

The Effectiveness and Safety of Percutaneous Cystolithotripsy for Vesicle Calculus in Children: A Single-Center Study

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ABSTRACT

Background: Primary bladder stones are common among children from developing countries but may be difficult to cure. Transurethral cystolithotripsy, open cystolithotomy, and shock wave lithotripsy are the treatment modalities for vesical calculi in children. Transurethral lithotripsy is less efficient in children because of the small caliber of the urethra. PCCL is a less intrusive and efficient procedure for removing bladder stones in pediatric patients.

Objectives: The objective of the study was to determine the safety and efficacy of PCCL in children with bladder stones in third-world nations.

Materials and Methods: There was a search for (PCCL) in pediatric individuals diagnosed with vesical calculus. 90% male and 10% female total of 120 patients enrolled in the single-center trial at the Department of Pediatric Urology at the Institute of Kidney Diseases between January 2021 to January 2022. The surgery was performed under a general anesthetic. After a thorough inspection, a suprapubic puncture of the lower urinary tract (by cystoscopy) was done. The tract was only dilated up to 14 Fr. The stone was fragmented using pneumatic lithotripsy after passing the nephroscope. After 36 hours per urethral catheter was removed.

Results: In this study, the mean age of the patients was 4.2.14 years. The majority of patients were kids. The average gem was 9.3 millimeters in diameter. Successful stone fragmentation and retrieval took place in an average of 40 min. The only major problems seen during or after surgery were hematuria, infection, and moderate mucosal injury; all three were managed conservatively. In 108 out of 120 cases (90%), ammonium acid urate was found to be the primary constituent of the stones and the core.

Conclusion: The success rate of percutaneous cystolithotripsy in the treatment of bladder stones in children is higher, and it is ready for immediate use. The operation is quick and causes minimal discomfort.

Keywords: Effectiveness, Percutaneous, Cystolithotripsy, Vesical Calculus, Children

INTRODUCTION

Urinary bladder stones have been a problem for humanity. A bladder stone was found by archaeologists in the ancient Egyptian corpse pelvis that was more than 6,000 years old¹. Luckily, during the last half-century, there has been a significant decrease in the frequency of bladder calculi in industrialized nations. In the Western world, over 6% of all genito-urinary calculi may be attributed to them². However, young people in developing countries continue to have a comparatively high rate of bladder calculi³.

Traditional surgery, sound waves lithotripsy (SWL), suprapubic, and transurethral cystolithotomy are all decent alternatives for treating bladder stones. It makes perfect sense to choose a therapy method that results in little pain given the options available⁴. In modern medicine, open cystolithotomies are often only done when necessary.

Furthermore, urethral lithotripsy is an effective method for treating vesical stones in adults. Children also have a harder time using these tools since their urethras are smaller⁵. The efficiency of SWL is based on the high treatment rate and the difficulties in voiding broken stone particles. To avoid urethral narrowing, a percutaneous suprapubic technique may be performed. When applied to the treatment of bladder stones, the same percutaneous access and tract dilation methods developed for the surgical removal of renal stones have shown to be beneficial. A coeval study was conducted to describe the outcomes of our single-results centers for the percutaneous suprapubic method and bladder stone treatment⁶.

MATERIALS AND METHODS

This study was conducted in IKD Hayatabad, Peshawar, Pakistan, between January 2021 to January 2022. One hundred twenty children, 90% male, 108 patients, and 10% female 12 patients were diagnosed with PCCL throughout this period. We took careful notes on each patient's medical history, conducted full physical examinations, and carefully diagnosed each one. Diagnostic procedures included ultrasound and X-rays. Urine was collected for

a culture and sensitivity test. A bladder stone x-ray was taken at KUB (Figure 1). Because of this therapy, the body felt numb. 25 to 50 milligrams per kilogram of body weight of cephalexin was given to everyone. Screening for sub-vesical obstructions ("urethral valve", "stricture") and allowing the bladder to "resorb urethral stones" are two benefits of urethroscopy. A suprapubic needle stick followed inflation. A 1-cm incision was made over the puncture site, a guidewire was inserted into the guiding rod, and a 16Fr Amplatz dilator was used. Using a nephroscope, the stone was either completely or partially removed. The PUC came out the next day. To ensure that all components had been taken out, patients were followed up with utilizing x-ray KUB/ultrasonography after 3-4 weeks. We check for symptom relief, the absence of infection or sepsis, mucosal damage, and the need for retreatment. The information was collected using a convenient sample method, put into a standard data entry form, and analyzed using SPSS 24

RESULTS

Over the duration of the study, 120 patients were seen at the hospital. Vesical calculus was not observed in the medical record of the patients. Patients had a median age of 4.2 years. Table 1 presents the background information of the patients. Operating room men outnumbered girls by a ratio of 14 to 4. Most individuals had dysuria and increased urine frequency for the middle of 4.2 days. Acute urinary retention and a weaker urinary stream characterized the second clinical presentation (Table 2). There was an average size of 9.2 mm for the stones. The patients needed one session to remove their stones (Table 3). When patients were discharged, they could all urinate on their own. Mild surgical complications like infection/sepsis, hematuria and minor mucosal damage, are included in Table 3, along with the short-term outcomes for patients with them. Figure 3 shows that uric acid stones made up

83.2 percent of all stones, followed by calcium stones (11.0 percent) and mixed stones (4.2 percent).



Figure 1: Bladder stone on x-ray at KUB, Figure 2: Calcification of the bladder as shown during cystourethroscopy in a child.

