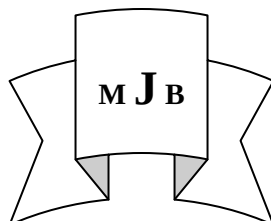


## A Comparative Study of Percutaneous Suprapubic Cystolitholapaxy versus Open Cystolithotomy in Adults

Ahmed Turki Obaid

Dept. of Surgery, College of Medicine, University of Babylon, Hilla, Iraq.



### Abstract

**Objective:** to compare the outcome of percutaneous suprapubic cystolitholapaxy with open cystolithotomy in adult.

**Study design:** comparative study.

**Place and duration of the study:** urological and surgical department of AL-Hilla teaching hospital, from March to November 2012.

**Methodology:** forty patients (34 male and 6 female), from 21-44 years of age were enrolled in the study. The size of the stones range from 31mm to 44mm. patients were divided in two equal groups, group 1 and 2. Group 1 submitted for percutaneous suprapubic cystolitholapaxy and group 2 for open cystolithotomy. The procedure was done under general or spinal anesthesia.

**Result:** complete clearance of stone was achieved in all cases of group 1 and group 2, P value>0.05, transient hematuria occurs in seven patients in group 1, while in group 2 only one patient develop hematuria, p value (<0.05). Postoperative fever occurs in one patients and in eleven patients in group1 and 2 respectively, p value<0.05. Postoperative pain that require parenteral analgesia not occur in group 1 and in seven patients in group 2, p value <0.05. Average of wound length in group 1 was 2cm and 5 cm in group 2, p value <0.05. The average of the operative time 52.5 minutes and 37.5 minutes in group 1and 2 respectively, p value <0.05. The duration of transurethral catheterization 3-4 day, and 7-10 days in group 1 and 2 respectively, p value<0.05. No one develop wound infection in group 1 and five patients in group 2, p value<0.05. No one develop urinary leakage and three patients develop that in group 2, p value>0.05.

**Conclusion:** percutaneous suprapubic cystolitholapaxy is an efficient, safe, minimally invasive and cost effective method.

### الخلاصة

**الغرض من الدراسة:** هو إجراء دراسة للمقارنة بين النتائج المستوحاة من عملية رفع حصاة المثانة عن طريق ناظور أسفل البطن وعن طريق عملية الفتح الجراحية التقليدية.

**نوع الدراسة:** دراسة مقارنة مقطعية

**مكان وفترة الدراسة:** تم إجراء هذه الدراسة في شعبة الجراحة البولية /مستشفى الحلة التعليمي العام من شهر شباط ولغاية شهر كانون الثاني ٢٠١٢

**طريقة العمل:** تم اختيار أربعون مريض يعانون من حصاة المثانة وكانت أعمارهم تتراوح بين ٢١ الى ٤١ سنة وكانت حجم حصاة المثانة تتراوح بين ٣١ الى ٤٠ ملم وتم إبعاد الاطفال من الدراسة والمرضى الذين لديهم عمليات سابقة في أسفل البطن ومنطقة الحوض. ٣٤ مريض كانوا من الذكور و٦ مرضى كانوا من الاناث. ثم تم تقسيم المرضى عشوائيا وبصورة متساوية الى مجموعتين، المجموعة الاولى وتضم عشرون مريضا والمجموعة الثانية تضم عشرون مريضا ايضا. المجموعة الاولى تم تهيأتهم لإجراء عملية رفع حصاة المثانة عن طريق ناظور أسفل البطن، أما المجموعة الثانية تم تحضيرهم لإجراء عملية رفع حصاة المثانة عن طريق عملية الفتح الجراحية التقليدية. كلا العمليتين تم إجرائها تحت التخدير النصفى والتخدير العام.

**النتائج:** تم التخلص من حصى المثانة وبشكل كامل لجميع المرضى وفي كلا المجموعتين، أما التبول الدموي المؤقت فقد حصل في ٧ مرضى في المجموعة الاولى ومريض واحد فقط في المجموعة الثانية. هناك مريض واحد فقط في المجموعة الاولى واحد عشر مريض في المجموعة الثانية عانوا من إرتفاع طفيف في درجة الحرارة. أما بما يتعلق بالألم مابعد العملية والذي يحتاج الى عقاقير ضد الألم، فهناك مريض واحد فقط في المجموعة الاولى وسبعة مرضى في المجموعة الثانية كانوا قد إحتاجوا الى هذا النوع من العقاقير. إن معدل طول الجرح في المجموعة الاولى هو ٢ سم أما معدل طول الجرح في المجموعة الثانية هو ٥ سم. وكان معدل وقت العملية في المجموعة الاولى ٥٢.٥ دقيقة ومعدل وقت العملية في المجموعة الثانية ٣٧.٥ دقيقة. أما الفترة المطلوبة لاستخدام صوندة الأدرار فهي ٣-٤ أيام في المجموعة الاولى و ٧-١٠ أيام في المجموعة الثانية. لم يحصل إلتهاب للجرح مابعد العملية لاي من المرضى في المجموعة الاولى ولكن حدث الى ٥ مرضى في المجموعة الثانية والذي تم علاجه بصورة تحفظية عن طريق العقاقير والمضادات الحيوية. وبما يتعلق بنضح الأدرار من المثانة فلم يحصل لاي مريض في المجموعة الاولى ولكن حصل لثلاثة مرضى في المجموعة الثانية والذي تم علاجه بطريقة تحفظية.

