

## Original Article Evaluation of Percutaneous Suprapubic Cystolithotripsy under Local Anesthesia

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### ABSTRACT

**Objective:** To evaluate the feasibility and effectiveness of percutaneous cystolithotripsy under local anesthesia.

**Patients and Methods:** In this prospective study we analyzed the results of percutaneous cystolithotripsy under local anesthesia performed in 42 patients (36 men and 6 women). Suprapubic access was obtained with ultrasound guidance, and fragmentation of the stone was performed using the Swiss Lithoclast.

**Results:** The overall success rate was 95% (40/42) and the procedure was well tolerated. No major intra-operative complications were encountered. Bladder irrigation was necessary in 8 cases because of gross hematuria and only one case of excessive hematuria required control with bugbee electrode diathermy under deep analgesia. The mean hospital stay was 2.8 (range 2–6) days. The mean catheterization period was 4.3 (range 3-8) days. After a mean follow-up of 12 months, bladder stone recurrence occurred in 2 patients.

**Conclusion:** Percutaneous cystolithotripsy under local anesthesia is an effective and safe technique to remove bladder calculi and can be used as an alternative treatment option in selected patients.

**Keywords :** Percutaneous cystolithotripsy (PCCL), bladder stones, anesthesia

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### INTRODUCTION

Bladder calculi have plagued mankind since ancient times. Archeologists have discovered a stone in the pelvis of an Egyptian skeleton dating back more than 7000 years. In the past 50 years, the incidence of vesical calculi has declined significantly in developed countries; currently they represent roughly 5% of all urinary calculi in the Western world and usually occur in patients with underlying urologic disorders<sup>1</sup>. The most prevalent cause is bladder outlet obstruction due to benign prostatic hyperplasia (BPH), but infections with urea-splitting organisms, neurogenic bladder, urethral strictures, foreign bodies, and calculi migration from the upper urinary tract have also been described<sup>1</sup>.

Various techniques have been used for the management of bladder stones, such as open cystolithotomy, transurethral cystolithotripsy (TUCL), percutaneous cystolithotripsy (PCCL) and minimally invasive procedures including extracorporeal shock wave lithotripsy (ESWL) which is the least invasive, but has the limitation that its efficacy is determined by the size and hardness of the stones. PCCL is a well-established technique with high efficacy and fewer complications than transurethral cystolithotripsy, especially when treating large stones<sup>2,3</sup>, but it is traditionally performed under general or spinal anesthesia<sup>4</sup>.

This study was conducted to evaluate the feasibility, safety and effectiveness of PCCL under local anesthesia and to determine, whether it can be used as an alternative therapeutic modality in selected patients.

## PATIENTS AND METHODS

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This prospective study performed between July 2004 and June 2007 included 42 patients with bladder stones, 36 (86%) men and 6 (14%) women. The patients' mean age was 54 (range 19–85) years. The stones were due to benign prostatic hyperplasia (BPH) in 23, neurogenic bladder in 12 and stone migration from the upper tract in 4, while huge stones had formed around neglected ureteric stents in 3 patients.

Patients with a history of bladder malignancies, previous radiotherapy, previous pelvi-abdominal surgery, persistent urinary tract infection (UTI), a history of urinary retention and renal insufficiency were excluded from the study.

All patients were subjected to a full medical history, complete clinical examination, laboratory investigations (urinalysis, urine culture, complete blood count, bleeding profile and prostate specific antigen in elderly patients) and imaging studies (pelvi-abdominal ultrasonography, plain abdominal radiography and intravenous urography for certain cases). The details of the operative approach were explained and informed consent was obtained from all patients.

The patient was placed in the supine position and an intravenous (IV) infusion was started. Pre-operative medication consisted of pethidine hydrochloride 50 mg, atropine sulphate and diazepam infusion (0.1 mg/kg). Prophylactic antibiotics (2 gm third-generation cephalosporin, except in cases with a positive urine culture) were continued until removal of the catheter.

Bladder filling was obtained either by Lax 20 mg with IV fluids or by a Foley catheter which was introduced after lubricating the urethra with 10 ml xylocaine gel. The blad-

der was completely filled with saline to make suprapubic access easier. Then 2% xylocaine solution was injected 4 cm above the symphysis pubis for local anesthesia. Ultrasonic guidance for the confirmation of bladder filling and localization was used for safety and teaching purposes in all patients.

After making a 2 cm transverse incision, a suprapubic puncture was made with an 18-gauge needle. The obturator was then removed and a 0.035 inch floppy-tip guide-wire was inserted and coiled inside the bladder. The track was dilated over the wire using telescoping metal dilators. First, an Amplatz sheath with an inner diameter of 30F and then a 26F rigid nephroscope were introduced into the bladder, and the stones were fragmented using the Swiss Lithoclast. Larger fragments were removed with grasping forceps, while smaller fragments were flushed from the sheath by irrigation of saline through a urethral catheter.

During the procedure, the heart rate, arterial pressure, ventilatory frequency and peripheral oxygen saturation were monitored every 5 minutes. An anesthetist was on standby in the event that the patient did not tolerate the procedure. Intra-operative pain was assessed using a 10-cm visual analogue scale consisting of a horizontal line marked "no pain" at one end and "worst possible pain" at the other.

The patients were followed up with an abdominal plain X-ray and pelvi-abdominal ultrasound one month after PCCL and then every 6 months for two years.

