Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Urology

Comparison of Outcome of Percutaneous Nephrolithotomy and Open Ureterolithotomy in the Management of Large Upper Ureteric Stone

Dr. Md. Sayeef Ullah Sujan[1*], Dr. Muntasir Habib[2], Dr. Tasnim Alam Manzer[3], Dr. Md. Julfiquer Ali Siddiky[4], Dr. Furkan Ahmed[5], Dr. Sudip Das Gupta[6]

[1]Assistant Professor, Department of Urology, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh
[2]Medical Officer Department of Urology, Sir Salimullah Medical College, Mitford Hospital, Dhaka, Bangladesh
[3]Associate Prof of Urology, East West Medical College, Dhaka, Bangladesh
[4]IMO, Department of Urology, Rangpur Medical College Hospital, Rangpur, Bangladesh
[5]Assistant Professor, Department of Urology, Sir Salimullah Medical College, Dhaka, Bangladesh
[6]Professor& Department Head, Department of Urology, Sir Salimullah Medical College, Dhaka, Bangladesh

DOI: https://doi.org/10.36347/sjams.2025.v13i02.038 | **Received:** 21.12.2023 | **Accepted:** 30.01.2024 | **Published:** 25.02.2025

***Corresponding author:** Dr. Md. Sayeef Ullah Sujan
Assistant Professor, Department of Urology, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh

Abstract **Original Research Article**

Background: Different treatment modalities have been introduced for upper ureteral stone which was previously treated by open surgery. Percutaneous nephrolithotomy (PCNL) is one of them and is being recommended as standard by several studies. Recently PCNL is being practiced in Bangladesh too. Therefore, this study was designed to compare the outcome of treatment of large upper ureteric stone by PCNL and open ureterolithotomy (OU). ***Methodology:*** This quasi-experimental study was conducted in the Department of Urology, Sir Salimullah Medical College Mitford Hospital, Dhaka from January 2019 to December 2020. A total of 70 patients were included in the study according to selection criteria. Study patients were divided into two groups: Group-A and Group-B underwent open ureterolithotomy (OU) and PCNL respectively. ***Result:*** Mean operative time was shorter in patients who underwent PCNL than the patients who underwent OU (90.17±8.27 min Vs110.14+14.17min, p<.05). Complete stone-clearance rate was similar in patients of both groups (97.1% Vs 94.3%, p>.05). No significant difference were regarding Per-operative and post-operative complications in patients of both groups (p>.05). Mean post-operative hospital stay was significantly shorter among patients who underwent PCNL (1.80±0.75 days Vs 5.0+1.43 days, p<.05). Convalescence was also significantly shorter among patients who underwent PCNL (1.98±0.91 weeks Vs 3.85±0.97 weeks, p<.05). ***Conclusion:*** In this study PCNL was observed with significant shorter operative time, hospital stay and shorter convalescence in comparison with OU. Thus it can be concluded that PCNL is better than open ureterolithotomy in the management of large upper ureteral stone.

Keywords: Percutaneous nephrolithotomy (PCNL), open ureterolithotomy, Urolithiasis.

INTRODUCTION

Urolithiasis is the most common urologic benign disease with 10-15% prevalence [1]. It is a significant cause of morbidity in developing countries as patients present with complications like urosepsis, renal failure etc [2]. Stone disease is a substantial portion of the operative workload on urologists in this part of the world [3]. Various non-invasive, minimally invasive and open surgical procedures may be performed for stone disease depending upon its location and size [4].

In the last three decades, various new technique including percutaneousnephrolithotomy (PCNL), shockwave lithotripsy (SWL), ureteroscopic lithotripsy (URSL), retrograde intrarenal surgery (RIRS) and multiple endoscopic methods of stone fragmentation has changed the management of urolithiasis dramatically. But the complete clearance of stone depends upon the mode of surgical treatment.

Proximal ureteric stones are challenging for operative management [5]. In ureteroscopic lithotripsy, chances of inadvertent push back are high due to significant proximal dilation [6]. In ESWL (Extra corporeal shock wave lithotripsy), improper fragmentation and incomplete clearance is the main issue due to edema and poor localization. ESWL has been less successful for large ureteric stone. Before 1980 majority of large upper ureteric stonerequire open operation for their removal. But open surgery is associated with

several morbidities. Surgical treatment of ureteric calculi, the highest complication rate was seen in patients who had open ureterolithotomy [7]. But open mini access ureterolithotomy is a safe and reliable minimally invasive procedure for management of proximal ureteric stone [8]. Therefore, the debate over the optimal treatment for a large upper ureteric stone of 1.5 cm diameter or more.

