



RISK FACTORS ASSESSMENT FOR MODERATE TO SEVERE POSTOPERATIVE PAIN AFTER PERCUTANEOUS NEPHROLITHOTOMY : A PROSPECTIVE STUDY

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ABSTRACT **Objective:** To find out Risk Factors for Moderate to Severe Post Operative Pain after Percutaneous Nephrolithotomy. **Materials And Methods:** We Concluded a prospective study in a tertiary care hospital at Govt. Medical College, Kota (Raj.) between January 2022 to February 2023 in 176 patients with Renal calculus in whom PCNL was done (10 patients were excluded as they were unable to provide VAS score properly). Data collection was performed for age, gender, diameter of renal calculus, number of renal calculi, pre-operative urine culture, number of tracts, operative time, postoperative pain and VAS pain score. Pain intensity was assessed with VAS scoring system every 4 hr on POD-0. Patients categorised into 2 groups according to VAS pain score: GROUP A- mild or no pain (VAS score, 0–3) and GROUP B - moderate (4-6) to severe pain (7–10). **Results :** 112 (67.46 %) patients out of 166 had moderate- to-severe pain . Significant difference in Diameter of renal calculus, Number of renal calculi , operative time and number of tracts were seen using Chi-Square test. Multivariate logistic regression analysis showed that the independent risk factors for Moderate to Severe postoperative pain after PCNL were diameter of renal calculus (P = 0.001), number of renal calculi (P < 0.01), operative time (P < 0.01) and number of tracts (P = 0.032). **Conclusions:** Diameter of renal calculus, Number of renal calculi, Number of tracts and Operative time are significant predictors of Moderate to Severe postoperative pain after PCNL. Early identification of risk factors and formulating preventive measures are essential to control postoperative pain and to improve patients' quality of life.

KEYWORDS : Visual Analog Scale (VAS) Score , Percutaneous Nephrolithotomy (PCNL)

INTRODUCTION:

PCNL has become surgery of choice for renal stones 2 cm or larger, since its first description in 1976[1]. PCNL has proven to be an efficacious treatment for large and staghorn stones, stones in kidneys with abnormal anatomy and stones in complicated patient groups with stone-free rates from 75% to 95% [2-6]. Complications ranges from 16% to 83% (major complications around 4.7%).

PCNL is a minimally invasive procedure for removing renal calculi, though a large number of patients experience acute moderate-to-severe post-operative pain .

Pain intensity was assessed at 30 min after extubation and then every 4 hourly on POD-0. According to VAS score, patients were divided into 2 groups: GROUP A - mild or no pain group (VAS score, 0–3) and GROUP B - moderate (4-6)-to-severe (7-10) pain group . Pre-operative-, peri-operative- and post-operative data were collected and analyzed. The indicators with statistical significant differences were studied and multivariate logistic regression analysis was used to find the risk factors for postoperative pain after PCNL.

Substantial action for postoperative opioid consumption may be required, as pain can be associated with severe postoperative somatosensory and visceral pain [7].

If postoperative pain is not alleviated in time, consequences can be delayed ambulation , pulmonary dysfunction, prolonged hospitalization and increased cost of treatment [8]. More importantly, pain may be converted from acute to chronic which has its implication on quality of life of patient.

The present study aims to provide a novel perspective to improve clinical outcomes by identifying the Risk Factors for postoperative pain after PCNL.

MATERIALS AND METHODS:

A prospective study has been carried out in a tertiary care hospital at

Govt. Medical College, Kota (Raj.) between January 2022 to February 2023 in 176 patients with Renal calculus in whom PCNL was done. 10 patients were excluded as they were unable to provide VAS score properly.

Informed written consents were taken from all patients included in the study.

All patients were assessed preoperatively and baseline demographic parameters were recorded. In addition to routine investigations; Plain and CECT Abdomen and pelvis was done for all the patients.

Data collection was performed for age, gender, diameter of renal calculus, pre-operative urine culture, number of tracts, operative time, number of renal calculi, postoperative pain and VAS pain score.

Inclusion criteria for the study are as follows:

- (1) patients posted for elective PCNL under general anesthesia
- (2) patients from 18 to 70 years of age

Exclusion criteria for the study are :

- (1) Patient who did not give consent
- (2) History of ipsilateral renal stone surgery;
- (3) severe cardiac and pulmonary insufficiency and coagulation disorders;
- (4) spinal deformity or history of prior spinal cord surgery;
- (5) neurological disorders, psychiatric disorders or any substance abuse
- (6) Simultaneous Bilateral Procedure

Surgical Technique

PCNL were performed under General Anaesthesia. Five French ureteral catheter was placed in ipsilateral pelvicalyceal system by cystoscopy or ureteroscopy in lithotomy position under fluoroscopic guidance. All PCNL done in prone position, puncture made using bull's eye technique under fluoroscopic guidance using 18 gauze initial puncture needle after retrograde PCS opacification via ureteral catheter. Tract dilatation (upto 24/26 fr) was done by using Alken's telescopic dilators . Nephroscopy were done with a 22 French rigid nephroscope. Large stones were fragmented with pneumatic

lithotripter. Small stones and fragments were removed with forceps. The exit strategy was standard with 20/24 Fr PCN tube. Intraoperative variables studied included operative time and number of the tracts.