**الاستنتاجات:** إن عملية رفع حصى المثانة عن طريق نلظور أسفل البطن هي طريقة فعالة وامنة ولا تعرض المريض الى الكثير من المضاعفات التي قد يتعرض لها المريض أثناء عملية رفع حصى المثانة بالطريقة الجراحية التقليدية.

## Introduction

Bladder stones have been treated both medically and surgically for many centuries. The oldest bladder stone discovered dates back to 4800 BC and was found by archaeologists in Egypt around the turn of the 20th century [1]. The first literary references to bladder stones date back to a time as early as, or earlier than, the time of Hippocrates [2]. Famous historical figures who developed vesical calculi include King Leopold I of Belgium, Napoleon Bonaparte, Emperor Napoleon III, Peter the Great, Louis XIV, George IV, Oliver Cromwell, Benjamin Franklin, the philosopher Bacon, the scientist Newton, the physicians Harvey and Boerhaave, and the anatomist Scarpa[1]. Operations to remove bladder stones via the perineum were performed by Hindus, Greeks, Romans, and Arabs. Ammonius (200 BC), Celsus (first century), and the Hindu surgeon Susruta were among the first to write about perineal lithotomy to treat bladder calculi [3]. In the 1500s, Pierre Franco introduced suprapubic lithotomy [3]. In an attempt to avoid incisions, another form of surgical treatment, transurethral lithotripsy,

became more common in the early 1800s. Lithotripsy was developed through creative applications of everyday tools. Although many other creative and colourful transurethral instruments were developed, technological advancement in the modern era came in the form of the fenestrated lithotrite. This device allowed stones to be grasped and crushed so their fragments could be evacuated from the bladder via glass or metal suction bottles [4]. Sir Philip Crampton was the first to introduce the manual crushing concept in Dublin (circa 1834). However, litholopaxy was not firmly established until Henry J. Bigelow, the famous professor of surgery at Harvard, performed (1876) and popularized (1878) the procedure [1]. The mechanical crushing of stones remained popular through the 1960s and 1970s, although it was fraught with complications when performed by inexperienced urologists [5].

In the 1950s, endoscopic electrohydraulic lithotripsy (EHL) was first performed in the Soviet Union. Over the next 4 decades, multiple other modalities have been developed and allow safe transurethral or percutaneous stone ablation [6].

The incidence of primary bladder calculi in the United States and Western Europe has been steadily and significantly declining since the 19th century because of improved diet, nutrition, and infection control. In these countries, vesical calculi affect adults, with a steadily declining frequency in children. In the Western hemisphere, vesical calculi primarily affect men who are usually older than 50 years and have associated bladder outlet obstruction. However, bladder calculi remain common in less-developed countries and areas such as Thailand, Burma, Indonesia, the Middle East, and North Africa. Although the prevalence of bladder calculi is declining in these populations, it remains a disease that affects children, among whom the disease is far more common in boys than in girls [6].

In 1977, Van Reen published a symposium on idiopathic urinary bladder stone disease [7]. Unfortunately, no definitive worldwide data accurately reflect the frequency of bladder calculi. This is mostly because of poor hospital records in developing regions of the world. Despite several studies in countries with a high incidence of the disease, the reporting is not uniform. Bladder outlet obstruction remains the most common cause of bladder calculi in adults. Prostatic enlargement, elevation of the bladder neck, and high postvoid residual urine volume cause stasis, which leads to crystal nucleation and accretion. This ultimately results in overt calculi. In addition, patients who have static urine and develop urinary tract infections are more likely to form bladder calculi. In a study of patients with spinal cord injuries (newly acquired neurogenic bladders) who were monitored for more than 8 years, 36% developed bladder calculi. More recent

reports indicate that, because of better care of patients with injured spinal cords, this rate has dropped to less than 10%. Bladder inflammation secondary to external beam radiation or schistosomiasis can also predispose to vesical calculi [8]. Other rare anatomic abnormalities that have been implicated as contributors to stasis and stone formation include sliding inguinal hernias containing the urinary bladder [9]. Multiple underlying risk factors predispose to bladder stones in paediatric patients who undergo bladder augmentation. Preventive antibiotic therapy for recurrent infections decreased the amount of struvite stone formation but yielded no statistically significant reduction in overall stone formation [10]. Other etiologic factors for bladder stone formation include foreign bodies in the bladder that act as a nidus for stone formation. These are subclassified into iatrogenic and noniatrogenic bodies. The first group includes suture material, shattered Foley catheter balloons, eggshell calcifications that form on a catheter balloon, staples, ureteral stents, migrating contraceptive devices, erosions of surgical implants, and prostatic urethral stents [11, 12, 13, 14, 15]. Stones on suture material may have an early presentation if sutures were originally placed within the bladder lumen or may have a delayed presentation if they are caused by erosion through the bladder wall [16]. Noniatrogenic causes include objects placed into the bladder by the patients for recreational and various other reasons [17].

