



EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY AND URETERORENOSCOPY WITH PNEUMATIC LITHOTRIPSY IN THE MANAGEMENT OF IMPACTED UPPER URETERIC CALCULUS – A COMPARATIVE STUDY

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ABSTRACT **INTRODUCTION:** Ureteric calculus is the common health problem affects all the age group Upper ureteric calculus disease is usually managed with Ureterorenoscopy and Intracorporeal lithotripsy or Extracorporeal shock wave lithotripsy. No proper guidelines available for the management of Impacted Ureteric calculus.
AIM OF STUDY: To compare the efficacy of Insitu Extracorporeal lithotripsy and Ureterorenoscopy with Intracorporeal lithotripsy.
MATERIALS AND METHODS: Total no of patients 43, were divided into 2 groups Group A: 22 patients underwent Ureterorenoscopy and Group B: 21 patients Underwent Insitu Extracorporeal lithotripsy. Patients followed up till stone clearance.
RESULTS: There was no difference in the age and stone size between Ureterorenoscopy and Extracorporeal lithotripsy group. Success rate in URS & Intra corporeal pneumatic lithotripsy was 72.7% and in ESWL was 57.1%. Failure in URS was 27.2%, and in ESWL was 42.8%. Overall success rate in URS was 75.8%.
DISCUSSION: Ideal management of impacted ureteric calculus is still controversial. Though Extracorporeal lithotripsy (ESWL) is accepted as first line of treatment for most upper urinary tract stones, results are not predictable in Impacted upper ureteric calculus.
CONCLUSION: Insitu ESWL for impacted upper ureteric calculus might not be as successful as expected. Ureterorenoscopy with pneumatic lithotripsy inexperienced hands has very satisfactory results, when Holmium laser not available.

KEYWORDS : Impacted ureteric calculus, Insitu Extracorporeal lithotripsy, Ureterorenoscopy

INTRODUCTION

Urinary stone disease is the third common health issue after infection and prostatic diseases in the human urinary tract. Ureteric stone disease is the most common among urinary stone disease. Ureteric stone clearance is done by Ureterorenoscopy (URS) with intracorporeal lithotripsy, Extracorporeal lithotripsy (ESWL), Laparoscopic or Open surgery. Radiologically Ureter is divided into upper, mid and lower ureter. Upper ureter is marked from tip of L2 transverse process up to Upper border of sacroiliac joint. Mid ureter from Upper border of Sacroiliac joint to Lower border of sacroiliac joint. Lower ureter runs from Lower border of sacroiliac joint to Pubic tubercle. Upper ureteric calculus can be treated with both ESWL and URS, both are accepted as first-line An impacted ureteral calculus is defined as a stone remains at the same site for more than two months and inability to pass a guide wire or ureteric catheter beyond the stone², contrast may not appear distal to the calculus obstruction. Best treatment for impacted upper ureteral calculus remains controversial. URS with Laser may be the best option but laser is available only in limited centres especially in developing nations like India. Routine semi rigid ureteroscopy with pneumatic lithotripsy has high complication rates. Results with ESWL for Impacted upper ureteric calculus is not good. Fragments after shock waves cannot move due to impaction as a result absorption and reflection of shock waves leads to poor results³.

AIM OF STUDY

To compare the efficacy of Insitu ESWL & Ureterorenoscopy, Intracorporeal pneumatic lithotripsy in the management of Impacted upper ureteric calculus.

MATERIALS & METHODS

Patients admitted for the management of impacted upper ureteric calculus were included in the prospective study. Exclusion Criteria: Patients with bilateral ureteric calculi, Sepsis, Coagulation disorder, Renal failure, Previous intervention were excluded from the study. Informed written Consent obtained from the patients.

Patients were randomized into two groups - Group A -URS & intracorporeal pneumatic lithotripsy, Group B - Insitu ESWL. Success rates & complications were analyzed. Patients were followed with Physical examination, Renal function test, X ray KUB, Ultrasound KUB after 2 weeks & every fortnights thereafter for 3 months or until complete stone clearance.

Extracorporeal lithotripsy (ESWL):

Dornier Delta 2 Electromagnetic lithotripsy machine was used for SWL (Picture 1). Bowel preparation was done with anti-flatulent (charcoal) & laxative (bisacodyl) in the night before the procedure. Narcotic analgesia (Inj.pentazocine & Inj. promethazine i.m) 30 min was given before the procedure to manage pain.

Procedure was done in the supine position, Fluoroscopy and or Ultrasonogram (USG) was used to focus the stone. 2500 shocks at the rate of 60/minute was given.



Figure 1. Dornier Delta II Machine

Uretero renoscopy (URS):

All the patients were evaluated for comorbid conditions. Surgery done under regional anesthesia. Patient was operated in lithotomy position. Guide wire (Teflon or hydrophilic) inserted, vesicouretric junction dilated prior to the introduction of the ureteroscope.

Ureteroscopy was performed with 8-9.5 F semi rigid ureteroscope and Pneumatic lithotripsy was done to fragment the stones. Fragments removed with a 3F grasping forceps and a Double-J stent was placed in all patients.

Analysis:

TOTAL number of patients – 43, URS (Group A): 22 patients, URS (Group A): 21 patients. Mean age in URS (Group A) was 36 years (21-64) and in ESWL (Group B) was 36.5 years (22-68). Mean size of the stones, in URS (Group A) - 14.0mm (10-20mm) and in ESWL Group B) -13.5mm (9-21 mm). Not much difference between the two groups (Table 1).

