

# Outcome and Complications of Mini Percutaneous Nephrolithotomy (PCNL) in the Treatment of Renal Calculi

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## ABSTRACT

**Objective:** To determine the outcome and complications of mini PCNL in the treatment of renal calculi.

**Study Design:** This is a cross sectional study.

**Place and Duration of Study:** This study was conducted at the Department of Urology in Shaikh Zayed Hospital, Lahore from September, 2019 to March, 2020.

**Materials and Methods:** A total 60 cases were included in this study after the approval of the study protocol from hospital ethical committee. All the patients presenting in the Department of Urology, Shaikh Zayed Hospital, fulfilling the inclusion criteria, will be included in the study after explaining and taking fully informed written consent. The mini-PCNL procedure was performed under general anesthesia. Post-operative complications and Outcomes (Stone Clearance, fall in Hemoglobin and Hospital stay) were noted which has been mentioned in the operational definition.

**Results:** Age distribution of the patients was done, it showed that 68.3% (n=41) patients were in age group of 18-40 years and 31.7%(n=19) in age of 41-60 years and mean age was 36.28±9.73 years. There were 46.7% (n=28) were male and 53.3%(n=32) were female. Stone clearance was in 85% (n=51) patients. Complications were present in 15% (n=9) patients.

**Conclusion:** We concluded that mini PCNL technique is good in stone clearance; drop in Hb level and hospital stay. There were little complications found in patients. But this study showed that mini PCNL is good procedure in treatment of renal calculi.

**Key Words:** Urinary Tract Stone, PCNL, Renal Calculi

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## INTRODUCTION

Deposition of mineral and salts leads towards the formation of kidney stones. They can have impact on any part of the urinary system. Kidney stones can get formulated when there is high concentration and mineral deposits in the blood.<sup>1</sup> Infact, recent estimates place the prevalence in the United States population at 10.6% for men and 7.1% for women. The risk of developing kidney stone increases with age.<sup>2</sup> Stones in the kidney can be painful but less damaging to the urinary system if they are diagnosed early.

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In case the diagnosis of the kidney stones becomes late then they may cause complications leading towards the renal surgery.<sup>3</sup> Anyhow, there are high chances of recurrence of kidney stones among male as compared to female cases. So it is proposed that prophylactic management is necessary for the management of urolithiasis.<sup>4</sup>

In order to detect the kidney stones, most commonly ultrasonography is carried out in the suspected cases, but it is also true that non-contrast CT of pelvic is also considered on a larger scale to rule diagnosis the kidney stone.<sup>5</sup> For further confirmation, a radiographic image of kidney, uerter and bladder followed CT scan helps for follow up of the cases. Alternatively, Ct can be repeated as it has the same diagnostic accuracy as of KUB and hence could be an alternative if in initial scan there is suspicion of the kidney stone. The non-contrast CT is the cornerstone of initial radiographic assessment.<sup>6</sup> Stones diseases are common in population still there are only few studies that discussed about its expense to benefit ration of surgical procedure. So studies are needed as there are various treatment methods opted for treating the various stone sizes including ureteroscopy, lithotripsy. It is good practice to use PCNL for stones size of large sizes. While the

single/multiple stage URS can be used for treatment of smaller or stones located in the ureter.

There are limited studies regarding the cost-effectiveness of surgical treatment options for stone disease. Such data would be welcome given the manifold treatment options for stones of various sizes in various positions in the urinary tract [i.e., ureteroscopy, shock wave lithotripsy and Percutaneous Nephrolithotomy]. For instance, while PCNL is preferred for large renal stones, intermediate size renal stones can be treated with single or multi-stage URS; also clinical guidelines support use of either SWL or URS for most ureteral or smaller renal stones.<sup>7</sup> The 2016 guidelines made by European Association of Urology indicates that PCNL should be used as first-line treatment of kidney stones that larger than 2.0cm, in case PCNL is not an option and for stones smaller than 2.0cm, PCNL is recommended.<sup>8</sup> The stone clearance rate of mini PCNL was 79.3% and complication rate was 51%.<sup>9</sup> The primary stone-free rate was (90.8%). It was observed that calve in grade III type complication was present in 5.2% but none of the cases was reported with grade IV or V.<sup>10</sup> In another study it was noted that stone clearance was 94%, mean duration of hospital stay was 2±1.5 days and complication grades were I,II,III in 1(33.3%) of the cases.<sup>11</sup> Mean drop in Hb was 1.15±1.08mg/dl<sup>12</sup> and mean hemoglobin drop (g/dL)0.6±0.68 in another study.<sup>13</sup>

