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Percutaneous Treatment of Bladder Calculi in Children: 5 Years Experience

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ABSTRACT

Introduction: We sought to evaluate the safety and efficacy of percutaneous cystolithotripsy in children.

Materials and Methods: Thirty children (27 boys and 3 girls; mean age, 6.06 ± 2.64 years; range, 1.5 to 12 years) with bladder calculi underwent percutaneous stone removal. The mean size of the largest diameters of the calculi was 24.8 ± 8.47 mm (range, 13 mm to 50 mm). Under general anesthesia, a 1-cm incision was made 1 to 2 cm above the pubic symphysis. A 26-F nephroscope was introduced into the bladder following tract dilation, and the calculi were removed. If the calculi were larger than 1 cm, fragmentation was performed. The procedure was done without fluoroscopy. Finally, a urethral catheter was placed for 48 hours.

Results: All patients became stone free. The mean operative time was 23.13 ± 8.38 minutes (range, 12 to 40 minutes). All patients were discharged 24 hours after operation, except 1, who was hospitalized 2 more days for suprapubic pain and severe irritating symptoms. No significant intraoperative or postoperative complications were seen.

Conclusion: Percutaneous suprapubic cystolithotripsy is an efficient and safe technique for treating bladder calculi in children. We recommend this technique for treating large bladder calculi (larger than 1 cm) in children.

KEY WORDS: bladder calculi, percutaneous cystolithotripsy, children

Introduction

Although, urinary calculi, especially bladder calculi, are a rare entity in children in developed countries, it are a common disease among children in developing countries.[1,2] During the past decade, transurethral lithotripsy has become an alternative to open cystolithotomy; however, the method is hampered in children with narrow caliber urethra.[1,3]

We present our results of percutaneous cystolithotripsy (PCCL) without the use of fluoroscopy in children with bladder calculi.

Materials and Methods

Between April 2001 and February 2005, we performed 30 percutaneous stone removal procedures from the bladders of 27 boys and 3 girls (mean age, 6.06 ± 2.64 years; range, 1.5 to 12 years). The diagnosis was based on plain abdominal radiography and ultrasonography (Figure 1). The mean size of the largest diameters of the calculi was 24.8 ± 8.47 mm (range, 13 to 50 mm). The most-common presenting complaints were urinary retention, dysuria and/or frequency, and hematuria.

Urine culture was performed in all patients preoperatively, and if needed, antibiotic therapy was carried out. The surgical operations were performed under general anesthesia, following prior informed parental consent and if possible, assent from the children. All patients underwent an initial cystourethroscopy to exclude any subvesical obstruction. Then, an 8-F or a 10-F Foley catheter was inserted into the bladder. The bladder was filled with saline to its maximum capacity. A 1-cm transverse incision was made 1

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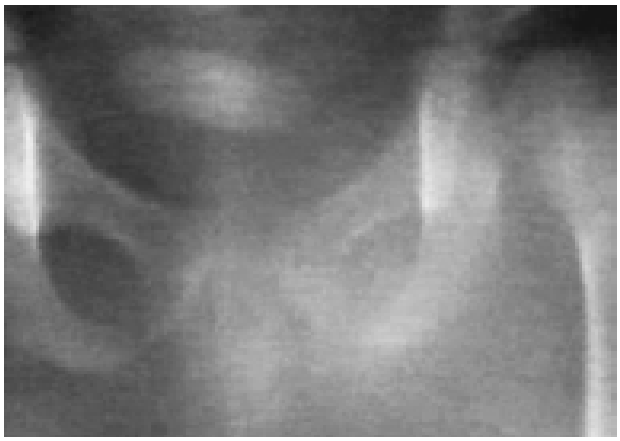

Fig. 1. Plain abdominal radiography in a 3-year-old girl with a large bladder calculus

to 2 cm above the pubic symphysis. The bladder was punctured with an 18-gauge needle, and a 0.035-inch J-type guide wire was placed into the bladder. Subsequently, using telescoping metal dilators, the tract was dilated up to 30 F over the guide wire. An Amplatz sheath with an inner diameter of 30 F was introduced into the bladder (Figure 2). A 26-F nephroscope was introduced after tract dilation, and the calculus was removed if it was small, or fragmented with a Swiss Lithoclast (EMS, Lausanne, Switzerland) if it was larger than 1 cm (Figure 3). The fragments were removed with a grasping forceps. The procedure was done without fluoroscopy. At the end of the procedure, an 8-F or a 10-F urethral catheter was introduced into the bladder for 48 hours. No suprapubic catheter was needed. Antibiotic prophylaxis continued for 5 days after the operation. In cases without complications, patients were discharged from the hospital 24 hours after the surgery. In all patients, ultrasonography was performed after the 5th postoperative day.

Results

Two patients with positive preoperative urine cultures were treated with appropriate antibiotics. The mean operative time was 23.13 ± 8.38 minutes (range, 12 to 40 minutes). No significant intraoperative or postoperative complications were seen. All of the patients were discharged 24 hours after the operation, with the exception of a 5-year-old child who complained of suprapubic pain and severe, irritating symptoms. He was discharged 48 hours after catheter removal. In all of the patients, the urethral catheter was removed 48 hours after the operation. Seven patients complained of increased urinary frequency and dysuria after catheter removal, which improved by anticholinergic agents.

Ultrasonography on the fifth postoperative day showed no collection, and the bladder was free of stones in all patients. No pain or irritation at the site of operation was reported 5 days postoperatively. Calculi were composed of ammonium acid urate in 11 (36.7%), ammonium acid urate and calcium oxalate in 16 (53.3%), and cystine in 3 patients (10%).

