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LAPAROSCOPIC MANAGEMENT OF UPPER URINARY TRACT STONES: AN EIGHT-YEAR SINGLE-CENTRE EXPERIENCE: A RETROSPECTIVE CASE SERIES OF 13 PATIENTS (2013-2021)

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ABSTRACT

Background: Laparoscopic stone surgery now occupies a selective role between endourological treatment and open surgery. This study describes the indications, feasibility, and outcomes of laparoscopic treatment for upper urinary tract stones at a tertiary Moroccan centre.

Methods: We retrospectively reviewed 13 consecutive patients who underwent laparoscopic stone extraction in the Department of Urology, Hassan II University Hospital, Fez, from January 2013 to January 2021. Demographic, clinical, laboratory, radiological, operative, and postoperative variables were extracted from the source database.

Results: Out of 200 cases of upper urinary tract stones managed over 8 years, 13 patients underwent laparoscopic treatment. The average age of our patients was 56 years, with a sex ratio of 1.16. Thirteen laparoscopic procedures were performed: 11 ureterolithotomies and 2 pyelolithotomies, including one stone extraction in a patient with junctional obstruction. Complete stone-free success was noted in 12 of the 13 patients who underwent laparoscopic stone extraction (92.30%). Only one patient developed a postoperative complication: atrial fibrillation tachycardia.

Conclusion: In this small, highly selected series, laparoscopy achieved a high single-session stone-free rate with no conversion. Its contemporary role is best viewed as a rescue or reconstructive option for large impacted stones, failed or unsuitable endourological treatment, and stones associated with anatomical abnormalities, provided appropriate laparoscopic expertise is available.

Keywords: Urolithiasis; Laparoscopy; Ureterolithotomy; Pyelolithotomy; Impacted Ureteral Stone; Stone-Free Rate

1 INTRODUCTION

Urolithiasis is a common, recurrent disorder that affects patients throughout adult life and generates substantial emergency and elective surgical activity. During the past four decades, treatment has shifted from open stone surgery to shock-wave lithotripsy (SWL), ureteroscopy (URS), retrograde intrarenal surgery, and percutaneous nephrolithotomy (PCNL). Current guidelines therefore reserve laparoscopic or open stone removal for uncommon situations in which these less invasive approaches have failed or are unlikely to succeed [1,2].

Despite this restricted indication, laparoscopy remains clinically relevant. Large or chronically impacted proximal ureteral stones may be associated with marked upstream dilatation, ureteral oedema, and a low probability of spontaneous passage. Repeated endoscopic treatment may require several procedures and can leave residual fragments. Similarly, selected solitary renal pelvic stones, especially when accompanied by ureteropelvic junction obstruction, may be removed during a reconstructive laparoscopic procedure. Comparative evidence suggests that laparoscopic ureterolithotomy can provide a high initial stone-free rate for large proximal ureteral stones, although at the cost of longer operative time and hospital stay than URS [3-6].

Access to flexible ureteroscopy, laser lithotripsy, and modern PCNL is uneven across health systems. In resource-constrained settings, laparoscopic surgery may offer a minimally invasive alternative to open surgery when endourological equipment is unavailable or previous treatment has failed. The present study converts an institutional thesis into an article-format report and evaluates the indications, perioperative outcomes, and contemporary place of laparoscopy in upper urinary tract stone disease.

2 MATERIALS AND METHODS

2.1 Study design and setting

This was a retrospective, descriptive, single-centre case series conducted in the Department of Urology at Hassan II University Hospital, Fez, Morocco. All patients treated laparoscopically for urinary stones between January 2013 and January 2021 were eligible. Thirteen procedures were identified. The study objective was to describe the centre's indications and assess technical feasibility and perioperative outcomes.

2.2 Data collection



Figure 1: Plain abdominal radiograph (KUB) showing a calcific opacity projecting over the right renal area.

Information was abstracted from medical records using a standardized data sheet. Variables included age, sex, comorbidities, previous stone episodes and procedures, presenting symptoms, physical findings, serum urea and creatinine, complete blood count, urine culture, plain kidney-ureter-bladder radiography (**Figure 1**), ultrasonography,

computed tomography, stone location and size, American Society of Anesthesiologists (ASA) class, operative approach, trocar number, ureteral stenting, operative time, technical difficulties, blood loss, intraoperative complications, conversion, postoperative analgesia, complications, drain removal, length of stay, residual stone, and recurrence.

2.3 Preoperative assessment and definitions

All patients underwent computed tomography to characterize stone location, dimensions, obstruction, renal function, and associated urinary abnormalities. Urine culture was obtained in all cases, and bacteriuria was treated according to susceptibility results. Stone-free status was defined in the source study as the absence of a residual fragment on immediate postoperative imaging. Recurrence was defined as a new stone documented during follow-up. Complications are reported descriptively because the original database did not apply a formal Clavien-Dindo grade.

