IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Research Article
January 2018 Vol.:11, Issue:2

Endoscopically Assisted Percutaneous Suprapubic Cystolitholapaxy for Large and Multiple Vesical Stones

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Faris Albadran*[1], Haider AbuAlmaali[2], Sami Masoodi[3]

1. Urologist at Alhussain Teaching Hospital, Karbala, Iraq.

2. Urologist at Alhussain Teaching Hospital, Karbala, Iraq.

3. Urologist at Alkarama Teaching Hospital, Baghdad, Iraq.

Submission: 30 December 2017
Accepted: 5 January 2018
Published: 30 January 2018

Keywords: Urinary bladder calculi. Percutaneous cystolitholapaxy, Endoscopically assisted

ABSTRACT

Background:- The ideal treatment option for vesical stones remains controversial. Endoscopically assisted percutaneous suprapubic cystolitholapaxy represents one of the treatment options for large and multiple bladder calculi. **Objectives:-** To evaluate endoscopically assisted PCCL for management of large or multiple vesical stones in respect of operative time, hospital stay, duration of catheterization, effectiveness, morbidity, and complications. **Methods:-** A Prospective descriptive study of 80 patients with vesical stones≥25mm in size treated with endoscopic assisted PCCL in the department of urology, Alhussain and Alkarama teaching hospital from April 2010 to April 2017. **Results:-** 75 males and 5 females, age range (16-75) years old, with average stones size 38.5 ± 4.1mm. Multiple stones were detected in (40%). The average operative time was 53.4 ± 8.47 minutes, with a success rate of 97.5%. The mean duration of; the suprapubic catheterization was 0.75 ± 0.4 day, the urethral catheterization was 1.5 ± 0.8 days, and the hospital stay was 2 ± 1.1(1–5) days. Complications were: intraoperative bleeding and missed residual stones with urine retention and leakage in 2 (2.5%) patients, hematuria in 24 (30%) patients, pain in 18 (22.5%) patients, fever in 16 (20%) patients, UTI in 11 (13.75%)patients, and wound infections in 3 (3.75%) patients. Postoperative IPSS (15.0 ± 2.7) and QoL (2.5 ± 0.59) scores significantly improved in comparison to preoperative IPSS (20.1 ± 5.8) and QoL (3.9 ± 1.2) scores [P < 0.001]. **Conclusion:-** Endoscopically assisted PCCL can be used safely and successfully for treating large and multiple bladder stones. It is minimally invasive, efficient, and cost-effective procedure with low morbidity and complications rate.

INTRODUCTION:

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]. Bladder calculi represent 5% of urolithiasis [2,3]. Multiple stones are found in 25% of cases [4]. Primary vesical calculus is stones develop in the absence of any known functional, anatomic, or infectious factors and the term does not necessarily imply that stones have formed de novo in the bladder. In developing countries, primary bladder calculi are most common in children below 10 y, with deficiency of vitamin A,B 6,low-protein, phosphate diets [5]. Secondary vesical stones (due to voiding dysfunction or a foreign body). The most common cause of bladder calculi in adults are Bladder outlet obstruction and high post-void residual urine with stasis, which leads to crystal nucleation (e.g.PBH, elevation of the bladder neck, urethral stricture, trauma, neurogenic bladder, etc.)[4,6]. Most bladder calculi are seen in men. Tight incontinence repair, cystoceles, and diverticula are the most common cause in females [7]. Patients who have static urine and develop urinary tract infections are more likely to form bladder calculi. Iatrogenic foreign bodies in the bladder act as a nidus for stone formation.(suture material, shattered Foley catheter balloons, eggshell calcifications that form on a catheter balloon, staples, forgotten double-J ureteral stents, migrating contraceptive devices, erosions of surgical implants, and prostatic urethral stents) [8,9,10,11,12]. Stones on suture material have an early presentation if sutures were within the bladder lumen, or delayed if they are caused by erosion through the bladder wall [13]. Noniatrogenic causes include objects placed into the bladder by the patients for recreational and various other reasons [14]. Bladder inflammation secondary to schistosomiasis or external beam radiation [15], viral protease inhibitors can predispose to vesical calculi[16]. Vesical stone in adults is composed of uric acid (>50%), calcium oxalate, calcium phosphate, ammonium urate, cysteine, or magnesium ammonium phosphate (associated with infection)[17,18]. Stones are composed of ammonium acid urate, calcium oxalate,o r an impure mixture of ammonium acid urate and calcium oxalate with calcium phosphate [19, 20]. The presentation of vesical calculi varies from completely asymptomatic to and obstructive voiding symptoms (frequency, hesitancy, urgency, decreased force of the urinary stream, incontinence, and urinary retention) [18], terminal gross hematuria, sudden termination of voiding, lower abdominal pain aggravated by brisk movement, and pain referred to the tip of the penis, scrotum, perineum, back. Parents of children with stone may notice reaction and enuresis. Larger stones tend to cause fewer symptoms, likely owing to restricted movement within the bladder. Common physical