Metabolic abnormalities are not a significant cause of stone formation in patients with urinary diversions. In this group of patients, the stones are primarily composed of calcium and

struvite. In rare cases, medications (e.g., viral protease inhibitors) may be the source for bladder calculus formation [18].

In general, if an otherwise healthy person in the United States or Europe is found to have a bladder stone, a complete urological evaluation must be undertaken to find a cause for urinary stasis. Examples include benign prostatic hyperplasia, urethral stricture, neurogenic bladder, diverticula, and congenital anomalies such as ureterocele and bladder neck contracture. In females, examples include an incontinence repair that is too tight, cystocoeles, and bladder diverticuli [19]. The most common type of vesical stone in adults is composed of uric acid (>50%). Less frequently, bladder calculi are composed of calcium oxalate, calcium phosphate, ammonium urate, cysteine, or magnesium ammonium phosphate (when associated with infection), [20, 21.] Paediatric stones are composed mainly of ammonium acid urate, calcium oxalate, or an impure mixture of ammonium acid urate and calcium oxalate with calcium phosphate [22, 23, 24]. The presentation of vesical calculi varies from completely asymptomatic to symptoms of suprapubic pain, dysuria, intermittency, frequency, hesitancy, nocturia, and urinary retention [21]. Other common signs include terminal gross hematuria and sudden termination of voiding with some degree of associated pain referred to the tip of the penis, scrotum, perineum, back, or hip. Common physical examination findings include suprapubic tenderness, fullness, and, occasionally, a palpable distended bladder if the patient is in acute urinary retention. In general, most vesical calculi procedures are performed via endoscopy. However, when the stone is too large or

too hard or if the patient's urethra is too small (e.g., in children) or surgically altered, complicating access to the bladder, the open or percutaneous suprapubic surgical approach is preferable.

Relative contraindications exist to certain types of bladder stone ablative techniques. Electrohydraulic lithotripsy (EHL) should be used with great caution in patients with small-capacity bladders and those with cardiac-pacing or defibrillation devices. Percutaneous lithotripsy may be more hazardous in patients who have undergone prior lower abdominal surgery or prior pelvic surgery or who have small-capacity noncompliant bladders [25].

Pregnancy is a relative contraindication to some forms of lithotripsy (e.g., extracorporeal shock-wave lithotripsy [ESWL], EHL, mechanical lithotripsy), but the benefits of eliminating a source of infection, retention, or pain with other modalities (e.g., holmium laser, lithoclast), as well as a potential complicator of vaginal delivery if stones are large, may outweigh the risk of intervention [26, 27]. With the recent widespread availability of ultrasonography, this relatively inexpensive and rapid modality can be more widely used to diagnose bladder calculi. The sonogram, showing a classic hyperechoic object with posterior shadowing, is effective in identifying both radiolucent and radio-opaque stones [28]. CT scan is usually obtained for other reasons (e.g., abdominal pain, pelvic mass, suspected abscess) but may demonstrate bladder calculi when performed without intravenous contrast. Cystoscopy remains the most commonly used test to confirm the presence of bladder stones and plan treatment. This procedure allows for the visualization of

stones and assessment of their number, size, and position. Additionally, examination of the urethra, prostate, bladder wall, and ureteral orifices allows identification of strictures, prostatic obstruction, bladder diverticula, and bladder tumours [8]. The only potentially effective medical treatment for bladder calculi is urinary alkalinisation for the dissolution of uric acid stones. Stone dissolution may be possible if the urinary pH can be made greater than or equal to 6.5. Potassium citrate (Polycitra K, Urocit K) at 60 mEq/d is the treatment of choice. However, overly aggressive alkalization may lead to calcium phosphate deposits on the stone surface, making further medical therapy ineffective [8]. Historically, stones were removed via the high operation, using a suprapubic incision, or the low operation, using a perineal incision. In the absence of antibiotic therapy and adequate haemostatic techniques, both operations were associated with a high morbidity and mortality rate. Civiale performed the first documented blind transurethral lithotripsy in 1822. Even with the introduction of the cystoscope in 1877, bladder injury was always a risk. Currently, 3 different surgical approaches to this problem are used. Unlike in renal and most ureteral calculi, ESWL has shown little efficacy for bladder calculi in most centres,[29, 30], but some studies suggest that ESWL performed with the patient in the prone position can be considered for treatment [5]. The first approach in adults is transurethral cystolitholapaxy. After cystoscopy is performed to visualize the stone, an energy source is used to fragment it, and the fragments are removed through the cystoscope. The energy sources are mechanical (i.e.,

lithoclast [pneumatic jack hammer]), ultrasonic, electrohydraulic (i.e., EHL [spark-induced pressure wave]), manual lithotrite, and laser. The pulsed-dye or other wavelength-specific light sources (e.g., holmium) fracture the stone by direct absorption, vaporization, water absorption, and pressure wave generation [31]. Because of recent advancements in instrumentation, the smaller caliber of the paediatric urethra can be accommodated, allowing these approaches to be applicable in selected children [32].