2.4 Surgical technique

All operations were performed under general anaesthesia with intravenous antibiotic prophylaxis. A transperitoneal approach was used in every case. Three or four trocars were placed according to side and anatomy. After medial mobilization of the colon, the ureter was identified at the transition between the dilated proximal segment and the stone-bearing segment. A cold ureterotomy was made directly over the calculus, the stone was extracted, and the incision was sutured (**Figure 2**). Pyelolithotomy was performed by opening the renal pelvis and extracting the pelvic or accessible calyceal stone. Internal drainage with a double-J stent was present preoperatively in seven patients and was placed perioperatively in six. A drain was left adjacent to the repair.

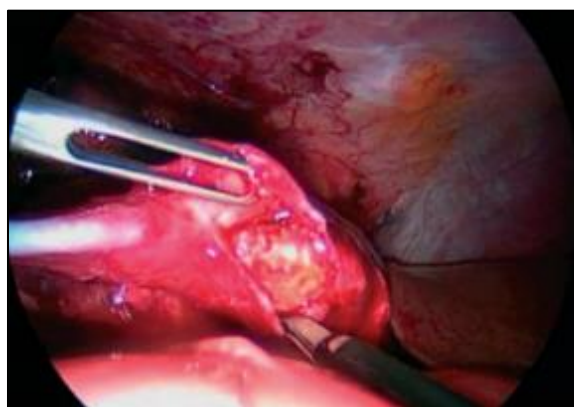


Figure 2: Transperitoneal ureterotomy: stone extraction.

2.5 Analysis and data integrity

Continuous variables are summarized by means and ranges when available; categorical variables are reported as counts and percentages.

3 RESULTS

3.1 Patient characteristics

Seven patients were male (53.8%) and six female (46.2%), giving a male-to-female ratio of 1.16. Mean age was 56.46 years (range, 35-86). Eight patients (61.5%) had a previous history of urinary stones, and six (46.2%) had undergone prior stone surgery. Comorbidities included diabetes mellitus in three patients, hypertension in two, chronic kidney disease in one, a pacemaker for atrioventricular block in one, and septic inferior vena cava thrombosis in one. Patient-level anaesthesia data identified three ASA I and nine ASA II patients.

3.2 Clinical and radiological presentation

Flank pain was the dominant presentation (11/13, 84.6%); renal colic occurred in four patients (30.8%). Less common symptoms included dysuria, stone passage, haematuria, and urinary frequency. Flank tenderness was documented in seven patients. Renal function was impaired in two patients, with estimated glomerular filtration rates reported as 33 and 25 mL/min. Urine cultures were sterile in 11 patients; two grew *Escherichia coli*, including one multidrug-resistant isolate. Twelve stones were radiopaque on plain radiography. Computed tomography localized ten stones to the lumbar ureter, one to the pelvic ureter, and two to the renal pelvis/ureteropelvic junction. Recorded maximum dimensions ranged from 7 to 30 mm.

3.3 Operative outcomes

Eleven laparoscopic ureterolithotomies (84.6%) and two pyelolithotomies (15.4%) were performed; 11 procedures were right-sided. The overall mean operative time was 165 minutes. No intraoperative complication was recorded, and no patient required conversion to open surgery. One patient had difficult dissection of the Toldt fascia because of parietocolic adhesions. Internal double-J drainage was used in all cases.

3.4 Postoperative outcomes

Multimodal analgesia consisted of paracetamol and nefopam, with opioids in the immediate postoperative period. Drains were generally removed on postoperative day 3. One patient developed postoperative sepsis and required four days of intensive-care management. Mean hospital stay was 3.70 days. Complete stone clearance was obtained in 12 of 13 patients (92.3%). One patient developed a right lower-calyceal stone during follow-up. The duration and completeness of follow-up were not standardized (**Table 1**).

Table 1: Main perioperative findings

Outcome	Finding
Patients	13
Procedures	11 ureterolithotomies; 2 pyelolithotomies
Approach	Transperitoneal in all cases
Mean operative time	165 min (source narrative)
Conversion	0/13
Intraoperative complications	0/13
Postoperative complications	1/13 (sepsis requiring intensive care)
Mean hospital stay	3.70 days
Stone-free status	12/13 (92.3%; structured thesis summary)
Recurrence	1/13 (right lower-calyceal stone)

4 DISCUSSION

This eight-year experience suggests that transperitoneal laparoscopic stone extraction is feasible in carefully selected patients. No conversion or intraoperative complication occurred, the reported single-session stone-free rate was 92.3%, and mean hospital stay was less than four days. These findings support laparoscopy as an option when standard endourological treatment is unlikely to succeed, previous procedures have failed, or concomitant reconstruction is required. However, they do not justify its routine use in place of ureteroscopy (URS) or percutaneous nephrolithotomy (PCNL).

