

# Comparison of Post-Operative Pain Between Standard Versus Mini-Percutaneous Nephrolithotomy

PO Pain Between Standard VS Mini-Percutaneous Nephrolithotomy

Awais Ahmad<sup>1</sup>, Muhammad Asif<sup>1</sup>, Junaid Jamil Khattak<sup>2</sup>, Ilyas Zahoor<sup>3</sup>, Muhammad Salman Khan<sup>1</sup> and Kausar Anwar<sup>1</sup>

## ABSTRACT

**Objective:** To compare postoperative pain between standard vs mini percutaneous nephrolithotomy.

**Study Design:** A Comparative Cross-Sectional Study

**Place and Duration of Study:** This study was conducted at the Urology Department, Lady Reading Hospital, Peshawar from June 9<sup>th</sup>, 2022 to June 9<sup>th</sup>, 2023.

**Methods:** A total of 140 patients with kidney stones (more than 10mm) were randomly allocated in two groups. Patients of Group A were subjected to mini PCNL while group B were subjected to standard PCNL. Follow-up was done to determine the intensity of pain on Visual Analogue Score (VAS).

**Results:** In group A mean age was 36.3±8.5 years and in group B it was 38.9±10.1 years (p=0.096). Males in group A were 57.1% compared to 70% in group B (p=0.114). 14.5±3.7mm was mean size of stone in group A compared to 15.5±3.3mm in group B (p=0.071). The mean BMI of group A was 26.3±3.5kg/m<sup>2</sup> compared to 26.2±3.3kg/m<sup>2</sup> in group B (p=0.893). 14.3% in group A were diabetic compared to 17.1% in group B (p=0.642). 8.6% in group A were hypertensive compared to 11.4% in group B (p=0.573). 12.9% in group A were smokers compared to 24.3% in group B (p=0.082). On follow-up, the mean postoperative pain on the visual analogue scale in the group mPCNL group was 2.5±0.9 compared to 3.1±1.1 in the sPCNL group (p < 0.001).

**Conclusion:** Mini PCNL is associated with less postoperative pain than standard PCNL. We recommend, taking into account the side effects of both procedures, more randomized control trails with larger samples.

**Key Words:** Urolithiasis, Pain, visual analogue scale, Percutaneous nephrolithotomy( PCNL)

**Citation of article:** Ahmad A, Asif M, Khattak JJ, Zahoor I, Khan MS, Anwar K. Comparison of Post-Operative Pain Between Standard Versus Mini-Percutaneous Nephrolithotomy. Med Forum 2023;34(12): 79-83. doi:10.60110/medforum.341219.

## INTRODUCTION

In our country, estimated prevalence of urolithiasis is 10 to 15% but only 1-2% of symptomatic patients come to the hospitals<sup>1</sup>. Currently, different treatment modalities for renal stone are in practice. Minimally invasive endoscopic procedures are replacing open surgeries<sup>3</sup>. Treatment of urolithiasis is much safe and effective with advancement in endoscopic procedures<sup>4</sup>, with more than 90% stone clearance PCNL has revolutionized treatment of urolithiasis<sup>5</sup>.

To prevent ureteral obstruction and promote healing, pigtail ureteric stents had been used in endoscopic surgeries<sup>6,7</sup>.

In large (>20) and smaller stones (10=20 mm), PCNL is the preferred therapy, according to European Association of Urology (EAU) guidelines<sup>8</sup>. Excellent stone-free rates following PCNL have been reported, which ranges from 76% to 98%<sup>9</sup>. However, attributed to its complications, PCNL is a challenging technique<sup>10</sup>. Mini-PCNL, a modification of the traditional PCNL technique (24 to 30Fr working channel) to micro endoscope short percutaneous tract (16 to 22Fr) has been created to reduce morbidity associated with instrumentation, blood loss, postoperative pain, and probable kidney damage<sup>11</sup>. The method involved tract dilation upto 16Fr followed by the use of a 15Fr vascular peel-away sheath and a 12Fr nephroscope is used to remove the stones<sup>12</sup>.

The mean pain score at 24 hours was significantly lower in mPCNL vs. sPCNL, at 0.3 (0.46) vs 0.75 (0.53) (P < 0.001)<sup>13</sup>. In another study, in mPCNL group mean pain on VPS was 5.44±1.5 compared to 6.19±1.65 in the sPCNL group (p > 0.06)<sup>14</sup>.

This study is designed to compare the mean pain score after sPCNL vs. mPCNL. Studying literature, we found controversial statistics of postoperative pain following

<sup>1</sup>. Department of Urology, Lady Reading Hospital Peshawar.

