



## ABUNDANCE OF PERCUTANEOUS SUPRAPUBIC CYSTOLITHOTOMY SURGERY IN TREATMENT OF LARGE BLADDER CALCULI AND ITS COMPLICATIONS

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### ABSTRACT

**Introduction:** Large bladder calculi are common in developing countries. The aim of this study was to descriptively evaluate the percutaneous suprapubic cystolithotomy surgery in patients with bladder calculi larger than 3 cm. **Methods:** In this descriptive study, information were collected from the questionnaires before and after surgery and also from the records. Data were analyzed using the software SPSS on the levels of descriptive and inferential statistics. **Results:** A total of 110 patients participated in this study. The females comprised 34.5% of the patients. The mean age of the patients was  $36.53 \pm 25.39$  years. All patients were examined in two groups of children (34.5%) and adults (65.5%). Prolonged hematuria was observed in 13.3% of children and 8.3% of adults, cystostomy tube placement occurred in 2.6% of children and 5.6% of adults, and urinary leakage happened in 4.2% of adults. The mean decrease of hemoglobin in adults (0.62) was more than that in children (0.43). With increasing age, the size and number of calculi as well as hemoglobin downfall increased in the patients. The calculus size was larger in men than in women. The duration of hospitalization increased with increasing complication rates. The length of hospitalization and decrease in hemoglobin elevated with increases in the number and size of calculi in adults. Patients with urinary leakage complained of more pain. As the number of calculi rose, prolonged hematuria increased. **Conclusion:** The percutaneous suprapubic cystolithotripsy surgery is a safe and effective treatment for bladder calculi in children and adults.

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### Introduction

Bladder calculi usually occur in men over 50 years old and are often associated with a stricture of the bladder outlet. The risk factors of bladder calculi include stricture of bladder outlet, neurogenic bladder, external body, bladder diverticulum, and rarely the upper tract calculi. Most bladder calculi are the infectious (struvite) ones but calcium oxalate and uric acid calculi are also common. Bladder calculi are found randomly during the evaluation of patients with symptoms of urinary irritation or obstruction. Recurrent urinary tract infections are common and considered as a risk factor [1].

Bladder calculi are usually radiolucent and may be single or multiple observed with a filling defect in IVU cystogram phase or accidentally on the CT scan. In ultrasonography, a moving mass raises suspicion of bladder calculus [2]. There are several ways to treat bladder calculi, including extracorporeal shock wave lithotripsy (ESWL), cystolitholapaxy, pneumatic, ultrasonic and laser lithotripsy, electrohydraulic lithotripsy, percutaneous cystolithotomy, and cystolithotomy. Several factors are involved in determining the type of surgical techniques, including size, calculus composition, calculus location, previous methods of calculus therapy, etiology, and risk factors that promote the formation and recurrence of calculi, previous surgery of the lower urinary tract, age and physical condition of the patient, associated diseases, patient's job, the

surgeon's experience, and the risk of surgical complications [3]. Briefly, there are various endoscopic procedures to treat bladder calculi. Percutaneous cystolithotomy is considered as a viable alternative to open cystolithotomy in children with a narrow urethra, in patients with the non-passage urethra and bladder neck, in patients with very large or multiple calculi, as well as in patients who do not tolerate long surgeries [4]. Contraindications of this approach include history of bladder cancer, previous pelvic or abdominal surgery, pelvic irradiation, and active infections in urinary tract or abdominal wall [5]. Indications for this procedure include calculi larger than 3.0 cm, multiple calculi larger than 1.0 cm with a total diameter of more than 3.0 cm, and inability in transureteral cystolithotomy surgery because of the anatomy of the patient [6]. This study describes the type of operation, an appropriate rate of success, absence of notable complications, and the short duration of hospitalization aiming to offer this type of treatment for large bladder calculi and treatment of bladder calculi in children.