The second approach in adults (and often primary approach in the paediatric population) is percutaneous suprapubic cystolitholapaxy. The percutaneous route allows the use of shorter- and larger-diameter endoscopic equipment (usually with an ultrasonic lithotripter), which allows rapid fragmentation and evacuation of the calculi [33]. Often, a combined transurethral and percutaneous approach can be used to aid in stone stabilization and to facilitate irrigation of the stone debris. The authors favour the combined approach with the use of the ultrasonic lithotripter or the pneumatic lithoclast. The holmium laser is also effective but is generally slower, even with the 1000-micron fiber [34].

The EHL unit has been associated with a higher incidence of bladder mucosal injury. Options for accessing the bladder may be challenging in certain circumstances, such as in patients who have undergone prior bladder reconstruction or after prior bladder neck procedures for improved continence. Paez et al (2007) described percutaneous removal of bladder stones via ultrasound-assisted access of the bladder through prior suprapubic tube tracts. In one case, they used a Mitrofanoff catheterization channel with a 30F

Amplatz sheath. They reported no complications, and percutaneous treatment was judged a safe alternative in this population subset [35]. This same procedure has also been described in continent diversions with urethral closure [36].

#### **Patient and method:**

This comparative study with prospective data performed in our urological centre in AL-Hilla teaching hospital. From March 2012 to November 2012, forty patients with urinary bladder stone attend our urological center in AL-Hilla teaching hospital, 34 males (85%) and 6 females (15%), with an age range from (21-44) years old ,average age was 32.5years and the stone size ranged from 31mm to 40mm, with average size 35.5mm.

Urological assessment was performed including proper medical and urological history, physical examination, urine analysis and culture if needed, renal function test, Kidney, Ureter, Bladder plain X-ray (KUB), ultrasonography of the urinary tract and specific investigations in a case of secondary bladder stones.

Options of the management were explained to the patients and the possibility of the intraoperative conversion from percutaneous approach to open cystolithotomy was also explained.

Patients with history of lower abdominal surgery, bladder surgery, open prostatic surgery, small capacity of the bladder and the other congenital or acquired limb anomaly that interfere with dorsal lithotomy position were excluded from the study.

After receiving informed consent from the patients, they were randomly assigned in two groups, group 1 (percutaneous removal using

nephroscope), and group 2 (open cystolithotomy).

All patients received prophylactic antibiotics 24 hours prior to surgery. Cystourethroscopy was performed initially after administering spinal or general anesthesia to the patients.

Pneumatic lithoclast was used to fragment the stones in group 1 patients who prepare for percutaneous approach. In group 1 (=20), after general or spinal anesthesia patient positioned in dorsal lithotomy position, then after adequate lubrication into urethra. Cystoscopy (Karl Storz 22F) was performed to determine the size, number, and the presence of associated pathology, then the bladder was filled through the cystoscopy by normal saline. A transverse incision of 1-2 cm was made about 2.25cm above the pubic symphysis. Bladder puncture was done through the incision with an 18-gauge needle and guide wire was inserted into the bladder cavity. The Suprapubic cystostomy tract was dilated with Amplatz dilator by treading over the guide wire until working sheath (28F) was able to advance into the bladder cavity. All procedure previously mentioned was performed under direct vision through the cystoscopy because the unavailability of the fluoroscopy in our hospital yet.

Then the 24F nephroscope pass through the cystostomy tract and the stone visualized with partially filled urinary bladder by normal saline through transurethral foley catheter and the stone start to be fragmented into small piece by the pneumatic lithoclast. The fragmented stones were removed by forceps through the cystostomy tract and by Allik evacuation through the working amplatz sheath. Suprapubic catheter left with inflation of the balloon by 15 cc

normal saline to prevent the extravasations through cystostomy tact that removed after 48 hours and transurethral foley catheter was left for good drainage of the bladder that removed after 72 hours.

Group 2 (n=20) that prepare for open cystolithotomy, in which the procedure done under general or spinal anesthesia by the usual traditional procedure and the transurethral catheter was left for 7-10 days.

### **Result**

Forty patients of bladder stone treated in the urological department in Al-Hilla teaching hospital from March 2012 to November 2012. We compare the result between group 1 and group 2, regarding stone clearance, length of the incision, duration of operation, duration of the catheterization, hematuria, wound infection, urinary leakage, transient pyrexia and the need of postoperative analgesia.

In group 1 (n=20), age of the patients range from 21 - 43 years old and so the average age was (32) years, stone size range from 3.1-3.6 cm so average stone size (3.35) cm, sixteen patients were male and only four patients is female.

In group 2 (n=20), age of the patients range from 25-44 years old and so average age (34.5)years, stone size range from 3.4-4cm so average stone size (3.7)cm, eighteen patients were male and two patients were female.