examination findings include suprapubic tenderness, fullness, and, occasionally, a palpable distended bladder if the patient is in acute urinary retention. A large percentage of bladder stones are radio-opaque. The sonogram, showing an object with posterior shadowing, is effective in identifying both and radio-opaque stones [21]. CT scan is usually obtained for other reasons (e.g. abdominal pain, pelvic mass, suspected abscess) demonstrate bladder calculi when performed without contrast. Cystoscope used to confirm the presence of bladder stones, their number, size, position, plan the treatment, examination of the urethra, prostate, bladder wall, ureteral orifices and allows identification of strictures, bladder, and bladder tumor [15].The only potentially effective medical treatment for bladder calculi is urinary alkalinisation (pH>6.5)for the dissolution of uric acid stones. Potassium citrate at 60 mEq/d is the treatment of choice. However, aggressive alkalization may lead to calcium phosphate deposits on the stone surface, making further medical therapy ineffective [15]. Various surgical treatment of vesical calculi has evolved over years. Ammonius (200 BC), Celsus (first century), and the Hindu surgeon Susruta were among the first to write about perineal lithotomy to treat bladder calculi [22]. In the 1500s, Pierre Franco introduced suprapubic cystolithotomy [22]. Civiale performed the first documented blind transurethral lithotripsy in 1822 [22]. Krishnan and colleagues were the first to report the use of a percutaneous suprapubic approach[23].

The ideal treatment for bladder stones remains controversial and the elimination of the causal factor (eg, bladder outlet obstruction, infections, foreign body, or diet) is mandatory for therapeutic success and prevention of recurrence [6]. The choice of surgical approach depends on the availability of equipment, surgical experience, underlying comorbidities, and stone size and composition [24].

Currently, four approaches have been used; 1- Extracorporeal shock wave lithotripsy (ESWL) is a noninvasive procedure, not treat the etiology and not eliminate stone fragments. Its efficacy is associated with the calculi size and the best results when they are smaller than 2 cm [25]. ESWL is a good option for patients with small calculi and high surgical risk, as it does not need anesthesia, with a stone-free rate of 72–99% [26]. However, >17% of patients require adjuvant cystoscopy for evacuation of stone fragments [27]. 2- Open suprapubic cystolithotomy is the most invasive, but it continues to be the gold standard treatment to remove big bladder stones[28]. It is the first option in children and bladder diverticulectomy or when open prostatectomy indicated. 3- Transurethral cystolitholapaxy (TUCL) is the most

frequently used approach for bladder stone removal in adults owing to its high efficacy rates [29]. 4- Percutaneous suprapubic cystolitholapaxy (PCCL) under fluoroscope or ultrasound or endoscope guidance allows rapid fragmentation and evacuation of the large stones due to the use of shorter and larger diameter endoscope with an ultrasonic lithotripter or the pneumatic lithoclast [30]. IT associated with rectal or vascular injury and it is contraindicated in urothelial carcinoma [31] and may be hazardous in patients who have undergone prior lower abdominal surgery or prior pelvic surgery or who have small capacity noncompliant bladders [32]. Various types of endoscopic lithotrites with different energy sources e.g.manual lithotrite (mechanical crushing), Electro-Hydraulic Lithotripsy (spark induced pressure wave, with higher incidence of bladder mucosal injury), ballistic (pneumatic jackhammer), ultrasonic lithotripter, or holmium/YAG laser (direct absorption, vaporization, water absorption, and pressure wave).

We observed that open cystolithotomy and TUCL is widely used as the first line of treatment in most centers in Iraq, due to the limited experiences in PCCL and unavailability of the fluoroscope.

So, we have conducted a study to evaluate PCCL under cystoscopic guidance for management of large or multiple bladder stones in respect of operative time, hospital stay, duration of catheter placement, effectiveness, morbidity, safety, and complications in our hospitals. We believe that this may help to increase the therapeutic effectiveness and decrease the morbidity and complications associated with vesical calculi removal procedures.

MATERIALS AND METHODS:

Patients and method

Study Design: This observational study was conducted with prospective data collection for 80 patients with urinary bladder stones≥25mm in size who underwent cystoscopically guided PCCL in the department of urology, Alhussain Teaching Hospital, and Alkarama Teaching Hospital from April 2010 to April 2017. All patients underwent a complete urological assessment and preoperative evaluation including: a full medical and urological history including the (IPSS) International Prostate Symptom Score and quality of life due to urinary symptoms score (QoL), physical examination; laboratory investigations including urine analysis, urine culture and sensitivity if needed, renal function test, preoperative laboratory assessment; and imaging studies including abdominopelvic ultrasonography, plain abdominal

radiograph of the kidneys, ureters and bladder (KUB), and specific investigations in a cases of secondary bladder stones.

Exclusion Criteria: Patients with [bladder tumors , previous pelvic radiotherapy, previous pelvic or abdominal surgery; BPH of >80 ml, very small capacity bladders, bladder diverticulae, lower limbs anomaly that interfere with dorsal lithotomy position, age under 15 years; and patients with stones size < 2.5 cm in whom ESWL or TUCL are indicated.] were excluded from the study.