Percutaneous nephrolithotomy is becoming the procedure of choice in reasonably bigger stones in the kidney but now people are also considering it for upper ureteric stone [9].

Recently PCNL is being practiced and becoming popular in many centers in our country. But it is more associated with a higher complication rate and failure to pushback [10]. There is a debate between different modalities of treatment in the management of large upper ureteric stone. In this prospective study, we compared the outcomes of percutaneous nephrolithotomy (PCNL) and open ureterolithotomy in the management of large upper ureteric stone.

OBJECTIVES OF THE STUDY

To compare the outcome of percutaneous nephrolithotomy (PCNL) and open ureterolithotomy in the management of large upper ureteric stone.

MATERIALS & METHODS

This quasi experimental study was conducted in the Department of Urology, Sir Salimullah Medical College Mitford Hospital, Dhaka from January 2019 to December 2020. A total of 70 patients with ureteric stone admitted in department of urology were included in the study according to selection criteria. Purposive sampling method was followed in the study. Study patients were divided into two groups: Group-A and Group-B underwent open ureterolithotomy (OU) and PCNL respectively.

Inclusion criteria:

- Age of patients: 15-70 years
- Patients with single, upper ureteric stone
- Stone Size more than 1.5 cm

Exclusion Criteria:

- Uncorrectable coagulopathy.
- End stage renal disease. (Serum Creatinine > 8 mg/dl)
- Pregnant women.
- Patients with distal obstruction.
- Radiolucent stone.

RESULTS

In this prospective quasi experimental study total number of respondent were 70. Group-A (Control) Included 35 patient underwent open ureterolithotomy (OU) and Group-B (Experimental) comprised of 35 patients who had underwent PCNL. The findings derived from data analysis were presented below.

31.43% (11 Out of 35) of respondents were aged between 45 - 54 years in group Aand 28.5% (10 Out of 35) within age range of 35-44 years in group B. Mean age ofthe patients was 45.88±14.47 (SD) years in group A and 44.91±13.92 (SD) years ingroup B. No significant difference has been found between two groups (Table 1).

Table 1: Age distribution of the respondents (n=70)

Age (in year)	Group		P value
	Group-A n=35(%)	Group-B n=35(%)	
15-24	03 (08.57)	04 (11.43)	**0.776**
25-34	05 (14.29)	05 (14.29)	
35-44	07 (20.00)	10 (28.57)	
45-54	11 (31.43)	08 (22.85)	
55-64	06 (17.14)	07 (20.00)	
65-70	03 (08.57)	01 (02.86)	
Total	**35 (100)**	**35 (100)**	
Mean ± SD	**45.88 ± 14.47**	**44.91 ± 13.92**	

About 45.70% (16) of the respondents in group A and 51.4% (18) of the patients ingroup B were male. No significant difference has been found between two groups (Table 2).

Table 2: Gender distribution of the respondents (n = 70)

Sex	Group		P value
	Group-A n=35(%)	Group-B n=35(%)	
Male	16 (45.70)	18 (51.40)	0.406
Female	19 (54.30)	17 (48.60)	
Total	**35 (100)**	**35 (100)**	

Mean diameter of stone was 19.57±1.54mm in group A and 20.05±1.34 mm inGroup-B. No significant difference has been found between two groups (Table 3).

Table 3: Comparisons of stone size in between two groups (n=70)

Group	Stone Size (mm)	P value*
Group-A	19.57 ± 1.54	<0.165
Group-B	20.05 ± 1.34	

45.7% stone was in right ureter and 54.3% in left ureter of Group A. 51.4% stone was in right ureter and 48.6% in left ureter of patient in Group B. No significant difference was seen in between two groups (Table 4).