Stone impaction and local anatomy are important considerations in patient selection and surgical planning. Prolonged ureteral impaction may lead to inflammation, periureteral fibrosis, and proximal hydroureteronephrosis, making dissection more challenging. Limited ureteral mobilization and preservation of periureteral tissue are therefore essential to protect the segmental blood supply and minimize the risk of subsequent stricture. The transperitoneal approach offers a broad working space and familiar anatomical landmarks, although it requires colonic mobilization and exposes the peritoneal cavity to potential urinary leakage or infection. Conversely, the retroperitoneal approach provides direct access and limits intraperitoneal contamination but offers a narrower working space. For renal pelvic stones, the relationship between the pelvis and hilar vessels, together with stone distribution, determines the suitability of pyelolithotomy.

Current guidelines recommend URS or shock-wave lithotripsy (SWL) for most ureteral stones and PCNL as the first-line treatment for renal stones larger than 2 cm. Laparoscopic or open stone removal is reserved for uncommon situations in which these approaches have failed or are unlikely to succeed [1,2]. For large proximal ureteral stones, meta-analyses have reported higher initial stone-free rates and fewer auxiliary procedures after laparoscopic ureterolithotomy than after ureteroscopic lithotripsy, at the expense of longer operative times and hospital stays [3,4]. Randomized and prospective studies have similarly demonstrated high clearance rates, particularly for large impacted stones [5–8]. The principal benefit of laparoscopic ureterolithotomy is thus the possibility of complete, intact stone extraction in a single procedure, balanced against its greater invasiveness compared with endoscopic treatment.

For solitary renal pelvic stones larger than 2 cm, comparative reviews have associated laparoscopic pyelolithotomy with high stone-free rates and less haemoglobin loss than PCNL, although operative times are generally longer and the generalizability of these findings remains uncertain [9–12]. PCNL remains the preferred approach for complex or branching calculi because of its greater versatility. Laparoscopic pyelolithotomy may be particularly suitable for a large solitary stone within an extrarenal pelvis, concomitant ureteropelvic junction obstruction requiring pyeloplasty, or circumstances in which percutaneous access is undesirable [13–16]. Robotic assistance can facilitate intracorporeal suturing, but its additional cost and selective indications limit its broader role [12,17].

In the present series, most stones were located in the lumbar ureter, and many patients had undergone previous stone treatment, suggesting a population with difficult or recurrent disease. The absence of conversion and the relatively short hospital stay are encouraging, although the small sample and lack of a comparator group limit conclusions about relative effectiveness. One significant infectious complication occurred, underscoring the importance of preoperative infection control, drainage of infected obstruction, culture-directed antibiotic therapy, and avoidance of high-pressure manipulation. All patients underwent ureteral stenting, likely reflecting concerns about postoperative oedema, urinary leakage, and healing of the suture line. Although stent omission has been described in selected uncomplicated cases, supporting evidence remains limited [18].

Several limitations should be acknowledged. This retrospective, single-centre study included only 13 patients treated over eight years, limiting the precision and generalizability of its findings. Selection criteria, surgeon experience, blood loss, follow-up duration, stone composition, and standardized complication grading were incompletely documented. Inconsistencies in the available data also affected estimates of stone clearance, operative time, and ASA classification. The more conservative stone-free estimate of 12/13 was retained, together with the reported overall mean operative time, while ASA classification was reconstructed from individual patient records. These limitations restrict comparisons with other treatment modalities and highlight the need for prospective studies using standardized outcome definitions, postoperative imaging, and follow-up protocols.

Laparoscopy therefore retains a selective role within a multimodal approach to stone management. Suitable candidates may include patients with large impacted proximal ureteral stones after failed URS or SWL, stones unlikely to be cleared endoscopically in a single session, solitary renal pelvic stones with favourable anatomy, or associated abnormalities requiring laparoscopic reconstruction. Treatment selection should integrate stone burden, urinary tract anatomy, infection status, renal function, available resources, surgical expertise, and patient preference.

5 CONCLUSION

Laparoscopic ureterolithotomy and pyelolithotomy provided high single-session clearance with no conversion in this selected institutional series. The approach remains valuable as a rescue or combined reconstructive procedure, particularly for large impacted proximal ureteral stones and selected renal pelvic stones. Because contemporary URS and PCNL are less invasive and broadly effective, laparoscopy should remain selective. Larger prospective studies with uniform definitions, complication grading, and long-term imaging are required to determine its comparative value in resource-limited and referral settings.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no competing interests.

Statement of informed consent

Written informed consent was obtained from the patients concerned for publication of their clinical information and accompanying images.