The details of the operative procedure and options of the management were explained to all patients and the possibility of the intraoperative conversion from the percutaneous approach to open cystolithotomy was also explained before obtaining informed consent. All patients with sterile urine received prophylactic antibiotics with the induction of anesthesia, and those with bacteriuria were treated according to the culture and sensitivity results 7 days before surgery.

Surgical procedure: After administering spinal or general anesthesia the patient positioned in dorsal lithotomy position, adequate lubrication into urethra, urethrocystoscopy was performed initially by 19 F cystoscope to determine the size, number, and the presence of associated pathology, then the bladder was filled through the cystoscope by normal saline to make suprapubic access easier. The anterior wall of the bladder was endoscopically observed to provide continuous intravesical guidance for the percutaneous puncture and dilatation during the percutaneous approach and avoids injury of the posterior wall of the bladder and the rectum. Also, all steps of the PCCL can be monitored by the assistant surgeon to avoid slippage of the guide wire or loss of the track and the sheath and can be used to direct the nephroscope towards missed stones. The cystoscope was not left in situ throughout the procedure but only to establish the access for the percutaneous tract under direct vision and at the end of the procedure, when suction of the stone fragments was needed. A suprapubic puncture was made with an 18-G needle through a10mm transverse skin incision 2.5 cm above the symphysis pubis. The obturator was then removed and a 0.97 mm (0.03800) floppy-tip guidewire was advanced into the bladder through the needle and coiled inside the bladder. Dilatation of the cystostomy tract over the wire followed, using Amplatz renal dilator set, to allow insertion of the Amplatz sheath with an inner diameter of 30 F. A 26-F rigid nephroscope was then advanced into the bladder, and the stones were fragmented using the pneumatic lithoclast. Stones of <8 mm were actively removed with a grasper forceps

through the percutaneous route, whilst smaller fragments by an Ellik evacuator followed by whole bladder flushing through the cystoscope or the percutaneous working sheath to produce a unidirectional irrigation jet to eliminate any residual fragments through the percutaneous working or cystoscopy sheath. After complete stone clearance, suprapubic 20F two-way Foley catheter left to wash hematuria with inflation of the balloon by 15 cc normal saline to prevent the extravasations through cystostomy tact that removed when hematuria become less, and urethral 20F two-way Foley catheter was left for good drainage of the bladder that removed when the urine becomes clear. KUB and/or the US were performed after removal of the urethral catheter to document complete stone clearance. Patients were discharged home when voiding satisfactory 2 times. The Clavien–Dindo classification system [33] was used to grade postoperative complications. All patients were followed-up after a week by urine analysis with culture and sensitivity, and 6 weeks later we assess the International Prostate Symptom Score (IPSS), and quality of life due to urinary symptoms score (QoL).

Statistical analysis: Data were analyzed using the commercially available Microsoft Excel 2016 spreadsheet. Descriptive data are presented as the range, the average (mean) and the Standard Deviation for continuous variables, and the number and percentage for categorical variables. Postoperative continuous variables were compared with their baseline values using the paired t-test; a two-sided P-value < 0.05 was considered to indicate statistical significance.

RESULTS AND DISCUSSION:

RESULTS:

80 patients included in this study 75 males (93.75%) and 5 females (6.25%), age range (16 - 75) years old, an average was 52.5±15.2 years. The average stones size measured by the longest axis of the stone determined by preoperative KUB and the pelvic US was 38.5mm ± 4.1, range (25-55)mm. A single stone was detected in 48 (60%) patients, whilst 34 (40%) had multiple stones (Fig. 1).

