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Pediatric Endourology In Urolithiasis: Initial Experience And Lessons Learnt.

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Abstract

Backg round: Pediatric endourological stone treatment requires a balance between clearance, safe access and procedural burden. Early institutional experience can identify technical and documentation challenges that influence service development. Aim: To share our experience and challenges in the endourological management of pediatric stone disease. ***Methods***: A retrospective review of the supplied PCNL and URSL master charts from IGICH, Bengaluru, covering the reported period 2017-2024, was performed. Twenty-two PCNL and 24 URSL records represented 44 identifiable children because two appeared in both cohorts. Descriptive statistics and 95% confidence intervals were calculated using available denominators. Exploratory associations with repeat URS procedures were assessed using Welch t tests and Fisher exact tests. ***Results***: Mean age was 7.13 (3.96) years, and 26 children (59.1%) were male. Initial complete clearance was recorded in 13/18 interpretable PCNL records (72.2%; 95% CI 49.1-87.5%) and 11/23 interpretable URSL records (47.8%; 95% CI 29.2-67.0%). Five PCNL records documented access difficulties. Two of 19 evaluable PCNL records showed perinephric collections. The URSL cohort underwent 37 recorded procedures; 11/24 children (45.8%) had more than one procedure. Three children had postoperative complications, including two urinary tract infections. Age, maximum stone diameter, preoperative stenting, bilateral disease and sex were not significantly associated with repeat URS procedures. Final stone-free rates could not be verified because of incomplete documentation. ***Conclusion***: The series identified access difficulties, staged treatment and incomplete outcome ascertainment as important challenges. Structured training, metabolic assessment and standardized follow-up documentation were key service-improvement priorities. Findings should be interpreted as an initial descriptive experience pending reconciliation of source records.

Keywords: Pediatric urolithiasis; Percutaneous nephrolithotomy; Ureteroscopy.

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INTRODUCTION

Pediatric urolithiasis poses a distinctive clinical challenge because treatment must relieve obstruction and achieve stone clearance while protecting the developing urinary tract and limiting repeated anesthesia and radiation exposure. Tasian et al. (2016)[1] documented changing stone-disease incidence, including a substantial increase among adolescents, emphasizing the growing relevance of this condition to pediatric practice. Childhood stones may coexist with metabolic abnormalities, urinary infection or anatomical anomalies, and successful surgery alone does not address the risk of further stone formation. Chu et al. (2016)[2] emphasized the importance of evaluating underlying risk factors and incorporating preventive measures into the management of pediatric stone disease.

Endourological procedures have expanded the options for treating children who require active stone removal. Ureteroscopic lithotripsy permits direct visualization and fragmentation of ureteric calculi, whereas percutaneous nephrolithotomy provides access to renal stones requiring a percutaneous approach. Güven et al. (2017)[3], in the pediatric component of the Clinical Research Office of the Endourological Society ureteroscopy study, evaluated ureteroscopy across several centers and age groups, demonstrating the importance of assessing outcomes in children specifically. Procedure selection nevertheless depends on stone location and burden, urinary anatomy, available equipment and surgical expertise. Saad et al. (2015)[4] demonstrated this trade-off in a randomized comparison for large pediatric renal stones: PCNL achieved better single-treatment clearance, while retrograde intrarenal surgery offered advantages in morbidity and radiation exposure.

Technical feasibility does not eliminate the challenges of establishing a pediatric stone service. Small collecting systems and ureters can restrict access, bilateral disease can complicate outcome assessment, and staged treatment may increase the number of procedures required. Equipment availability and familiarity with pediatric instrumentation may also influence

operative planning. Juliebø-Jones et al. (2023)[5] highlighted continuing variation in pediatric stone surgery, including differences in imaging, treatment selection and follow-up. Early institutional experience should therefore document access difficulties, additional procedures, complications and completeness of outcome recording, rather than report clearance alone. The present study reviewed the initial experience of PCNL and URSL at a pediatric surgical center, with particular attention to practical challenges and lessons relevant to developing a structured pediatric endourology service.

AIM

To share our experience and challenges in the endourological management of pediatric stone disease.