Discussion

Urinary calculi are relatively uncommon in children compared with adults and are formed in association with a variety of factors, including identifiable metabolic and genetic disorders, geographic and socioeconomic boundaries, and exposure to medication and other environmental influences.[4] Urinary calculi in children are categorized into 3 broad epidemiologic patterns: calculi seen in premature infants of very low birth weight, upper urinary tract calculi seen in children and adolescents, and endemic bladder calculi.[1,4] In developed countries, occurrence of

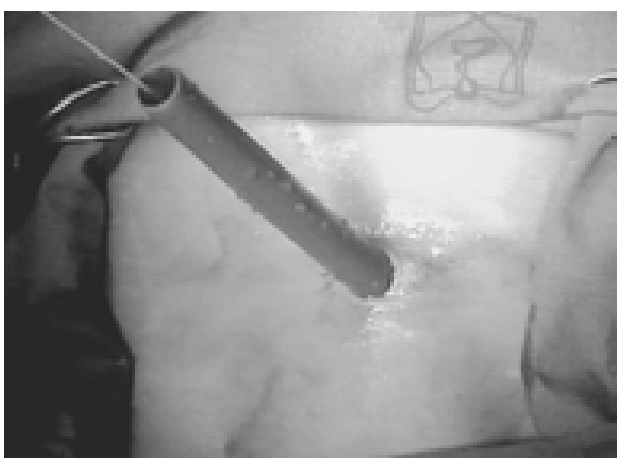

Fig. 2. A 30-F Amplatz which is inserted into the bladder following dilation in a 3-year-old girl

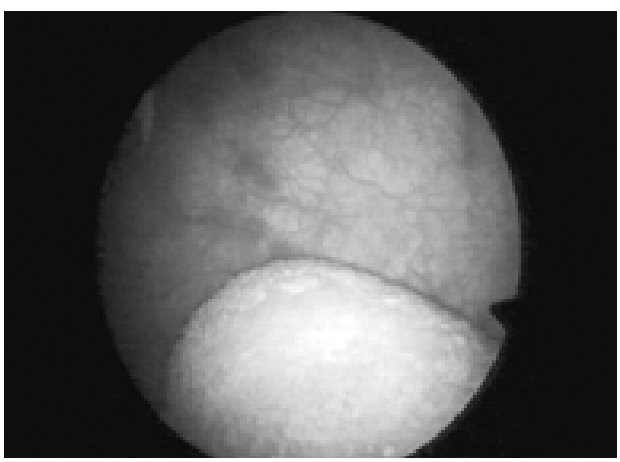

Fig. 3. Endoscopic feature of the bladder calculus in a 3-year-old girl

urinary calculi in children represents 1% to 5% of all urinary calculi, and moreover, urinary bladder calculi are very rare.[1] At the same time, in developing countries (such as those in the Middle East, Thailand, and Indonesia), occurrence of urinary calculi in children represents 30% of all urinary calculi. The endemic bladder calculus is still a common disease in childhood.[1,2,4] Most pediatric bladder calculi in endemic areas are composed of ammonium acid urate, calcium oxalate, or mixtures thereof.[5]

The occurrence of such calculi may be traced to the common practice in endemic areas of feeding infants human breast milk and cereal foods, such as polished rice or millet. Human breast milk, in contrast with cow's milk, is low in phosphorus, as is polished rice. Such low-phosphate diets result in high peaks of urinary ammonia excretion.[1,4]

Various techniques have been used to remove calculi from the bladder including open cystolithotomy, transurethral lithotripsy, and percutaneous cystolithotripsy (PCCL).[6-9] Open surgery has the inherent problems of a long scar, prolonged catheterization, extended hospitalization, and risk of infection.[10] In children, especially in boys, because of the size limitations secondary to the small urethra and concerns about iatrogenic urethral stricture, transurethral endoscopic removal may be more difficult and fraught with danger. Gopalakrishnan and colleagues were the first to report use of a percutaneous suprapubic approach in managing bladder calculi.[8] The morbidity of PCCL is significantly less than that of open cystolithotomy.[1,3] Using the percutaneous suprapubic approach, a 26-F nephroscope can be introduced into the bladder without urethral injury. In this manner, the large and hard stones can be disintegrated and removed in large fragments, so that the intervention can be performed quickly. In our study, the largest calculus was 5 cm in diameter.

In this study, we used a single percutaneous puncture. The access site was positioned 1 cm to 2 cm above the pubic symphysis, and the puncture was performed with a distended bladder to avoid inadvertent bowel injury. The 30-F Amplatz sheath allowed for passage of a standard nephroscope, and the calculi were removed using fragmentation, if necessary. The procedure was done without fluoroscopy, and no significant complications were seen. Salah and coworkers have reported successful PCCL in 117 children, 77% of whom were younger than 5 years. In their study, dilation of the tract was made under fluoroscopy, and this could be associated with complications.[1] We preferred blind dilation to prevent any complication. Also, Salah and colleagues used ultrasonic lithotripsy, while we used pneumatic lithotripsy. Agrawal and colleagues have performed this procedure on 38 children without fluoroscopy.[3] The largest calculus diameter in their study was 2.8 cm. No eventful complications were reported in these studies. Postoperatively, the authors performed a cystostomy in all patients. In comparison, we inserted a Foley catheter, and the largest diameter in our patients was 5 cm. It seems that all these approaches in percutaneous stone removal in children are successful.

Conclusion

Percutaneous suprapubic cystolithotripsy is an efficient and safe technique for treating bladder calculi in children. We recommend this technique for treating large bladder calculi (greater than 1 cm) in children.

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