Table 4: Distribution of the respondents by stone side (n=70)

Group	Location		P value
	Right Ureter n=35(%)	Left Ureter n=35(%)	
Group-A	16 (42.70)	19 (54.30)	0.406
Group-B	18 (51.40)	17 (48.60)	

The table showed that mean operative time was 110.14+14.37 min in group A and 90.17±18.27 min in group B. Mean operative time was significantly shorter in patients underwent PCNL as compared to OU (Table 5).

Table 5: Comparison of operative time in between two groups (n=70)

Group	Location	P value
Group-A	110.14 ± 14.37	<0.01
Group-B	90.17 ± 8.27	

Regarding per operative complication 7(20%) and 5(14.3%) had bleeding and multiple injury in group A. Where in group B bleeding and renal pelvis injury was 5(14.3%) and 5 (14.3%) patients respectively (Table 6).

Table 6: Distribution of patients according to per-operative complications. (n=70)

	Group-A n=35(%)	Group-B n=35(%)
With Complication	12 (34.3)	10 (28.6)
Bleeding	7 (20)	5 (14.3)
Pleural injury	5 (14.3)	0
Renal pelvis injury	0	5 (14.3)

Stone free rate was 94.3% in Group A and 97.1% in Group B No significant difference was found in between two groups (Table 7).

Table 7: Comparison of stone-clearance rate in Between two groups (n=70)

	Group-A n=35(%)	Group-B n=35(%)	P value
Stone clearance rate	33 (94.3)	34 (97.1)	0.500
Residual Stone	2 (5.7)	1 (2.9)	
Total	**35 (100)**	**35 (100)**	

In Open Ureterolithotomy (OU) post-operative complications was fever, urine leakage, blood transfusion, and wound infection respectively 6(17.1%), 1(2.9%),5(14.3%) and 2(5.7%). In case of PCNL fever and blood transfusion was 7(20%) and 4(11.4%) patients respectively (Table 8).

Table 8: Distribution of patients according to post-operative complications. (n=70)

	Group-A n=35(%)	**Group-B n=35(%)**
With Complication	14 (40)	11 (31.4)
Fever	6 (17.1)	7 (20)
Urinary leakage	1 (2.9)	0
Blood transfusion	5 (14.3)	4 (11.4)
Wound infection	2 (5.7)	0

Only 12(34.3%) patients in Group A and 10(28.6%) in Group B had per-operative complication. There was no significant difference in between two groups. Similarly no significant difference was observed in post-operative complications (Table 9).

Table 9: Association of Per-Operative and Post-Operative Complications with type of surgery. (n=70)

Complications	**Group-A n=35(%)**	**Group-B n=35(%)**	**P value***
Per-Operative Complication			
With Complication	12 (34.3)	10 (28.6)	
Without Complication	23 (65.6)	25 (71.4)	**0.399**
Post-Operative Complication			
With Complication	14 (40)	11 (31.4)	
Without Complication	21 (60)	24 (68.6)	**0.309**

Mean post-operative hospital stay was significantly shorter (P<0.001) in experimental group as compared to control (5.0±1.43 vs 1.80±0.75 days). Similarly mean time required to return to normal activity was significantly shorter (P<0.001) in group B.(3.85±0.97 vs 1.98±0.91 weeks) (Table 10).

Table 10: Comparison of post-operative hospital stay and time required toreturn to normal activity in both groups (n=70)

	Group-A Mean ± SD	**Group-B Mean ± SD**	**P value***
Postoperative hospital stay (days)	5.0 ± 1.43	1.80 ± 0.75	<0.001
Time required to return normal activity (weeks)	3.85 ± 0.97	1.98 ± 0.91	<0.001

DISCUSSION

Large upper ureteric calculi are frequently associated with obstructive uropathy [9]. The management of Large upper ureteric stone is challenging for urologist. Various treatment modalities including open ureterolithotomy, PCNL, Flexible URS, ESWL, Laparoscopic procedure, all are effective management option for removal of upper ureteric stone, but each associated with its own success rate and morbidity A total of 70 patients were included in this study, of whom 35 were treated by Open Ureterolithotomy (OU) (Group A) and 35 were treated by PCNL (Group B) [9]. This study aimed to observe the outcome of percutaneous nephrolithotomy (PCNL) in comparison to open ureterolithotomy in the management of large upper ureteric stones.