OBJECTIVES

1. To describe the demographic characteristics, clinical presentation and stone characteristics of children managed with PCNL and URSL.
2. To evaluate documented stone clearance, repeat interventions, stenting and procedure-related complications.
3. To identify technical difficulties, explore factors associated with repeat URS procedures and describe lessons for improving pediatric stone care.

MATERIALS AND METHODS

Source of data

Data were obtained from the supplied PCNL and URSL master charts maintained for pediatric stone cases. The accompanying departmental presentation supplied information on the institutional setting, study period, preoperative evaluation and operative methods. The available records included age, sex, presentation, laterality, stone location and dimensions, selected metabolic findings, procedural details, clearance entries, complications and stone composition. Hospital identifiers were used only to identify overlapping records and were omitted from the reported results.

Study design

The study was a retrospective, single-center descriptive case series with exploratory within-URSL analyses. It was not a randomized or matched comparison of PCNL and URSL. Children receiving both treatments were retained in each relevant procedure-specific summary but were counted once in the overall demographic description.

Study location

The study was conducted in the Department of Pediatric Surgery, Indira Gandhi Institute of Child Health (IGICH), Bengaluru, Karnataka, India

Study duration

The reported study period extended from 2017 to 2024.

Sample size and sampling method

All records available were included through complete enumeration of the available case series. There were 22 PCNL records and 24 URSL records, with two overlapping children. The number of unique identifiable children was calculated using the inclusion-exclusion equation:

$N(\text{unique}) = N(\text{PCNL}) + N(\text{URSL}) - N(\text{both}) = 22 + 24 - 2 = 44$ children.

The procedure-specific denominators were 22 and 24, respectively, and were reduced where a variable was missing. A prospective sample-size calculation had not been documented and was not retrospectively invented. For planning a future study estimating a proportion, the conventional equation would be $n = Z^2(1-\alpha/2) \times p(1-p) / d^2$, where $Z = 1.96$ for 95% confidence, p is the anticipated proportion and d is absolute precision. With an explicitly illustrative $p = 0.50$ and $d = 0.10$, $n = 1.96^2 \times 0.50 \times 0.50 / 0.10^2 = 96.04$, rounded upward to 97. This illustration is not the basis of the present sample of 44 children and does not establish its statistical power.

Inclusion criteria

Records of pediatric patients with renal and/or ureteric calculi entered in the institutional PCNL or URSL charts for the reported study period were included. Attempted PCNL procedures with access failure, subsequent referral or incomplete clearance were retained to capture the initial experience. Bilateral disease, anatomical anomalies and documented metabolic disorders were not excluded. Children undergoing both procedures contributed to both procedure-specific descriptions. The observed age range was 11 months to 16 years; the source did not state a separate protocol-defined upper age limit.

Exclusion criteria

Children managed exclusively by observation, medical therapy, shockwave lithotripsy or open surgery were outside the supplied cohort and were not included. Repeat procedures were not counted as additional children. No additional clinical exclusions were imposed after examining outcomes.

Procedure and methodology

According to the presentation, children underwent appropriate imaging and urine evaluation, including routine examination, microscopy and culture. Urinary calcium assessment and the calcium-to-creatinine ratio formed part of the stated evaluation, and metabolic evaluation was undertaken for recurrent stone disease. A sterile urine culture was reported to have been confirmed before surgery, and broad-spectrum antibiotics were administered.

PCNL was performed under general anesthesia. In lithotomy position, a ureteric catheter and Foley catheter were placed, after which the child was turned prone. Percutaneous access was obtained under C-arm guidance using a biplanar gradual-descent technique and a two-part puncture needle. The tract was dilated with an Alken serial dilator system. A pneumatic lithoclast was used for fragmentation, and intraoperative clearance was assessed fluoroscopically. Ureteric stents and nephrostomy tubes were described in the operative protocol. Tract diameters were not recorded sufficiently to classify these cases as standard, mini- or ultra-mini-PCNL. Tract loss, a false passage and difficulty accessing a nondilated collecting system were extracted as technical challenges. Repeat PCNL, planned reintervention and referral were recorded separately.