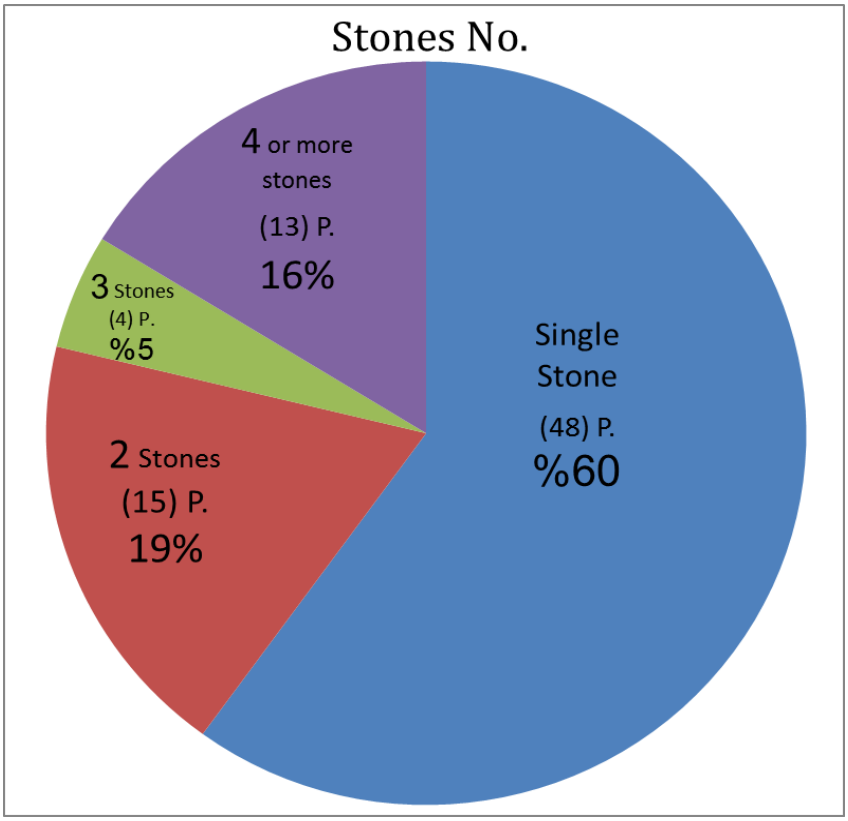

Figure 1: Distribution of the number of vesical stones in the study patients.

Bacteriuria and positive urine culture were found in 58(72.5%) patients. The cause was prostatic enlargement in 42(52%) patients, 23 patients were on alpha-adrenergic blockers plus 5 alpha-reductase inhibitors,14 on alpha-blocker only. They continued their medications postoperatively, except 20 of them underwent combined TURP and PCCL at the same time. Neurogenic bladder dysfunction was the cause of 16(20%) patients. Eleven(14%) patients had foreign bodies or neglected ureteric stents, around which large bladder stones had been formed, they were removed smoothly. Five(6%) patients had the urethral stricture, optical urethrotomy done simultaneously with PCCL. No cause found in 6 (8%) patients (Fig. 2).

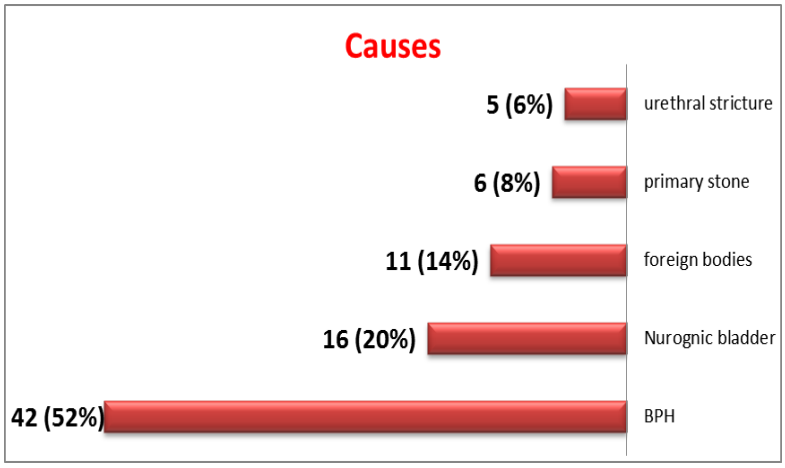

Figure 2: Causes of vesical stones in the study patients.

The average operative time was 53.4±8.47; range (40–75) minutes (We exclude the time for the combined surgical procedure)(Fig. 3).

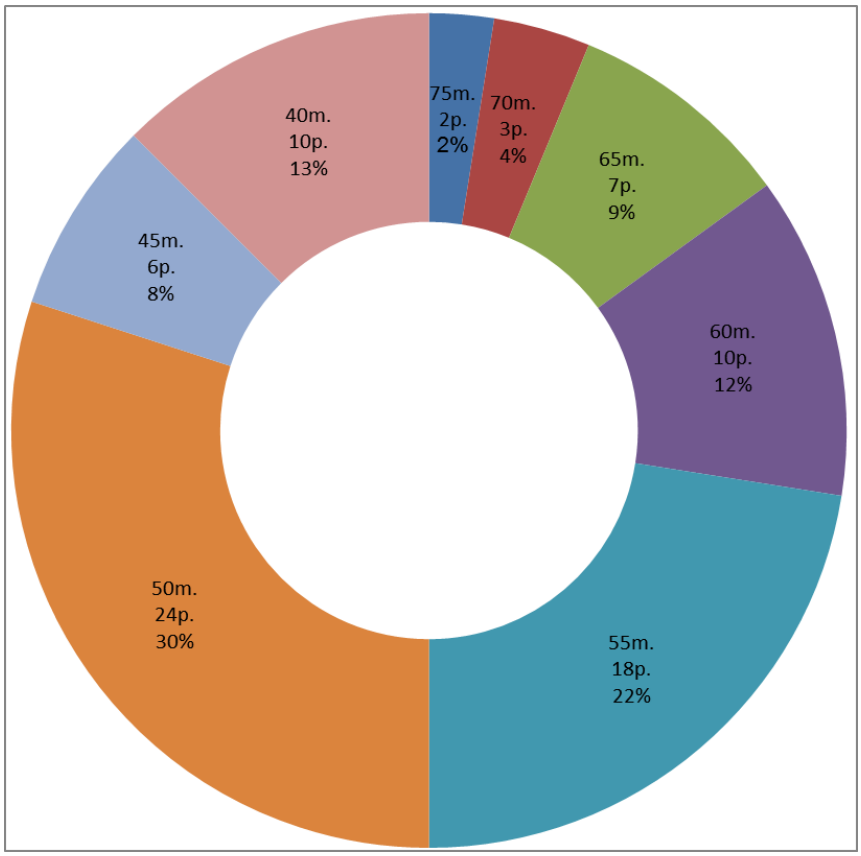

Figure 3: Operative time of the PCCL.

