Tubeless Mini Percutaneous Nephrolithotomy in Infants and Preschool Children: A Preliminary Report

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Abbreviations and Acronyms

CaOx = calcium oxalate

PCNL = percutaneous nephrolithotomy

SWL = shock wave lithotripsy

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Purpose: We retrospectively analyzed the outcomes of tubeless mini percutaneous nephrolithotomy in infants and preschool children, and compared them with age matched controls who underwent nephrostomy drainage.

Materials and Methods: A total of 28 renal units in 26 children were operated on for stone disease using the mini percutaneous nephrolithotomy technique. Holmium laser and pneumatic lithotriptor were used for stone fragmentation. Children who underwent complete stone removal and had a clear nephrostomy tract only had a ureteral catheter placed. Those with residual stones or bleeding from the nephrostomy tract underwent nephrostomy drainage. We compared both groups with regard to patient and stone characteristics, and postoperative findings.

Results: A total of 12 renal units had only a ureteral catheter for diversion, while 16 had nephrostomy drainage. Mean respective ages of the stentless and nephrostomy groups were 3 (range 0.58 to 6) and 3.3 years (1.5 to 6). Mean respective stone burdens were 192 (range 100 to 400) and 416 (775 to 1,380) mm^2. Surgery and fluoroscopy times were shorter in the tubeless group. Complication rates were higher (6 of 14 vs 0 of 12) and duration of hospitalization was longer (4.9 [range 3 to 14] vs 3.1 days [2 to 6]) in the nephrostomy group. Stone-free rates were 91.6% in the tubeless and 78.5% in the nephrostomy groups.

Conclusions: Tubeless percutaneous nephrolithotomy was observed to be a safe option for selected children with stone disease. The success and safety of tubeless percutaneous nephrolithotomy depends on patient selection criteria, including low volume and infection-free stones that are removed completely without any bleeding from the access tract.

Key Words: nephrostomy, percutaneous; pediatrics; urinary calculi

PEDIATRIC urolithiasis is a health problem that primarily affects children in developing countries, where it is endemic.[1] The majority of pediatric stone disease cases can be managed effectively and safely using shock wave lithotripsy. However, not all stones respond to shock wave lithotripsy, and these stones can be managed by percutaneous nephrolithotomy or retrograde intrarenal surgery.[2] Percutaneous nephrolithotomy has become a standard surgical choice for complex pediatric stone disease since first reported in 1985 by Woodside et al.[3]

Traditional percutaneous techniques use nephrostomy tract dilation of 26Fr to 32Fr. Smaller dilation sets and sheaths have been used successfully in adults.[4] Jackman et al described the 11Fr mini PCNL technique and re-

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ported their early experience in children.[5] Since then, endourologists have been encouraged to use smaller instruments in pediatric patients.

Nephrostomy drainage using reentry catheters following PCNL is known to be helpful for drainage and hemostasis, and facilitates easy repeat access of the kidney in cases of repeat PCNL. Nonetheless, tube related morbidity such as significant postoperative pain has led surgeons to modify the technique to tubeless and totally tubeless procedures. We performed tubeless PCNL in selected infants and preschool children, and analyzed the outcomes compared to stented cases.

