

**Impacted Upper Ureteric Stone: Prospective Randomized Trial Comparing Percutaneous Ureterolithotomy with Laparoscopic Retroperitoneal Ureterolithotomy**

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Type of publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: Urolithiasis is a common and recurrent disease which has significant morbidity and work loss. The management of ureteric stone has been streamlined with the advent of ureteroscopy (URS) and shock lithotripsy (SWL) and become less invasive, compared to open surgical procedure .The open surgery is virtually obsolete with availability of these services in big cities. The treatment for patient with large impacted proximal ureteral stone remains controversial especially at institution with limited resources.

Purpose :The aim of study to evaluate the clinical outcomes of Percutaneous Ureterolithotomy (PCUL) in comparison with Laparoscopic retroperitoneal ureterolithotomy (LRPUL) in impacted upper ureteric stone of size 10 mm or more.

Method and material : A total of 30 patients were included in our study between December 2016 to September 2017 at L.L.R. Hospital, GSVM Medical College Kanpur and Kanpur urology centre, Kanpur. By randomization, patients were divided into two groups.

Group 1 patients were treated by PCUL and Group 2 patients by LRPUL.

Results :In our study, LRPUL took less operative time as compared to PCUL and also less duration of hospital stay.

Conclusion :Overall laparoscopic retroperitoneal ureterolithotomy is preferred over percutaneous ureterolithotomy with advantage of less time consumption, no need for C- ARM and no radiation exposure to patient and OT staff.

Keyword :Percutaneous ureterolithotomy, Laparoscopic retroperitoneal ureterolithotomy, impacted upper ureteric stone.

Background :Urolithiasis is a common and recurrent disease which is immense in magnitude and require substantial expenses for its management^{1,2}. The management of ureteric stone has been standardized with the introduction of ureteroscopy (URS) and shock lithotripsy (SWL)³.

Use of open surgery is virtually obsolete in best urological centers^{4,5} but one may have to use laparoscopic ureterolithotomy in a small subset of patients as a salvage

procedure for failed URS and / SWL or as a primary procedure for a large stone⁶⁻⁸ especially impacted one which poses a significant challenge . Large impacted upper ureteric calculus is defined as a stone located above the lower border of the fifth lumbar vertebra, remaining fixed at the same site for at least six weeks moreover It is associated with hydronephrosis or / and prevent contrast medium from passing below the calculus on intravenous urography(IVP)^{9,10,11,12} . Moreover, there is inability to pass a guidewire or ureteric catheter beyond the stone in the initial attempt during intervention . The treatment for patient with large impacted proximal ureteral stone remains controversial; the surgical option for the treatment of proximal ureteral stone include shockwave lithotripsy (SWL),ureteroscopy,PCNL, and rarely¹¹ laparoscopic or open surgery .

Material and Method: The present study was conducted on the patients attending the emergency surgical ward and OPD at LL.R. Hospital and associated hospital, GSVM Medical College, Kanpur and Kanpur urology center, Kanpur. From December 2016 to September 2017, patients with solitary renal pelvic stones was selected and randomly allocated to two groups.

Group 1 included 15 patients who were treated by laparoscopic retroperitoneal ureterolithotomy (LRPUL) and **group 2** included 15 patients who were treated by PCUL. The differences between the two procedures were compared and analyzed.

Inclusion criteria

1. Solitary, upper ureteric stone
2. Functional ipsilateral kidney
3. Stone size of 10 mm and above

Exclusion criteria

1. Solitary kidney
2. Renal failure

3. Recurrent stone former
4. Family history
5. Diabetes
6. HTN and Dyslipidemia
7. Associated renal disease
8. Dietary habit

Primary outcomes

1. Hospital stay
2. Duration of surgery
3. Post-operative complication

Operative technique: In the PCUL procedure , all patient underwent general anaesthesia and a 6 F open -ended ureter catheter was first placed via transurethral. Percutaneous access was performed under fluoroscopy guidance with the patient in the prone position using 18 G access needle and the posterior middle / superior calyx was preferentially used. A 0.35mm Terumo guide wire was placed in the collecting system, and skin and fascia were incised before the access needle was retracted . The nephrostomy tube was dilated by using sequential Alken metal dilators (Karl Storz GmbH, Tuttingen, Germany) . A 30 F Amplatz sheath (Mikrovasive) was inserted by aiming at renal collecting system. A 24 F long nephroscope was used to access the ureteral stone. The stone were fragmented using pneumatic lithotripter. Following confirmation of complete clearance of stone both endoscopically and fluoroscopically, `a open end nephrostomy tube (Devon) was placed anterogradely. In laparoscopic ureterolithotomy the patient is given general anaesthesia and a foley catheter is passed. The patient is put in lateral position (kidney) raising the kidney bridge. A 10 mm camera port is made midway between renal angle and iliac crest at a point where the sudden dip is felt if the finger are passed from posterior to anterior side over longitudinal quadratus in muscle . Two 5 mm port are made one just below the 12 th rib and other

at the anterior superior iliac spine level in the posterior axillary line. The gas is inflated by one of the ports and ureter is identified by dissecting the plane between lumbar fossa and psoas muscle. The peritoneum is reflected upwards. The ureter is identified by its peristalsis and the stone is detected by the it's a bulge to proximal ureteric dilatation. A ureterotomy is done and the stone is delivered in toto, retrieved by 10 mm port using other 5 mm port by use of 4.5 mm. The ureterotomy stiched by 3-0 ½ circle round body vicryl (after putting a double J stent from one of the working port. The DJ stent is placed using one of the suction rods mounted over a 0.35 terumo guide wire. A tube drain is put in the retroperitoneum. The post- operative clearance X ray is taken on day of surgery. There is any residual fragment then it is recorded and dealt according in both the group. The results are tabulated and analyzed accordingly.