Evaluation Of Pain

Patient pain was assessed using VAS scoring system. It is a standard and verified 10-point scale for pain self-report, in which score of '0' represents no pain and score of '10' represents the highest pain level. VAS scores were assessed at 30 min immediately after extubation, followed by every 4 hourly on POD-0.

When patient complained of moderate to severe pain, Tramadol (50 mg IV) was given under our protocol.

No major intra or post-operative complication were reported in our study.

Statistical Analysis

Clinical variables are compared and Factors potentially predictive of Post-operative Pain after PCNL including patient age, gender, diameter of renal calculus, pre-operative urine culture, number of tracts, operative time, number of renal calculi, postoperative pain and VAS pain score were determined by the Chi-Square test. Receiver-operating characteristic (ROC) curve analysis was used. Quantitative data were expressed as mean +/- standard deviation (x +/- s).

P-values <0.05 are considered statistically significant.

RESULTS

In the present study, a total of 176 patients were included in whom PCNL was done (10 patients were excluded as they were unable to provide vas score properly). Among them, 106 were Male and 60 were Female. 112 (67.46%) patients had moderate- to-severe pain and 54 (32.54%) patients had mild or no pain. The results showed that number of renal calculi (P < 0.01), diameter of renal calculus (P < 0.01), operative time (P < 0.01) and number of tracts (P = 0.032) were significantly different between two groups (Table 1). Multivariate logistic regression analysis showed that independent risk factors for postoperative pain after PCNL included diameter of renal calculus (P = 0.001), number of renal calculi (P < 0.01), operative time (P < 0.01) and number of tracts (P = 0.032).

Table 1. Baseline Demographic Variables And Outcome

	GROUP A Mild or no pain group (n = 54)	GROUP B Moderate to severe pain group (n = 112)	p
Gender			0.687
Female	20 (33.3%)	30 (66.6%)	
Male	34 (32.1%)	72 (67.9%)	
Age (years, mean +/- SD)	41.24 +/- 11.10	40.72 +/- 11.98	
Renal calculus diameter (mm, mean +/- SD)	13 +/- 1.5	25 +/- 5	< 0.01
Preoperative urine culture			0.417
Negative	36 (34.7%)	68 (65.3%)	
Positive	18 (28.1%)	44 (70.9%)	
Number of Tracts			0.032
1	46 (41.9%)	64 (58.1%)	
2	8 (14.3%)	48 (85.7%)	
Duration of surgery (min, mean +/- SD)	48.75 +/- 15.42	80.7 +/- 19.8	<0.01
Number of renal calculus			<0.01
1	28 (77.7%)	8 (22.3%)	
>1	26 (20%)	104 (80%)	

DISCUSSION

According to EAU guidelines, PCNL is the first-line treatment for large (> 2 cm), inferior calyx and multiple renal calculi [8]. PCNL is an invasive procedure with reported complication rate of up to 83% [9] and major complication rates of about 4.7% [3,4,12-15].

There is global increase in incidence of renal stones in all age groups due to changed dietary habits and global warming [16].

To the best of our knowledge, At present, there are not many reports

about causes and risk factors of pain after PCNL. Haotian et al. showed that incidence of moderate-to-severe pain after PCNL was around 66.7% [17]. In our study, incidence of moderate-to-severe pain after PCNL was around 67.4%.

Large calculi or large stone burdens may prolong operation time, which can lead to perfusion fluid imbalance and increase of internal pressure of renal pelvis. Higher internal pressure of renal pelvis, release of bacteria and toxins (after stone crushing associated with lavage) into peripheral vascular and lymphatic vessels of renal pelvis and renal pelvis venous reflux into the blood, increases the risk of infection and leads to the release of cellular mediators, causing pain [18].

Postoperative pain after PCNL may be due to percutaneous access tract through the parenchyma and parenchymal shearing, renal pelvic pressure, visceral pain mainly due to autonomic nerve reaction and flank pain caused by indwelling nephrostomy tube [9-11].

Pain may originate from renal capsule, muscle, subcutaneous tissues, and skin [19].

Main causes of acute postoperative pain after PCNL were visceral pain from kidneys and ureters and body surface pain from incisions according to anatomical studies. Origin of renal pain is from T10-L1 spinal nerve, and ureteral pain from T10-L2 spinal nerve. However, incisions and pathways are typically formed below the 12th rib or in between the 11th and 12th ribs, where a cutaneous innervation is mainly undertaken by T10-11. Post-operative pain may also be aggravated due to renal puncture and dilatation, peritubular compression of renal cortex and dilation of renal capsule.

Our study has some limitations –

1. Pain intensity was examined using a self-reported scale and as threshold of tolerance varied from person to person, results might get affected.
2. Further multi-center studies with large sample size required to obtain more accurate clinical data for in-depth analysis.

CONCLUSION

We concluded from this study that Diameter of renal calculus, number of renal calculi, number of tracts and operative time were significant predictors of moderate to severe postoperative pain after PCNL. Early identification of risk factors for postoperative moderate-to-severe pain after PCNL and formulating preventive measures are essential to control postoperative pain and to improve patients' quality of life.

CONFLICT OF INTEREST: None.

INFORMED CONSENT: Informed written consent was obtained from all participants included in study.

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