



**PERCUTANEOUS NEPHROLITHOTOMY IN GERIATRIC POPULATION-A SINGLE TERTIARY CENTER RETROSPECTIVE OBSERVATIONAL STUDY**

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**ABSTRACT**

**Introduction:** The geriatric stone population is not merely an extension of younger stone forming patients presenting at an older age but rather they commonly experience the first symptomatic stone episode de-novo later in life. This study aims to assess the preoperative parameters, Intraoperative parameters and postoperative complications of PCNL in Elderly patients above 60 years.

**Materials and Methods:** Observational study in 100 patients above the age of 60 years with large renal and upper ureteric calculus subjected to PCNL between october 2018 to october 2020 in a tertiary care center were evaluated and included based on the criteria as per study.

**Results:** In our study, the mean age among the group of patients who underwent study was 66 years with male predominance of 62%. Obstructive calculi with or without infection in 13% of patients. 3 patients underwent preoperative decompression. The major concern in elderly were the comorbidities with 60% T2DM, 44% SHTN, 8% CAD and 1% CKD. Mean stone size was 21.12± 12.2mm. Mean operative time was 91 minutes. Single tract used in almost 96% cases. 2% had gross hematuria. 12% had postoperative blood transfusion. 4% had post operative fever treated with antibiotics and 1% had Urosepsis. PCN site urine leak in 1% of patients treated conservatively. Initial stone free rate was around 92%. Mean hospital stay was 2.47 days.

**Conclusion:** In elderly patients, prevalence of renal stone disease is found to be higher in males and patients most commonly present with flank pain, followed by fever. The presence of renal stones with obstruction and/or associated infection causes deranged renal parameters which may require preoperative diversion in the form of either PCN insertion or DJ stenting, which helps in mitigating this problem. Age related co morbidities or age itself should not be considered as discouraging factor while selecting PCNL as treatment modality in elderly patients with renal stone disease.

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**INTRODUCTION**

The geriatric stone population is not merely an extension of younger stone forming patients presenting at an older age. Rather, geriatric patients commonly experience the first symptomatic stone episode de-novo later in life. The percutaneous renal surgery dates back to 1955, when a milestone was set by Goodwin[1] and colleagues who reported a Nephrostomy tube percutaneously for draining a hydronephrotic kidney. The percutaneous access for removal of renal stones was not established until 1976 when Fernstrom and Johannson[2] performed the first percutaneous nephrolithotomy (PCNL). The percutaneous era truly commenced in 1979 with the work of Smith [3], Alken and Clayman [4,5]. Since then, PCNL has developed with rapid strides as the procedure of choice for the management of large volume renal calculi. PCNL as the primary treatment of choice

has shown to produce stone free rates as high as 87%. Overall, the incidence of geriatric stone disease appears to be between 0.1% and 2%[6,7], and there is no evidence of an increased incidence of urinary stones with age.

The present study aims to assess the safety and efficacy profile of PCNL in the elderly population above the age of 60 years. Our institute is a tertiary care centre for urological problems. This region falls in the stone belt of India and has significant number of geriatric patients presenting with urolithiasis. Some of them come with obstructive uropathy or renal failure, urinary tract infection and associated complications. We therefore, thought to evaluate geriatric urolithiasis population for their nature of clinical presentations, associated problems effect on general health and the feasibility of subsequent management with PCNL, as this has become one of the major primary mode of treatment for urolithiasis

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today. This study assess the safety and efficacy of PCNL in elderly age group. The present-day literature lacks such studies in this age group, only few reports are available. So this study will enlighten and authenticate the feasibility and efficacy of PCNL in elderly patients of urolithiasis.

