



## Experience Of Pediatric Percutaneous Nephrolithotomy By Using Conventional Equipments –In A Rural Hospital

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### ABSTRACT

*A prospective study of 13 children, who had undergone PCNL (Percutaneous nephrolithotomy) with adult sized instruments in our rural hospital over a period of three years. There were 10 boys and 03 girls, with a mean age of 7 years (range, 24 months to 15 years). Mean stone burden was 2.0 cm<sup>2</sup>. The tract was dilated up to 20fr. Stone clearance rate was 76.92%. Three (23.07%) patients required blood transfusion, two (15.38%) Children had fever and two (15.38%) had prolonged leak from nephrostomy site. Pediatric PCNL using adult sized instruments is relatively safe in children.*

**Keywords :** percutaneous nephrolithotomy, ureteroscopy, Stone burden, pediatric urolithiasis

### Introduction:

Pediatric urolithiasis poses a technical challenge to the urologist. Percutaneous nephrolithotomy (PCNL) is an established mode of treatment for large renal calculi. Incidence of urolithiasis in humans is 5-10% and paediatric urolithiasis comprises nearly 2-3% of them. [1]

Pediatric urolithiasis is known to be associated with urinary infection, anatomic and metabolic abnormalities. Aim of treating renal calculi in children is complete stone clearance, eradication of urinary infection and correction of underlying metabolic or anatomical abnormalities. [2]

Woodside and associates reported first case series of pediatric PCNL in 1985 claiming 100% stone free rate with no significant complications.[3] The main concern to perform PCNL in children is large size of conventional nephroscope, small size of kidney; bleeding and radiation exposure. Several reports have established safety and efficacy of pediatric PCNL. [4]

Patients with anatomical abnormality and renal calculi are usually treated by open surgery. In absence of anatomical abnormality and renal calculi larger than 2 cm<sup>2</sup> should be treated by PCNL and renal calculi smaller than 1.5 cm are treated by ESWL. PCNL is less invasive procedure and the clearance rate is in the range of 71-78%. [5]

Better equipment lead to feasibility of PCNL in pediatric population. But we presented our experience of pediatric PCNL in last three years by using conventional equipments in a rural setup where advanced modalities are either not available or are available in limited number.

Aim of our study was to evaluate the safety and efficacy of pediatric percutaneous nephrolithotomy (PCNL) by using adult size instruments.

### Materials & Methods:

A prospective study of 13 children, presenting with renal stones, admitted and treated at a rural hospital over a period of three years was undertaken. All cases were thoroughly investigated by haemogram, renal function tests, urine routine, urine culture and intravenous pyelograph or plain & contrast

CT KUB. Single stage PCNL was performed by using adult instruments Wolf nephroscope inner sheath (size 18 fr) or, wolf ureteroscope (8/9.8fr.) under general anaesthesia. Under lithotomy position, using ureteroscope, ipsilateral ureter catheterised with 4 fr ureteric Catheter. All pressure points were well padded. Initial puncture and tract dilatation done under fluoroscopic control in an exact similar fashion like adult PCNL. 20 fr amplatz sheath was inserted. Nephroscope (size 18 F) was used without outer sheath. Pneumatic lithotripsy was used to fragment the stones. 4fr Dj stent and 18 fr nephrostomy tubes were kept in all patients after the procedure. Blood loss was estimated by Postoperative haemogram and PCV in all patients 4 hours after the procedure. Check X-ray KUB was done in all cases to assess stone clearance on first postoperative day. Nephrostomy was kept open for 24 hours and clamped on second postoperative day. If patients had no fever, abdominal pain, Nephrostomy removed on third postoperative day. Per urethral feeding tube was removed after complete cessation of leak from nephrostomy site. Dj stents removed after stone clearance confirmed using standard 8/9.8 fr wolf ureteroscope under GA. After removing all tubes, urine culture was done. Average operation time was 80 minutes.

