

Laparoscopic pyelolithotomy as a monotherapy for the management of intermediate-sized renal pelvic stones

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Abstract

Introduction: Renal calculi are one of the major reason leading to kidney failure or urinal obstructions. Percutaneous nephrolithotomy is considered as the major management option for intermediate to large renal pelvic stones. In the present study we compare Percutaneous nephrolithotomy vs laparoscopic pyelolithotomy procedures in the management of intermediate sized renal pelvic stones.

Methods: The time duration of study was between July 2012 and Jan 2014, 20 patients with solitary intermediate sized renal pelvic stones were selected and randomly divided into two groups; group one included 10 patients who were treated by laparoscopic pyelolithotomy and group two included 10 patients who were treated by PCNL. The differences in procedure time, blood loss, stone clearance and duration of hospital stay between the two procedures were compared and analyzed.

Results: There was no difference between the two groups regarding patient demographics and stone size. There was statistically significant difference between laparoscopic pyelolithotomy and PCNL regarding mean estimated blood loss (<50 mL vs. 180–250 mL), hospital stay (3–5 days vs. 4–6 days), mean time of postoperative analgesia (2.2 ± 0.9 days vs. 2 ± 0.9 days), and stone-free rate (100% vs. 95%). The operative time was significantly longer in the laparoscopic pyelolithotomy group (80–150 min vs. 45–75 min).

Conclusion: Although PCNL is the gold standard for intermediate-sized renal pelvic stones of 2-4 cm, laparoscopic pyelolithotomy is a suitable surgical technique in selected cases.

Keywords: Laparoscopic pyelolithotomy, percutaneous nephrolithotomy, renal pelvic stone, retrograde intrarenal surgery

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INTRODUCTION

Previously, open surgery was the only option available for the management of renal stones; currently, there are different minimally invasive modalities such as percutaneous nephrolithotomy (PCNL) and retrograde intrarenal surgery (RIRS).^[1,2] The European Association of Urology 2015 guidelines, clearly states that renal stones for 1–2 cm in

diameter can be managed with shock wave lithotripsy (SWL) or endourological interventions.^[3] SWL, RIRS and minimally invasive percutaneous nephrolithotomy (MIP) are highly effective treatment options for stones up to 2 cm.^[4] SWL is a minimally invasive technique, and it is usually the first choice method due to good patient tolerance and low complication rate.^[5] However, it is associated with lower

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success rate and higher retreatment rate. At the same time, with the advances in endourological instrumentation and technology, RIRS and MIP have increasingly being used as the treatment option for stones.^[6,7]

In this study, we classified renal stones as small stones if the size is <2 cm, intermediate if 2–4 cm and large if >4 cm. Laparoscopic renal surgery has become focused since the initial report of laparoscopic nephrectomy by Clayman *et al.*,^[8] and the concept of stone removal by laparoscopy in selected cases has become more accepted, especially for intermediate-sized stones.^[9,10]

METHODS

During the period of July 2012 to Jan 2014, patients with intermediate sized solitary renal pelvic stones were selected and randomly allocated in to two groups. Group 1 included 10 patients who were treated by laparoscopic pyelolithotomy and group 2 included 10 patients who were treated by PCNL. Written informed consents were taken from the patients and approved by our Human Ethics Committee (YUEC78/31/7/2012).

All patients were assessed using computed tomography urogram and subjects with positive urine cultures were made sterile by appropriate antibiotics before the procedure.

Surgical technique

Laparoscopic pyelolithotomy was performed by the standard procedure described by Gaur *et al.*,^[11] and Al-Hunayan and associate.^[12] After good exposure of the renal pelvis transperitoneally, pyelotomy was performed by diathermy hook and completed by laparoscopic Potts scissors. The stone was delivered intact in an endobag, the renal pelvis was irrigated with physiological saline, and laparoscopic suction was applied simultaneously to remove any fragments. Pyelotomy closure was performed by intracorporeal interrupted absorbable sutures after inserting 5 French double-J ureteral stent.