URSL was performed under general anesthesia after cystoscopic identification and catheterization of the ureteric orifice. A pediatric semirigid ureteroscope of 4.5/6 Fr or 6.5/8 Fr was introduced, and stones were fragmented, predominantly using a pneumatic lithoclast. Fragments were retrieved with a Dormia basket or forceps. One chart entry explicitly mentioned laser use. Postoperative double-J stenting was described as routine in the presentation, but actual chart entries showed placement in 23 of 24 children. Preoperative stenting and the number of URS procedures were extracted from the patient records. The abbreviation URSL was used here for ureteroscopic lithotripsy, not to imply that every child received laser lithotripsy.

Outcome definitions and data processing

Age was converted from years and months into decimal years. Stone size was defined for this analysis as the largest recorded linear dimension per child within each procedure chart. In bilateral or multidimensional entries, the largest dimension was retained; dimensions were not added together or converted to stone volume. A recorded size of zero was treated as unavailable. This derived measure was a maximum diameter, not cumulative stone burden.

Initial complete clearance was counted only when the initial-clearance field explicitly recorded 1 or an unambiguous complete result. Values of 0.5 were treated as incomplete clearance without assuming that precisely half the stone volume remained. A PCNL entry describing 50% clearance on one side and 100% on the other was classified as incomplete at the patient level. One URSL entry describing right-sided clearance and left-sided PCNL did not establish bilateral patient-level clearance and was kept separate.

Repeat URS treatment was defined as more than one URS procedure in the chart, regardless of whether the procedures were planned stages or unplanned retreatment. Complications were extracted as recorded. Missing complication fields were not coded as negative, and Clavien-Dindo grades were not assigned without information on treatment and clinical severity. Bilateral disease was not equated with bilateral renal units operated because side-specific procedural completion could not be reconstructed consistently.

Sample processing

This was a record-based analysis, and no new biological specimens were collected for the present work. The departmental protocol described preoperative urine testing and submission of retrieved stone fragments for analysis. Available stone-composition results were transcribed without assuming a particular analytical method, because the records did not identify whether infrared spectroscopy, X-ray diffraction or chemical analysis had been used. Culture methods, specimen transport, laboratory reference ranges and completeness of 24-hour urine collections were not available. Metabolic and composition fields were analyzed as documented findings rather than as evidence of universal testing.

Statistical methods

Continuous variables were summarized as mean (standard deviation), with 95% confidence intervals for means calculated using the t distribution. Categorical variables were presented as n/N (%) with Wilson 95% confidence intervals. Analyses were performed using Python and SciPy; SPSS use was not assumed. Within the URSL cohort, age and maximum stone diameter were compared between children with one versus more than one URS procedure using exploratory Welch t tests. Categorical associations with repeat procedures were examined using two-sided Fisher exact tests. Conditional odds ratios and exact 95% confidence intervals were calculated for categorical associations. Mean differences were expressed as repeat-procedure minus single-procedure values.

Two-sided p values below 0.05 were treated as statistically significant for these exploratory analyses. No multiplicity adjustment or multivariable modeling was undertaken because of the small sample. PCNL-versus-URSL significance testing was not performed because the groups overlapped and represented different clinical indications. Descriptive proportions were not tested against arbitrary hypothetical values; their test-statistic and p-value entries were marked not applicable. All missing data were handled using variable-specific available denominators without imputation.

Data collection

The two charts were reviewed for identifiers, demographics, presenting complaints, renal or ureteric laterality, stone location and size, metabolic findings, access technique, stenting, clearance, additional procedures, complications and composition. Identifiers were cross-checked to avoid double-counting children in the overall sample. Inconsistencies between the presentation and charts were retained in a reconciliation note instead of being silently resolved in favor of better outcomes.

RESULTS

Forty-four identifiable children contributed 22 PCNL and 24 URSL records; two children appeared in both cohorts. The following four tables were calculated from the available charts. In Tables 1-3, NA means that no defensible hypothesis test applied to the descriptive estimate. This does not mean that a test was nonsignificant. All confidence intervals are 95% intervals.