<sup>2</sup>. Department of Urology, Muhammad Teaching Hospital, Peshawar.

<sup>3</sup>. Department of Urology, North West Teaching Hospital, Peshawar.

Correspondence: Muhammad Asif, Associate Professor of Urology, Lady Reading Hospital, Peshawar, Contact No: 03359935313, 03109918201 Email: drasif\_15@yahoo.com

Received: August, 2023

Accepted: November, 2023

Printed: December, 2023

these, steered our mind to this idea. Some studies are in favor of sPCNL and others favor mPCNL regarding postop pain, yet many fail to generalize these modalities. This study will integrate these in light of postop pain in adult population. This study will help lay a foundation for urologists for future research recommendation and for randomized control trails to distinguish these modalities.

**METHODS**

The Urology Department of Lady Reading Hospital in Peshawar conducted a Comparative Cross-Sectional Study from June 9 to June 10, 2023. Routine baseline investigations i.e. complete blood counts, biochemical analysis (serum electrolytes, urea, and creatinine) urinalysis and urine culture (if puss cells in urine), X-ray KUB (kidney, ureter, and bladder), and ultrasound KUB (kidney, ureter, and bladder) were performed in all patients. By block randomization, patients were allocated in two groups. Group A patients underwent mini PCNL while group B patients underwent standard PCNL. The sample size was 70 in each group keeping a 5.44±1.5 mean pain score in mPCNL and 6.19±1.65 mean pain score in sPCNL<sup>14</sup>. Inclusion criteria were newly diagnosed patient from 20 to 60 years of age having renal stones of size 10mm on ultrasound. Patients who had procedures for renal stones, BPH on DRE, UTI and any functional or anatomical abnormalities of urinary tract were excluded. PCNL was performed in prone position 28Fr sheath and 26Fr nephroscope was used in sPCNL while 16Fr sheath and 12Fr nephroscope was used in mPCNL. On first postop day, pain assessment done.. All the procedures were performed by a single experienced urologist having a minimum of five years of experience.

**Data Collection Procedure:** The ethical committee was consulted, the patients were told of the goal and potential advantages of the trial, and written, informed consent was acquired. Name, address, sex, and age were noted on a pre-made proforma. To prevent bias, the exclusion criteria were closely adhered to.

Data analysis was conducted using SPSS version 21. The mean and standard deviation of age, stone size, height, weight, BMI, and postoperative discomfort were determined using descriptive statistics. Frequency and percentage were calculated for gender, DM, HTN, and smoking status. Pain in both the groups was compared using a T-test keeping a p-value ≤ 0.05 as significant. The P-value of Pain in both groups was stratified among gender, stone size, BMI, DM, HTN, and smoking status to see the effect modification using a T-test.

**RESULTS**

140 patients in total, split into two groups. Patients in group B received standard PCNL (sPCNL), whereas

patients in group A received micro PCNL (mPCNL). 37.6+9.6 years was the average age. There is a minimum age of 23 and a maximum age of 55. Group B's mean age was 38.9+10.1 years, while group A's was 36.3+8.5 years (p=0.096). Table 1 compares the ages of the various groupings.

There were 57.1% males in group A compared to 70% in group B (p 0.114). (Table -2), for comparison of gender. The mean size of the stone in group A was 14.5±3.7mm compared to 15.5±3.3mm in group B (p=0.071). (See table-3), for comparison of categories of stone size between both groups. The mean BMI of group A was 26.3±3.5kg/m<sup>2</sup> compared to 26.2±3.3kg/m<sup>2</sup> in group B (p=0.893).

14.3% in group A were diabetic compared to 17.1% in group B (p=0.642). 8.6% in group A were hypertensive compared to 11.4% in group B (p =0.573). 12.9% in group A were smokers compared to 24.3% in group B (p 0.082).

On follow-up, mean postoperative pain on the visual analogue scale in group mPCNL group was 2.5 ± 0.9 compared to 3.1 ± 1.1 in sPCNL group (p < 0.001). (table-4).

The statistical significance of pain of different variables was calculated using the student T-test and ANOVA Test. (table-5).