PCNL was performed by the standard prone technique. Posterior calyx was punctured with an 18 gauge needle and track dilated up to 30 French and the stone removed after breaking with pneumatic lithotripsy. In each group, patient's age, sex, stone size, operative time, estimated blood loss, postoperative analgesia, duration of hospital stay, and stone-free rate were analyzed and compared.

Statistical analysis

The statistical analysis was performed biostatistical software (SPSS version 22, IBM, Armonk, NY, USA). The

values of *P* were estimated and considered to be statistically significant if <0.05.

RESULTS

There were no statistically significant differences between the laparoscopic pyelolithotomy and PCNL groups in patients and stone characteristics. Mean age of patients was 44.7 ± 20 years in the laparoscopic pyelolithotomy group versus 43.3 ± 22 years in the PCNL group. The mean stone size in the laparoscopic pyelolithotomy and PCNL groups was 2.95 ± 0.9 cm versus 3.08 ± 1 cm, respectively [Figure 1a and b]. In the laparoscopic pyelolithotomy group, 70% were male and 30% were female; in the PCNL group, there were 60% of males and 40% of females [Figure 2].

There was statistically significant difference in the mean operative time in PCNL group and laparoscopic pyelolithotomy group (45–75 min vs. 80–150 min, respectively) and estimated blood loss (180–250 mL vs. <50 mL, respectively). The time to oral intake was 1.5–2.5 days laparoscopic pyelolithotomy and 1–2 days in PCNL. Mean time of postoperative hospital stay was 3–5 days laparoscopic and 4–6 days in PCNL and the mean time of postoperative analgesia was 2.2 ± 0.9 days laparoscopic and 2 ± 0.9 days, PCNL. There was statistically significant difference regarding the stone-free rate evaluated at the end of 1 month, it was 100% in the laparoscopic pyelolithotomy group and 95% in the PCNL group [Table 1].

DISCUSSION

In the early 1990s, Retroperitoneoscopic pyelolithotomy was introduced for the management of renal calculi but did not gain much popularity among urologists because of the long learning curve of the procedure and the well-

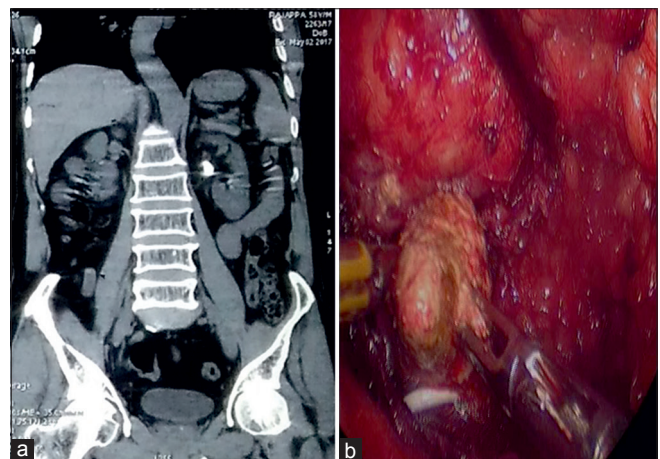


Figure 1: (a) Computed tomography image showing renal pelvic stone, (b) renal stone removed laparoscopically from the renal pelvis

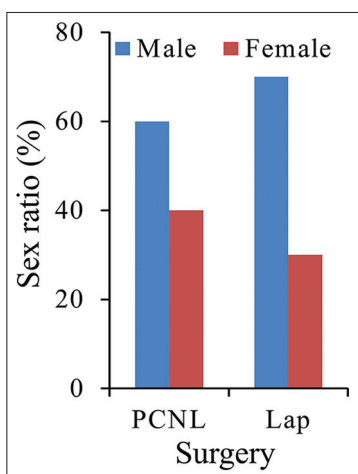


Figure 2: Graph showing the male female ratio in the procedures done

Table 1: The comparison of two surgical procedures such as laparoscopic pyelolithotomy and percutaneous nephrolithotomy in stone management