**Objectives**

1. To assess the stone free rate of PCNL in elderly patients and the rate of various complications of PCNL in the elderly patients
2. To evaluate the mode of presentation, Comorbidities, preoperative preparations in elderly patients

**METHODOLOGY**

This was a retrospective observational study done at 100 patients above 60 years of age who underwent PCNL from october 2018 to october 2020 at Department of Urology and Renal transplantation, SRIHER Chennai. Departmental approval and Ethical Board Review approval was taken prior to start of this academic work. Informed consent was taken from all the patients. Patients above the age of 60 years and who are having renal stone and upper ureteric stone were included in this study. Patients younger than 60years of age, who were having uncorrected coagulopathy, who were having stone size less than 1cm and who were unfit to do PCNL procedure were excluded from the study. Patients were initially diagnosed after taking full history and physical examination. Radiological investigation like NCCT KUB (Non Contrast Computed Tomography Kidney Ureter Bladder) to assess Stone size in cm (largest diameter), number of stones in which sum of the diameter is used and stone location was assessed. Once decision made for Percutaneous Nephrolithotomy (PCNL), a complete blood count (CBC), electrolytes, serum urea, creatinine and PT/APTT were done one day ahead of the PCNL procedure. Preoperatively one unit of blood was arranged after doing blood cross match and grouping. Patients having positive urine cultures were treated preoperatively with culture sensitive antibiotics. Various patient factors were recorded including age, gender, stone location. Intraoperative variables included site of entry, procedure time and type of postoperative drainage used. Postoperative end results including achieving status of patients being stone-free (SFS), residual fragments of stone, complications categorised on the basis of modified Clavian grading system. According to this classification, grades one and two account for insignificant minor complications and grades three and four represent major complications.

On general anesthesia, In lithotomy position 5 Fr Ureteric catheter was passed in the desired ureter up to renal pelvis and then patient turned to prone position. Under fluoroscopic guidance desired calyceal punctures were made using 18G diamond-tipped needle. Then percutaneous tract was broadened up to 26-30 Fr (using sequential metallic dilators). Stones were broken with pneumatic lithoclast and retrieved out using graspers. Double Jstent was placed in all patients. In case of need, nephrostomy tube was also placed (removed in 2-3 days). Double J stents were removed after 1-2 weeks if there was complete stone clearance or very small residual fragment were detected on X-ray KUB. Clinically insignificant residual fragments (CIRF) were determined to be those fragments which were less than 4mm in size. Auxillary procedures like RIRS, 2nd PCNL or ESWL will be planned based on the size of residual fragments

**RESULTS**

In the present study, in a series of 688 patients who underwent PCNL, 100 patients with age more than 60 years were studied and observed.

**Preoperative Parameters**

**Age Distribution**

Mean age among the group of patients who underwent study was 66 years. The youngest being 60 and the eldest being 85 years of age.

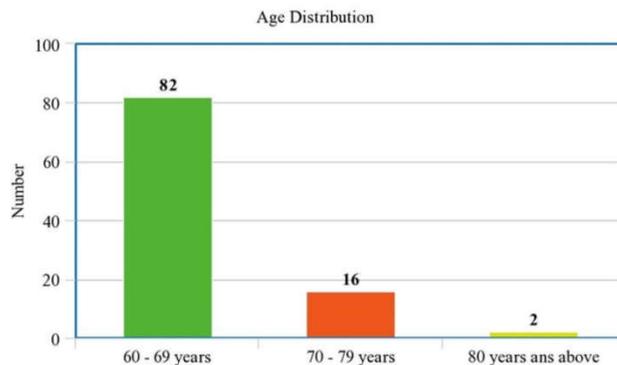


Figure 1 Age Distribution

**Sex Distribution**

In this study, out of total 100 patients 62 (62%) were male and 38 (38%) patients were female.

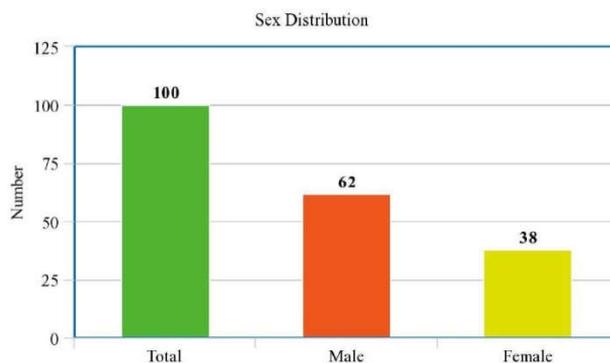


Figure 2 Sex Distribution

**Location of stones**

In this study, 35 stones were found in renal pelvis, 7 stones were in the middle calyx, 18 in the lower calyx, 2 stones in the upper calyx and 13 in proximal ureter. 15 patients (15%) out of the total 100 included in the study had either staghorn or partial staghorn calculi. 10 patients had multiple calculi at multiple locations.