**Table No.1: Age comparison between the two groups (n = 70 each)**

		Treatment Groups	
		mPCNL	sPCNL
Age groups	23-30 years	23 32.9%	18 25.7%
	> 30-40 years	21 30.0%	19 27.1%
	> 40-55 years	26 37.1%	33 47.1%
Total		70 100.0%	70 100.0%

**Table No.2: Gender Comparisons for Both Groups (n=70 each)**

		Treatment Groups	
		mPCNL	sPCNL
Gender	Male	40 (57.1%)	49 (70.0%)
	Female	30 (42.9%)	21 (30.0%)
Total		70 (100.0%)	70 (100.0%)

**Table No.3: Size Comparison of the Stones in the Two Groups (n = 70 each)**

		Treatment Groups		P value
		mPCNL	sPCNL	
Size of stone	10-15mm	44 (62.9%)	33(47.1%)	0.062
	> 15mm	26 (37.1%)	37(52.9%)	
Total		70(100.0%)	70(100.0%)	

**Table No.4: Comparison of each group's mean level of pain (n=70 each)**

Treatment Groups	Mean	SD	P value
mPCNL	2.4	0.9	< 0.001
sPCNL	3.1	1.1	

**Table No.5: P-value of postoperative pain in both age groups using T-test and ANOVA test**

Age groups	Mean pain in Group A	Mean pain in Group B	P value
23-30 years	2.8 (0.9)	3.2 (1.4)	0.290
>30-40 years	2.7 (1.0)	3 (0.8)	
>40-55 years	2.2 (0.7)	3.2 (1.0)	
Gender			
Male	2.5 (0.8)	3.2 (1.0)	
Female	2.4 (1.0)	3 (1.2)	
Size of stone			
10-15mm	2.4 (0.8)	3.3 (1.0)	<0.001
>15-20mm	2.5 (1.1)	3 (1.0)	
BMI (kg/m <sup>2</sup> )			
20.4-25.5	2.4 (0.9)	3.3 (1.1)	<0.001
>25.5-29.9	2.3 (0.9)	2.8 (1.0)	
>29.9-32	2.6 (0.8)	3.4 (0.9)	
DM			
Yes	1.9 (0.9)	3 (1.0)	0.016
No	2.6 (0.9)	3.2 (1.0)	
HTN			
Yes	2.0 (0.5)	2.9 (0.9)	0.054
No	2.6 (0.9)	3.2 (1.1)	
SMOKING			
Yes	2.7 (1.0)	3.4 (0.8)	0.049
No	2.4 (0.9)	3.1 (1.1)	

## DISCUSSION

Modern urologists treat urolithiasis with safer and more efficient lithotripsy thanks to technological advancements. As of right now, PCNL is regarded by AUA and EAU recommendations as the recommended treatment for renal stones larger than 2.0 cm. Furthermore, because of their relative safety, "mini-PCNL" development is gaining popularity. Furthermore, reports indicate that compared to conventional PCNL, small PCNL is a safer method in terms of complications and Hb decline.

Certain surgeons have a tendency to forego placing the nephrostomy tube due to the swift progress made in PCNL techniques. Zilberman and colleagues examined the micro PCNL publications. In comparison to normal PCNL, they reported comparable results with mPCNL<sup>15</sup>. Less hospital days, pain ratings, analgesic usage, a quicker return to regular activities, and cheaper expenditures are all associated with mPCNL.

Furthermore, certain instances with single tracts, no distal obstruction, no intraoperative difficulties, and no planning for the second look are criteria for mPCNL<sup>16,17</sup>.

Of the patients in the Karami et al<sup>18</sup> study, 210 had undergone mPCNL. Every patient had kidney stones larger than 2 cm (average 3 cm), and 21 of them had staghorn stones. 91.04% of the cases had no stones, and 8.95% (18 patients) still had residual shards of stone that were about 7 mm; all of these patients received

SWL treatment. A blood transfusion was required for 22 patients (10.9%), 16 patients (7.9%) experienced a UTI, and 40 patients experienced mild bleeding. Diclofenac or indomethacin were administered to treat pain; 10 individuals received 50 mg of pethidine. The average stay in the hospital was three days. The researchers emphasized that mPCNL is a cost-effective, safe method that offers excellent patient comfort.<sup>18</sup>

In a related trial, Shah et al<sup>28</sup> examined the pain, analgesic requirement, and number of hospital days of patients who were randomly assigned to receive mPCNL or a small diameter (8F) nephrostomy tube. A 6F Double J tube was used to contain the mPCNL group. There were fewer hospital days, analgesic needs, and discomfort in that group. However, 39.4% of the same sample experienced Double J discomfort.

