dilatation up to 24 Fr (20-24 Fr) with use of nephrostomy tube and double J stent or externalized ureteral catheter. 'Tubeless' or standard PCNL is complete with DJ stent or ureteral catheter for internal drainage and this necessitated the postoperative cystoscopy to remove DJ Stent. Post-operative cystoscopy, stent related infection and dysuria are few of the disadvantages in PCNL technique. Use of external ureteral catheter in place of DJ Stent has been reported by Laganapiwat et al and Mouracode et al[15,16]. They found significant reduction in hospital stay reduction and need of analgesia. Karamiet al[17] found tubeless PCNL with only external catheter to be economically less costly, safe, and effective. In our study we have compared using internal and external catheter for the standard PCNL. Majority of our patients had undergone PCNL after negative urine culture and had stone size of 10-20 mm. Use of external ureteral stent has significantly reduced the cost as compared to the use of DJ Stent. DJ stent has added cost significantly for the majority of Nepalese with low economic status in our study groups. DJ stents in situ has increased the morbidity due to stent–related complications like fever, dysuria, and haematuria but there was no life threatening complication like septicaemia. Sixteen patients in DJ stent group had stent related complications. Grade III A complication was seen in four patients which needed surgical intervention. Only four cases had grade I morbidity and one had grade IIIA haematuria in group 2. Need of interventions were more in DJ stent group as compared to the other group with added cost. Though the stent related complications are seen more in group 1 but it was not statistically significant. Larger study could give better insight into it. The use of external ureteral catheter has minimized the morbidity, the cost and re-cystoscopy. Two patients in group II experienced prolonged urine leak from the tract after the removal of the nephrostomy tract and ureteral stent which was managed conservatively.

Minimizing the morbidity remains the main goal. Schilling et al[18] reported the use gelatin-thrombin-haemostatic sealant whereas Jou et al[19] used diathermy coagulation of the intra-renal bleeders and tract in tubeless PCNL. Use of nephrostomy tube was believed to reduce bleeding as reported by Winfield et al[20] in 1986. With the advancement of technology, surgical expertise and modification 'tubeless' PCNL is preferred technique compared to standard PCNL[21].

CONCLUSION

The modification in standard PCNL in our study has the potential advantages of reduced stent-related morbidity and significant reduction in the cost. 'Tubeless' PCNL as reported by other studies have been shown to be safe and effective. Moreover, stent-related discomforts because of the presence of a Double-J stent and the need for postoperative cystoscopy to remove the Double-J stent can be avoided with an externalized ureteral catheter.

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