Results

TABLE 1: Distribution of Cases According To Age

Sr. No.	Age in years	No	%
1.	20-30	10	33.33
2.	30-40	11	36.67
3.	>40	9	30.00
Total		30	100

The mean age of patients in our study is 37.8 and SD 13.49.

Table 2: Distribution of Cases According To Sex.

No.	Sex	No	%
1.	Male	26	86.66
2.	Female	4	13.33
Total		30	100

Table 3: Distribution of Size of Stone

No.	Stone size	LAP	PCUL	Total	%
1.	>10-13 mm	7	9	16	53.33
2.	>13-15 mm	4	4	8	26.67
3.	> 15 mm	4	2	6	20.00
Total		15	15	30	100
Mean /SD		13.44/ 1.86	13.23/ 2.08	12.97/ 1.92	

Mean stone size in our study is 12.97mm and SD 1.92.

TABLE 4: Distribution of Complication during Treatment.

No.	Complication	LRPUL		PCUL		Total	
		No.	%	No.	%	No.	%
1.	Fever	2	13.33	2	13.33	4	13.33
2.	Hemorrhage	2	13.33	4	26.67	6	20.00
3.	No complication	11	73.33	9	60.00	20	66.67
Total		15	100	15	100	30	100

Table 5: Distribution of Average Time Taken During Procedure.

No.	Average time taken	LRPUL		PCUL		Total	
		No.	%	No.	%	No.	%
1.	<50 min	14	93.33	2	13.33	16	53.33
2.	>50 min	1	6.67	13	86.67	14	46.67
Total		15	100	15	100	30	100

In our study, the average time taken in LRPUL is 39 minutes (SD 7.12) and that in PCUL is 59.33 minutes (SD 7.52). Hence, LRPUL is less time taking procedure than PCUL (t=>0.60 p<0.001).

Table 6: Distribution of Mean Duration of Hospital Stay.

No.	Average hospital stay	LRPUL		PCUL		Total	
		No	%	No	%	No	%
1.	< 5 days	2	13.33	4	26.67	6	20.00
2.	5-<8 days	8	53.33	9	60.00	17	56.67
3.	> 8 days	5	33.33	2	13.33	7	23.33
Total		15	100	15	100	30	100
mean/sd		6.33/ 1.88		5.93/ 3.10		6.13/ 2.48	

The average hospital stay after LRPUL was 6.33 days (SD= 1.88) while that in PCUL was 5.93 days (SD= 3.10) in our study. It shows no significant difference regarding duration of hospital stay. (t=0.43, p>0.05)

Discussion

Laparoscopic ureterolithotomy has a high success rate in patients with a large stone burden, and complete clearance can be achieved in a single session as in PCNL¹³. However, laparoscopy necessitates three small incisions instead of the one that suffices for PCNL and requires dissection in the retroperitoneum to expose the ureter, which is similar to open surgery¹⁴. Complete removal of the stone is the primary management goal to relieve obstruction, eliminate infection, prevent further stone growth, and preserve renal function^{11,12}. Although open ureterolithotomy for patients with proximal ureteral stone had a median stone free rate of 97%, it not recommended as a first-line treatment, because of longer hospitalization and greater post-operative morbidity¹¹.

In our study maximum 53.33% of the stones were in size of >10-13mm followed by 26.67% in size of >13-15 mm and only 20.00% were in size of more than 15 mm with mean stone size of 12.97mm.

There were no complications in about 73.33% of the patients in LRPUL and in 60.00% of patient in PCUL

while rest suffered one or more complications during treatment. In our study main complications were hemorrhage in 20.00% and fever in only 13.33 %. In our study with both modalities no significant difference was seen regarding complications. (z=0.87 p>0.05)

Our study shows no difference regarding duration of hospital stay (t=0.43; p>0.05) with mean hospital stay in LRPUL of 6.33 days (SD=1.88) and in PCUL of 5.93 days (SD=3.10).

Regarding time taken during operation our study shows LRPUL is less time taking procedure than PCUL (t=>0.60; p<0.001) with mean time taken during LRPUL is 39.00 min (SD 7.12) and in PCUL is 59.33 min (SD 7.52).

Conclusion

This prospective randomized controlled trial between LRPUL and PCUL for upper ureteric stone (size 10 mm and more) studied the data obtained from a total of 30 patients divided equally between the two arms.

- The duration of operation is less for laparoscopic retroperineal ureterolithotomy as compared to percutaneous ureterolithotomy.
- In our study the average hospital stay and complications in both the groups shows no significant difference.
- Patient satisfaction more in LRPUL as compared to PCUL (In PCUL, ureteric stone recovered in multiple pieces while in LRPUL intact stone recovered which gives more satisfaction to patient with no doubt regarding residual stone piece.)
- Overall laparoscopic retroperitoneal ureterolithotomy is preferred over percutaneous ureterolithotomy with advantage of less time consuming, no need for C-ARM, and no radiation exposure to patient and OT staff.

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