## Methods

In the original design of this study, patients who referred during the period of June 2007 to June 2008 were examined, but the duration of the study was extended because of a low number of patients and a low degree of reliable statistical results so that the results obtained are statistically dependable. This is a descriptive research. The study population consisted of all adults with multiple calculi larger than 3.0 cm in the bladder and all children with bladder calculi admitted to the urology clinic from June 2007 to December 2009. The patients were enrolled in the study regardless of age and gender, and the absence of calculi had been confirmed through simple pictures of X-ray or ultrasound. They underwent percutaneous suprapubic cystolithotomy surgery by a surgeon in Jahrom Peymanieh Hospital. This study was calculated using a census and a part of information was extracted from the archived hospital records and also by the filled questionnaires before and after the operation.

**Inclusion criteria:** All children and adults enrolled in the present study had bladder calculi larger than 3.0 cm regardless of age and gender who referred with dysuria symptoms, hematuria, and suprapubic pain, for which the absence of calculi had been confirmed through simple pictures of X-ray or ultrasound and underwent percutaneous suprapubic cystolithotomy surgery in Jahrom Peymanieh Hospital.

**Exclusion criteria:** All excluded patients had referred with bladder calculi and obstructive symptoms caused by an enlarged prostate gland and needed prostatectomy. Patients with active infections in the abdominal wall or history of pelvic and abdominal surgeries were eliminated. Patients with bladder malignancies or history of positive pelvic radiotherapy were ignored. If some patients had coagulopathy or used to take aspirin and warfarin, they were excluded until normalization of coagulation tests. In the case that a patient had a positive urine culture, the surgery was postponed in order to consume antibiotics for a full period until urine culture became negative.

**Surgical techniques:** The patients were first exposed to regional epidural or spinal anesthesia, then were cystoscoped in the lithotomy position and the bladder was filled with wash liquid. Then, Chiba needle was entered 2 cm above the symphysis pubis of the bladder with cystoscopy and at the same time, the needle entrance was assessed followed by guide wire insertion into the bladder; in the next step, the needle was removed, the dilator antenna was passed, and then the dilator was inserted into the bladder. Ultimately, the amplatz sheath was put in.

The entire process was controlled by cystoscopy and direct observation. Using cystoscopy, the bladder's interior was observed, the calculi were broken by a lithotripter, all the calculi were removed with a forceps, and, eventually, a urinary catheter was inserted after the amplatz had been removed.

After surgery, if the patients showed no complications such as hematuria, urinary leakage, etc., they were discharged as outpatients or after hospitalizing for a night.

**Postoperative visits:** In the second study, the patients referred twice to complete the questionnaires after the surgery. A week later, the patients were evaluated for the presence or absence of the following complications:

- Hematuria: Presence of ten red blood cells per HPF
- Drop in hemoglobin: Hemoglobin reduction after surgery in relation to before.
- Anastomotic urinary leakage: non-bloody and non-suppurative anastomotic discharge.
- Febrile urinary tract infection: Presence of more than five white blood cells per HPF with fever.
- Suture infection: Purulent discharge, redness, tenderness, and stiffness in the stitches.
- Pain level: The patient selected a number between zero to ten to express the pain after the operation. The numbers less than three, between three to six, between six to nine, and nine or ten, respectively, were considered as mild, average, intense, and very severe. In children, these degrees were obtained by direct questioning.

The success rate of surgery was determined with sonography and ascertaining the presence or absence of calculi in the bladder two weeks after the surgery. Data were analyzed using the software SPSS on the levels of descriptive and inferential statistics.

## Results

In this study, all adults with multiple calculi larger than 3 cm in the bladder and all children with bladder calculi admitted to the urology clinic from June 2007 to December 2009 were selected, for which the presence of calculi had been proven with simple pictures of radiology or ultrasound.

A total of 110 rural and urban patients had undergone percutaneous suprapubic cystolithotripsy during the study period in the Jahrom Peymanieh Hospital. The operation time was 35-90 min. Of the total patients, 38 (34.5%) and 72 (65.5%) individuals were females and males, respectively. The age range of children- less than 10 years- included 38 (34.5%) patients and 72 (65%) of the individuals were adults. The mean age of patients was  $36.53 \pm 25.39$  years and the age distribution of patients in the study was 2-85 years, which were separately investigated in two groups of children and adults.

