Original Article

Ureteral Stones Removal by different ways

Treatment of Large Proximal Ureteral Stones: Extracoporeal Shock Wave Lithotripsy versus Ureterolithotrisy versus Laparoscopic Ureterolithotomy

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ABSTRACT

Objective: To compare efficacy of extracorporeal shock wave lithotripsy, rigid ureterolithotripsy, and laparoscopic ureterolithotomy in treatment of large proximal ureteral stones.

Study Design: Prospective randomized study.

Place and Duration of Study: This study was conducted at the Department of Urology, Lahore General Hospital, Lahore from March 2012 to March 2014.

Materials and Methods: A total of 40 patients with large proximal ureteral stones (greater than 1cm) were prospectively randomized for study at Postgraduate Medical Institute Lahore. Eligible patients were treated with extracorporeal shock wave lithotripsy, rigid ureterolithotripsy and laparoscopic ureterolithotomy.

Results: Extracorporeal shock wave lithotripsy had 37.5% success rate, rigid ureterolithotripsy 64.3% and laparoscopic ureterolithotomy 90%. Fewer treatment sessions were required with laparoscopic ureterolithotomy vs rigid ureterolithotripsy vs extracorporeal shock wave lithotripsy (mean±SD1.6±0.5vs2.1±o.9±vs2.7±1.07,p=0.017)

Conclusion: Higher success rate is achieved with laparoscopic ureterolithotomy in treatment of large proximal ureteral stones but with fewer additional procedures. It is associated with more postoperative pain,longer procedure and a longer hospital stay. It is more advantageous than open ureterolithotomy, remains a salvage, second line procedure in treatment of large proximal ureteral stones.

Key Words: Proximal Ureteral Stones, Extracoporeal Shock Wave Lithotripsy, Ureterolithotrisy, Laparoscopic Ureterolithotomy

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INTRODUCTION

Ureteral stones may cause severe pain, lead to hydronephrosis and/or urinary tract infection, and ultimately may be the reason for renal function loss. Although small distal ureteral stones most commonly spontaneously pass through the ureter into the bladder, large proximal ureteral stones (>10mm) can take more than 2–3 weeks to pass all the way[1].In a worst scenario, these stones can get impacted in the ureter, requiring surgical intervention.

Medical expulsive therapy using alpha-blockers (i.e. tamsulosin, alfuzosin) or calcium channel blockers (i.e. nifedipine) have been used for several years in the treatment of patients suffering from ureteral stone, reportedly resulting in a higher stone-free rate and a shorter time to stone expulsion when compared to placebo[2]. However, a recent multicenter, randomized, placebo-controlled trial has demonstrated different outcomes and questioned the role of medical expulsive therapy[3] .

Thus, surgical intervention may be the best alternative for patients with refractory pain to analgesics, and early intervention may be considered for large proximal calculi that are unlikely to pass spontaneously. Although there is consensus that ureteroscopy is the most efficient treatment for patients with distal ureteral stones, there is a debate regarding large proximal ureteral stones[4]. AUA (American Urological Association) and EAU (European Association of Urology) have recommended ureteroscopic lithotripsy (URS) or shockwave lithotripsy (SWL) as first option, although percutaneous nephrolithotomy (PCNL) and laparoscopic ureterolithotomy (LU) may be suitable.

Currently, there is a clear tendency of less SWL and more URS in the treatment of patient with urinary stones, even in developing countries[5]. As flexible ureteroscopies are not available in all services, semi rigid or rigid ureteroscopy has been used for treatment

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of ureteral stones in all locations, even for those in proximal ureter. PCNL is a procedure with high risk of surgical complications, whereas LU has gained some popularity[6]. Based on these concepts, in this study we aimed to compare the outcomes from ESWL, URS and with those from LU for management of large proximal ureteral stones.

MATERIALS AND METHODS

A total of 40 patients with large proximal ureteral stone s(1cm or larger) were enrolled in the study at single institution between March 2012 to March 2014.

Inclusion Criteria: Proximal ureteral stones sized 1cm or larger located between ureteropelvic junction and pelvic brim.

Exclusion Criteria: Exclusion criteria were pregnancy, ureteral stone with renal failure, previous open surgery for ureteric or renal stone, incomplete follow up during or after treatment.

Stone size was measured during KUB OR CT. Envelopes for randomization were made and patient was assigned to chosen treatment of SWL, URS with pneumatic lithotripsy or laparoscopic uretero-lithotomy/LAP.