Patients were divided in two equal groups 1 and 2, twenty cases in each group. Groups 1 were submitted for percutaneous Suprapubic cystostolitholapaxy and group 2 for open cystolithotomy.

Regarding complete clearance of stone was achieved in all cases of group 1 and group 2, P value>0.05, so there is no clinical and statistical difference between both groups. As in group 1 all stones had been fragmented in small pieces and then removed by the stone forceps or by Allik evacuation, in group 2 the stone had been removed 1 one piece and so there is no residual stone fragments in both groups.

Regarding transient hematuria occurs in seven patients in group 1 that account (35%) which resolve spontaneously after 24 hours, while in group 2 only one patient develop hematuria that account (5%), so the p value (<0.05), mean there is clinical and statistical difference between each groups.

**Table 1** incidence of transient hematuria

| Group   | Hematuria |
|---------|-----------|
| Group 1 | 7(35%)    |
| Group 2 | 1(5%)     |

Regarding postoperative fever in group 1, one patient develop fever that account 5%, while in group 2 eleven patients develop postoperative fever, account 55% that started in the day 1 postoperatively which was low grade

fever that takes benign course and was treated by parenteral antibiotic. So the p value was (<0.05). So there is statistical and clinical difference regarding postoperative fever between both groups.

**Table 2** incidence of postoperative fever

| Group   | Postoperative fever |
|---------|---------------------|
| Group 1 | 1(5%)               |
| Group 2 | 11(55%)             |

Regarding postoperative pain, in group 1, no one develop pain that need parenteral analgesia, while in group 2 seven patients develop pain account

35%, that only subsided with parenteral analgesia, so p value <0.05, mean there was clinical and statistical difference between each groups.

**Table 3** incidence of postoperative pain

| Group   | Postoperative pain |
|---------|--------------------|
| Group 1 | 0                  |
| Group 2 | 7(35%)             |

Regarding wound incision the, in group 1 the length of suprapubic incision range from 1-3 cm and the average length of the incision 2 cm, while the length of wound incision in group 2

range from 4-6 cm and so the average length of the suprapubic incision was 5cm, so p value <0.05, mean there is clinical and statistical difference between both groups

**Table 4** average length of the wound

| Group   | Average length of the wound |
|---------|-----------------------------|
| Group 1 | 2cm                         |
| Group 2 | 5 cm                        |

Regarding operation time, in group 1 the operation time range from 45 minutes to 60 minutes so the average of the operative time 52.5 minutes, while in group 2 the operation time range from 30 minutes to 45 minutes, so the average of

the operative time in group 2 patients was 37.5minutes, p value <0.05, so there is clinical and statistical difference between two groups regarding the operation times.

**Table 5** average operative time

| Group   | Average operative time |
|---------|------------------------|
| Group 1 | 52.5 minutes           |
| Group 2 | 37.5 minutes           |

Regarding duration of the catheterization, in group 1 the duration of transurethral catheterization 3-4 days so the average duration of the

catheterization (3.5) days, after that catheter had been removed, while in group 2 the duration of the catheterization range from 7-10 days, so

the average duration of the catheterization was (8.5) days, p value<0.05, that mean there was clinical

and statistical difference between both groups.

**Table 6** average duration of transurethral catheterization

| Group   | Duration of catheterization |
|---------|-----------------------------|
| Group 1 | 3.5 days                    |
| Group 2 | 8.5 days                    |

Wound infection in group 1, no one develop wound infection while in group 2 only five patients develop wound infection, account 25%, that take

benign course and resolved with parenteral antibiotic, so p value <0.05 , mean there is clinical and statistical difference between both groups.

**Table 7** incidence of wound infection

| Group   | wound infection |
|---------|-----------------|
| Group 1 | 0               |
| Group 2 | 5(25%)          |

Regarding urinary leakage , no one in group 1 develop urinary leakage, while in group 2 only three patient develop urinary leakage that form 15%

from total number of patients in group 2(n=20), p value >0.05 , mean that there was no statistical difference between two groups but there is clinical difference.

**Table 8** incidence of urinary leakage

| Group   | Urinary leakage |
|---------|-----------------|
| Group 1 | 0               |
| Group 2 | 2(15%)          |

## **Discussion**

We choose the male patients for study because of their anatomic difference from the female patients. The instrumentation via female short urethra is easy and causes fewer trauma. Although open cystolithotomy is the most invasive option, it is a very reliable form of therapy and continues to represent the gold standard treatment to remove big bladder stones [37].

Iraq is included among those countries where the prevalence of this disease is higher [38]. About 25% of the patients

with urinary stone have a family history [39]. A solitary bladder calculus is usual, although multiple stones are found in 25% of cases. Vesical calculi are either primary or secondary [40]. Majority of the patients present with irritative bladder symptoms. Various techniques have been used to remove calculi from the bladder including open cystolithotomy, transurethral lithotripsy [41, 42]. Open surgery has the inherent problems of long scar, prolonged catheterization, extended hospitalization and risk of infection [43]. In children,

especially in boys, because of the size limitation secondary to the small urethra and concerns about iatrogenic urethral injury, so endoscopic manipulation more difficult and fraught with danger. Gopala Krishnan and colleagues were the first to report the use of a percutaneous suprapubic approach in managing bladder calculi [44]. The morbidity of percutaneous suprapubic approach is significantly less than that of open cystolithotomy [45, 46].