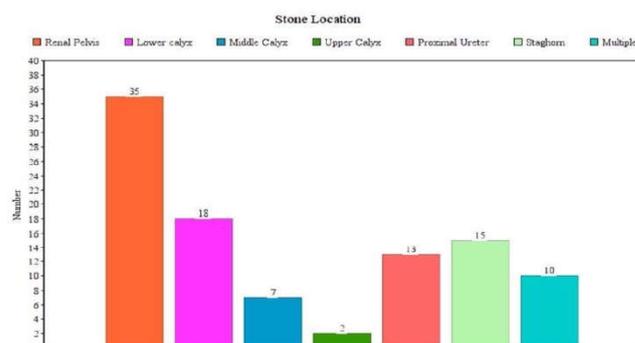


Figure 3 Stone Location

Number of patients with pre-operative PCN / DJ stent-13(13%) out of the total 100 patients who had infected system or obstructive symptoms, signs and with biochemical derangement were decompressed preoperatively either with PCN/ DJ Stent. 3 patients underwent pre-operative PCN insertion. Unilateral renal unit was stented in 5 patients, and rest of 5 patients underwent bilateral DJ stenting.

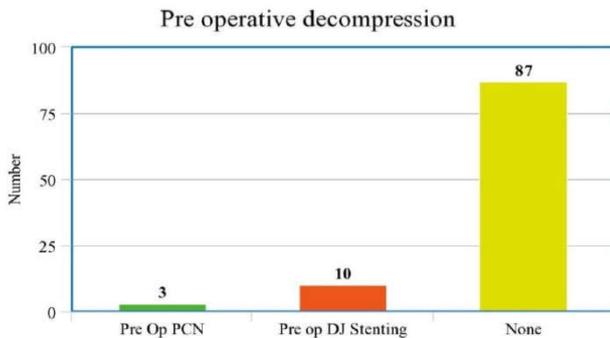


Figure 4 Pre-operative DJ stent/ PCN

**Laterality**

In this study 20 (20%) out of 100 had bilateral renal stones. Out of which 5 patients had bilateral staghorn calculus.

**Comorbidities**

In this study total 60 (60%) patients were diabetic and 44 (44%) patients had hypertension (33 patients had concurrent diabetes). 8 patients had coronary artery disease (CAD) and 1 was known case of chronic kidney disease (CKD).

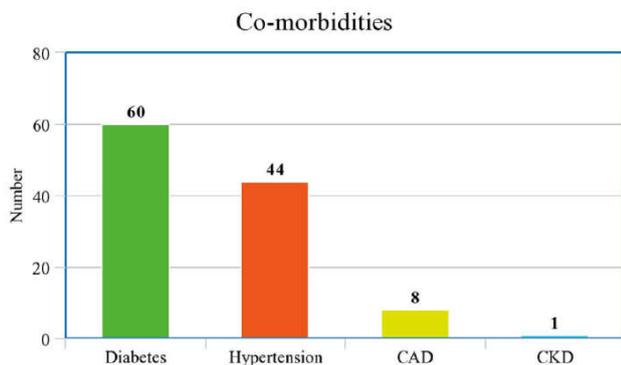


Figure 5 Co-morbidities

**Serum Creatinine**

12 (12%) out of the 100 patients had serum Creatinine values more than 1.5 mg/dl, for which 6 patients underwent pre-operative decompression. Out of 12 patients with raised serum creatinine value 8 patient had stone at Pelviureteric junction, which had obstructed the renal unit.

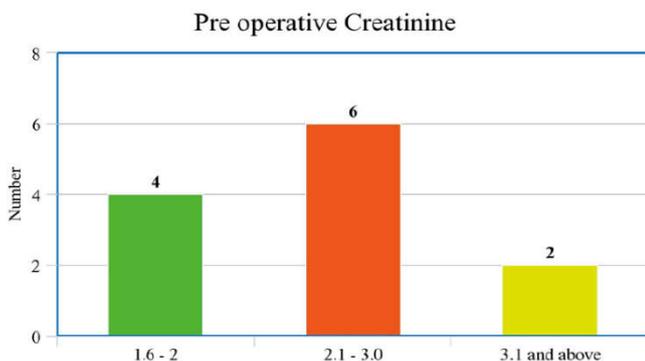


Figure 6 Serum Creatinine(pre-operative)

**Operative Parameters**

**Operating Time**

In our study, the mean operative time was 91 minutes, ranging from 50 minutes to 140 minutes.