The average (range) duration of the Suprapubic catheterization was 0.75 ± 0.4 (0.5 – 2) days, and for the urethral catheterization was 1.5 ± 0.8 (1 - 4) days, and the average (range) of hospital stay was 2 ± 1.1(1–5) days (Table-1).

Table 1: Descriptive statistics of data

Data Statistics	Average (Mean)	Standard Deviation	Lower range	Upper range
Age	52.5 years	15.2	16 y	75 y
Stone size	37.5 mm	4.1	25 mm	55 mm
Operative time	53.4 minutes	8.4	40 m	75 m
Duration of the suprapubic catheterization	0.75 day	0.4	0.5 day	2 days
Duration of the urethral catheterization	1.5 day	0.8	1 day	4 days
Hospital stay	2 days	1.1	1day	5 days

A success rate of 97.5% was achieved with complete stone clearance in 78 patients. Only 2 (2.5%) patients had severed intraoperative bleeding with missed residual stones, urine retention, suprapubic urine leakage and pre-vesical extravasation(Grade IIIb Clavien–Dindo complications). 24 (30%) patients had postoperative hematuria (Grade II Clavien–Dindo complications). Postoperative pain in 18 (22.5%) patients(Grade I Clavien–Dindo complications). Postoperative fever >38 C occurs in 16 (20%) patients (Grade II Clavien–Dindo complications). 11 (13.75%) developed postoperative lower UT infection (Grade II Clavien–Dindo complications). Suprapubic wound infections occur in 3 (3.75%)(**Table-2**).

Table 2: Complications.

Complications	No. of patients	Percentage	Clavien–Dindo complications Grade
Hematuria	24	30 %	II (only 2IIIb)
Pain	18	22.5 %	I
Fever	16	20 %	II
Lower U T I	11	13.75 %	II
Wound infection	3	3.75 %	II
Residual stones	2	2.5 %	IIIb
Urine leakage	2	2.5 %	IIIb
Urine retention	2	2.5 %	IIIb

The mean (SD) of the preoperative IPSS score was 20.1 (5.8) and 6 weeks postoperatively significantly improved to 15.0 (2.7); [P-value < 0.001].

The mean (SD) of the preoperative QoL score was 3.9 (1.2) and 6 weeks post operatively significantly improved to 2.5 (0.59); [P-value < 0.001] (Fig. 4).

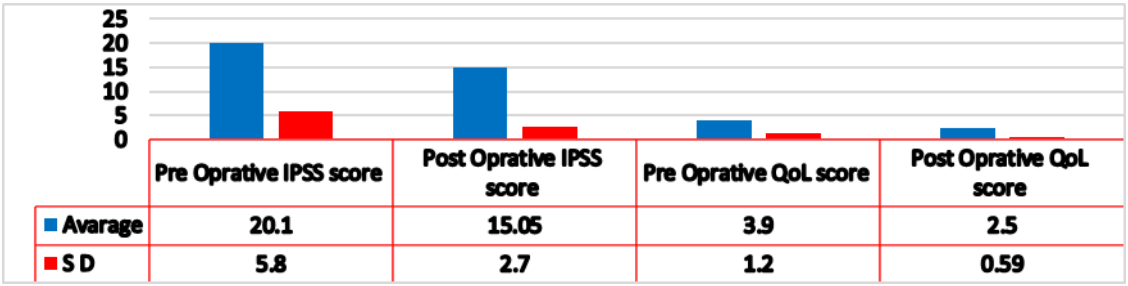

Figure 4: Pre and Post Oprative IPSS, QoL score

DISCUSSION:

Iraq is included among those countries where the prevalence of vesical stone is higher [34]. 25% of the patients with urinary stone have a family history [35]. The treatment options available for managing bladder calculi include transurethral cystolitholapaxy, open cystolithotomy, and shock wave lithotripsy. Open cystolithotomy and TUCL is widely used as the first line of treatment in most centers in Iraq. TUCL for larger calculi is time-consuming for larger calculi, and the manipulation has the potential to cause urethral injury especially in boys with the narrow urethra [36,37]. When the stone is too large or hard or if the patient's urethra is too narrow (e.g., in children) or surgically altered, complicating access to the bladder, the open or percutaneous suprapubic surgical approach is preferable [38]. The advantages of the open cystolithotomy include rapidity, easy removal of several calculi in a single procedure, and the ability to extract calculi that are adherent to bladder mucosa, or large stones that are too hard to fragment via endoscopic techniques. The major disadvantages include longer hospital stay, postoperative pain, scar, and longer bladder catheterization times which increase the risk of infection. PCCL has fewer complications than TUCL [39], and less morbidity than that of open cystolithotomy [40, 41]. PCCL can be safely and effectively performed under local anesthesia and it might also prove useful when prolonged urethral instrumentation should be avoided, such as in patients with a penile prosthesis or an artificial urinary sphincter and orthotopic neobladder [42]. Although fluoroscopic or ultrasonic guidance in PCCL is recommended, PCCL, guided with the