In this study majority of the patients were aged 45 - 54 in Group A and in Group Bmaximum patient were in 35 - 44 age groups. PCNL for proximal upper ureteric stone where maximum patient were aged 31-40 years [11]. Mean age of the patients was 45.88±14.47 years in Group A and 44.91±13.92 years in Group B. Besides, 45.7% of Group A and 51.4% of Group B were male. No significant difference was found in age distribution between the two groups of patients. A study by Juan *et al.*, also observed no significant differences in age, gender between the two groups [12]. Another studies also revealed that there was no statistically significant difference between two groups regarding age and sex (p-value >0.05) [10,13]. The mean value of stone size was 19.57±1.54mm and 20.05±1.34mm in Group A and Group B respectively. No significant difference has been found between two groups regarding the stone size. On previous studies there was no significant difference in between stone size and two groups [10,12,13].

In this study mean operative time was respectively 110.14+14.37 min & 90.17+8.27min in Group A (OU)& Group B (PCNL) which was significantly shorter in PCNL Group than open ureterolithotomy Group ($p<0.05$). Operative time was 94.13+17 min in PCNL with upper ureteric stone [14].

The rate of per operative and postoperative complications was lower for Group B than Group A. 34.3% in Group A (12 Out of 35) and 28.6% in Group B (10 Out of 35) had per operative complication. In group A (OU) 20% (7) had bleeding, 14.3% (5) had multiple injury during per operative period. But in PCNL 14.3% (5) had renal pelvis injury and 14.3% (5) had bleeding. The rate of post operative complication was 40% (14) vs 31.4% (11) in group A and group B. Post operatively 17.1% (6) had fever,14.3% (5) needed blood transfusion, 5.7% (2) had wound infection, 2.9% (1) had urinary leakage in group A, otherwise 20% (7) had fever and 14.4% (4) needed blood transfusion group in B. But there was no significant difference regarding per I operative complications between two groups ($P>0.05$). Another study found that also revealed similar finding [15]. Postoperative complication rate was 34% in patients who had open ureterolithotomy [7].

The current study observed that in Group a (OU) stone clearance rate was 94.31%and in Group B (PCNL) it was 97.1%. The stone clearance rate was higher in Group-B. But no significant difference has been found between two groups. A study by Paryaniet *et al.*, also found 98.4% stone clearance in PCNL with upper ureteric stone [11].

Post-operative hospital stay & time required to return to normal activity bear a significant economic and social impact on the patients after major surgery. Our study revealed that the patients had a significantly shorter mean postoperative hospital stay in Group B (1.80 ± 0.75 days) than Group A (5.0 ± 1.43 days) with P-value<0.001. Another study found that also revealed that mean post operative hospital stay was 6.2 ± 0.65 days in open ureterolithotomy with p value >0.001[16]. The mean time required to return to normal activity was also significantly less in Group B (1.98 ±0.91weeks) than Group A (3.85 ±0.97 weeks) with P-value <0.001. Study by Garg *et al.*, also revealed that mean postoperative hospital stay was 6.2+0.65 days in open ureterolithotomy ($P>0.0001$) hospital stay and recovery time was significantly less in the PCNL group than the open surgery group with a P-value >0.001. ss [16]. A significantly longer time to return to ordinary activity for the Open surgery group (21.7 ± 4.4days) than PCNL (15.4 ± 3.8 days) with P-value < 0.01 [15].

In this current study, operative time, postoperative hospital stay and convalescence were significantly shorter in PCNL Group. Therefore, the result of present study concurs with prior literature stating that PCNL is the better treatment option for patient with large upper ureteric stone.

CONCLUSION

PCNL was observed with shorter operative time, hospital stay and convalescence period as compared to open ureterolithotomy. However, two surgical procedures did not differ regarding per-operative & post-operative complications and stone clearance rate. Thus, it can be concluded that PCNL is better than open ureterolithotomy in the management of large upper ureteral stone.