Table 1: Demographic characteristics and recorded stone dimensions

Characteristic	Overall unique children	PCNL cohort	URSL cohort
Number of children	44	22	24
Age, years, mean (SD)	7.13 (3.96)	7.48 (4.15)	6.58 (3.75)
95% CI for mean age	5.93-8.34	5.64-9.32	5.00-8.17
Male, n/N (%)	26/44 (59.1)	12/22 (54.5)	15/24 (62.5)
Female, n/N (%)	18/44 (40.9)	10/22 (45.5)	9/24 (37.5)
Right-sided disease, n/N (%)		10/22 (45.5)	10/24 (41.7)
Left-sided disease, n/N (%)		8/22 (36.4)	9/24 (37.5)
Bilateral disease, n/N (%)		4/22 (18.2)	5/24 (20.8)
Largest stone diameter, mm, mean (SD)	Not pooled	16.00 (6.17), n=18	10.33 (2.70), n=23
95% CI for mean diameter		12.93-19.07	9.16-11.50

The mean age of the 44 identifiable children was 7.13 (3.96) years, and 26 (59.1%) were male. Mean ages were 7.48 (4.15) years in the PCNL cohort and 6.58 (3.75) years in the URSL cohort. Bilateral disease was recorded in four PCNL cases (18.2%) and five URSL cases (20.8%). The mean maximum recorded stone diameter was 16.00 (6.17) mm among 18 PCNL records and 10.33 (2.70) mm among 23 URSL records. These differences were descriptive and did not constitute a comparison of treatment effectiveness.

Table 2: Documented PCNL clearance, technical difficulties and complications

Outcome	n/N (%)	95% CI, %
Initial complete clearance documented, all PCNL records	13/22 (59.1)	38.7-76.7
Initial complete clearance among records with interpretable clearance	13/18 (72.2)	49.1-87.5
Incomplete initial clearance among interpretable records	5/18 (27.8)	12.5-50.9
Initial-clearance field unavailable or uninterpretable	4/22 (18.2)	7.3-38.5
Access difficulty documented	5/22 (22.7)	10.1-43.4
Redo PCNL recorded	3/22 (13.6)	4.7-33.3
Further PCNL planned, not confirmed as completed	1/22 (4.5)	0.8-21.8
Referral recorded	3/22 (13.6)	4.7-33.3
Perinephric collection, available records	2/19 (10.5)	2.9-31.4
Blood transfusion, available records	0/18 (0.0)	0.0-17.6
Conversion to open surgery, available records	0/18 (0.0)	0.0-17.6
Urosepsis, available records	0/18 (0.0)	0.0-17.6

Initial complete clearance was documented in 13 of 22 PCNL records (59.1%). Among the 18 records with interpretable initial-clearance entries, 13 (72.2%; 95% CI 49.1-87.5%) indicated complete clearance and five indicated incomplete clearance. Five children had a documented access difficulty. Three records described redo PCNL, one described a planned repeat PCNL and three recorded referral. Perinephric collection occurred in two of 19 records with available information (10.5%). No transfusion, conversion to open surgery or urosepsis was recorded among the 18 records with data for each outcome; the wide confidence intervals and missing entries precluded an assertion of zero overall risk.

Table 3: URSL procedural burden, clearance, stenting and complications

Outcome	n/N (%) or mean (SD)	95% CI
One URS procedure	13/24 (54.2)	35.1-72.1%
Two URS procedures	9/24 (37.5)	21.2-57.3%
Three URS procedures	2/24 (8.3)	2.3-25.8%
More than one URS procedure	11/24 (45.8)	27.9-64.9%
Initial complete clearance documented, all records	11/24 (45.8)	27.9-64.9%
Initial complete clearance among unambiguous entries	11/23 (47.8)	29.2-67.0%
Incomplete initial clearance among unambiguous entries	12/23 (52.2)	33.0-70.8%
Preoperative DJ stent	12/24 (50.0)	31.4-68.6%
Postoperative DJ stent	23/24 (95.8)	79.8-99.3%
Any recorded intraoperative complication	0/24 (0.0)	0.0-13.8%
Any recorded postoperative complication	3/24 (12.5)	4.3-31.0%
Postoperative urinary tract infection	2/24 (8.3)	2.3-25.8%
Hematuria with urinary retention	1/24 (4.2)	0.7-20.2%