cystoscope (combined transurethral and percutaneous approach) aid in stone stabilization, facilitate irrigation of the stone debris, and radiation hazards can be avoided.

A success rate of 97.5% was achieved with complete stone clearance in 78 patients. This was probably due to the double visual control, via the cystoscope and nephroscope, to find any missed stone or gravel, and by the continuous flushing of the gravel through the Amplatz sheath. The lower incidence of complications seems to be due to direct visual control via the cystoscope during the puncture and dilatation of the tract, and avoids injury of the posterior wall of the bladder and rectum, so no major complication was noted including bladder rupture, intra peritoneal leakage nor conversion to open stone surgery, except 2 (2.5%) patients had sever intra operative bleeding both had pre oprative UTI and failed three ESWL, which caused poor visualization and missing residual stones, and then after removal of the urethral catheter led to urine retention, suprapubic urine leakage, and pre-vesical extravasation; requiring cystoscopic removal under general anesthesia (Grade IIIb Clavien–Dindo complications). Most of the patients had post-operative transient minor hematuria resolve spontaneously without wash within 24 hours, except 24 (30%) patients had hematuria which needs normal saline wash and resolve spontaneously after 2 to 3 days (Grade II Clavien–Dindo complications), [2 of them had pre oprative failed three ESWL; other 2 had large stone burdens more than 50 mm, and 20 of them underwent combined PCCL and TURP (with the suprapubic sheath in situ to provide continuous drainage.) at the same time safely and successfully]. TUCL and resection of the prostate have been reported to be difficult with a high incidence of morbidity in patients with large, hard or multiple stones and a large prostate, especially the middle lobe [28]. In these cases, PCCL may be a good alternative to manage the stone followed by TURP, as visualization is excellent during rapid stone fragmentation, and resection of the prostate is faster with continuous suprapubic drainage [37]. The smaller caliber of the working channel during TUCL, compared with PCCL, necessitates disintegration of the stones into smaller fragments. This elongates the duration of the intervention and results in increased urethral and bladder trauma. Combined TURP and PCCL are a safer, more effective, and much faster alternative to combined TURP and TUCL in patients with large bladder stones and large prostates [43,44]. Postoperative pain that needs more than one-time parenteral analgetics drugs occurs in 18 (22.5%) patients was mostly from the urethral catheter (Grade I Clavien–Dindo complications). Postoperative fever >38 C occurs in 16 (20%) patients started in the day 1 postoperatively which was low-grade fever and treated with parenteral antibiotics, antipyretics, and i.v. fluids (Grade II Clavien–Dindo

complications). Despite the use of prophylactic antibiotics 1 hour prior to surgery, 11 (13.75%) developed postoperative lower UT infection, 9 of them had stones larger than 40mm; an d were treated by parenteral antibiotics (Grade II Clavien–Dindo complications). Suprapubic wound infections occurs in 3 (3.75%)[1was diabetic and other 2 had urine leakage] treated by frequent dressing changes with antibiotics.

We compare our study with Adel H. et al.[45], Ahmed T.[46], and Akmal M. et al.[47] studies(**Table-3**).

Table-3: Studies Comparison.

Study Statistics	Our Study	**Adel** et al. Study	**Ahmed T.**Study	**Akmal**et al.Study
Number of patients	80	40	20	19
Age year	52.5(16-75)	36.9(5-60)	32(21-43)	(3.5-90)
Stone sizemm	37.5(25-55)	35 (32–45)	33.5(31-36)	32(10-50)
Operative time minutes	53.4(40–75)	26.5(20-30)	52.5(45-60)	---
Suprapubic catheterization	0.75 day	Not used	Not used	Not used
Urethral catheterization day	1.5(1-4)	1.2 ± [0.41]	3.5(3-4)	3
Hospital stay day	2 (1-5)	2.2(1-5)	---	3
Success rate	97.5%	100%	100%	100%
Hematuria	24(30 %)	---	7(35%)	2(10.5%)
Pain	18(22.5 %)	---	---	---
Fever	16(20 %)	2(5%)	1(5%)	---
Lower U T I	11(13.7 %)	---	---	2(10.5%)
Wound infection	3(3.75 %)	0	0	0
Residual stones	2(2.5 %)	0	0	0
Urine leakage	2(2.5 %)	0	0	1(5.26%)
Urine retention	2(2.5 %)	0	0	0

Average,(Range),[SD].