Bellman and Jung successfully used the method to patients who were obese<sup>15</sup>. Done on bilateral kidney stones by Shah et al. Jou et al. emphasized that staghorn stones larger than 3 cm were potentially potential candidates for mPCNL.<sup>20</sup>

PCNL is a difficult procedure; even in the hands of the most skilled practitioners, problems might arise in 1.1–83% of cases. The most significant side effect is bleeding, which can be treated with the intervention (0.6–17%)<sup>21,22</sup>. Nephrostomy tube placement can prevent bleeding during nephroscopy, puncture, and dilatation of the tract. This could imply that hemostasis cannot be achieved in mPCNL. Although they are experimental, it is claimed that diathermy or fibrin injections are used for internal and parenchymal bleeding<sup>23,24</sup>. Cormio et al. found reduced hospital stays for mPCNL patients after using Tachosil® for bleeding<sup>25</sup>. Data from 5803 patients and 96 centers were reported by de la Rosette et al. They documented 1.8% hydrothorax, 3.4% renal pelvis perforation, and 7.8% serious bleeding; 328 patients (5.7%) had blood transfusions. In our study, it is reflected.<sup>26</sup>

Different analgesics have been employed in earlier trials. Morphine, diclofenac, and Pethidine were utilized by Aghamir et al<sup>16</sup>, Shah et al<sup>27</sup>. Shen et al. and Gonulalan et al<sup>28,29</sup> reportedly prefers mPCNL to sPCNL as it carries worst pain and more postop narcotic analgesics.

## CONCLUSION

Comparing mini PCNL to regular PCNL, less postoperative pain is reported. More randomized controlled studies are advised, especially with bigger sample sizes.

### Author's Contribution:

Concept & Design of Study: Awais Ahmad  
Drafting: Muhammad Asif, Junaid Jamil Khattak

Data Analysis: Ilyas Zahoor,  
Muhammad Salman

Revisiting Critically: Khan, Kausar Anwar  
Awais Ahmad,  
Muhammad Asif, Junaid  
Jamil Khattak