**Children group**

Among the children studied, 25 patients (65.8%) were boys and 13 individuals (34.2%) were girls. Their mean age was  $4.81 \pm 1.67$  and the age distribution of patients in this group was 2-9 years. The following results were obtained through examining possible complications associated with percutaneous suprapubic cystolithotomy surgery.

Febrile urinary tract infection, infectious sutures, urinary leakage, and urethral stricture were not observed in the children. A portion of the patients (13.2%) suffered prolonged hematuria after the surgery. Cystostomy tube insertion was required in 2.6% of the children. The mean postoperative hemoglobin drop and its dispersion, respectively, were  $0.43 \pm 0.19$  mg/dl and 0.1 mg/dl to 1.2 mg/dl.

The percutaneous suprapubic cystolithotomy surgery was successful in 100% of the patients studied and no recurrence was observed in ultrasound two weeks after the surgery.

**Adults**

The following results were obtained through examining possible complications associated with percutaneous suprapubic cystolithotomy surgery.

Febrile urinary tract infection, infectious sutures, and urethral stricture were not observed in the adults. Urinary leakage was observed in 4.2% of adults after the surgery. A portion of the patients (8.3%) suffered post-surgery prolonged hematuria. Cystostomy tube insertion was required in 5.6% of the children. The mean postoperative hemoglobin drop and its dispersion, respectively, were  $0.62 \pm 0.56$  mg/dl and 0.1 mg/dl to 3.0 mg/dl.

The percutaneous suprapubic cystolithotomy surgery was successful in 100% of the patients studied and no recurrence was observed in ultrasound two weeks after the surgery.

The relationships between age and postoperative complications in percutaneous suprapubic cystolithotomy surgery (leakage of urine, prolonged hematuria, cystostomy tube insertion) were not significant as revealed by Pearson's correlation coefficient.

**Table 1.** Possible complications in the children

Abundance		Percent		
Present	Absent	Present	Absent	
5	33	13.2	86.8	Prolonged hematuria
1	37	2.6	97.4	Cystostomy tube insertion
0	38	0	100	Febrile urinary tract infection
0	38	0	100	Infectious stitches
0	38	0	100	Urethral stricture
0	38	0	100	Leakage of urine

**Table 2.** Possible complications in adults

Abundance		Percent		
Present	Absent	Present	Absent	
6	66	8.3	91.7	Long hematuria
4	68	5.6	94.4	Cystostomy tube insertion
0	72	0	100	Febrile urinary tract infection.
0	72	0	100	Infectious stitches
0	72	0	100	Urethral stricture
0	69	4.2	65.8	Leakage of urine

**Table 3:** Statistical relationship between perioperative bleeding and possible resultant complications

Children		Adults		
R	P	R	P	
0.051	0.761	0.065	0.585	Long hematuria
0.055	0.743	0.024	0.844	Cystostomy tube insertion
-	-	-	-	Febrile urinary tract infection
-	-	-	-	Infectious stitches
-	-	-	-	Urethral stricture
-	-	0.276	0.019	Leakage of urine

**Table 4.** Possible complications of the surgery in terms of total size and number of calculi

Size of calculus				Number of calculus				
Children		Adult		Children		Adult		
R	P	R	P	R	P	R	P	
0.209	0.208	0.121	0.132	0.422	0.008 √	0.364	0.002 √	Long hematuria
0.231	0.198	0.024	0.839	0.027	0.872	0.014	0.908	Cystostomy tube insertion
-	-	-	-	-	-	-	-	Febrile urinary tract infection
-	-	-	-	-	-	-	-	Infectious stitches
-	-	-	-	-	-	-	-	Urethral stricture
-	-	0.180	0.130	-	-	0.156	0.191	Leakage of urine

## Discussion

Cystolithotomy is the most invasive treatment option, yet, the most reliable method, which has continued to date as a golden standard for the treatment and removal of large bladder calculi. On the other hand, bladder calculus disease is a common problem both in the region and the country. Different transureteral modalities are used for the removal of bladder calculi, such as pneumatic lithotripsy, ultrasonic lithotripsy, and electrohydraulic lithotripsy, all of which require transureteral manipulations that have the risk of urethral stricture. In the percutaneous approach, there is an excellent direct visibility and control of bladder calculi. Recently, endoscopic percutaneous as a safe procedure with minimal invasion is implemented for the treatment of bladder calculi in children that can be a simple alternative to endoscopic transureteral procedures. Endoscopic percutaneous cystolithotomy is an effective and safe treatment option for bladder calculi in reconstructed bladders that is preferred over the rest of methods.