REFERENCES

1. Lypez, M. & Hoppe, B., (2010). History, epidemiology and regional diversities of urolithiasis. *Pediatric Nephrology*, 25(1), 49–59.
2. Hussain, M., Rizvi, S. A., Askari, H., Sultan, G., Lal, M., Ali, B., & Naqvi, S. A. (2009). Management of stone disease: 17 years experience of a stone clinic in a developing country. *Hypertension*, *6819*, 17-6.
3. Hussain, M. (2014). Enormity of urolithiasis in Sindh province. *JPMA. The Journal of the Pakistan Medical Association*, *64*(12), 1337-1338.
4. Pevzner, M., Stisser, B. C., Luskin, J., Yeamans, J. C., Cheng-Lucey, M., & Pahira, J. J. (2011). Alternative management of complex renal stones. *International urology and nephrology*, *43*, 631-638.
5. Ciftci, H., Savas, M., Altunkol, A., Yeni, E., Verit, A., & Celepkolu, B. (2010). Influence of stone size, location and impaction on the success of ureteroscopic pneumolithotripsy. *Georgian Medical News*, (183), 7-12.
6. Farahat, Y.A., Elbahnasy, A.E.M. & Elashry, O.M., (2011). A randomized prospective controlled study for assessment of different ureteral occlusion devices in prevention of stone migration during pneumatic lithotripsy. *Urology*, 77(1), 30-35.
7. Kehinde, E. O., Al-Awadi, K. A., Al-Hunayan, A., Okasha, G. H., Al-Tawheed, A., & Ali, Y. (2003). Morbidity associated with surgical treatment of ureteric calculi in a teaching hospital in Kuwait. *Annals of the Royal College of Surgeons of England*, *85*(5), 340.
8. Sharma, D. M., Maharaj, D., & Naraynsingh, V. (2003). Open mini-access ureterolithotomy: the treatment of choice for the refractory ureteric stone?. *BJU international*, *92*(6), 614-616.
9. Basiri, A., Simforoosh, N., Ziace, A., Shayaninasab, H., Moghaddam, S.M.M.H. and Zare, S., (2008). Retrograde, antegrade, and laparoscopic approaches for the management of large, proximal ureteral stones: A randomized clinical trial. *Journal of Endourology*, 22(12), 2677-2680.
10. Zhu, H., Ye, X., Xiao, X., Chen, X., Zhang, Q. and Wang, H., (2014). Retrograde, antegrade, and

laparoscopic approaches to the management of large upper ureteral stones after shockwave lithotripsy failure: A four-year retrospective study. *Journal of Endourology*, 28(1), 100-103.

11. Paryani, J.P., Memon, S.R., Rajpar, Z.H., Laghari, M.S., (2012). Push and Perc; JLUMHS SEPTEMBER-DECEMBER 2012; Vol 11: No. 03.
12. Juan, Y.S., Shen, J.T., Li, C.C., Wang, C.J., Chuang, S.M., Huang, C.H., (2008). Comparison of percutaneous nephrolithotomy and ureteroscopic lithotripsy in the management of impacted, large, proximal ureteral stones. *Kaohsiung Journal of Medical Sciences*, 24(4), 204-209.
13. El-nasr, M., Mohyelden, K., Youssof, H.A., EL-Helaly, H.A. and El Sayed, H.M., (2020). Outcomes of Percutaneous NephrolithotomyVersus Open Stone Surgery for Pateints with Staghor Calculi Safety and Efficacy. *Al-Azhar International Medical Journal*, 0(0), 0-0.
14. Ahmed, T., Kabir, M. H., Khairuzzaman, M., Ahsan, M. M., Jahan, M., and Islam, M. S. (2018). Outcome of PCNL in Proximal Ureteric Stone: A Comparative Study with Laparoscopic Retrieval. *Bangladesh Journal of Urology*, 21(1), 25-30. https://doi.org/10.3329/bju.v21i1.49748.
15. Ismail, S., Ali, M., Ghobashy, E., Elleithy, T., El-Baz, A., & Roushdy, M. (2008). Open Surgery in the Management of Multiple and Staghorn Kidney Stones: Its Role in the Era of Minimally Invasive Techniques Open Surgery in the Management of Multiple and Staghorn Kidney Stones: Its Role in the Era of Minimally Invasive Techniques. *UroToday International Journal*, 1939-48.
16. Al-Kohlany, K.M., Shokeir, A.A., Mosbah, A., Mohsen, T., Shoma, A.M., Eraky, I. (2005). Treatment of complete staghorn stones: A prospective randomized comparison of open surgery versus percutaneous nephrolithotomy. *Journal of Urology*, 173(2), 469-473.