

## ORIGINAL RESEARCH

# Migrated upper ureteric stone during laparoscopic ureterolithotomy (LU); Does percutaneous nephrolithotomy (PNL) remain the salvage procedure of choice?

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### ABSTRACT

**Objective-** To review our experience of percutaneous nephrolithotomy (PNL) as salvage procedure for stone removal in patients with intraoperative migrated upper ureteral stones in pelvi-calyceal system (PCS) during laparoscopic ureterolithotomy (LU). **Methods-** Between 2015 and 2022, a total of 95 patients were subjected to either transperitoneal (TPLU) or retroperitoneal LU (RPLU). TPLU was done in 28 and RPLU was done in 67 cases respectively. In 18 cases there was intra operative up migration of stone in PCS. Of these 18 patients, open surgery was done in 6 cases (3 in each retroperitoneal and transperitoneal group) and PNL was done in 12 cases of retroperitoneal ureterolithotomy group. Stone clearance was confirmed intraoperatively by fluoroscopy and by x ray KUB in post operative period. **Results-** Mean age of patients was 42.86±9.15 yrs. 10 were males and 8 were females. Mean stone size was 1.64±0.34 cm. Migrated stone was present in pelvis (6), middle calyx (10) and inferior calyx (2). Open surgery was done in 6 cases with complete stone clearance. During PNL, mid posterior calyceal puncture was done in 8 and superior calyceal puncture was done in 4 renal units. Complete stone clearance was achieved in all patients in same sitting. 2 patients of PNL group and 3 of open surgery group had postoperative fever which was conservatively managed. 3 patients in open surgery group had ileus which was managed conservatively. **Conclusion-** PNL is a viable and highly successful salvage procedure in patients with up migrated upper ureteric stones during laparoscopic ureterolithotomy.

**Keywords:** Stone, Laparoscopy, Ureterolithotomy, Percutaneous nephrolithotomy

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### INTRODUCTION

The treatments of upper ureteral stones include extracorporeal shock wave lithotripsy (ESWL), ureteroscopy (URS), percutaneous nephrolithotomy (PNL) and rarely open or laparoscopic surgery. Open ureterolithotomy has stone free rate (SFR) of >90% in such cases but it has drawbacks of longer hospitalisation and increased post operative morbidity so it is not recommended as a first line intervention. Laparoscopic ureterolithotomy (LU) is a viable alternative to open surgery for treatment of large (>1.5 cm), impacted, proximal ureteral stones. Other indications of LU are concomitant upper tract abnormalities (UPJO, ureteral stricture), stones difficult to access ureteroscopically and failed cases of ESWL. [1,2]

In LU the operating surgeons may get difficulty due to intraoperative stone up migration in pelvi-calyceal system (PCS) or inability to localize the stone necessitating conversion to open surgery. PNL in the same sitting can be a successful alternative with advantages of less pain, short hospital stay and stone free rate (SFR) equal to open surgery. The PNL as a salvage procedure for stone removal during LU has been reported only in one study by Singh et al. [9] The authors are presenting their experience and outcomes of PNL in patients with up migrated upper ureteral stones in PCS during LU.

### MATERIAL AND METHODS

**Subjects-** In a retrospective study between 2015 and 2022, the records of 95 cases of upper ureteric stones subjected to laparoscopic ureterolithotomy (TPLU-28,

RPLU- 67) were analyzed. In 18 cases, the ureteric stone was up migrated in pelvi-calyceal system (PCS) intraoperatively (15 during RPLU and 3 during TPLU). The PNL as a salvage procedure was used for stone removal in 12 and open surgery in 6 cases respectively.