REFERENCES

- [1] European Association of Urology. EAU Guidelines on Urolithiasis. Arnhem: EAU Guidelines Office; 2026.
- [2] Assimos D, Krambeck A, Miller NL, et al. Surgical management of stones: American Urological Association/Endourological Society guideline. *J Urol*. 2016; 196:1153-1160. doi: 10.1016/j.juro.2016.05.090.
- [3] Li J, Chang X, Wang Y, Han Z. Laparoscopic ureterolithotomy versus ureteroscopic laser lithotripsy for large proximal ureteral stones: a systematic review and meta-analysis. *Minerva Urol Nefrol*. 2020; 72:30-37. doi:10.23736/S0393-2249.19.03557-4.
- [4] Wu T, Duan X, Chen S, et al. Ureteroscopic lithotripsy versus laparoscopic ureterolithotomy or percutaneous nephrolithotomy in large proximal ureteral stones: systematic review and meta-analysis. *Urol Int*. 2017; 99:308-319. doi:10.1159/000471773.
- [5] Lopes Neto AC, Korkes F, Silva JL II, et al. Prospective randomized study of treatment of large proximal ureteral stones: SWL versus ureterolithotripsy versus laparoscopy. *J Urol*. 2012; 187:164-168. doi: 10.1016/j.juro.2011.09.054.
- [6] Ko YH, Kang SG, Park JY, et al. Laparoscopic ureterolithotomy as a primary modality for large proximal ureteral calculi: comparison with rigid ureteroscopic pneumatic lithotripsy. *J Laparoendosc Adv Surg Tech A*. 2011; 21:7-13. doi:10.1089/lap.2010.0340.
- [7] Bayar G, Tanriverdi O, Taskiran M, et al. Comparison of laparoscopic and open ureterolithotomy in impacted and very large ureteral stones. *Urol J*. 2014; 11:1423-1428.
- [8] Feyaerts A, Rietbergen J, Navarra S, Vallancien G, Guillonnet B. Laparoscopic ureterolithotomy for ureteral calculi. *Eur Urol*. 2001; 40:609-613. doi:10.1159/000049842.
- [9] Mao T, Wei N, Yu J, Lu Y. Efficacy and safety of laparoscopic pyelolithotomy versus percutaneous nephrolithotomy for large renal stones: a meta-analysis. *J Int Med Res*. 2021; 49:300060520983136. doi:10.1177/0300060520983136.
- [10] Wang J, Yang Y, Chen M, et al. Laparoscopic pyelolithotomy versus percutaneous nephrolithotomy for renal pelvic calculi >2 cm: a meta-analysis. *Acta Chir Belg*. 2016; 116:346-356. doi:10.1080/00015458.2016.1181312.
- [11] Wang X, Li S, Liu T, Guo Y, Yang Z. Laparoscopic pyelolithotomy compared with percutaneous nephrolithotomy for large renal pelvic calculi: a meta-analysis. *J Urol*. 2013; 190:888-893. doi: 10.1016/j.juro.2013.02.092.
- [12] Carbonara U, Crocero F, Cantiello F, et al. The fight between PCNL, laparoscopic and robotic pyelolithotomy: a systematic review and meta-analysis. *Minerva Urol Nephrol*. 2022; 74:169-177. doi:10.23736/S2724-6051.21.04556-7.
- [13] Meria P, Milcent S, Desgrandchamps F, et al. Management of pelvic stones larger than 20 mm: transperitoneal laparoscopic pyelolithotomy or percutaneous nephrolithotomy? *Urol Int*. 2005; 75:322-326. doi:10.1159/000089168.
- [14] Goel A, Hemal AK. Evaluation of retroperitoneoscopic pyelolithotomy and comparison with percutaneous nephrolithotripsy. *Int Urol Nephrol*. 2003; 35:73-76. doi:10.1023/A:1025988823720.
- [15] Lee JW, Cho SY, Yeon JS, et al. Laparoscopic pyelolithotomy: outcomes in relation to stone distribution within the kidney. *J Endourol*. 2013; 27:592-597. doi:10.1089/end.2012.0601.
- [16] Ball AJ, Leveille RJ, Patel VR, Wong C. Laparoscopic pyeloplasty and flexible nephroscopy: simultaneous treatment of UPJ obstruction and nephrolithiasis. *JSLs*. 2004; 8:223-228.
- [17] Badalato GM, Hemal AK, Menon M, Badani KK. Current role of robot-assisted pyelolithotomy for large renal calculi: a contemporary analysis. *J Endourol*. 2009; 23:1719-1722. doi:10.1089/end.2009.1537.
- [18] Karami H, Javanmard B, Hasanzadeh-Hadah A, Mazloomfard MM, Lotfi B. Is a double-J catheter necessary after laparoscopic ureterolithotomy? A four-year experience. *J Endourol*. 2012; 26:1183-1186. doi:10.1089/end.2012.0160.