Mean operative time (min)	91
Max. operative time (min)	140
Min. operative time (min)	50

**Number of tracts used**

In this study single tract was used in all cases except 4 in which multiple tracts were used.

**Number of supracostal/subcostal punctures**

Out of 100 patients, 9 (9%) required supracostal puncture/s while in 91 patients (91%) subcostal puncture/s were done.

**Drainage**

In the study, in all the patients DJ stent was kept on the operated side. In 44 patients, a nephrostomy tube was also kept, in 56 patients nephrostomy tube was not kept.

**Stone Free Rate**

In our study stone clearance was obtained in 92% of cases in a single stage, two stage procedure was performed in 2 (2%) cases. In 96 (96%) of cases a single tract was adequate for clearance, 4 (4%) needed two tracts for clearance.

**Hospital stay**

In this study mean hospital stay was 2.47 days ranging from 1.5 days to 10 days.

**DISCUSSION**

PCNL has become one of the standard of care for management of large renal and proximal ureteric calculi. PCNL has got excellent stone clearance rate of 89% to 92 % in various series.(9) Many large studies have documented the success, operative complications and outcome in the general population. Literature for elderly patient undergoing PCNL is still not that ample. There is less available data for elderly patients showing effect of co morbidities on the surgery; and for the outcome in patients with stones related renal failure. Due to high number of elderly patients having associated comorbid conditions, extra attention should be given perioperatively and during anaesthesia period as well [8]. The average age of the PCNL in elderly patients in various studies range from 65 to 82 years, in our study the average age was 65 years and there was no significant difference in age. Sahin *et al* [9] (2001) had a female preponderance in their study of about 61%. They had no particular explanation for the same. Our study showed male: female ratio of 1.6: 1.The incidence incidence of Renal stone in our study was 19.62% which is comparable to other study.

While most studies did not provide a detailed analysis of the symptoms on presentation, we found that, flank pain was the commonest symptom (86%), followed by fever (12%) and hematuria (06%). The average hemoglobin preoperatively in our study was 11.77 g/dl. Three patients required preoperative blood transfusion. Stoller *et al*[8] recommended all patients undergoing PCNL donate two units of autologous blood, but

we found this impractical in elderly because of significant heart disease, uncontrolled hypertension and anaemia.

Adem *et al*[12] reported that their study had a significantly larger stone burden among the geriatric patients when compared to non-geriatric group ( 10.08 ± 6.5 mm vs. 8.28 ± 5.54 mm). Our study had mean stone size of 21.12 ± 12.2 mm which is larger than most studies.

In our study 73 patients had co morbidities diabetes mellitus, hypertension, coronary artery disease and chronic kidney disease. Adequate preoperative stabilisation of co morbidities. Patient positioning must be undertaken carefully, poor muscle bulk and tone, osteoporosis and arthritic conditions put elderly at risk for dislocations, pressure related skin breakdown, and post-operative musculoskeletal pain. Also in old age higher chances of DVT and Pulmonary embolism and care must be taken to diagnose and avoid it.

Hossein *et al*[11] have accessed the calculi in their study by lower caliceal (LC) puncture in 40 (80%) of the cases, middle caliceal (MC) puncture in 8 (16%) of cases and superior caliceal (SC) puncture in 2 (4%) of cases. Most other studies do not give specific breakup of type of access to the pelvicalyceal system (PCS). In our study we accessed the PCS using LC puncture in 71 (71%), MC puncture in 20 (20%) and SC puncture in 9 (9%) of our cases. Review of other literatures did not produce detailed analysis of stages, tract dilatation, number of tracts. In our study stone clearance was obtained in 92% of cases in a single stage, two stage procedure was performed in 2 (2%) cases. In 96 (96%) of cases a single tract was adequate for clearance, 4 (4%) needed two tracts for clearance.

