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Research Article

FREQUENCY OF SUCCESS OF PERCUTANEOUS NEPHROLITHOTOMY (PCNL) PROCEDURE IN PATIENTS WITH RENAL CALCULI

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Abstract:

Objective: To assess the frequency of success of Percutaneous Nephrolithotomy (PCNL) procedure in patients with renal calculi

Patients and Methods: This six months case series study was conducted in department of Urology at Liaquat University of Medical and Health Sciences Jamshoro. All patients of either gender having age 18 to 50 years presented with stone size 2-5 cm in size were enrolled. Under fluoroscopy guidance, percutaneous puncture was made in renal pelvic-calyces system and highlighted with contrast under C-arm. Puncture tract was dilated under fluoroscopy and working sheath was placed. Then with the help of Nephroscope stone was visualized and fragmented with pneumatic lithoclast and retrieved with forceps. Patient was followed after 1 week with X-ray KUB and u/s KUB for residual stones. Patient with no stone on ultrasound and x-ray was labeled as success.

Results: Mean age of the patients was 40.38 ±7.09 years. There were 68 (58.10%) males and 49 (41.90%) females. Mean BMI of the patients was 27.19 ±5.11Kg/m² while mean size of the stone was 3.10 ±0.98cm Frequency of success was found 109 (93.20%) patients.

Conclusion: Frequency of success of Percutaneous Nephrolithotomy (PCNL) procedure founds higher in participant patients with renal calculi

Keywords: Success, Percutaneous Nephrolithotomy (PCNL), Renal Calculi

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INTRODUCTION:

Urolithiasis is a significant source of morbidity for our population which affects national health cost in billions of rupees annually; literature report that 10-15% estimated Pakistani population is suffering from renal disease. [1] Renal stone if untreated can lead to urinary tract infection, obstructive uropathy and finally end stage renal disease. Kidney stone can be treated by Shockwave lithotripsy (SWL), Percutaneous Nephrolithotomy (PCNL), Open Surgery and/ or combination of above. [2] In one study the success rate of percutaneous nephrolithotomy was 99.3% and 90.2% in patients with simple and complex stones, overall success rate of 94.9% was achieved. [3] Seventy one percent stone free rate was achieved by Rana AM, using PCNL as monotherapy in single sitting which improved to 97% when combined with SWL [4]. Percutaneous Nephrolithotomy was first introduced in 1976 as less invasive procedure for large and complex renal calculi of 2cm and larger in size. But introduction of SWL in early 1980 changed the trend towards noninvasive method. With advancement in radiology and endoscopic urology PCNL is the treatment option of choice for most of the renal stones [5]. Percutaneous Nephrolithotomy can also be applied to stone in calyceal diverticulum, horseshoe kidney, transplanted kidney and in children. Potential advantages include less hospital stay with lower cost, lower discomfort and complication rate [6, 7]. Main complications of Percutaneous Nephrolithotomy are bleeding, transfusion, extravasation, injury to adjacent organs, post-operative pyrexia, leakage from nephrostomy tube site, urinary tract infection, puncture site wound infection and residual stones [8]. Moreover, this minimally invasive approach offers the benefits of decreased blood loss, better cosmetic results as well as early return to work. Percutaneous Nephrolithotomy can be performed in diverse group of patients with co-morbid conditions and renal abnormalities [9]. Most patients with kidney stone disease and renal insufficiency experience improvement or stabilization of renal function after PCNL [10]. The frequency of success rate of percutaneous nephrolithotomy in patients with renal stones was 94.9% [3]. With this background we rationalized this study estimated the success of percutaneous nephrolithotomy in the clearance of renal stones in our population as literacy and skills in our part of the world are much less than developed countries. Hence this study helps and provides evidence for step forward towards the minimal invasive approach.

PATIENTS AND METHODS:

This six months case series study was conducted in department of Urology at Liaquat University of Medical and Health Sciences Jamshoro and focused on the frequency of success of Percutaneous Nephrolithotomy (PCNL) procedure in participant patients with renal calculi. The inclusion criteria were either gender, age 18 to 50 years and the stone size 2-5 cm in size on ultrasonography and intravenous urography (IVU) while The exclusion criteria were patients with coagulation disorders like hemophilia assessed on history confirmed by physicians, end stage renal disease (glomerular filtration rate (GFR) of 15 ml/min or less), pregnancy (Female) urine report showing beta HCG positive, morbid obesity ($BMI \geq 40 \text{ kg/m}^2$), congenital renal anomalies like renal agenesis renal dysgenesis congenital renal hypoplasia, pulmonary disorders like COPD including chronic bronchitis, emphysema, Renal Stone size less than 2 cm or more than 5 cm and the culture proven urinary tract infection. All the patients fulfilling the inclusion criteria presenting in urology department with signs and symptoms of renal calculi and diagnosed on ultrasonography and IVU was enrolled for the study. Patients was informed about the purpose of study, steps of PCNL procedure, its merits and demerits and possible complications. Patient's safety was ensured before any intervention. Informed written consent was taken and patient was evaluated for coagulation profile, hemoglobin level, serum creatinine and urine for culture (BHCG in fertile female to exclude pregnancy). Percutaneous Nephrolithotomy was performed under general anesthesia by experienced and qualified Urologist having more than 5 years experienced, first cystoscopic guided ureteral catheter was placed under lithotomy position then patient's position was changed to prone position. Under fluoroscopy guidance, percutaneous puncture was made in renal pelvic-calyces system and highlighted with contrast under C-arm. Puncture tract was dilated under fluoroscopy and working sheath was placed. Then with the help of Nephroscope stone was visualized and fragmented with pneumatic lithoclast and retrieved with forceps. Once stone was cleared completely, 16 French nelaton was retrained in PCNL tract and removed on 1st post-operative day. Patient was discharged on 2nd postoperative day after Foley's catheter removal. Patients' demographic data, was collected on the proforma by principal investigator. Patient was followed after 1 week with X-ray KUB and u/s KUB for residual stones. Patient with no stone on ultrasound and x-ray was labeled as success.

