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ORIGINAL ARTICLE

SAFETY AND EFFICACY OF PAEDIATRIC PCNL

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ABSTRACT: AIMS AND OBJECTIVES OF THE STUDY: To evaluate the indications of PCNL in children with age from 1to14yrs, identify the complications, treatment of complications, and prevention of complications and to evaluate the safety & efficacy of management of kidney stones in children by PCNL. **MATERIAL & METHODS:** Study period includes October 2010 to February 2013. 28 cases of renal stone in paediatric age group were admitted in our Hospital and evaluated for size of the stone, number of stones, congenital anomalies. **RESULTS:** In our centre, we have operated a total number of 28 children and total renal units were 32. Sex distribution in our study was male 17 and female 11, children's were 9.3 years (minimum age 1.2yrs-maximum age 13.8yrs) and mean size of stone was 21.1 mm (smallest size being 15mm and biggest being 26 mm). The maximum sheath size used in children was 24 F. out of 28 children, only one patient required blood transfusion rating to 3.5%. We have not used sandwiched therapy and all the 32 renal units were subjected to the PCNL mono therapy only with success rate of 96.4%. Our complication rates are low and are in comparison with many series published. Our main complications were fever, hematuria, and ileus, two patients of each variety equivalent to 7.1% of each type mentioned above and sepsis was in one patient amounting to 3.5%. **CONCLUSION:** Evolution of technique and miniaturization of instruments have changed the management of paediatric stone disease[2]**.**Despite encouraging results, however, concern remains regarding safety of endourologic treatment in smaller patients and its subsequent effects on the growing kidney[4.] Outcomes and morbidity rates have improved with the development of smaller endoscopic instruments and refined techniques using smaller access sheaths. At our center, PCNL is now the procedure of choice in the management of large kidney stone burden in children.
KEYWORDS: Pcnl, urs, eswl, rgc, fluoroscopy, sandwich therapy.

INTRODUCTION: Urinary stone disease is one of the oldest diseases known to mankind. It was noticed in Egyptian mummies. Nephrolithiasis continues to be a major problem in India. It is more prevalent in northern states than in southern states of India.

In Andhra Pradesh, its incidence is about 20% and in our hospital pediatric incidence is about 8-10%. Until 1980, urinary stones were a major health problem, with a significant proportion of patients requiring extensive open surgical procedures with its associated morbidity.

SWL had been the preferred method of management of most stones in children, but certain factors, however limit the success of SWL, including large stone, complex or multiple stones, large lower pole stones, cystine stones, and anomalous kidneys.[1]

PCNL is the treatment of choice for a large or complex stones, as it has the advantage of rapid and complete clearance of large stone burden. There is recent tendency towards replacing the standard dilatation techniques with small access tracts. In experienced hands, the complications rates

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are low. PCNL is well established as successful procedure and it has been reported effective in pediatric population over a period of 3-4 decades.

Technologic advancement and miniaturization of instruments have changed the management of pediatric stone disease. Recent advancements in instrumentation, such as smaller nephroscopes (15F-18F), more efficient energy sources for intracorporeal lithotripsy, including holmium: yttrium-aluminum-garnet (YAG) laser and smaller pneumatic lithoclast and ultrasound probes have greatly facilitated percutaneous treatment techniques.

In the past, PCNL was reserved only for cases of failed SWL. Presently it is being used as primary treatment in patients with large upper tract stone burden (>1.5 cm), lower pole caculi > 1 cm, concurrent anatomic abnormalities impairing urinary drainage and stone clearance, including uretero pelvic junction obstruction, ureteroenteral anastomotic strictures, infundibular stenosis, or stones in a calyceal diverticulum and in cases of known cysteine or struvite composition[1]. Despite widespread adoption, however, there is currently no international consensus on the indications for PCNL in children.

MATERIAL & METHODS: Study period was from October 2010 to February 2013. 28 cases of renal stone in pediatric age group were admitted in our Hospital and evaluated for size of the stone, number of stones, congenital anomalies.

INCLUSION CRITERIA: Renal stones of >1.0 cm, failed cases of URS /ESWL, anatomical abnormality which hampers the drainage & stones clearance, i.e., children with lower pole renal calculi drained by long, narrow infundibulum with acute infundibulo-pelvic-angle.

EXCLUSION CRITERIA: Poor general health with CRF. All cases were evaluated with Complete urine analysis, Urine culture and sensitivity, Complete hemogram, Renal parameters, X-ray KUB, Ultra sound KUB region, IVU, Non-contrast CT scan KUB region for radiolucent calculi. Culture positive cases were treated till culture is negative. All cases were administered with pre-operative antibiotic with extension to intra op and post op coverage.

PROCEDURE: Under general anesthesia, patients were subjected for retrograde catheterization by using cystoscope. After doing RGC patients were turned to prone position. Posterior inferior calyceal puncture with fluoroscopic guidance performed by using 18 G needle and single step dilatation of tract performed upto 18-24 F as per stone burden and size of the patient by using rigid nephroscope.