Final Approval of version: Awais Ahmad

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

**Source of Funding:** None

**Ethical Approval:** No.127/LRH/MTI dated 27.05.2021

## REFERENCES

1. Imtiaz S, Salman B, Qureshi R, Drohlia MF, Ahmad A. A review of the epidemiology of chronic kidney disease in Pakistan: a global and regional perspective. *Saudi J Kidney Dis Transpl* 2018;29(6):1441-5.
2. Bai Y, Tang Y, Deng L, Wang X, Yang Y, Wang J, Han P. Management of large renal stones: Laparoscopic pyelolithotomy versus percutaneous nephrolithotomy. *BMC Urol* 2017;17(1):1-9.
3. Sari S, Ozok HU, Cakici MC, Ozdemir H, Bas O, Karakoyunlu N, et al. A comparison of retrograde intrarenal surgery and percutaneous nephrolithotomy for management of renal stones 2 cm. *Urol J* 2017;14(1):2949-54.
4. Scotland KB, Rudnick B, Healy KA, Hubosky SG, Bagley DH. Retrograde ureteroscopic management of large renal calculi: a single institutional experience and concise literature review. *J Endourol* 2018;32(7):603-7.
5. Chung DY, Kang DH, Cho KS, Jeong WS, Jung HD, Kwon JK, et al. Comparison of stone-free rates following shock wave lithotripsy, percutaneous nephrolithotomy, and retrograde intrarenal surgery for treatment of renal stones: a systematic review and network meta-analysis. *PloS One* 2019;14(2):e0211316.
6. Nielsen TK, Jensen JB. Efficacy of commercialized extracorporeal shock wave lithotripsy service: a review of 589 renal stones. *BMC Urol* 2017;17(1):1-5.
7. Wang CJ, Huang SW, and Chang CH: Indications of stented uncomplicated ureteroscopic lithotripsy: a prospective randomized controlled study. *Urol Res* 2012;37(2):83-8.
8. Ghani KR, Andonian S, Bultitude M, Desai M, Giusti G, Okhunov Z, et al. Percutaneous nephrolithotomy: update, trends, and future directions. *Europ Urol* 2016;70(2):382-96.
9. Kukreja RA. Should mini percutaneous nephrolithotomy (MiniPNL/Miniperc) be the ideal tract for medium-sized renal calculi (15– 30 mm)? *World J Urol* 2018;36(2):285-91.
10. Zeng G, Wan S, Zhao Z, Zhu J, Tuerxun A, Song C, et al, Jiang Z. Super-mini percutaneous nephrolithotomy (SMP): a new concept in technique and instrumentation. *Br J Urol* 2016;117(4):655-61.
11. Ferakis N, Stavropoulos M. Mini percutaneous nephrolithotomy in the treatment of renal and upper ureteral stones: Lessons learned from a review of the literature. *Urol Ann* 2015;7(2):141-6.
12. Wright A, Rukin N, Smith D, De la Rosette J, Somani BK. ‘Mini, ultra, micro’—nomenclature and cost of these new minimally invasive percutaneous nephrolithotomy (PCNL) techniques. *Therap Adv Urol* 2016;8(2):142-6.
13. Guddeti RS, Hegde P, Chawla A, de la Rosette JJ, Laguna Pes MP, Kapadia A. Super-mini percutaneous nephrolithotomy (PCNL) vs standard PCNL for the management of renal calculi of < 2 cm: a randomized controlled study. *Br J Urol Int* 2020;126(2):273-9.
14. Rahman M, Hoque MM, Karim KM, Bari AA, Rahman T, Asad A. Tract size in percutaneous nephrolithotomy (PCNL): does it matter? *Chattagram Maa-O-Shishu Hosp Med Coll J* 2019;18(2):18-22.
15. Zilberman DE, Lipkin ME, de la Rosette JJ, Ferrandino MN, Mamoulakis C, Laguna MP, et al. Tubeless percutaneous nephrolithotomy--the new standard of care? *J Urol* 2010; 184: 1261-6.
16. Aghamir SM, Hosseini SR, Gooran S: Tubeless percutaneous nephrolithotomy. *J Endourol*. 2004; 18: 647-8.
17. Limb J, Bellman GC. Tubeless percutaneous renal surgery: review of first 112 patients. *Urol* 2002;59: 527-31.
18. Karami H, Jabbari M, Arbab AH. Tubeless percutaneous nephrolithotomy: 5 years of experience in 201 patients. *J Endourol* 2007; 21:1411-3.
19. Shah HN, Sodha HS, Khandkar AA, Kharodawala S, Hegde SS, Bansal MB. A randomized trial evaluating type of nephrostomy drainage after percutaneous nephrolithotomy: small bore v tubeless. *J Endourol* 2008;22: 1433-9.
20. Jou YC, Cheng MC, Lin CT, Chen PC, Shen JH. Nephrostomy tube-free percutaneous nephrolithotomy for patients with large stones and staghorn stones. *Urol* 2006;67: 30-4.
21. Michel MS, Trojan L, Rassweiler JJ: Complications in percutaneous nephrolithotomy. *Eur Urol* 2007; 51: 899-906.
22. Skolarikos A, de la Rosette J. Prevention and treatment of complications following percutaneous nephrolithotomy. *Curr Opin Urol* 2008;18:229-34.
23. Aron M, Goel R, Kesarwani PK, Gupta NP. Hemostasis in tubeless PNL: point of technique. *Urol Int* 2004;73:244-7.
24. Noller MW, Baughman SM, Morey AF, Auge BK. Fibrin sealant enables tubeless percutaneous stone

- surgery. *J Urol* 2004;172: 166-9.
25. Cormio L, Perrone A, Di Fino G, Ruocco N, De Siati M, de la Rosette J, et al. TachoSil® sealed tubeless percutaneous nephrolithotomy to reduce urine leakage and bleeding: outcome of a randomized controlled study. *J Urol* 2012;188: 145-50.
  26. de la Rosette J, Assimos D, Desai M, Gutierrez J, Lingeman J, Scarpa R, et al. The Clinical Research Office of the Endourological Society Percutaneous Nephrolithotomy Global Study: indications, complications, and outcomes in 5803 patients. *J Endourol* 2011;25:11-7.
  27. Shah HN, Kausik V, Hedge S, Shah JN, Bansal MB. Initial experience with hemostatic fibrin glue as an adjuvant during tubeless percutaneous nephrolithotomy. *J Endourol* 2006;20:194–198.
  28. Shen P, Liu Y, Wang J. Nephrostomy tube-free versus nephrostomy tube for renal drainage after percutaneous nephrolithotomy: a systematic review and meta-analysis. *Urol Int* 2012;88: 298–306.
  29. Gonulalan U, Cicek T, Istanbuluoglu O, Kosan M, Ozturk B, Ozkardes H. Tubeless percutaneous nephrolithotomy is effective and safe in short- and long-term urinary drainage. *Urolithiasis* 2013; 41: 341–346.
  30. Karami H, Gholamrezaie HR. Tubeless percutaneous nephrolithotomy in selected patients. *J Endourol* 2004;18:475–47.