Success of Percutaneous Nephrolithotomy: absence of echogenic mass (stone) on ultrasound was labeled as success

Renal Stone (Calculi): Presence of echogenic mass (stone) in the kidney assessed on ultrasound was labelled as renal stone.

The data was entered, cleaned and analyzed with the help of statistical package for social sciences (SPSS) version 17. Means and standard variation was calculated like variables age, BMI and size of stone. Gender, comorbid conditions like HTN, DM and success (stone clearance) was measured in

proportion. Effect modifiers like age, gender, BMI, size of stone, HTN, DM was stratified. Post stratification, Chi-square test was applied for statistical difference in the outcome. Significance level was set at $p\text{-value} \leq 0.05$.

RESULTS:

Mean age of the patients was 40.38 ± 7.09 years (Table 1). Majority of the patients 65 (55.60%) were presented with >35 years of age (Table 2) while the frequency of success was found 109 (93.20%) patients (Table 3).

Table 1: Age of the Patients n=117

Age of the patients (in years)	Mean \pm SD	Minimum	Maximum
	40.38 \pm 7.09	32	50

Table 2: Comparison of Age with Success n=117

Age (in years)	Success		Total	p-value
	Yes	No		
≤ 35	50 (45.9)	2 (25)	52 (44.4)	0.297
>35	59 (54.1)	6 (75)	65 (55.6)	
Total	109 (100)	8 (1000)	117 (100)	

Table 3: Comparison of Gender with Success n=117

Gender	Success		Total	p-value
	Yes	No		
Male	65 (59.6)	3 (37.5)	68 (58.1)	0.277
Female	44 (40.4)	5 (62.5)	49 (41.9)	
Total	109 (100)	8 (1000)	117 (100)	

DISCUSSION:

Renal stone if untreated can lead to urinary tract infection, obstructive uropathy and finally end stage renal disease. Kidney stone can be treated by Shockwave lithotripsy (SWL), percutaneous Nephrolithotomy (PCNL), open surgery and/ or combination of above [11-13]. In one study the success rate of percutaneous nephrolithotomy was 99.3% and 90.2% in patients with simple and complex stones, overall success rate of 94.9% was achieved [3]. Seventy one percent stone free rate was achieved by Rana AM, using PCNL as monotherapy in single sitting which improved to 97% when combined with SWL [4]. Percutaneous Nephrolithotomy was first introduced in 1976 as less invasive procedure for large and complex renal calculi of 2cm and larger in size. But introduction of

SWL in early 1980 changed the trend towards non invasive method. With advancement in radiology and endoscopic urology PCNL is the treatment option of choice for most of the renal stones [5]. Percutaneous Nephrolithotomy can also be applied to stone in calyceal diverticulum, horseshoe kidney, transplanted kidney and in children [14]. Potential advantages include less hospital stay with lower cost, lower discomfort and complication rate [15]. Main complications of Percutaneous Nephrolithotomy are bleeding, transfusion, extravasation, injury to adjacent organs, post-operative pyrexia, leakage from nephrostomy tube site, urinary tract infection, puncture site wound infection and residual stones [16]. In this study, frequency of success was found 109 (93.20%) patients. Similar results were found in a study in which frequency of success rate of

percutaneous nephrolithotomy in patients with renal stones was 94.9% [3]. Moreover, it was further revealed that stone location, but not the access point location, was the major determinant for success, which was 99.3 and 90.2% in patients with simple and complex stones, respectively ($p < 0.01$). Significant complications included bleeding necessitating blood transfusion in 28 (10.2%), and hydropneumothorax in 2 (0.7%) patients. Bleeding was observed in 39.1 and 7.5% of patients managed with supracostal access, and subcostal access, respectively ($p < 0.01$). An increased number of access points significantly augmented the risk for bleeding. Bleeding was encountered in 7.6% of patients managed with 1 percutaneous access point, and in 18.5% of cases managed with ≥ 2 access points ($p < 0.05$). Hydropneumothorax occurred in patients with supracostal access [3]

CONCLUSION:

Frequency of success of Percutaneous Nephrolithotomy (PCNL) procedure founds higher in participant patients with renal calculi

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