The mean operative time was 53.4 min, which is longer than that in Adel H. et al. study [45], this may be due to the larger stone size in our study, the type of the lithoclast that we are used, and limited experiences especially in the beginning of the study. We believe that the

suprapubic catheterization may help in urine drainage, washing, and shorting the duration of the urethral catheterization; which was not used in the other comparative studies. The average (range) of hospital stay was 2 (1–5) days which was similar to the other comparative studies.

Postoperative hematuria that occur in 24 patients that account 30% and that agree with study performed by Ahmed T.(the PCCL group) which observed the hematuria in 7 (35%) patients, and disagree with study performed by Akmal M.et al. which observed the hematuria that occur only in 2 (10.5%) patients, and Adel H. et al. study in which they found no one develop hematuria. This may be explained by the excessive manipulation in our procedure due to our minor experience, and 20 of them underwent combined PCCL and TURP at the same time.

Our study disagree with study performed by Adel H.and co-worker and the study performed by Ahmed T. (the PCCL group) in which they found only 2 (5%) patients, and 1 (5%) patient respectively develop postoperative transient pyrexia which occurs in 16 (20%) patients in our study; this possibly due to the combined TURP at the same time and the flushing of the infected stone gravel on the exposed area of the prostate

No one develops urinary leakage in the study performed by Adel H. and co-worker and the study performed by Ahmed T.(the PCCL group); while Akmal M. and co-worker noticed one (5,25%) patient and we had 2 (2.5%) patients develop urinary leakage. This was due to missing residual stones, and then after removal of the urethral catheter led to urine retention, suprapubic urine leakage, and pre-vesical extravasation; requiring cystoscopic removal under general anesthesia which resolve spontaneously without sequels.

The main limitations of the present study are the relatively small sample size, lack of a control group, and the lack of pressure flow studies to differentiate conditions of neurogenic bladder dysfunction and consequently avoid the possibility of fistula formation after removal of the urethral catheter.

CONCLUSION:

Endoscopically assisted PCCL for treating large and multiple bladder calculi is an efficient, low morbidity option with short duration of catheterization and less postoperative pain, cost-effective technique regarding procedure time and post-operative hospital stay, safe procedure with low incidence of complications, minimally invasive technique avoids urethral injury and radiation hazards with the imperceptible scar. Complications noticed with this procedure are

minor and can be reduced by the experienced surgeon. The short convalescence periods and low morbidity make it preferable alternative to open cystolithotomy and can be used safely and successfully for treating large and multiple bladder stones where fluoroscope is not available.

REFERENCES:

1. Ellis H. A History of Bladder Stone. Journal of the Royal Society of Medicine Volume 72 April 1979:248.
2. Schwartz BF, Stoller ML.The vesical calculus. Urol Clin North Am. May 2000;27(2):333-46.
3. Tiselius HG. Epidemiological and medical management of stone disease. BJU Int. 2003;91(8):758-62.
4. Tanagho E, McAninch J, Smith's General Urology 17th Edition, 2008;16:272
5. Ali SH, Rifat UN. Etiological and clinical patterns of childhood urolithiasis in Iraq. Pediatr Nephrol 2005;20:1453–7.
6. Papatsoris AG, Varkarakis I, Dellis A. et al.Bladder lithiasis: from open surgery to lithotripsy. Urol Res 2006;34:163–7.
7. 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.
8. 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 exstrophy repair. World J Urol. Aug 2001;19(4):261-2.
9. 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.
10. Eichel L, Allende R, Mevorach RA, et al. Bladder calculus formation and urinary retention secondary to perforation of normal bladder by a ventriculoperitoneal shunt. Urology. Aug 2002;60(2):344.
11. 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.
12. Rafique M. Vesical calculus formation on permanent sutures. J Coll Physicians Surg Pak. Jun 2005;15(6):373-4.
13. Arunkalaivanan AS, Smith AR. Bladder calculus after laparoscopic colposuspension. J Obstet Gynaecol. Jan 2002;22(1):101.
14. Lau S, Zammit P, Bikhchandani J, Buchholz NP. The unbreakable bladder stone--Munchhausen's tale. Urol Int. 2006;77(3):284-5.
15. Ho K, Segura J. Lower Urinary Tract Calculi. In: Wein A, Kavoussi L, Novick A, Partin A, PetersC. Campbell-Walsh Urology.3.9th. Philadelphia,Pa: Saunders Elsevier; 2007:2663-73.
16. Russinko PJ, Agarwal S, Choi MJ, Kelty PJ. Obstructive nephropathy secondary to sulfasalazine calculi. Urology. Oct 2003;62(4):748.
17. Douenias R, Rich M, Badlani G, et al. Predisposing factors in bladder calculi. Review of 100 cases. Urology. Mar 1991;37(3):240-3.
18. Hammad FT, Kaya M, Kazim E. Bladder calculi: did the clinical picture change?. Urology. Jun 2006;67(6):1154-8.
19. 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.
20. Bakane BC, Nagtilak SB, Patil B. Urolithiasis: a tribal scenario. Indian J Pediatr. Nov-Dec 1999;66(6):863-5.
21. Huang WC, Yang JM. Sonographic appearance of a bladder calculus secondary to a suture from a bladder neck suspension. J Ultrasound Med. Nov 2002;21(11):1303-5.
22. Bouchet H. [Surgery of bladder lithiasis in the 19th century]. Ann Chir. 1999;53(9):908-14.
23. Gopalakrishnan G, Bhaskar P, Jehangir E. Suprapubic lithotripsy. Br J Urol 1988;62:389.
24. Bhatia V, Biyani CS. Vesical lithiasis: open surgery versus cystolithotripsy versus extracorporeal shock wave therapy. J Urol1994;151(3):660–2.