URS was performed with patient under spinal or general anaesthesia using 8.9 FR ureteroscope. Laparoscopic ureterolithotomy was performed through transperitoneal approach with patient under general anaesthesia. Clinical data were collected before, during and after treatment. Post treatment pain was assessed using visual scale.

After treatment patients were followed and imaging investigations included X ray KUB, USG after two weeks. CT was done after two months. Statistical analysis was performed using SPSS 20 Anova test.

RESULTS

Detailed data is provided in tables 1 and 2. Presenting symptoms included pain(87%),microscopic or gross heamaturia (44%), and stone was incidently diagnosed in 8% of patients. In 30.3% of patients urinary tract infection was diagnosed and pretreatment antibiotics were administered.

SWL was completed in all patients using good analgesia with mean duration of 43.8± 2.3 mintues. All procedures were performed under fluoroscopic guidance with mean radiation exposure 3.8+1.1. The impulse rate varied from 2000 to 5000 at mean power setting of 4(range 3 to 6) and a frequency of 75 to 125 Hz. After failure of the first session, 7 patients had to undergo second session. Two patients received third session of ESWL. One patient developed haematuria with symptoms of UTI which was managed conservatively. After failure of SWL,5 patients underwent URS.

URS patients received spinal (85.3%) or general anesthesia(14.7%).Mean duration of procedure was 72.3+3.8 and radiation mean exposure 2.6+1.9.A rigid ureteroscope was passed into the ureter using a safety wire and stone visualized in 85.7% of patients. Stones were fragmented through pneumatic lithotripsy.DJ stent was placed in 92.5% of patients. In 1 patient there was mucosal bleeding that was managed conservatively. Urinary tract infection developed in 1 patient. No major complication occurred. One patient had stone push up and percutaneus stone removal was performed. Two patients underwent ESWL for residual stones.

Laparoscopic ureterolithotomy was performed through transperitoneal route under general anesthesia. Difficulties during the surgical procedures included intense periureteral inflammatory process(55.5%), difficulty in ureteral stent placement(12.5%) and stone migration (6.8%).One patient required adjunctive percutaneus procedure to remove migrated stone.No major complication nor urinary leakage occurred. Double J Stent was placed in 92.4% of patients.

The overall stone free rate after one week and 4 weeks of treatment was 59% and 64% ,respectively for all 3 groups. Evaluation of the stone-free rates in each group revealed a statistically significant differance among patients undergoing SWL vs URS vs LAP(37.5 vs 64% vs 90%, p=o.o27.NO long term complications were observed.

Table No.1: Patients clinical and imaging presentation

	SWL	URS	LAP	Pvalue
No pts	16	14	10	
Mean pt age (SD)	34.1(9.1)	33 (9.5)	34.7 (8.8)	0.96
% M/F ratio	50/50 (8/8)	57/43 (8/6)	60/40 (6/4)	
Mean cm stone size (SD)	1.6(0.39)	2.05(0.32)	2.8(0.26)	0.076
%R/L(No)	62/38(10/6)	43/57(6/8)	40/60(4/6)	
% Pain(No) of pts)	87 (14)	71.4(10)	80(8)	0.55
% Hematuria	44(7)	35.7(5)	70(7)	0.23
%Hydronephrosis(No)	(10)	(12)	(10)	(0.05)
%Previous stone treatments No	0(0)	14(2)	30(3)	0.07
% Family history of stone disease	37.5(6)	28.5(4)	50(5)	0.35
Mean mg/dl creatinine(SD	0.97(0.15)	0.93(0.13)	0.97(0.12)	

Table No.2: Results of different treatments

	SWL	URS	LAP	Pvalue
Nopts	16	14	10	
Mean Minutes procedure Duration (SD)	43.8(2.3)	72.3(3.8)	135(3.9)	0.000
% stone free 1week(No)	(37.5)6	(50)7	(90)9	
%stone clearance overall	(37.5%)6	(64.3%)9	(90%)9	0.027
Mean procedure under anaesthesia(SD until stone free	2.7(1.07)	2.1(0.9)	1.6(0.52)	0.017
Mean hrs length of stay in hospital (SD)	1.4(0.46)	22.1(4.9)	67.3(5)	0.000
Mean minutes flouroscopy	3.8(1.1)	2.6(1.9)	0.216	
Mean postoperative pain on visual scale	1.5(.8)	1.6(0.98)	1.3(0.8)	0.047
% of pts After treatment opioid requirement (No)	0(0)	28.5(4)	50(5)	0.010
%Post treatment voiding symptoms(No)	37.5(6)	50(7)	40(4)	0.774
% of pts Satisfied (No)	75(12)	92.8(13)	90(9)	0.992

DISCUSSION

Gradual technical advances have modified the management of upper urinary tract stones.Initially ESWL,and URS reduced the role of open surgery in these patients.However in treatment of large proximal ureteral stones controversy still exists. Although SWL is less invasive but it has certain limitations.Ureteric stones are often more difficult to locate and therefore more difficult to target with the shockwave.The major disadvantages of SWL are long duration of treatment and requirement for auxillary procedures.