Thirteen children (54.2%) had one URS procedure, nine (37.5%) had two and two (8.3%) had three, yielding 37 recorded procedures. More than one procedure was recorded in 11 children (45.8%; 95% CI 27.9-64.9%). Initial complete clearance was explicitly documented in 11 records and represented 47.8% of the 23 unambiguous entries. Preoperative DJ stenting was recorded in half the cohort, and postoperative stenting in 23 children (95.8%). Three children had postoperative complications: two urinary tract infections and one episode described as hematuria with urinary retention. No intraoperative complication was recorded. The final-clearance data were insufficient to verify universal stone freedom.

Table 4: Exploratory factors associated with more than one URS procedure

Characteristic	Repeat URS, n=11	Single URS, n=13	Effect (95% CI)	Test statistic	p
Age, years, mean (SD)	6.29 (3.52)	6.83 (4.07)	MD -0.55 (-3.76 to 2.67)	Welch t=-0.352	0.728
Maximum diameter, mm, mean (SD)	10.90 (2.69), n=10	9.89 (2.74), n=13	MD 1.01 (-1.37 to 3.39)	Welch t=0.884	0.387
Preoperative DJ stent, n (%)	7 (63.6)	5 (38.5)	OR 2.68 (0.41-20.26)	Fisher exact	0.414
Bilateral disease, n (%)	1 (9.1)	4 (30.8)	OR 0.24 (0.004-3.03)	Fisher exact	0.327
Male sex, n (%)	8 (72.7)	7 (53.8)	OR 2.21 (0.32-19.10)	Fisher exact	0.423

Children with repeat procedures had a mean age of 6.29 (3.52) years compared with 6.83 (4.07) years among those with a single procedure (mean difference -0.55 years; p=0.728). Mean maximum stone diameter was 10.90 (2.69) versus 9.89 (2.74) mm (mean difference 1.01 mm; p=0.387). Preoperative stenting was more frequent among children with repeat procedures, but the association was imprecise and not statistically significant (conditional OR 2.68; 95% CI 0.41-20.26; p=0.414). Neither bilateral disease nor sex showed a statistically significant association. The wide intervals did not exclude clinically important effects, and lack of significance should not be interpreted as equivalence or absence of an association.

DISCUSSION

Demographic profile and clinical context

The present series comprised 44 identifiable children with a mean age of 7.13 years and a modest male predominance. These findings describe children selected for endourological care at one institution and cannot establish population incidence or sex-specific risk. Tasian et al. (2016)[1] provided population-based evidence of increasing stone disease, particularly in adolescents; the younger age profile in the present series likely reflects referral patterns and the pediatric surgical setting rather than a contradictory epidemiological trend. Chu et al. (2016)[2] emphasized that pediatric stone care should integrate acute treatment and prevention. This is particularly relevant to a cohort that included infants, bilateral disease and uncommon stone compositions.

Güven et al. (2017)[3] evaluated 192 pediatric cases within the CROES ureteroscopy study, spanning infants through adolescents. The present 24-child URSL cohort was substantially smaller, limiting the precision of complication estimates and subgroup analyses. Juliebø-Jones et al. (2023)[5] also described the diversity of pediatric stone surgery and the difficulty of standardizing its assessment. Our use of patient-level denominators, separate procedure counts and explicit missing-data categories addresses part of this problem, although it cannot replace missing source documentation.

Stone characteristics and choice of intervention

The maximum recorded diameter averaged 16.00 mm in the PCNL chart and 10.33 mm in the URSL chart. These values reflected different stone locations and clinical selection and should not be interpreted as baseline comparability. Saad et al. (2015)[4] studied children with renal stones larger than 2 cm and reported single-treatment stone-free rates of 95.5% after

PCNL and 71% after retrograde intrarenal surgery, alongside greater morbidity with PCNL. Their randomized renal-stone comparison is therefore distinct from our overlapping renal and ureteric case series. A direct significance test between our cohorts would not reproduce that comparison.