**OPERATIVE TECHNIQUE**

**Laparoscopic ureterolithotomy-** The procedure was performed under general anaesthesia. Cystoscopy and ureteric catheterisation was done. Ureteric catheter was placed just below the stone if stone was impassable. The patient was placed in lateral decubitus kidney position with the table flexed. LU was performed by either transperitoneal or retroperitoneal approach with 3 ports. When the stone up migration was suspected it was confirmed by fluoroscopy. Open surgical removal of migrated stone was done by standard technique and double J stent was placed after surgery. For PNL, the patients were turned in prone position. After injecting the contrast through previously placed ureteric catheter the PCS was identified. Under fluoroscopy guidance appropriate calyceal puncture and dilatation of tract was done up to 28 Fr. A 26 Fr (Richard wolf) nephroscope was used for nephroscopy. The stone was either broken by mechanical lithoclast (Swiss lithoclast) or retrieved as

such. At the end of the procedure a double J stent and nephrostomy tube were inserted according to surgeon’s choice.

**Post operative course and care-** A plain X ray KUB was done on 2nd post operative day to assess complete stone clearance. Nephrostomy tube was removed after complete clearance of hematuria and double J stent was removed after 2 weeks under local anaesthesia. The post operative complications including pain, bleeding, febrile urinary tract infection (UTI), ileus, scar and hospital stay were compared between open surgery and PNL group using unpaired t test. P value less than 0.05 was considered statistically significant.

**RESULTS**

The final study population included 18 cases of upmigrated upper ureteric stones in PCS during LU. The mean age of patients was 42.86±9.15 years. 10 patients were males and 8 were females. Mean stone size was 1.64±0.34 cm. Stone was present on right side in 12 and on left side in 6 cases. Migrated stone was present in renal pelvis in 6, middle calyx in 10 and inferior calyx in 2 renal units.

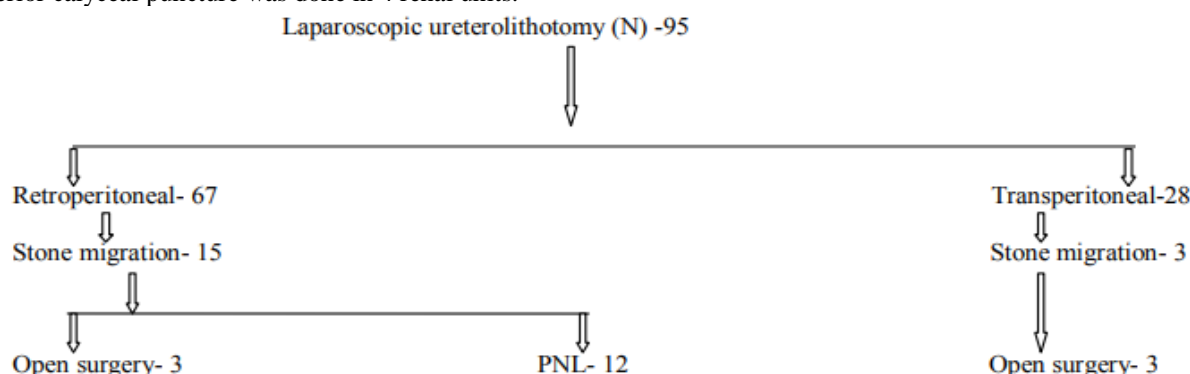
Table 1. Showing the demographic and clinical characteristics of 18 cases whose stone migrated intraoperatively during LU.

**Table-1: Patient demographics, stone characteristics, surgical approach and complications.**

Age(yrs)	42.86±9.15
Sex(M:F)	10:8
Stonesize(cm)	1.64±0.34
Stonelaterality(Rt:Lt)	12:6
Migrated stonelocation	
a)Pelvis	6
b)Middlecalyx	10
c)Inferior calyx	2
Open surgery	6
PNL	12
Calyx puncture during PNL(12)	
a) Mid posterior	8
b)Superior	4

6 cases were subjected to open surgery (3 cases in each retroperitoneal and transperitoneal group) and 12 cases underwent percutaneous nephrolithotomy (PNL).

During PNL the most common calyceal puncture was through the mid posterior calyx in 8 renal units and superior calyceal puncture was done in 4 renal units.