Stone fragmentation made by pneumatic lithoclast and DJ Stent was placed. Nephrostomy kept in all patients.

At the conclusion of procedure, stone clearance was evaluated fluoroscopically and sonologically. Nephrostogram was done for the assessment of intra-renal pelvicalyceal system injury and to know any intravasation of the contrast.

POST OPERATIVE FOLLOW UP: On the 1st Post-operative day -X-Ray KUB & Ultra Sound KUB region done in all the patients to assess the stone clearance before removing the nephrostomy. CBP, S. CREATINE was checked on 1st pod. Any residual fragment of size > 3mm was considered significant.

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RESULTS: In our centre, we have operated a total number of 28 children and total renal units 32. Out of 28 patients 11 patients had congenital anomalies, the details are given in table No '3' but none of the anomalies did not give us any problem during the PCNL procedures except the horse shoe kidney in which the stone was approached through the upper calyx and in all other cases the approach to the stone was through the lower calyx.

Sex distribution in our study was male 17 and female 11, children's were 9.3 years (1.2yr-13.8yr) (Table -1)and mean size of stone was 21.1 mm (smallest size being 15mm and biggest being 26 mm) (Table-2). The maximum sheath size used in children was 24 F.

Out of 28 children, only one patient required blood transfusion rating to 3.5%. we have not used sandwiched therapy and all the 32 renal units were subjected to the PCNL mono therapy only with success rate of 96.4%. Our complication rates are low and are in comparison with many series published.

The our main complication were fever, hematuria, and ileus, two patients of each variety equivalent to 7.1% of each type mentioned above and sepsis was in one patient amounting to 3.5% (Table -4). In one patient, where small residual stone was noticed in both x-ray KUB and Ultrasound, Relook PCNL was done and the residual fragment was removed. Since we could clear almost all the stones with the PCNL alone, we did not find any necessity for sandwich therapy using SWL technique.

Our success rates and complication rates were almost same as that of other series reported in Table No. 5.

DISCUSSION: With increasing experience, PCNL is currently being used as monotherapy and in combination with SWL (sandwich therapy) in children, achieving stone-free rates that range from 68% to 100%. Recent large retrospective series of PCNL monotherapy have demonstrated high efficacy rates that approach 90%. In 56 children (mean age 9.1 years) with a mean stone burden of 37.5 mm, Desai and coworkers[5] reported a stone-free rate of 89.8% using EHL through a 14F nephroscope and a 20-24 F sheath. Of these, 61% needed multiple tracts, and 45% were staged procedures.

Findings demonstrated that the number and size of tracts were significantly associated with postoperative hemoglobin decrease (mean 1.9 g/ dL) and overall transfusion rate (14%). In 52 children with a mean age of 7.9 years and a mean stone burden of 28mm, Zeren[3] and associates reported a 87% stone-free rate using ultrasound and EHL for fragmentation and tract dilatation from 18F to 30F. Complications included postoperative fever (30%) and need for transfusion (24%). In 135 children who were aged 8.9 years with a mean stone burden of 507 mm, Salah[6] and colleagues reported a 98.5% stone-free rate using ultrasound through a 26F nephroscope.

Complications were low (8% urine leak rate and 0.7% transfusion rate), with only one patient needing a second procedure. In a recent series of 46 children with a mean stone burden of 32 mm, Bilen and coworkers[10] reported an 88% stone- free rate using EHL, ultrasound, and the holmium laser. When stratified by tract size (14F, 20F, and 24F), efficacy rates were similar in all other groups but there were no complications or transfusions in the 14F tract group.

In an effort to reduce the number of tracts and associated morbidity, some centers have chosen to follow primary PCNL with adjunctive SWL therapy to clear residual stone fragments. In a small series of 29 children, with mean age of 3.8 years and a mean stone burden of 2.4 cm, Mahmud and associates[11] reported a 60% stone-free rate after PCNL mono therapy using EHL through a 17F

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angled nephroscope. Only one tract was used in all the patients, and after SWL sandwich therapy, the stone-free rate increased to 100 %.

In a larger series of 169 children with a mean stone burden of 3.1 cm, Samad and colleagues[8] reported a 59 % monotherapy stone-free rate with 96% of cases performed through a single tract. Approximately one third (34.5%) of primary failures were treated with SWL; the cumulative stone-free rate in all patients was 93.8% with a 3.6% transfusion rate.

CONCLUSION: Evolution of technique and miniaturization of instruments have changed the management of pediatric stone disease**.** Despite encouraging results, however, concern remains regarding safety of endourologic treatment in smaller patients and its subsequent effects on the growing kidney. Similar to adult population, large retrospective series have demonstrated that PCNL is a safe and effective procedure for the management of nephrolithiasis in children. Outcomes and morbidity rates have improved with the development of smaller endoscopic instruments and refined techniques using smaller access sheaths.

In our study we have evaluated the indications of pcnl in pediatric age group by doing pcnl in different clinical situations like children with anatomical anomalies, children with unfavorable calyceal anatomy for eswl, and in infant with age 1.2yr and we could complete with low complication rates as mentioned above.