In the study of Ahmadinia and Marhoon MS, the average age of individuals studied was greater while in a study by Salah MA, it was lower than that in our study [7-9]. The average age of adults in a study by Breda was lower than that estimated herein [10].

In the studies conducted by Ahmadinia, Salah MA, and Al-Marhoon MS, the average size of calculi in infants was lower than that in our study [7-9]. Wolin TA et al. reported a higher average size of calculi in adults, which was lesser than that in our research [11]. The operation times in the studies of Ahmadinia and Salah MA were low compared to our records whereas Lam PN had a longer operation time than that experienced here [7, 9].

A shorter duration of hospitalization was found in the study of Ahmadinia as opposed to that observed in the infants of our study [9], but this variable was higher in the studies of Salah MA and L Marhoon MS than our study both in endoscopic and open operations [7, 8]. Breda and Docimo SJ reported longer mean durations of hospitalization both in endoscopic and open operations than those recorded in the adults of our study [10, 12].

Docimo SJ noted a low postoperative narcotic consumption, likewise, only 2.6% of patients complained of severe pain in our investigation [12].

Ahmadinia, Paez, Lam PN, Salah MA, and Wolin TA observed no major complications during and after surgery [7, 9, 11, 13, 14]. Postoperative complications were rare in Gan W and only a small amount of bleeding was noticed [15]. In the study of Breda, minor complications were detected in 12% of patients [10]. Al-Marhoon MS showed that 3.7% of patients were affected by extravasation in endoscopic surgery while 1.8% of the children revealed intestine injury in open operation, 7.4% showed urinary leakage, and 1.8% of patients suffered urethral stricture after the surgery [8]. Miller DC reported that 75% of patients displayed tearing the laparoscopy sac during operation [16].

In the present study, such complications as febrile infection of urinary tract, infectious stitches, and urethral stricture were observed in none of the patients. Leakages occurred in only 4.2% of adults, and prolonged hematuria happened in 13.2% of children and 8% of adults. Cystostomy tube insertions were required in 2.6% of infants and 5.6% of adults. Mean decreases in hemoglobin levels of infants and adults were  $0.43 \pm 0.19$  and  $0.62 \pm 0.56$ , respectively.

A success rate of 100% was reported by Ahmadinia, Gan W, Al-Marhoon MS, Docimo SJ, Salah MA, Wolin TA, and Paez similar to that achieved in our study [7-9, 11, 12, 15]; however, success rates of 95%, 75%, and 50% were attained in the studies of Breda [10], Miller DC [16] and Lam PN, respectively [13].

Using inferential statistics, significant relationships were obtained between some of the variables in this study, which were not mentioned in the literature reviewed.

In our study, the number and overall size of bladder calculi increased with aging, which was associated with decreased hemoglobin levels in adults after surgery. Also, hemoglobin drop elevated with aging. In adults, rises in the number and overall size of calculi prolonged the duration of hospital stay and increased pain intensity. Additionally, rising the number of calculi in the patients caused further prolonged hematuria.

As perioperative bleeding increased, urinary leakage elevated in the adults, which may be a causal relationship. Adult pain intensity was also higher with the boosted rates of urinary leakage.

In general, patients who had complications following the surgery experienced longer hospitalization durations indicating sympathetic attention of doctors and nurses in the surgery ward to postsurgical care and timely discharge of the patients.

The overall size of the calculus in men was greater than in women, and the rate of perioperative bleeding was higher in boys than girls, both of which deserve a reflection.

The current study clearly shows that the percutaneous suprapubic cystolithotripsy is safe and cost-effective as well as widely applicable to a variety of calculi regardless of size, number, morphology, and anatomy of the urethra and the age of patient. Removal of calculi from the bladder through endoscopic and percutaneous procedures is a non-invasive approach and an alternative to open surgery and endoscopy through the urethra.

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