The main reasons for bleeding during PCNL which requires postoperative transfusion are higher average stone burden, multiple tracts, prolonged operative time, diabetes mellitus. Average stay Of 2.5 days which is mostly less than other studies (9,11). Short hospital stay is due to less usage of nephrostomy tubes, early removal of nephrostomy tube, Early mobilisation.

**Comparision**

Parameters	Other Studies	Our Study
Stone size	10.08+/-6.5 mm	21.12+/-12.2 mm
Number of tracts	1.05+/-0.2	1.02+/-0.2
Amplatz	24.5+/- 7.7 Fr	26+/- 6 Fr
Operation time	75+/- 6.4 mins	91 mins
Blood transfusion	21%	12%
Post Op Fever	14%	5%
Length of Hospital stay	3.14+/- 0.4 days	2.5 +/- 0.3 days
Stone Free Rate	82%	92%

**CONCLUSION**

In elderly patients, prevalence of renal stone disease is found to be higher in males and they most commonly present with flank pain, followed by fever. The presence of renal stones with obstruction and/or associated infection causes deranged renal parameters which may require preoperative diversion in the form of either PCN insertion or DJ stenting, which helps in mitigating this problem.

Complication rates and hospital stay of elderly patients undergoing PCNL can be reduced by better control of comorbid condition, optimization of patient prior to procedure, Proper positioning of elderly patients considering fragility of aging body, Appropriate tract size selection, Judicious use of irrigation fluid in elderly patients especially with poor cardiovascular reserve, Avoiding nephrostomy tube if possible and early mobilization of patient.

Following these principles, comparable results of complication rate and stone free rate compared to young patients can be obtained. Age related co morbidities or age itself should not be considered as discouraging factor while selecting PCNL as treatment modality in elderly patients with renal stone disease.

**References**

1. Goodwin WE, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. J Am Med Assoc 1955;157:891
2. Fernstrom I, Johannsson B. Percutaneous pyelolithotomy. A new extraction technique. Scand J Urol Nephrol 1976; 10:257-9.
3. Smith AD. A personal perspective on the origins of endourology and the endourological society. J Endourol 2002;16:705-8.
4. Castaneda-Zuniga WR, Clayman R, Smith A, Rusnak B, Herrera M, Amplatz K. Nephrostolithotomy: Percutaneous techniques for urinary calculus removal. J Urol 2002; 167:849-853.
5. Rupel E, Brown R. Nephroscopy with removal of stone following nephrostomy for obstructive calculus anuria. J Urol 1941;46:177-82.
6. Jones DJ, Russell GL, Kellett MJ, Wickham JE. The changing practice of percutaneous stone surgery. Review of 1000 cases 1981-1988. Br J Urol. 1990;66:1-5.
7. Duvdevani M, Razvi H, Sofer M, Beiko DT, Nott L, Chew BH, Denstedt JD. Third prize: contemporary percutaneous nephrolithotripsy: 1585 procedures in 1338 consecutive patients. J Endourol. 2007 Aug;21(8):824-9.
8. Stoller ML, Bolton D, St Lezin M, Lawrence M. Percutaneous nephrolithotomy in the elderly. Urology. 1994 Nov;44(5):651-4.
9. Sahin A, Atsü N, Erdem E, Oner S, Bilen C, Bakkaloğlu M, Kendi S. Percutaneous nephrolithotomy in patients aged 60 years or older. J Endourol. 2001 Jun;15(5):489-91
10. Anagnostou T, Thompson T, Ng CF, Moussa S, Smith G, Tolley DA. Safety and outcome of percutaneous nephrolithotomy in the elderly: retrospective comparison to a younger patient group. J Endourol. 2008 Sep;22(9):2139-45.
11. Karami H, Mazloomfard MM, Golshan A, Rahjoo T, Javanmard B. Does age affect outcomes of percutaneous nephrolithotomy? Urol J. 2010 Winter;7(1):17-21.
12. Tok, A., Ozturk, S., Tepeler, A. *et al*. The effects of percutaneous nephrolithotomy on renal function in geriatric patients in the early postoperative period. Int Urol Nephrol 41, 219–223 (2009).

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