Complete stone clearance was achieved in all 18 cases (PNL-12, Open surgery-6) in the same sitting achieving 100% success rate.

Two patients had post operative fever in PNL group which was managed with broad spectrum antibiotics and antipyretics. None of these patients had hematuria requiring blood transfusion. The mean (SD) hospital

stay in PNL group was 1.76(0.34) days. Double J stent was removed after 2 weeks in all cases.

Patients in which stone was retrieved by open surgery had longer hospital stay (mean±SD) 3.28(0.32) days, incision scar, greater analgesic requirement (292±31.36 mg v/s 165±21.47mg), prolonged ileus (3 v/s none) and febrile UTI (3 v/s 2) than PNL group.

**Table-2: Comparison of clinical variables and complications between PNL and open surgery group.**

	PNL group	Open surgery group	P value
Mean±SD day hospital Stay	1.76 ± 0.34	3.28 ± 0.32	<0.0001
Mean±SD mg Tramadol required	165±21.47mg	292±31.36mg	<0.0001
No paralytic ileus	0	3	0.99
No febrile urinary tract infection	2	3	0.99

## DISCUSSION

Primary treatment modalities for management of ureteric stones available in the armamentarium of urologist are SWL, ureteroscopic lithotripsy, laparoscopic and robotic ureterolithotomy and rarely open surgery.[1,2,3] SWL has high success rate for ureteric stone fragmentation but it may require multiple sessions and not able to break hard stones like cystine or calcium oxalate monohydrate stones. Also in cases of impacted ureteral stones outcome of SWL is poor.[4,5]

Ureteroscopic lithotripsy with semirigid or flexible ureteroscope and laser lithotripsy is minimally invasive treatment option available for ureteric stones.[6] The limitations of this treatment modality are migration of stone fragments in pelvi-calyceal system, difficult negotiation of scope in presence of ureteric stricture, impaired vision if there is bleeding, ureteral injury and non-availability of flexible ureteroscopes at all centres.[7,8]

Migration of either complete stone or stone fragments in kidney is a known complication of all of these treatment modalities. The reported migration rate varies from 2% to 60% for ureteroscopy [4,5] and it depends on stone location with upper ureteric stones having highest retropulsion rates. We searched the English literature for incidence of stone up migration during laparoscopic ureterolithotomy but exact incidence is not known.

Singh et al [9] in their study reported stone up migration in 3 of 48 cases (6.25%) which were managed by PNL in same operative session.

Most of the time removal of migrated stone during LU requires conversion to open surgery. The laparoscopic pyelolithotomy (LP) and PNL in same operative session or SWL are other alternatives for the management of these cases.

### Laparoscopic pyelolithotomy (LP) versus PNL for migrated upper ureteric stone-

1. During retroperitoneoscopic surgery, LP can be done through the same ports but transperitoneoscopic surgery may or may not need extra ports.

2. In intrarenal pelvis, LP is very difficult and may require auxiliary procedures like flexible ureteroscope, cystoscope or nephroscope. It increases operative time, cost and these may or may not be available at all centres.

3. Ischemia of ureter on long term follow up is a concern- during LU, dissection of ureter denudes its vascularity and if they are subjected to pyelolithotomy it strips the vessels of pelvis and adjoining portion of upper ureter. So in whole of the procedure large segment of ureter is deprived of its vascularity with possible ischemia of ureter in future.

PNL in the same sitting is a better alternative to open surgical conversion or LP in such cases with added advantages of complete stone clearance, less operative time, no ureteral ischemia, less cost, doesn't require auxiliary procedure with shorter hospital stay.

## THE LIMITATIONS OF OUR STUDY WERE

1. study was retrospective,
2. small study population.

## CONCLUSION

PNL in the same sitting is a viable and highly successful alternative to open ureterolithotomy in migrated upper ureteric stone during laparoscopic ureterolithotomy.

## ACKNOWLEDGEMENT

None

## CONFLICT OF INTEREST

None

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