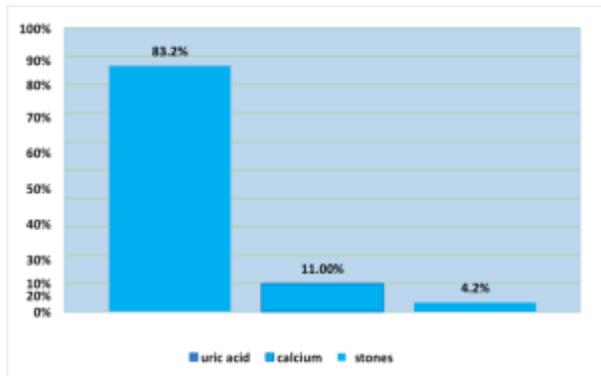


Figure 3: Summary of the study

Table 1: Occurrence of variables and patient values (n=120)

variables	Values
(Mean±SD) Age in years	4.2±3.01
Gender (kids: girls) male 90% and female 10%	14:02, 108±12 120
(Mean±SD) Symptom Duration in days	3.6±2.22
Stone size(mm)	9.2±3

Table 2: Occurrence of clinical performances and percentage (n=120)

Scientific performance	incidence	Ratio%
dysuria	45	41.2
Acute urinary retention	15	15.2
Increase urinary frequency	30	25.1
Decrease urinary stream	30	18.2
Total(n)	120	99.07

Table 3: Statistical analysis of variables and values for pre-and post-operative care =(120)

variables	values
Operative time in minutes(mean±SD)	28.06±2.11
Stone free rate	99.7%
Stay in hospital (days)(mean±SD)	1.22±1.58
Retreatment rate	0
Intraoperative complication like mucosal injury	2
Postoperative complications like hematuria, infection)	4
Additional treatment	1
Death	0

DISCUSSION

The incidence of bladder stones in children is extremely uncommon in industrialized nations. Consequently, it causes 1-6% of all UTIs⁷. Stones in the bladder are quite unusual.

Globally, 1/3 of all pediatric urinary tract stones occur in non-industrialized nations. Urolithiasis causes discord among the elderly because kidney stones and other forms of obstruction cause the formation of pebbles in the urinary tract⁸. The majority of pediatric bladder stones are caused by malnutrition. The risk of bladder stones in children increases with voiding dysfunctions, urethral strictures, vesicoureteral reflux, PUV, and foreign bodies. Adults often get bladder stone fractures of the urethra⁹. All cases of vesical calculi are susceptible to endoscopic treatment. If the stone is very large, it might cause injury to the urethra¹⁰. Urethras in

children are very small. The ages 4–10 and 14–15 are more common when bladder stones occur in developing countries. Patients in this research were four years old, the same age as those in past research¹¹. In the US and Western Europe in the late nineteenth century, diet, nutrition, and infection management contributed to a decrease in primary bladder calculi. In certain areas, adult vesical calculi are more prevalent than children¹². The indexing findings show an abnormally high ratio of children, boys, and girls. Turk et al. and Skolarikos et al. observed similar trends in their research. Boys are more likely to be diagnosed with vesical lithiasis than Girls, even in poor countries¹³.

This study found that the most common symptoms of bladder stones were dysuria (83.2% of participants), high urinary frequency (24.8%), acute urine retention (14.2%), and a diminished urinary stream (18.8%). According to Badani et al., Examining children with urinary tract infections for bladder stones is important¹⁴.

Ammonium acid urate makes up 83.2% of bladder stones in children, followed by calcium (11% of stones) and mixed stones (4.2% of stones). Uric acid accounts for more than half of vesical stones. Several different minerals, such as ammonium urate, calcium oxalate, calcium phosphate, magnesium ammonium phosphate and cysteine may combine to form bladder calculi (associated with infection)¹⁵. The risk of arthritis or hyperuricemia in bladder stones patients is low. Many molecules pile one on the other, with one in the center. It is possible to remove vesical stones by endoscopy. When the rock is large or complicated, or when the patient has a narrow urethra (as in children), open or percutaneous suprapubic surgery is recommended¹⁶.

Treatment options for stones in the urinary tract include open suprapubic cystostomy, percutaneous suprapubic cystolithotripsy, and transurethral cystolithotripsy. In this optical investigation, PCCL successfully extricated all stones. In nations with few medical resources, such as Pakistan, PCCL has effectively treated bladder stones. This investigation revealed a single occurrence of mild mucosal irritation after surgery. Children with vesicolithiasis who were given PCCL reported no adverse effects (92.1%)¹⁷. Besides two patients who had self-limiting hematuria and infection/sepsis needing IV antibiotics, no patients reported serious complications after surgery. With a complication rate of 11.2%, the method is safe for children. Even though there is a severe lack of medical resources and trained personnel, the issue rate is on par with the rest of the industrialized world. Deaths were not detected in the research¹⁸. The urethra is covered during the percutaneous suprapubic route, which allows for a 25 Fr or, if necessary, a 30 Fr to 33 Fr Amplatz sheath to be inserted into the bladder. The removal process may be sped up by breaking big stones into smaller pieces. The size and breakup of the sheath reduced its useful life. According to the data, it takes a stone 31 seconds to be broken¹⁹. There are so many cases of primary bladder stones in this age range that no additional treatment is necessary. Concurrent procedures may be necessary for adults with blockages or impediments²⁰. Comparatively, PCCL has fewer adverse effects than open cystostomy. Rare wound infections shorten patients' time in hospitals. The results are in line with past studies¹⁸.

CONCLUSION

If a child does have a bladder stone and there's no urologist in the area, percutaneous urethral stricture lithotripsy may be an option. The extraction of the stone from the bladder is performed with the use of a catheter that is placed into the urinary bladder. The treatment is simple and presents just a small number of possible adverse effects.

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