Stone clearance had been achieved in all patients in group 1, as when we get access to the bladder throughout the suprapubic approach, stone had been fragmented in small pieces through the pneumatic lithoclast, and then removed by stone forceps and so complete stone clearance had been achieved. While in group 2, in open vesicolithotomy stone had been removed in one segment. So that in both groups complete stone clearance had been achieved, mean there is no clinical or statistical difference in both groups, and so  $P$  value  $> 0.05$ .

Regarding transit hematuria that occur in the postoperative period, in group 1 seven patients develop hematuria, account about 35% that take benign course and resolve spontaneously in the 1st 24 hours postoperatively. While in group 2 only one patient develop hematuria, account only 5% of the group 2, that also take benign course and resolve in the 1st 24 hours postoperatively, that mean the  $p$  value less than 0.05, so there is clinical and statistical difference between two groups, and that agree with study performed by Rafique Ahmed Sahito and co-workers and study performed by Camacho and co-worker which also observed the hematuria that occur only in two patients that subjected for percutaneous approach but there is no statistical difference

between two groups[45], these may be explained due to excessive manipulation occur in our procedure due to our minor experience in such procedure and may be due to the type of the lithoclast that we are used.

Regarding postoperative fever in group 1 only one patient develop fever that account 5%, while in group 2, eleven patients develops fever that account 55%, in both group fevers occur in the first postoperative day, usually low grade and resolve with good hydration and parenteral antibiotics.

Our study agree with study performed by Rafique Ahmed Sahito and co-worker and the study performed by Salah MD and co-worker in which they found no one develop postoperative transient pyrexia in percutaneous group while three patients in open group that account 17% of the patients[46].

Our study not agree with study performed Firas Al-Hammouri MD and co-worker in which they show that no one develop fever in the group undergo open vesicolitotomy and two patients in the group that undergo percutaneous approach for vesical stone that account 18% of the patients.

Urinary extravasations, in our study in group 1 no one develop urinary extravasations, while in group 2 only three patients develop urinary extravasations that account 15% from the total number of patients in group 2 mean that  $p$  value  $> 0.05$ , this agree with study Rafique Ahmed Sahito and co-worker, that notice no one develop urinary extravasations in percutaneous group and only 2 patients in group 2 that undergo open vesicolitotomy that formed less than 5% of the total number of patients in group 2. Our study disagree with study performed Ikari O et al that notice three patients develop

urinary leakage or extraperitoneal urinary extravasations in which all patient resolve spontaneously without sequels [47], these possibly due to the relatively short laparoscopic trocar as compared with the Amplatz® sheath, as well as its sloppy surface.

postoperative pain, in group 1, one patient develop pain that need parenteral analgesia while in group 2, twelve patients had pain that make patient discomfort and so need parental analgesia, mean that  $p$  value  $<0.05$ , so there is clinical and statistical difference and so our study agree with study performed by Nazar and colleagues [48]. In our study the average length of the incision in group 1 was 2cm while the average length of the wound in the group 2 was 5 cm,  $p$  value  $<0.05$ , mean there is statistical, clinical and cosmetic difference between both groups, this result agree with result performed by Nazar Ali Memon and co-worker and also with study performed by Salah and co-worker [46]. They found the length of the incision in the percutaneous group about 1 cm and in the open group about 4cm. Although our study agree with study performed by the Kun-Hung Shen[37], in which they found the length of the wound 2cm in group 1 while in group 2 about 6.5cm.

Regarding operation time in group 1 the operative time range from (30-45) minutes while in group 2 the operative time (45-60) minutes,  $p$  value  $<0.05$ , this means that there is clinical and statistical difference between two groups. This disagree with study performed by Nazar Ali Memon and colleagues, in which the range of the operative time is (15-30) minutes, and the study performed by Rafique Ahmed Sahito and colleagues, the operative time in percutaneous group

(10-15) minutes and in open group (30-40) minutes [48], this explained due to our little experience of this procedure and the type of the lithoclast that used.

Regarding the duration of the transurethral catheterization in our study, in group 1, catheter removed after (3-4) days, while in group 2 the duration of catheterization 7-10 days, this mean there is clinical and statistical difference between both groups,  $p$  value  $<0.05$ . Our study agrees with study performed by Nazar Ali Memon, et. al, in which they found that the duration of catheterization in patients undergo percutaneous approach 48-72hrs, and also similar to the study performed by Bahita and Biyani [49], as they found the duration of catheterization in the patients undergo percutaneous approach about 2-3 days. Although our study agree with study performed by Ahmed Sahito, et. al, they found the duration of catheterization in the percutaneous group 2-3 days, and the duration of catheterization in the open group about 5-7 days.