**MATERIALS AND METHODS**

A total 60 cases will be included in this study after the approval of the study protocol from hospital ethical committee. All the patients presenting in the Department of Urology, Shaikh Zayed Hospital, fulfilling the inclusion criteria, will be included in the study after explaining and taking fully informed written consent. The mini-PCNL procedure will be performed under general anesthesia. Post-operative complications and outcomes (stone clearance, fall in hemoglobin and hospital stay) will be noted which has been mentioned in the operational definition.

**RESULTS**

Age distribution of the patients was done, it showed that 68.3%( n=41) patients were in age group of 18-40 years and 31.7%(n=19) were in age group of 41-60 years. Mean and standard deviation of age was calculated as 36.28±9.73 years (Table 1).

**Table No.1: Age distribution of patients (n=60)**

Age (years)	No.	%
18-40	41	68.3
41-60	19	31.7
Mean±SD	36.28 ± 9.73	

**Table No. 2: Sex distribution of patients**

Sex	No.	%
Male	28	46.7
Female	32	53.3

**Table No.3: Descriptive statistics of stone clearance**

Stone clearance	No.	%
Yes	51	85.0
No	9	15.0

**Table No.4: Descriptive statistics of complications**

Complications	No.	%
Yes	9	15.0
No	51	85.0

**Table No.5: Descriptive statistics of hospital stay and drop in Hb level**

Variables	Mean±SD
Drop of HB level (mg/dl)	1.13±0.36
Hospital stay (days)	3.95±1.56

**Table No.6: Stratification for stone clearance with respect to age, gender and duration of renal stone using Chi-square test**

		Stone clearance		P value
		Yes	No	
Age group	18-40	36 (60%)	5 (8.3%)	0.371
	41-60	15 (25%)	4 (6.7%)	
Gender	Male	23 (38.3%)	5(8.3%)	0.562
	Female	28 (46.7)	4(6.7%)	
Duration of renal stone	1-5 yrs	40 (66.7%)	8(13.3%)	0.470
	>5 yrs	11 (18.3%)	1(1.7%)	

**Table No.7: Stratification for hospital stay with respect to age, gender and duration of renal stone using t-test**

		Hospital Stay	P value
		Mean±SD	
Age group	18-40 yrs	3.93±1.58	0.868
	41-60 yrs	4±1.563	
Gender	Male	3.64±1.61	0.157
	Female	4.22±1.49	
Duration of renal stone	1-5 yrs	4.08±1.57	0.190
	>5 yrs	3.42±1.50	

**Table 8: Stratification for drop in Hb level with respect to age, gender and duration of renal stone using t-test**

Variable		Hospital Stay	P value
Age group	18-40 yrs	1.10±0.37	0.35
	41-60 yrs	0.19±0.34	
Gender	Male	1.12±0.32	0.86
	Female	1.14±0.	
Duration of renal stone	1-5 yrs	.12±0.36	0.24
	>5 yrs	1.15±0.35	

There were 46.7% (n=28) were male and 53.3% (n=32) were female (Table 2). Stone clearance was in 85% (n=51) patients (Table 3). Complications were present in 15% (n=9) patients (Table 4). The data was stratified for age, gender and duration of renal stone of the patients (Table 6-8) respectively.

## DISCUSSION

Kidney stones are usually detected in renal papillae weather attached of free consisting of mineral deposition. Parenchymal calcification in the diffuse renal is called nephrocalcinosis.<sup>14</sup> In current study we found that, age distribution of the patients was done, it showed that 68.3% (n=41) patients were in age group of 18-40 years and 31.7% (n=19) were in age group of 41-60 years with mean and standard deviation of age was calculated as  $36.28 \pm 9.73$  years. There were 46.7% (n=28) were male and 53.3% (n=32) were female. In current study out of 60 patients, stone clearance was in 85% (n=51) patient. Complications were present in 15% (n=9) of the patients. In this study mean drop of Hb level was  $1.13 \pm 0.36$  mg/dl and mean hospital stays was  $395 \pm 1.56$  days.

