

Original Research Article


# Laparoscopic management of urinary tract calculi: uncommon but effective alternative to open surgery in certain situations

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## Abstract

**Introduction:** The use of minimally invasive techniques has helped decrease the morbidity and convalescence associated with the management of urolithiasis. In this regard laparoscopy has also developed as one of the modalities. However, in comparison with other surgeries, laparoscopy for stone removal is relatively uncommon. Here we present our experience of laparoscopic stone surgeries.

**Materials and methods:** 10 patients with large renal and ureteric calculi where planned for laparoscopic surgery. Three patients had 2-3 cm proximal ureteric calculi, 2 patients had > 3cm renal pelvic calculi, 2 patients had multiple renal calculi associated with PUJ Obstruction, 2 patients had pelvic calculi in ectopic kidneys and one patient had calculus in crossed fused ectopia.

**Results:** All the patients had a smooth intra-operative course. Post-operative period was uneventful except for one patient with crossed fused ectopia. One of the patients with PUJ obstruction had a single residual calculus which was managed with ESWL on follow up.

**Conclusions:** Laparoscopic approach can be an effective alternative to endourological or open procedures for stone removal. It can be utilized for stone management in urinary tract where ESWL, PCNL and ureteroscopy have failed or deemed unsuitable. It is also a good option in patients with unusual anatomy such as ectopic kidney.

## Key words

Ectopic kidney, Laparoscopy, Pyelolithotomy, Renal calculus.

## Introduction

Currently most of the urinary tract stones are managed with endoscopic procedures and Extracorporeal Shock Wave Lithotripsy (ESWL) [1]. The use of these minimally invasive techniques has helped decrease the morbidity and convalescence associated with the management of urolithiasis.

However, some patients including those in whom SWL or endourologic methods fail or who need simultaneous reconstructive treatment of other urinary tract pathological conditions have traditionally been managed with open surgical procedures. Evolution of technology has permitted the development of laparoscopy as an alternative modality to manage such patients. In patients with stones and urinary tract anomalies, laparoscopic management may be an indispensable tool to avoid the morbidity of open surgery.

Laparoscopic surgery has the advantages of avoiding large open wounds or incisions and thus of decreasing blood loss, pain and discomfort. Patients have fewer unwanted effects from analgesia because less analgesia is required [2]. The rate postoperative complications are generally lower, especially those related to the wound such as dehiscence, infection, cellulitis and incisional hernia. Other benefits of early mobilization are lower rates of chest infection and deep vein thrombosis. Finally, the cosmetic advantages of the laparoscopic surgery add to the patient satisfaction and decrease anxiety [3].

Here, we present our experience of laparoscopic management of stone diseases carried out over a period of one year.

## Materials and methods

We selected 10 patients with urinary tract stone disease for laparoscopic procedures from March

2016 to February 2017. Patients with large renal and ureteric calculi were planned for laparoscopic management of their disease. Three patients had 2-3 cm proximal ureteric calculi, 2 patients had > 3cm renal pelvic calculi, 2 patients had multiple renal calculi associated with pelviureteric junction obstruction (PUJO), 2 patients had pelvic calculi in ectopic kidneys and one patient had calculus in crossed fused ectopia (**Figure – 1A, 1B, 1C, 1D** represent a patient with PUJO and secondary calculi). Patient statistics were as per **Table – 1**.

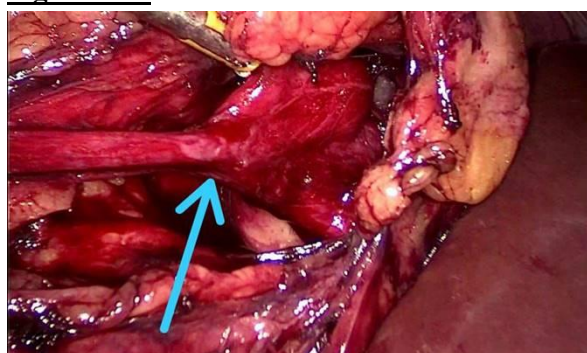
**Figure - 1A:** Right Renal Calculi.



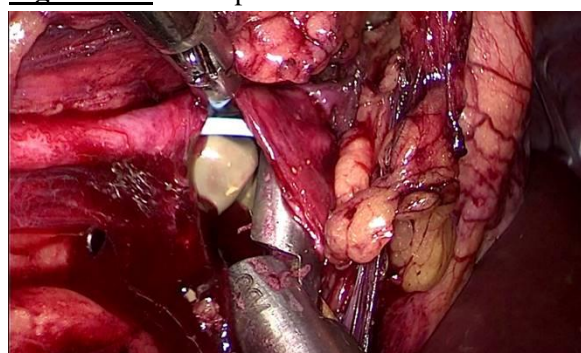
**Figure - 1B:** Calculi with PUJO.