### Results:

PCNL was undertaken in 13 renal units in 13 children (mean age 7 years, median 4.0). Male: female ratio was 10:3. Average stone burden was 2.0 cm<sup>2</sup> as assessed by plain CT scan/ conventional plain KUB. 11 patients had single stones and 2 had multiple stones. All patients had unilateral stones. There were 09 pelvic, 2 calyceal, and 2 partial staghorn calculi. The stone size varied from 1.5 to 2.5 cm<sup>2</sup> and average size was 2.0 cm<sup>2</sup>. Hematuria, abdominal pain and urinary tract infection were the common presenting symptoms. Special situations were like multiple urolithiasis in two patients, previous pyelolithotomy with recurrent stone in one.

"Figure 1"

Stones were cleared using PCNL in 10 of 13 renal units (76.92%); three patients who had residual stone fragments were rendered stone-free by ESWL. Three (23.07%) patients required blood transfusion, two (15.38%) Children had fever

and two (15.38%) had prolonged leak from nephrostomy site. At 3 months, all patients were stone free and one patient had metabolic cystinurea. Follow-up ranged from 6 month to 36 months and one patient had recurrence

#### Discussion:

PCNL is a treatment of choice for larger renal calculi without anatomical abnormality. [6]

Indications for PCNL in children are not different than in adults. PCNL has been performed in children as young as 19 months. [7] In our study, PCNL was performed on 24 month child without any significant complications.

We were presenting our experience of pediatric PCNL by using adult instrument. Similar experience in children is also suggested by seguna et al. [8] but Desai et al. [9] suggest limited tract dilatation < 21 F and use of pediatric instruments.

Main concern with adult instrument is larger tract dilatation and significant bleeding. Although this technique has quick, effective stone fragmentation and retrieval. Ultrasound-guided puncture could be good alternative to fluoroscopy and has the advantage of avoiding radiation and preventing visceral injury. [10]

Evolution of technique and miniaturization of instruments have changed the management of pediatric stone disease. But it comes with the great cost to the hospital and patients also. As a result, PCNL has now replaced open surgery for large stone burdens in children of all ages. Blood loss is a major complication of pediatric PCNL [11] is directly related to tract size dilatation.

PCNL is much less invasive than open surgery and the clearance rate is in the range of 71-78%.

[12] In our study, the clearance rate was 76.92% by using adult instruments which was correlated with previous studies.

#### "Table 1"

The size of the tract is still the main concern related to blood loss. [16] Zeren et al, showed a significant correlation of intra-operative bleeding with operative time, stone burden and sheath size.

Complications are similar to adults. Intraoperative bleeding, injury to the pelvic/cecal system and sepsis are major concerns with PCNL in children. Kroovand et al. [19]

In our series complications were bleeding in Three (23.07%) patients. two (15.38%) Children had fever which was correlated to previous studies

#### "Table 2"

However; prolonged leak from nephrostomy site was seen in two (15.38%) patients who were higher than previous studies. It may be due to larger tract dilatation.

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#### Conclusion:

PCNL in pediatric patients is a safe and effective mode of treatment. Adult instruments can be used in pediatric patients without significant hemorrhage except Stones with anatomical abnormalities. Advantage of pediatric PCNL is less morbid and minimal invasive procedure. Evolution of technique and miniaturization of instruments have changed the management of pediatric stone disease. One can avoid buying separate pediatric set of instruments which may result in considerable cost saving for a rural setup in a developing country like India.

We concluded that PCNL using adult sized instruments is relatively safe in children, with a clearance rate of 76.92%.

Table No-1

Comparison of stone free rates in various studies:

Study	no of children/ renal units	Mean Age (yrs)	Mean Stone size	Maximum sheath Fr	Stone free initial/final
Boormans et al.13	23/26	7.5	6.0cm2	18	58/81s
Gonen et al. 14	31/31	10.4	9.29cm2	30	61/68
Guven et al.15	17/20	1.8	1.9cm2	28	95/95
present study	13/13	7	2.0cm2	20	76.92/100

Table No-2

Comparison of complications occurred in various studies

Study	no of renal units	stone size	blood transfusion	open conversion	fever	Nephrostomy leak
Zeren et al [16]	55	1.68cm2	23.90%	1.6	29.8	0
Desai et al [17]	56	1.84cm2	14.30%	0	0	5.4
Holman et al[18]	138	2.25cm2	6.40%	0	1.1	8
Present study	13	2.0cm2	23.07%	0	15.38	15.38



Figure legends

Figure 1: Photograph of Prone position with lower two ribs and iliac crest mark and scar of previous surgery