	Group	Mean	P
Age	Laparoscopic pyelolithotomy	44.7±15.39	0.822
	Percutaneous nephrolithotomy	43.3±11.77	
Stone size	Laparoscopic pyelolithotomy	2.9±0.29	0.539
	Percutaneous nephrolithotomy	3.1±0.58	
Blood loss (mL)	Laparoscopic pyelolithotomy	42.9±5.44	<0.001*
	Percutaneous nephrolithotomy	203±23.71	
Duration of surgery (Min)	Laparoscopic pyelolithotomy	117±3 0.47	<0.001*
	Percutaneous nephrolithotomy	60±10.80	
Duration of Hospital stay (Days)	Laparoscopic pyelolithotomy	4±0.81	0.013*
	Percutaneous nephrolithotomy	5±0.81	

*Statistically significant

established PCNL technique 13. PCNL is considered as the key treatment modality in the management of renal stones that are more than 2 cm. Successful laparoscopic management of renal stones have been described; however, the indications have not been yet defined and outcomes have not been compared with the established techniques, such as PCNL.^[11] In the current study, laparoscopic pyelolithotomy was evaluated as a surgical monotherapy for the management of intermediate-sized renal pelvic stone (2–4 cm) and compared with PCNL which is considered the preferred surgical management.

In our study, the preoperative data of both groups were homogenous with no statistically significant difference regarding the age, sex, and stone size. The mean operative time of the PCNL group was statistically significantly shorter than that of laparoscopic pyelolithotomy which is similar to the study by Meria *et al.*^[14] The longer time of laparoscopic pyelolithotomy in our

study was usually related to the long learning curve of laparoscopic pyelolithotomy as well as the time needed for intracorporeal suturing and delivery of the stone into the endobag. The mean operative time of laparoscopic pyelolithotomy in our study, however, was acceptable and average in relation to many studies.^[15]

There was statistically significant difference between the two groups in items of estimated blood loss, postoperative hospital stay, and postoperative analgesia. Which is contradictory to the findings of Goel and Hamel,^[13] Meria *et al.*,^[14] and Tepeler *et al.*^[16]

After one month of surgery the study groups were analyzed for the stone-free rate. We observed that stone free rate was higher in the laparoscopic pyelolithotomy group in comparison with the PCNL group (100% vs 95%, respectively). In the study by Meria *et al.*,^[14] they reported a significant difference in the stone-free rate between laparoscopic transperitoneal pyelolithotomy (88%) and PCNL (82%). The high stone-free rate achieved in the current study was due to proper selection of cases, the intact removal of the stone in contrast to PCNL in which disintegration of the stone by the pneumatic lithotripsy may leave some residuals.^[17]

Although laparoscopic pyelolithotomy appears to be more invasive because three and sometimes four trocar punctures are needed compared with PCNL in which only a single hole is made, in PCNL there is transgression of the renal parenchyma with its potential for various complications, such as nephron damage and bleeding.^[18]

Although there is a controversy on laparoscopic pyelolithotomy for management of intermediate sized stone, it has still a role in the management of stones in patients with ureteropelvic junction obstruction, stones in congenitally abnormal kidneys, pelvic stones in solitary kidneys where there is no transgression of renal parenchyma.