**Figure - 1C:** PUJ Dissection.



**Figure - 1D:** Multiple Calculi.



**Table - 1:** Patient Statistics.

Pathology	Procedure	Number of Patients
Proximal Ureteric Calculi (2-3 cm)	Laparoscopic Ureterolithotomy	3
Renal Pelvic Calculi (> 3 cm)	Laparoscopic Pyelolithotomy	2
PUJO with multiple renal calculi	Laparoscopic pyelolithotomy & pyeloplasty	2
Pelvic Calculi in Ectopic Kidneys (Pelvic Kidney)	Laparoscopic Pyelolithotomy	2
Crossed Fused Ectopia with Pelvic Calculi	Laparoscopic Pyelolithotomy	1

**Table - 2:** Results of procedure.

Procedure	Mean Duration of Procedure (min)	Blood Loss (ml)	Drain Removal (POD)	Discharge (POD)	Stent Removal (POD)
Proximal Ureteric Calculi (2-3 cm)	65	Less than 50	3	3	28
Renal Pelvic Calculi (> 3 cm)	105	Less than 50	3	3	28
PUJO with multiple renal calculi	134	Less than 100	3	3	30
Pelvic Calculi in Ectopic Kidneys (Pelvic Kidney)	125	Less than 100	3	3	30
Crossed Fused Ectopia with Pelvic Calculi	128	Less than 100	7	8	36

POD = Post-operative day

## Results

All the patients had a smooth intra-operative course. Stent could not be placed antegradely in the patient with crossed fused ectopia. All (except the one with crossed fused ectopia) patients had an uneventful post-operative period.

One of the patients with PUJ Obstruction had a single residual calculi which was managed with ESWL on follow up. Diuretic renogram at 6weeks after stent removal in patients who underwent pyeloplasty showed no obstruction. Details of procedures were as per **Table – 2**.

Patient with crossed fused ectopia and calculus developed urine leak on third post-operative day. Retrograde stenting was attempted but failed. Open surgical correction and antegrade DJ stenting was done. Urine leak decreased but the patient had haematuria and clot retention on fifth postoperative day. Cystoscopic clot evacuation was attempted but if failed. Cystotomy and clot evacuation was done. Afterwards patient had a smooth recovery.

## **Discussion**

Though not very frequently used or required, laparoscopic management of stone disease is a feasible option and indispensable in certain situations.

Although large proximal ureteric calculi can be managed with percutaneous nephrolithotomy, laparoscopic ureterolithotomy is also a good option. We achieved complete stone clearance in all three patients who underwent laparoscopic ureterolithotomy. Kadyan B, et al. [4] in their study concluded that laparoscopic transperitoneal ureterolithotomy is a minimally invasive, safe and effective treatment modality and should be recommended to all patients of impacted large proximal stones, which are not amenable to URS or extracorporeal shock-wave lithotripsy or as a primary modality of choice especially if patient is otherwise candidate for open surgery.

Both of our patients who underwent laparoscopic pyelolithotomy had complete stone clearance, minimal blood loss and were discharged on third post-operative day after drain and foley catheter removal. Kramer BA, et al. [5] performed laparoscopic pyelolithotomy in five patients. Three of the patients had horseshoe kidney, one had a pelvic kidney and one had a large renal-pelvic calculus. All stones were solitary with a mean size of 2280 mm<sup>2</sup> (range 540-8200 mm<sup>2</sup>). All were approached transperitoneally with passage of a flexible cystoscope through a laparoscopic port to aid in stone extraction. The length of surgery was 74, 92, 134, 158, and 159 minutes. There were no minor or major

complications, and the estimated blood loss was <50 mL in all cases. All patients were discharged on postoperative day 1 with the drains removed. Four patients were stented for 4 to 6 weeks. The remaining patient was not stented because of poor compliance. The stents were removed with office cystoscopy. All patients were stone free on follow-up imaging.

Two patients with PUJO and secondary calculi underwent laparoscopic pyelolithotomy and pyeloplasty concomitantly. One of the patients had a residual stone which was missed intraoperatively. It was successfully managed with ESWL three weeks after surgery. Ramakumar S, et al. [6] concluded that laparoscopic pyelolithotomy is feasible when combined with pyeloplasty. Their results were comparable to those of stone removal during open pyeloplasty or percutaneous endopyelotomy. The advantages of open surgery appeared to be maintained in this minimally invasive approach. They used transperitoneal approach for laparoscopic pyeloplasty and pyelolithotomy in 19 patients (20 renal units). At 3 months 2 of their patients had residual calculi for a procedural stone-free rate of 90%. There was no evidence of obstruction in 18 of the 20 cases (90%), as confirmed by negative diuretic scan or radiological improvement of hydronephrosis.

We performed laparoscopic transperitoneal pyelolithotomy in two patients with pelvic kidneys. Both the patients had 100% stone clearance and an uneventful post-operative course. Gupta N, et al. [7] operated 6 patients with a left pelvic kidney. Two patients had ureteropelvic junction obstruction, 2 with non-functioning kidney and 2 with pelvic stones were selected. These patients underwent dismembered pyeloplasty, simple nephrectomy and pyelolithotomy by laparoscopic approach. One patient with pyelolithotomy was converted to open surgery while the others were completed laparoscopically. Mean hospital stay was 4.16 (range 3-5) days, blood loss 115 (range 30-300)

ml and mean operative time was 170 (range 140-220) min. There were no post-operative complications. After pyeloplasty there was significant improvement in renal function and drainage pattern on diuretic scan at 11 and 12 months.

Calculi in patients with crossed fused ectopia is rare since crossed fused ectopia in itself is a rare anomaly. Aggarwal S, et al. [8] reported laparoscopic stone removal in a patient with crossed fused ectopia with 100% stone clearance and no complications. Kamat N, et al. [9] also reported that laparoscopic pyelolithotomy is a safe, simple option for stones in the ectopic pelvic kidney with a laterally and anterior directed pelvis.

### **Conclusion**

Laparoscopic approach can be an effective alternative to endo urological or open procedures for stone removal. It can be utilized for stone management in urinary tract where ESWL, PCNL and ureteroscopy have failed or are deemed unsuitable. It is also a good option in patients with unusual anatomy such as ectopic kidney.

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