The 2016 guidelines made by European Association of Urology indicates that PCNL should be used as first-line treatment of kidney stones that larger than 2.0cm, in case PCNL is not an option. And for stones smaller than 2.0cm, mPCNL is recommended.<sup>8</sup> Another study found that the stone clearance rate of mini PCNL was 79.3% and complication rate was 51%.<sup>9</sup> The primary stone-free rate was (90.8%), the total complication rate was (26.9%) and calve in grade III complications occurred in 5.2% of all patients, and no grade IV or V complications were observed.<sup>10</sup> In another study it was noted that stone clearance was 94%, mean duration of hospital stay was  $2 \pm 1.5$  days and complication grades were I,II,III in 1(33.3%) of the cases.<sup>11</sup> Mean drop in Hb was  $1.15 \pm 1.08$  mg/dl<sup>12</sup> and mean hemoglobin drop (g/dL)  $0.6 \pm 0.68$  in another study.<sup>13</sup>

On evaluation, it was found that about 70-80% of the entire composition of the kidney stone is consisted of calcium oxalate and calcium phosphate. Remaining 20% part of the renal stone found to be consisted on struvite and ureic acid with few minerals exception of drug related stones. Struvite stones has high concentration in female while among male common extraction is calcium and uric acid as per composition of the renal stone is concerned. It is the calcium urate or phosphate that combines with the calcium oxalate for the emergence of the renal stone.<sup>15-19</sup> On evaluation of the epidemiological data extracted from various nations, a collective 114-720 per 100,000 individuals and prevalent of 1.7%-14.8% are noted that are further observed on a rise.<sup>20</sup>

In National Health and Nutrition Examination Survey, results showed that in United States there was prevalence of the kidney stones increased three times

from 1876-1980 to 2007-2010 which was 3.2% to 8.8%.<sup>14</sup> The lifetime prevalence of kidney stones in the United Kingdom increased by 63% (7.14–11.62%) between 2000 and 2010.<sup>14</sup> According to the updated European Association of Urology guidelines, ESWL can be harmful in some cases when stone sizes are larger, so it is recommended that PCNL could be opted as method of choice for removal of such stones even when they are present in the lower renal pole. Till date it was observed that PCNL has the efficacy in terms of removal of stone in 76% to 98%.

Percutaneous nephrolithotomy is still a challenging surgical technique and can be associated with significant complications that may compromise its efficacy. A randomized prospective trial evaluated the efficacy and safety of tubeless (JJ stent but no nephrostomy drainage tubes) versus conventional mini-PCNL (JJ stent and drainage tubes). There were no significant differences in operation time, stone clearance and complications. Less postoperative pain and consequently less need for analgesia were also confirmed in the group of patients who underwent tubeless (JJ stent but no nephrostomy tubes) mini-PCNL in a prospective comparative study. The morbidity of JJ-stents, however can be significant. Stent related discomfort is reported in 39% of patients. However, another modified procedure of PCNL which is called mini-PCNL is also effective in terms of less intraoperative blood loss, lesser pain and less hospital stay as small sheaths are used in this procedure. A research has evaluated that mini-PCNL is more effective as compared to conventional procedure as it results in the lower drop in Hb (0.53gdl & 0.8g/dl vs. 0.97g/dl & 1.3g/dl) so lower rate in of blood transfusion (1.4% vs 10.4%). Similarly, consumption of analgesia is also lower in the mini PCNL group as compared to other (55.4 vs 70.2g). Furthermore, mini-PCNL is also have impact on the early discharge of the cases (3.8 days and 3.2 days vs. 6.9 days and 4.8 days respectively). Although, mini-PCNL has not a proven clear advantage over the conventional procedure in terms of lower invasiveness, it remains a safe method.<sup>21</sup>

## CONCLUSION

We concluded that mini PCNL technique is good in stone clearance; drop in Hb level and hospital stay. There were little complications were found in patients. But this study showed that mini PCNL is good procedure in treatment of renal calculi.

### Author's Contribution:

Concept & Design of Study: Jawad Akbar  
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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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