CONCLUSION

Laparoscopic pyelolithotomy is considered as a safe procedure for selected cases with intermediate sized renal pelvic stone. This approach gives better results in terms stone clearance, less of intra operative blood loss, and on most occasions it nephron sparing procedure, namely, pyelolithotomy compared with PCNL where there is a transgression of the renal parenchyma with its associated complications.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Singal R, Dhar S. Retroperitoneal laparoscopic pyelolithotomy in renal pelvic stone versus open surgery – A comparative study. *Clujul Med* 2017;90. [doi.org/10.15386/cjmed-732].
2. Yang T, Liu S, Hu J, Wang L, Jiang H. The evaluation of risk factors for postoperative infectious complications after percutaneous nephrolithotomy. *Biomed Res Int* 2017;2017:4832051.
3. Clayman RV, Kavoussi LR, Soper NJ, Dierks SM, Meretyk S, Darcy MD, *et al.* Laparoscopic nephrectomy: Initial case report. *J Urol* 2017;197:S182-6.
4. Wang M, Zhang J, Niu Y, Xing N. Feasibility of pure conventional retroperitoneal laparoscopic radical nephrectomy with level II vena caval tumor thrombectomy. *Urology* 2016;90:101-4.
5. Singh V, Sinha RJ, Gupta DK, Pandey M. Prospective randomized comparison of retroperitoneoscopic pyelolithotomy versus percutaneous nephrolithotomy for solitary large pelvic kidney stones. *Urol Int* 2014;92:392-5.
6. Al-Hunayan A, Abdulhalim H, El-Bakry E, Hassabo M, Kehinde EO. Laparoscopic pyelolithotomy: Is the retroperitoneal route a better approach? *Int J Urol* 2009;16:181-6.
7. Gaur DD, Agarwal DK, Purohit KC, Darshane AS. Retroperitoneal laparoscopic pyelolithotomy. *J Urol* 1994;151:927-9.
8. Goel A, Hemal AK. Evaluation of role of retroperitoneoscopic pyelolithotomy and its comparison with percutaneous nephrolithotripsy. *Int Urol Nephrol* 2003;35:73-6.
9. Meria P, Milcent S, Desgrandchamps F, Mongiat-Artus P, Duclos JM, Teillac P. Management of pelvic stones larger than 20 mm: Laparoscopic transperitoneal laparoscopic pyelolithotomy or percutaneous nephrolithotomy? *Urol Int* 2005;75:322-6.
10. Andrade HS, Zargar H, Caputo PA, Akca O, Ramirez D, Kara O, *et al.* Robotic pyelolithotomy for staghorn nephrolithiasis during partial nephrectomy. *Int Braz J Urol* 2016;42:623-5.
11. Agarwal K, Agrawal MS. Place of percutaneous nephrolithotripsy (PCNL) in the management of renal calculi. *Sri Lanka J Surg* 2014;31.
12. Dagli M, Ramchandani P. Percutaneous nephrostomy: technical aspects and indications. In *Seminars in Interventional Radiology* 2011;28:424-37.
13. Tepeler A, Binbay M, Sari E, Akcay M, Berberoglu Y, Ahmet YA, *et al.* The comparison of laparoscopic pyelolithotomy versus percutaneous nephrolithotomy in the management of large renal pelvic stones. *Eur Urol Suppl* 2009;8:261.
14. Türk C, Petřík A, Sarica K, Seitz C, Skolarikos A, Straub M, Knoll T. EAU guidelines on interventional treatment for urolithiasis. *European urology* 2016;69:475-82.
15. Resorlu B, Issi Y, Onem K, Germiyanoglu C. Management of lower pole renal stones: The devil is in the details. *Ann Transl Med* 2016;4:98.
16. Kruck S, Anastasiadis AG, Herrmann TR, Walcher U, Abdelhafez MF, Nicklas AP, *et al.* Minimally invasive percutaneous nephrolithotomy: An alternative to retrograde intrarenal surgery and shockwave lithotripsy. *World J Urol* 2013;31:1555-61.
17. Kumar A, Vasudeva P, Nanda B, Kumar N, Das MK, Jha SK, *et al.* A prospective randomized comparison between shock wave lithotripsy and flexible ureterorenoscopy for lower caliceal stones ≤2 cm: A Single-center experience. *J Endourol* 2015;29:575-9.
18. Mi Y, Ren K, Pan H, Zhu L, Wu S, You X, *et al.* Flexible ureterorenoscopy (F-URS) with holmium laser versus extracorporeal shock wave lithotripsy (ESWL) for treatment of renal stone <2 cm: A meta-analysis. *Urolithiasis* 2016;44:353-65.