## RESULTS

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Of the 42 patients, 36 had a single stone and 6 had multiple stones. The average stone size measured by the longest axis of the stone was 3.4 (range 1.8–4.7) cm as determined by a pre-operative plain urinary tract film (PUT). The median procedure time was 65 (range 40–160) minutes. No major intra-operative complications were encountered. Moreover, no significant changes were detected

in heart rate, blood pressure, ventilation or oxygen saturation. Complete stone clearance was achieved in 40 patients (95%). One of the remaining two patients was postponed for inability to tolerate pain, while the other experienced excessive hematuria that led to abortion of the procedure. Both patients were treated with ESWL two weeks later. Excessive hematuria requiring bladder irrigation was noted in 8 patients and was controlled with bugbee electrode diathermy under deep analgesia in one patient.

The whole procedure was well tolerated by all patients except one. Deep analgesia was required in this patient only, and none of the patients required blood transfusion. Fever above 38°C was noted in only 2 patients who were treated with parenteral antibiotics. The suprapubic catheter was removed on the first post-operative day, the urethral catheter two days later, except in 9 patients with hematuria. The average hospital stay was 2.8 (range 2-6) days with a mean catheterization period of 4.3 days. Patients with BPH received medical treatment with follow-up of the voiding and stream patterns every 3 months that revealed improvement and patient satisfaction. After a mean follow-up of one year (range 9-18 months), two patients showed recurrence that was managed by TUCL with bladder neck incision.

## DISCUSSION

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Bladder calculi can be managed by cystolithotomy, ESWL, cystolitholapaxy, either transurethral (TUCL) or percutaneous (PCCL), using any modality for stone disintegration. ESWL is the least invasive method but mostly requires multiple sessions and auxiliary endoscopic procedures to render the patient stone-free<sup>5</sup>.

Transurethral surgery is frequently used to remove bladder calculi<sup>6</sup>, but the large size of the instruments and prolonged time of the procedure may result in complications, such as urethral injury and urethral stricture<sup>7</sup>.

PCCL has some advantages compared to transurethral surgery, as it allows for better visualization of the stones, causes no urethral injury and has no limitations, especially in patients with enlarged prostatic adenomas. Moreover, using large working sheaths considerably facilitates extraction of large stone fragments and reduces the operating time<sup>2</sup>. All these advantages make PCCL an attractive alternative to the transurethral approach<sup>4</sup>.

This study reports on the largest series of patients undergoing PCCL since the study of Vassilios and co-workers<sup>4</sup> who concluded that PCCL under local anesthesia is safe, well tolerated and effective to remove bladder calculi. The results of the two studies are comparable, apart from recurrence that was detected in two cases in our study, yielding a success rate of about 95%, in contrast to 97% achieved by Vassilios et al. This may be due to the longer period of follow-up and larger number of patients in our study. This may also be responsible for the relatively prolonged hospital stay and catheterization in our series compared with that reported by Adsan et al.<sup>8</sup> (2.8 and 4.3 days vs. 2.3 and 3 days for hospitalization and catheterization, respectively), but the mean operative time in our study was less (65 versus 73 minutes). In both studies the risks related to anesthesia and the cost of anesthesia and medication were reduced, which is an important issue for health services.

Percutaneous methods of stone extraction have been reported using the osteotome<sup>8</sup>, laparoscopic instruments<sup>9</sup>, and by percutaneous vacuum vesicolithotomy<sup>10</sup>. Gopalakrishnan et al.<sup>11</sup> were the first to apply the percutaneous suprapubic approach to treat a bladder stone in a 12-year-old child. Ikari and associates<sup>12</sup> used the procedure in 36 adult patients and showed it to be efficacious and safe. Wollin et al.<sup>7</sup> reported a high success rate and no complications in 15

patients with large bladder stones using the pneumatic Lithoclast.

The success rate in our study was nearly the same as that of the previous studies in spite of the fact that they were all done under general or spinal anesthesia. Although comparative studies on anesthesia costs have inherent difficulties, especially in different health care systems, the cost benefit of PCCL using local anesthesia is evident. The avoidance of anesthesia-related costs (anesthetist, anesthesia team, drugs, and recovery room) has helped to decrease the overall health-care costs.

A major argument against endoscopic surgery under local anesthesia is the assumption that pain intolerability may result in jerky movements by the patient, thereby increasing the risk of bladder injury or perforation. In our series, there were no major intra-operative complications and the procedure was tolerated well by 41/42 patients (98%). Vassilios et al.<sup>4</sup> concluded that PCCL under local anesthesia is safe and well tolerated by the patient, with no complications encountered. Also in our study the pain was well tolerated as there was continuous bladder drainage through the Amplatz sheath and transurethral catheter; pain during endoscopic vesical surgery is mainly caused by bladder overdistension. The empty bladder allows for better immobilization and fragmentation of the stones.

In the past, the presence of bladder stones secondary to BPH was considered an absolute indication for transurethral resection of the prostate (TURP). However, the introduction of several forms of medical therapy (e.g.  $\alpha$ -blockers) has altered this approach. It has been reported that most men with BPH and bladder stones with no history of urinary retention, hydronephrosis or renal insufficiency could be successfully treated with endoscopic stone removal and

drug therapy with no significant risk of stone recurrence or other complications<sup>13</sup>. In patients with large bladder calculi and a large prostate, PCCL and TURP should be used, as the vision is excellent during rapid stone fragmentation, and resection of the prostate is faster with continuous suprapubic drainage<sup>2</sup>. However, to establish PCCL as a reliable modality for managing vesical calculi, a large-scale multi-center study is needed to optimize the success rate and minimize the pain associated with the procedure.

In conclusion, in our preliminary experience, percutaneous cystolithotripsy under local anesthesia is an effective and safe technique to remove bladder calculi and can be used as an alternative treatment option in certain patients. Further information about this subject will be available after receiving the results of an ongoing study carried out in our department comparing PCCL and TUCL under local anesthesia.

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