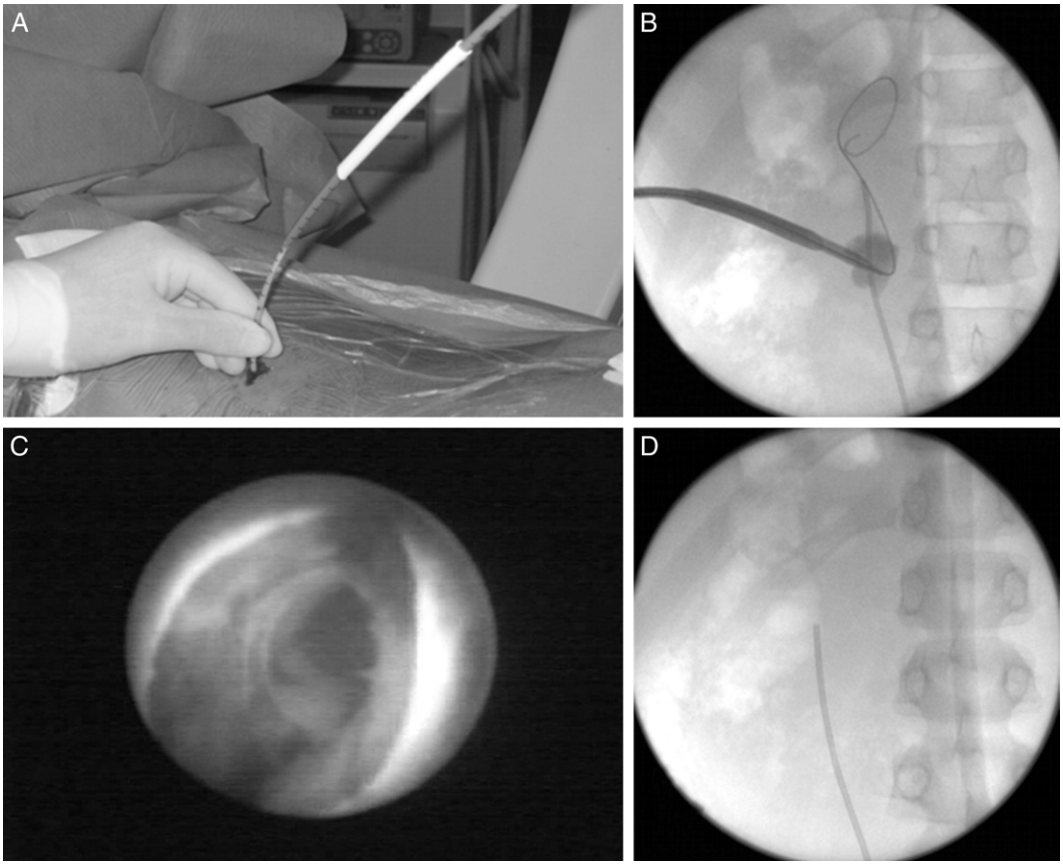
MATERIALS AND METHODS

The study included 26 preschool children and infants (16 boys and 10 girls) with a median age of 3.23 years (range 0.58 to 6) who underwent surgery for urolithiasis at 2 university hospitals. Informed consent was obtained from the family of each patient preoperatively.

Indications for PCNL included stones that were resistant to SWL, required repeated SWL sessions, were located in caliceal diverticula, or were faint or radiolucent, as well as dilated and/or obstructed collecting systems. Additionally patients whose families desired 1-session therapy were directly treated with mini PCNL.

Mini PCNL was performed using parenteral antibiotic prophylaxis with patients under general anesthesia. Children with documented urinary tract infections underwent surgery following 1 week of antibiotics if they were asymptomatic. We used 4Fr to 5Fr ureteral catheters (MarFlow®) for retrograde stenting. A 9.5Fr pediatric working cystoscope (Karl Storz, Tuttlingen, Germany) was used for nephroscopy, and an antegrade flexible nephroscope (7.5Fr, 67 cm, Karl Storz) was used for stones in the ureter and stones that remained in the calices. A holmium laser lithotriptor (VersaPulse® PowerSuite™) and pneumatic lithotriptor were used for in situ lithotripsy. Fragmented stones were removed with endoscopic graspers and short zero tip nitinol basket catheters.

Following placement of a ureteral catheter patients were placed in the prone position and renal access was achieved under fluoroscopic guidance. After dilation of the tract using telescopic dilators (MIPP, Rüsch, Kernen, Germany) a 14Fr renal sheath was put in place (parts *A* and *B* of figure). Pneumatic and laser lithotripsy under direct pediatric cystoscopic guidance was administered. As the diameter of the working channel was small, retrograde irrigation of the collecting system via the ureteral catheter was extremely useful when bleeding obscured the visual



A, dilation of tract using telescopic dilators. *B*, fluoroscopic image of telescopic dilators. *C*, endoscopic image of nephrostomy tract shows bloodless renal parenchyma. *D*, fluoroscopic image of indwelling ureteral catheter.