25. Bhatia V, Biyani CS. Extracorporeal shock wave lithotripsy for vesical lithiasis: initial experience. Br J Urol. 1993;71(6):695-9.
26. Husain I, El-Faqih SR, Shamsuddin AB, Atassi R. Primaryextracorporeal shock wave lithotripsy in the management of large bladder calculi. J Endourol 1994;8:183–6.
27. Delakas D, Daskalopoulos G, Cranidis A. Experience with the Dornier lithotriptor MPL 9000-X for the treatment of vesical lithiasis. Int Urol Nephrol 1998;30:703–12
28. Razvi HA, Song TY, Denstedt JD. Management of vesical calculi: Comparison of lithotripsy devices. J Endourol 1996;10:559-63.
29. Papatsoris AG, Varkarakis I, Dellis A, Deliveliotis C. Bladderlithiasis: from open surgery to lithotripsy. Urol Res2006;34:163–7.
30. Ikari O, Netto NR Jr, D'Ancona CA, Palma PC. Percutaneous treatment of bladder stones. J Urol. Jun 1993;149(6):1499-500.
31. 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.
32. 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.
33. Daniel Dindo, Nicolas Demartines, Pierre-Alain Clavien. Classification of Surgical Complications. Ann Surg. 2004 Aug; 240(2): 205–213.
34. Menon M, Resnick MI. Urinary litihisasis; etiology, diagnosis and medical management. In: Relic AB, Vaughen ED, Wein AJ ED Campbell's urology 8th edition Saunders London, 2002;30229-35.
35. Curhan GC, Willett WC, Rimm EB, Stampfer MJ. Family history and risk of kidney stones. J Am Soc Nephrol 1997; 8:1568-73.
36. Wollin TA1, Singal RK, Whelan T, Dicecco R, Razvi HA, Denstedt JD. Percutaneous suprapubic cystolithotripsy for treatment of large bladder calculi. J Endourol. 1999 Dec;13(10):739-44.
37. Asci R, Aybek Z, Sarikaya S, Bu¨yu¨kalpelli R, Yilmaz AF. The management of vesical calculi with combined optical mechanical cystolithotripsy and transurethral prostatectomy: is it safe and effective? BJU Int 1999;84:32–6
38. Joseph Basler. Bladder Stones Treatment & Management. Medscape, Jan 24, 2017.
39. Aron M, Agarwal MS, Goel A. Comparison of percutaneous with transurethral cystolithotripsy in patients with large prostates and large vesical calculi undergoing simultaneous transurethral prostatectomy. BJU Int 2003;91:293–5
40. 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.
41. Salah MA, Holman E, Toth C. Percutaneous suprapubic cystolithotripsy for pediatric bladder stones in a developing country. Eur Urol 2001; 466-70.
42. Tzortzis V, Aravantinos E, Karatzas A, Mitsogiannis IC,Moutzouris G, Melekos MD. Percutaneous suprapubic cystolithotripsy under local anesthesia. Urology 2006;68:38–41
43. Tugcu V, Polat H, Ozbay B, Gurbuz N, Eren GA, Tasci AI. Percutaneous versus transurethral. cystolithotripsy. J Endourol. 2009 Feb;23(2):237-41.
44. Monish Aron, Rajiv Goel, Gagan Gautam, Amlesh Seth, Narmada P. Gupta.Percutaneous versus transurethral cystolithotripsy and TURP for large prostates and large vesical calculi: Refinement of technique and updated data. International Urology and Nephrology March 2007, Volume 39, Issue 1, pp 173–177.
45. Adel H. Metwally, Mahmoud H. Sherief, Mohamed A. Elkoushy. Safety and efficacy of cystoscopically guided percutaneous suprapubic cystolitholapaxy without fluoroscopic guidance. Arab Journal of Urology (2016) 14, 211–215.
46. Ahmed T. Obaid. A Comparative Study of Percutaneous Suprapubic Cystolitholapaxy versus Open Cystolithotomy in Adults.Medical Journal of Babylon-Vol. 10- No. 1 -2013.
47. Akmal M, Munir MI, Jafari AA, Subhani GM, Javed SH. Percutaneous Cystolithotripsy is it Safe and Successful in All Age Groups?. APMC 2017;11(1):25-27.