Table 1. Size of the calculus

SIZE (mm)	URS (GROUP A)	ESWL (GROUP B)
≤ 10	4	6
11 -15	12	9
16 -20	6	5
>20	0	1
TOTAL	22	21

RESULTS:

Success is defined as stone free rate or insignificant fragment 4mm. Success rate in URS (Group A), Intra corporeal pneumatic lithotripsy was 72.7% (16/22) and in ESWL (Group B) was 57.1% (12/21). Immediate clearance was achieved in 16 cases of URS, multiple sittings of ESWL required and complete clearance achieved in only 12 patients and clearance was delayed up to 3 months (Table 2).

Table 2: Stone clearance

Follow up	URS (GROUP A) 16/22	ESWL (GROUP B) 12/21
1st MONTH	16	7
2nd MONTH	0	4
3rd MONTH	0	1

Failure is defined as significant residual calculus and residual stones after 3 months of ESWL. Failure in URS (Group A) was (6/22) 27.2%, and in ESWL (9/21) 42.8%.

Management of failed cases:

Failure in Ureterorenoscopy were migration in 3 cases, incomplete fragmentation 2 cases and perforation in one case. Perforation case was managed by open Ureterolithotomy and all other failure cases were managed with ESWL.

Failure after ESWL were sepsis in 2 patients, they were managed with percutaneous drainage initially and later URS /ICL and stenting done. There were 7 cases of failure in adequate fragmentation of which 5 patients required URS and pneumatic lithotripsy. 2 patients were managed with laser lithotripsy. Overall success rate in URS (Group A) was 22/29 (75.8%).

Complications:

Patients in Ureterorenoscopy with pneumatic lithotripsy experienced more complications than ESWL patients (Table 3). After ureterorenoscopy six patients developed dysuria, four patients developed hematuria, fever and loin pain in two each, one patient had mucosal injury and other one perforation of the ureter. Except the perforation all other complications were minor treated conservatively. Ureteric perforation was managed by open ureterolithotomy.

Table 3: Complications

COMPLICATIONS	URS (GROUP A)	ESWL (GROUP B)
FEVER	2	2
HEMATURIA	4	2
LOIN PAIN / COLIC	2	10
DYSURIA	6	0
MUCOSAL INJURY	1	0
PERFORATION	1	0

After ESWL being non-invasive, well tolerated 2 patients developed fever, 2 patients complained significant hematuria, 10 patients developed ureteric colic. All patients were managed conservatively.

DISCUSSION

Optimal management of impacted ureteric calculus is still controversial. Standard guidelines are not established in the treatment of impacted calculus. Extracorporeal lithotripsy (ESWL) is accepted as first line of treatment for most upper urinary tract stones. Results are not predictable in Impacted ureteric calculus but Deliveliotis C et al still recommend EWSL as a first choice⁴ and Ureterorenoscopy only if ESWL fails. In impacted calculus the fragmentation during shock wave lithotripsy is more difficult the reason being, for effective stone fragmentation with shock waves there should be some space around the stone with urine flow. After initial fragmentation with ESWL the fragments are tightly kept in the same site by the opposing ureteric mucosa. Absorption and reflection of shock waves occurs in the new interfaces results in poor further fragmentation. Srivasta A et al in their study observed that patients with mild proximal hydronephrosis (or none at all) had high success rate 93% but success rate dropped drastically to 35% in the impacted group (moderate to severe

hydronephrosis)⁵ they recommend percutaneous approach for impacted upper ureteric calculus. Ureterorenoscopy with Holmium laser stone fragmentation is the best option in case of ureteric calculus if available⁶. Pneumatic energy is strong enough for fragmenting most stones and is cheaper than Holmium laser. Tunc L et al recommend pneumatic lithotripsy rather than ESWL if the stone size is large (≥10mm)⁷. Lee YH et al recommend ESWL as first line of management for large upper ureteric calculus⁸. But both Tunc L et al and Lee YH et al studies are not for impacted calculus alone. In the study by Wu *et al.*⁹, the stone-free rate of large proximal ureteral stone after one session of URSL was 92.3% in comparison to 61% after one session of ESWL. While in the study conducted by Ziaee *et al.*¹⁰, when the stone size was in the range of 10-15 mm, the stone-free rate of SWL after one session was in the range of 73.3-80.2%, with a 1.2 mean number of sessions, this rate decreased sharply when the stone was impacted as in Ghoneim *et al* study to be 28.3%, with a mean session number in the range of 1.97-2.0. Although the impacted calculus usually needs more than one session of ESWL to be fragmented, the obstruction may be relieved after the first session due to partial disintegration of the calculus¹¹. Ureterorenoscopy is considered as a safe and effective technique with a very low incidence of complications. Ureteral perforation is one of the serious complications of ureteroscopy can occur even in experienced hands, but the risk becomes less with laser because the depth of thermal effect is 0.5-1 mm^{12,13}. Mostafa Khalil used Holmium laser in impacted calculus had high initial stone clearance rate and low retreatment rate¹⁴, ESWL had low initial stone clearance rate but after 3 months not much of difference in stone clearance compared to URS like in our study.

CONCLUSION

In situ ESWL for 'impacted' upper ureteric calculus might not be as successful as expected. Lack of natural expansion space for stones results in more failure. Use of semirigid URS & pneumatic lithotripsy in impacted upper ureteral stones in experienced hands has very satisfactory results, when Holmium laser & flexible URS are not available.

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