### **Conclusion**

Percutaneous suprapubic cystolitholapaxy is efficient, safe with low incidence of complications and minimally invasive technique for treating bladder calculi. It has definite edge on open cystolithotomy. It had reduced hospital stay, postoperative pain, wound infection, duration of catheterization and overall cost with imperceptible scar.

### **Reference**

1. Ellis H. A History of Bladder Stone. Oxford, England: Blackwell Scientific Publications; 1969
2. Schwartz BF, Stoller ML. The vesical calculus. Urol Clin North Am. May 2000;27(2):333-46. [view Abstract]

3. Bouchet H. [Surgery of bladder lithiasis in the 19th century]. *Ann Chir.* 1999;53(9):908-14. [View Abstract]
4. Ganem JP, Carson CC. Frère Jacques Beaulieu: from rogue lithotomist to nursery rhyme character. *J Urol.* Apr 1999;161(4):1067-9. [View Abstract]
5. Bhatia V, Biyani CS. Vesical lithiasis: open surgery versus cystolithotripsy versus extracorporeal shock wave therapy. *J Urol.* Mar 1994;151(3):660-2. [View Abstract]
6. Huffman JL, Ginsberg DA. Calculi in the Bladder and Urinary Diversions. In: Coe FL, Favus MJ, Pak CY, Parks JH, Preminger GM, eds. *Kidney Stones: Medical and Surgical Management.* Philadelphia, Pa: Lippincott-Raven; 1996:1025-34.
7. Van Reen R. Geographical and nutritional aspects of endemic stones. In: *Urinary Calculus.* Littleton, Mass: PSG Publishing Co; PSG Publishing Co:1981.
8. Ho K, Segura J. Lower Urinary Tract Calculi. In: Wein A, Kavoussi L, Novick A, Partin A, Peters C. *Campbell-Walsh Urology.* 3. 9th. Philadelphia, Pa: Saunders Elsevier; 2007:2663-73.
9. Ng AC, Leung AK, Robson WL. Urinary bladder calculi in a sliding vesical-inguinal-scrotal hernia diagnosed preoperatively by plain abdominal radiography. *Adv Ther.* Sep-Oct 2007;24(5):1016-9. [View Abstract]
10. Mathoera RB, Kok DJ, Nijman RJ. Bladder calculi in augmentation cystoplasty in children. *Urology.* Sep 1 2000;56(3):482-7. [View Abstract]
11. Rub R, Madeb R, Morgenstern S, Ben-Chaim J, Avidor Y. Development of a large bladder calculus on sutures used for pubic bone closure following extrophy repair. *World J Urol.* Aug 2001;19(4):261-2. [View Abstract]
12. Godbole P, Mackinnon AE. Expanded PTFE bladder neck slings for incontinence in children: the long-term outcome. *BJU Int.* Jan 2004;93(1):139-41. [View Abstract]
13. Eichel L, Allende R, Mevorach RA, et al. Bladder calculus formation and urinary retention secondary to perforation of a normal bladder by a ventriculoperitoneal shunt. *Urology.* Aug 2002;60(2):344. [View Abstract]
14. Hick EJ, Hernandez J, Yordan R, et al. Bladder calculus resulting from the migration of an intrauterine contraceptive device. *J Urol.* Nov 2004;172(5 Pt 1):1903. [View Abstract]
15. Rafique M. Vesical calculus formation on permanent sutures. *J Coll Physicians Surg Pak.* Jun 2005;15(6):373-4. [View Abstract]
16. Arunkalaivanan AS, Smith AR. Bladder calculus after laparoscopic colposuspension. *J Obstet Gynaecol.* Jan 2002;22(1):101. [View Abstract]
17. Lau S, Zammit P, Bikhchandani J, Buchholz NP. The unbreakable bladder stone--Munchhausen's tale. *Urol Int.* 2006;77(3):284-5. [View Abstract]
18. Russinko PJ, Agarwal S, Choi MJ, Keltz PJ. Obstructive nephropathy secondary to sulfasalazine calculi. *Urology.* Oct 2003;62(4):748. [View Abstract]
19. Mizuno K, Kamisawa H, Hamamoto S, Okamura T, Kohri K. Bilateral single-system ureteroceles with multiple calculi in an adult woman. *Urology.* Aug 2008;72(2):294-5. [View Abstract]
20. Douenias R, Rich M, Badlani G, et al. Predisposing factors in bladder calculi. Review of 100 cases. *Urology.* Mar 1991;37(3):240-3. [View Abstract]
21. Hammad FT, Kaya M, Kazim E. Bladder calculi: did the clinical picture