The design of our management including pre op urine culture, pre op, intra op and post op antibiotics, review and discussion of radiologic images before starting the procedure, execution of procedure by experienced surgeon in the team, and excellent post op care could prevent most of the complications and made pcnl as safe and effective procedure in children.

At our center, PCNL is now the procedure of choice in the management of large kidney stone burden in children.

REFERENCES:

1. Farhat WA, Kropp BP. Surgical Treatment of Pediatric Urinary Stones. AUA Update Series. 2007; 26: 22-27**.**
2. Badawy H, Salama A, Eissa M, Kotb E, Mora H, Shoukri I. Percutaneous management of renal calculi: Experience with percutaneous nephrolithotomy in 60 children. JUral 1999; 162:1710-1713.
3. Zeren S, SatarN; Bayazit AK, Payasli K, Ozkeceli ~R. Percutaneous nephrolithotomy in the management of pediatric renal calculi. J Endourol 2002; 16: 75-78.
4. Rizvi SA, Naqvi SA, Hussain Z, Hashrni A, Hussain M, Zafar MN, Sultan S, Mehdi H. Management of pediatric urolithiasis in Pakistan: Experience with 1, 440 children. J Urol 2003; 169: 634-637.
5. Desai MR, Kukreja RA, Patel SH, Bapat SO. Percutaneous nephrolithotomy for complex pediatric renal calculus disease J. Endourol 2004; 18: 23-27
6. Salah MA, T6th C, Khan AM, Holman E. Percutaneous nephrolithotomy in children: Experience with 138 cases in a developing try. World J Urol 2004; 22: 277-280.
7. Helal M, Black T, Lockhart J, Figueroa TE. The Hickman peel-away sheath: Alternative for pediatric percutaneous nephrolithotomy. J. Endourol 1997; 11: 171-172.
8. Samad L, Aquil 5, Zaidi Z. Paediatric percutaneous nephrolithotomy: Setting new frontiers. BJU Int 2006; 97: 359-363.

9. Shokerr AA Sheir KZ, EI-lahas AR, EI-Assmy AM, Eassa W, El-Kappany HA. Treatment of renal stone in children: A comparison between percutaneous nephrolithotomy and shock wave lithotripsy. J Urol 2006; 176: 706-710.
10. Bilen CY, Kocak B, Kitirci G, Ozkaya O, Sarikaya S. Percutaneous nephrolithotomy in children: Lessons learned in 5 years at a single institution. Journal of Urology 2007; 177: 1867-1871.
11. Mahmud M, Zaidi Z. Percutaneous nephrolithomy in children before school age: Experience of a Pakistani centre. BJU Int 2004; 94: 1352-1354.

Age group	No. of patients	%
0-5	**6**	**21.4**
5-10	**10**	**35.8**
10-14	**12**	**42.8**

Table 1 : Age of Patients

Stone size	No. of patients	%
Small stone (< 2cm, multiple)	6	21.4
Large Stone (> 2 cm)	18	64.2
Staghorn	0	0
Bi-lateral (< 2 cm)	4	14.2

Table 2: Size stones

Congenital anomalies	No. of patients	%
Horse shoe kidney	1	3.57
Mal rotated kidney	8	28.57
Incomplete duplex moiety	2	7.42
Total	**11**	**39.56**

Table 3: Type of Congenital anomalies

Complications	No. of patients	%
Fever	2	7.14
Hematuria	2	7.14
Ileus	2	7.14
Sepsis	1	3.57

Table 4: COMPLICATIONS IN OUR STUDY

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Study	No. children / Renal units	Mean age (yrs)	Stone size (mm)	Maximum sheath size (Fr)	Transfusion (%)	Stone free (%)	Sandwich therapy	Complications (%)
Badaway[2]	60	6	n/a	28	3.3	90	1.7	Fever 8.3 colon injury 1.7% Open conversion
Zeren[3]	55/62	7.9	16.8	30	23.9	86.9	1.6	Fever 29.8 open conversion 1.6
Rizvi[4]	62	n/a	47	22	25.3	67.7	27.4	Open Conversion 4.8 Fever 46.8 Urine leak 6.4 Hydrothorax 1.6
Desai\[5]	56	9.1	18.4	24	14.3	89.8	5.4	Urie leak 5.4
Salah[6]	135/138	8.9	22.5	28	0.7	98.6	0	Urine leak 8
Helal m[7]	138	8.9	22.5	28	0.4	98.5	0	Fever 1.1 Urine leak 8
Samad[8]	1692188	8.2	27.2	28	4	59.3	34.5	Fever 42.8 Hyponnatremia 06 obstruction 06
Shokeir[9]	75/82	6.6	14.4	30	1.2	95.1	4.8	Urine leak 1.2
Gandhi Hospital	28/32	9.3	21.1	24	3.5	96.42	0	Fever 7.14%, Haematuria 7.14, ileus 7.14, sepsis3.57%

Table 5

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