Van Batavia and Tasian (2016)[6] emphasized ultrasound-first diagnostic assessment and minimizing radiation in children. Our presentation documented fluoroscopically guided PCNL, but fluoroscopy duration and dose were unavailable. Consequently, radiation safety could be discussed as a service priority but could not be measured as a study outcome. Standardized recording of maximum diameter, cumulative burden, stone location and imaging modality would also improve interpretation of treatment selection.

PCNL clearance and access-related challenges

Among PCNL records with interpretable initial-clearance data, 72.2% indicated complete clearance. This estimate was lower than several published pediatric series but had a broad 95% CI of 49.1-87.5%. ElSheemy et al. (2016)[7], studying preschool children with 10-25 mm renal pelvic or lower calyceal stones, reported first-session clearance of 88.9% after mini-PCNL and 43.8% after shockwave lithotripsy. Kumar et al. (2023)[8], in a randomized study of 50 children, reported stone-free rates of 88% with mini-PCNL and 92% with standard PCNL. Differences from the present estimate could reflect case mix, access difficulties, equipment, clearance definitions and incomplete documentation. They do not demonstrate inferior institutional performance without comparable follow-up and case complexity.

Five PCNL records described access problems, including tract loss, a false passage and difficulty in a nondilated collecting system. These observations identify access as an important training and quality-improvement target. Jones et al. (2017)[9] systematically reviewed micro- and ultra-mini-PCNL, illustrating the expanding role of smaller instruments in pediatric practice. However, because our tract sizes were unavailable, the present cases cannot be classified as mini-PCNL or directly compared with a specified instrument category. The biplanar gradual-descent method was used locally, but this uncontrolled series cannot establish that it was safer than the bull's-eye technique. Mentorship and supervised case selection are practical lessons suggested by the experience, not tested interventions.

URSL clearance and procedural burden

The URSL charts recorded one procedure in 54.2% of children, with 45.8% undergoing repeat procedures. Initial complete clearance was documented in 47.8% of unambiguous entries. Jones et al. (2020)[10] reported 102 procedures in 81 children, with initial and final stone-free rates of 73% and 99%, respectively. Their study demonstrates why initial clearance and final clearance after staged treatment should be reported separately. It does not validate the 100% final-clearance statement in our presentation, because comparable final imaging data were absent from the supplied charts.

Featherstone et al. (2017)[11] reported 35 ureteroscopic procedures in 18 children with stones at least 1 cm, showing that multiple procedures may be necessary even in a laser-equipped service. Therefore, our repeated interventions cannot be attributed solely to limited laser availability. Rob et al. (2017)[12] reported an overall stone-free rate of approximately 90% across a systematic review of pediatric ureteroscopy, but studies varied in stone location, technique and endpoint timing. The local use of predominantly semirigid ureteroscopy and pneumatic fragmentation further limits direct comparison with flexible laser-based series.

Geraghty et al. (2023)[13] found higher stone-free rates with flexible ureteroscopy than shockwave lithotripsy in a meta-analysis of randomized trials, with trade-offs in operative time and hospital stay. That evidence supports individualized treatment planning but does not establish the relative benefit of laser versus pneumatic fragmentation in this cohort. A future audit should document the energy source for each procedure, reasons for staging, residual-fragment location and whether reintervention was planned or unplanned.

Stenting and exploratory associations

Preoperative stenting was recorded in 50.0% and postoperative stenting in 95.8% of URSL cases. In the exploratory analysis, preoperative stenting was associated with an estimated conditional odds ratio of 2.68 for repeat procedures, but the exact interval was very wide and included unity. This result cannot be interpreted as evidence that stenting caused retreatment: difficult access, obstruction or greater complexity may have prompted stenting initially. Ripa et al. (2022)[14] reviewed ureteral access sheaths in pediatric flexible ureteroscopy and highlighted limited, heterogeneous evidence concerning access, stenting and complications. Their setting differs from our predominantly semirigid practice. The present data were insufficient to determine the indications for stents or to evaluate access-sheath effects because the relevant fields were unfilled.