- change?. Urology. Jun 2006;67(6):1154-8. [View Abstract]
22. Kamoun A, Daudon M, Abdelmoula J, et al. Urolithiasis in Tunisian children: a study of 120 cases based on stone composition. *Pediatr Nephrol.* Nov 1999;13(9):920-5; discussion 926. [View Abstract]
23. Hodgkinson A. Composition of urinary tract calculi from some developing countries. *Urol Int.* 1979;34(1):26-35. [View Abstract]
24. Bakane BC, Nagtilak SB, Patil B. Urolithiasis: a tribal scenario. *Indian J Pediatr.* Nov-Dec 1999;66(6):863-5. [View Abstract]
25. Su CM, Lin HY, Li CC, et al. Bladder stone in a woman after cesarean section: a case report. *Kaohsiung J Med Sci.* Jan 2003;19(1):42-4. [View Abstract]
26. Millán-Rodríguez F, Izquierdo-Latorre F, Montlleó-González M, Rousaud-Barón F, Rousaud-Barón A, Villavicencio-Mavrich H. Treatment of bladder stones without associated prostate surgery: results of a prospective study. *Urology.* Sep 2005;66(3):505-9. [View Abstract]
27. Egwuatu VE. Bladder calculus with pregnancy. *J Urol.* Jun 1980;123(6):954-5. [View Abstract]
28. Huang WC, Yang JM. Sonographic appearance of a bladder calculus secondary to a suture from a bladderneck suspension. *J Ultrasound Med.* Nov 2002;21(11):1303-5. [View Abstract]
29. Webb M, Fong W. A large bladder calculus and severe vesicoureteric reflux as seen on Tc-99m MAG3 renography. *Clin Nucl Med.* Nov 2002;27(11):803-4. [View Abstract]
30. Losty P, Surana R, O'Donnell B. Limitations of extracorporeal shock wave lithotripsy for urinary tract calculi in young children. *J Pediatr Surg.* Aug 1993;28(8):1037-9. [View Abstract]
31. Bapat SS. Endoscopic removal of bladder stones in adults. *Br J Urol.* Nov 1977;49(6):527-30. [View Abstract]
32. Shokeir AA. Transurethral cystolitholapaxy in children. *J Endourol.* Apr 1994;8(2):157-9; discussion 159-60. [View Abstract]
33. Ikari O, Netto NR Jr, D'Ancona CA, Palma PC. Percutaneous treatment of bladder stones. *J Urol.* Jun 1993;149(6):1499-500. [View Abstract]
34. Wollin TA, Singal RK, Whelan T, et al. Percutaneous suprapubic cystolithotripsy for treatment of large bladder calculi. *J Endourol.* Dec 1999;13(10):739-44. [View Abstract]
35. Paez E, Reay E, Murthy LN, Pickard RS, Thomas DJ. Percutaneous treatment of calculi in reconstructed bladder. *J Endourol.* Mar 2007;21(3):334-6. [View Abstract]
36. Franzoni DF, Decter RM. Percutaneous vesicolithotomy: an alternative to open bladder surgery in patients with an impassable or surgically ablated urethra. *J Urol.* Sep 1999;162(3 Pt 1):777-8. [View Abstract]
37. Razvi HA, Song TY, Denstedt JD. Management of vesical calculi: Comparison of lithotripsy devices. *J Endourol* 1996;10:559-63.
38. Menon M, Resnick MI. Urinary lithiasis; etiology, diagnosis and medical management. In: Relic AB, Vaughen ED, Wein AJ ED Compell's urology 8th edition saunders London, 2002;30229-35.
39. Curhan GC, Willett WC, Rimm EB, Stampfer MJ. Family history and risk of kidney stones. *J Am Soc Nephrol* 1997; 8:1568-73.
40. Qureshi K, Oakley N, Hastiek management of urinary tract calculi. *Surgery Int* 2003; 0:285-90.

41. Cain PM, Casale AJ, Kaefer M, Yerkes E, Rink RC. Percutaneous cystolithotomy in the paediatric augmented bladder. J Urol 2002; 168:1881-2.
42. Mehran MR, Dawaba MS. Cystolitholapexy versus cystolithotomy in children. J endourol 000; 14:423-6.
43. Maheswari PN, Oswil AT, Bansal M. Percutaneous cystolithotomy for vesical calculi: a better approach. Tech Urol 1999; 5:40-2.
44. Gopalakrishnan G, Bhaskar P, Jehangir E. Suprapubic lithotripsy. Br J Urol 1988;62:389.
45. Camacho-Trejo VF, Aragon-Tovar AR, Puente JC, Castillo-Gonzalez JM, Vargas Valtierra P. Percutaneous treatment of bladder lithiasis: comparison of two surgical techniques. Rev Mex Urol 2008; 68:318-23.
46. Salah MA, Holman E, Toth C. Percutaneous suprapubic cystolithotripsy for pediatric bladder stones in a developing country. Eur Urol 2001; 466-70.
47. Ikari O, Netto NR Jr, D'Ancona CA, et al. Percutaneo treatment of bladder stones. J Urol 1499-500.
48. Nazar AM. Percutaneous use of stone punch in the management of vesical calculi in children: a new treatment modality. Gomal J Med Sci 2006;4:28-31.
49. Bhatia V, Biyani CK. Vesical lithiasis: open surgery versus cystolithotripsy versus extra corporeal shock wave therapy. J Urol 1995; 151:560-62.