Rigid URS is safe and effective treatment for proximal ureteral stones as demonstrated by existing literature.[7] Matalaga in systemic review described URSL was associated with better stone free rate,with lower economic cost thus being dominant over the ESWL as supported by other studies[8].Cui et al found high effectiveness with both treatments without differences in the rate of severe complications[9].Stones located at the upper ureter are associated with significant increased complication rates.Stone impaction and failure to adhere to the "break-n-leave" are independent predictors of occurance of complications[10]. There are certain factors which complicate access to stones like tortiousity of the ureter,angulation and severe edema at stone site. The most important and serious complications of ureteroscopic lithotripsy are ureteral avulsion and perforation. In the literature the incidence of ureteral perforation is between 0-1%.[11].

There are important findings in our study. Success rate was directly related to invasiveness of procedure.SWL is least invasive procedure. Success was achieved in 37.5% of cases.URS is minimally invasive procedure associated with more higher success rate 64.3% than SWL[12]. Laparoscopic ureterolithotomy carries higher morbidity than former procedure. On analysis of post treatment data this becomes more evident.LAP vs URS vs SWL takes significantly more time mean 135± 3.9 vs 12.3±3.8 vs 43.8 ±2.3 minutes p 0.000),requires longer hospital stay 67.3 ±5 vs 22.1 ±4.9 vs 1.4 ±0.46 hours p 0.000, requires more opioids to treat pain(50% vs 28% vs 0% of patients p=0.010).

Succsess rate of LAP is higher when compared with URS and ESWl (90% vs 64% vs 37.5% P=0.027).High success rate of LAP is also supported in other studies as well.[13] Laparoscopic ureterolithotomy requires fewer procedures under anaesthesia to render patients stone free when compared with ESWL and ureteroscopic lithotripsy[14]. The suitability of retroperitoneal laparoscopic ureterolithotomy has been assessed and found to be effective and safe in treatment of complex upper ureteral stones.[15]

ESWL is favoured on its non invasiveness ,minimal anaesthesia requirements, low morbidity and accepted efficacy. ESWL treatment is less invasive than ureteroscopy but has some limitations such as high retreatment rate and is not available in all centres[16]. High stone burden is cumbersome for ESWL. An increased stone burden is directly associated with stone free rate..There is need for some auxillary procedures to be done for stone clearance, for example first procedure stent insertion and ureteral stent removal as second procedure etc. Several studies have focused efficacy and safety of complementary URS in the management of ureteral stones after SWL failure[17]. URS can be safely performed in normal, obese and morbid obese patients[18,19]. The patient satisfaction rate was high in all treatment modalities(75%-92.8%, p=o.99). However overall treatment outcome and patient satisfaction were not significantly different between SWL and URS in some studies.[20] Voiding symptoms were seen more with laparoscopic and URS groups(50% and 40% vs37.5% p=0.774) than those who underwent ESWL probably due to placement of stent. Recent study also supports bothersome urinary symptoms about DJ stent after URSL.[21]

Our study has certain limitations. It was conducted at centre where limited equipment was available. In the present study rigid ureteroscope and ballistic lithotripter was available. The success rate can become higher if laser flexible ureteroscopes and nephroscopes are associated treatments as their use is expanding.[22,23] Reports from different studies proved the holmium laser with stone free rate 89-100% to be highly efficient.[24]

CONCLUSION

For large proximal ureteral stones, multiple treatment sessions are required for stone clearance.LAP is associated with more postoperative pain, longer duration of procedure and longer hospital stay than URS and SWL but achieves high success rate. It is more suitable procedure after failed ureterolithotripsy or SWL and more advantageous than open ureterolithotomy. It can be considered as good option where facilities for laser flexible URS or SWL are limited.

Author's Contribution:

Concept & Design of Study:	Asif Imran
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