Age, diameter, bilateral disease and sex also showed no statistically significant association with repeat URS procedures. Only 11 children had repeat procedures, and one diameter was missing. The intervals therefore remained compatible with meaningful associations in either direction. Procedure count should additionally be interpreted cautiously in bilateral disease, where a single recorded session may not mean clearance of both sides.

Complications and interpretation of safety

Three URSL patients had recorded postoperative events, including two urinary tract infections and one hematuria/retention episode. Jones et al. (2020)[10] similarly reported a small number of postoperative events, including retention and sepsis, supporting attention to complications even when intraoperative injury is absent. In the PCNL cohort, perinephric collections were recorded in two of 19 evaluable records. No transfusion, open conversion or urosepsis appeared among 18 records with data for each outcome, but missing values and wide confidence intervals precluded conclusions of universally complication-free treatment. Kumar et al. (2023)[8] found less hemoglobin reduction with mini-PCNL than standard PCNL, reinforcing the value of prospectively recording hemoglobin change and instrument size, neither of which could be analyzed here.

Ellison et al. (2025)[15], in a multicenter cohort of 1,039 children and adolescents, found that comparative outcomes depended on stone size and included patient-reported morbidity. Their subgroup results favored PCNL clearance for stones larger than 15 mm. Their population included older patients and used structured outcome assessment, so its estimates are not directly transferable to this younger, small institutional series. Nevertheless, it supports extending future evaluation beyond clearance to pain, urinary symptoms, recovery and treatment burden.

Metabolic evaluation and lessons learnt

Stone-composition results were available in only eight PCNL and five URSL records; these were procedure-group counts, not necessarily unique children. Calcium-containing stones predominated among recorded results, but cystine and xanthine were also identified. Tasian et al. (2017)[16] estimated approximately 50% symptomatic recurrence by three years in a pediatric cohort, emphasizing why surgical clearance should be followed by preventive care. Cao et al. (2023)[17] similarly emphasized metabolic assessment in pediatric nephrolithiasis. The restricted documentation in our charts prevented estimation of the prevalence of metabolic abnormalities and could not support the presentation's assertion that all children had stone analysis.

Güven et al. (2024)[18] addressed controversies and variation in pediatric stone management through a consensus statement. The present experience suggests practical priorities consistent with structured care: recording access failures, maintaining a distinct patient and procedure register, documenting stone analysis, planning postoperative imaging and tracking children referred elsewhere. Barreto et al. (2019)[19], in a Cochrane review, also highlighted uncertainty in the evidence comparing pediatric stone interventions.

CONCLUSION

PCNL and URSL were used across a broad pediatric age range, but access difficulties and repeat interventions were important features of the initial institutional experience. Initial complete clearance was recorded in 13 of 18 interpretable PCNL records and 11 of 23 interpretable URSL records. Eleven of 24 URSL patients had more than one procedure. The observed complications and incomplete follow-up supported careful access planning, supervised training, structured metabolic evaluation and standardized outcome documentation. The available data did not establish 100% final clearance, comparative treatment superiority or greater safety of one puncture technique.

LIMITATIONS OF STUDY

The retrospective, single-center design was susceptible to selection bias and incomplete recording. The small sample generated wide confidence intervals and limited exploratory analyses. Two children belonged to both procedural cohorts, and the procedures addressed different clinical indications, preventing an independent comparison of efficacy. The presentation and charts differed in PCNL case numbers, URS procedure counts, sex distributions and several outcome summaries. Dates, imaging criteria and the timing of clearance assessment were unavailable. Some children had bilateral disease without sufficiently detailed side-specific treatment records. Final clearance, follow-up duration, recurrence and long-term ureteric or renal outcomes could not be reliably assessed. Operative times, hospital stay, radiation exposure, hemoglobin change, tract size and standardized complication grades were unavailable. Metabolic work-up and stone-analysis reporting were incomplete. Reasons for stenting, planned staging and referral were insufficiently detailed, leaving substantial confounding. No comparison group evaluated puncture technique, mentorship or energy source; causal claims about these factors were therefore not justified.

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