

ORIGINAL PAPER

Geriatrics

How safe and effective is stentless laparoscopic ureterolithotomy in elderly patients?

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Abstract

Purpose: With the improvement of minimally invasive urology procedures, open surgical interventions are less common to treat ureteral calculus. Laparoscopic ureterolithotomy (LU) indications are large multiple and/or impacted ureteral calculus that may not be treated with shock-wave lithotripsy or ureterorenoscopy approaches. The aim of our study was to investigate the feasibility and safety of stentless LU in elderly patients.

Methods: Between October 2011 and December 2019, 38 geriatric patients underwent stentless transperitoneal LU for upper/mid ureteral calculi. The transperitoneal route was applied in all patients by two surgeons. No double J stent inserted in any patient. The data of all patients reviewed retrospectively.

Results: The average age was 64.60 ± 3.70 years. The mean calculi size was 19.42 ± 1.41 mm. Ten patients had unsuccessful shock wave lithotripsy or ureterorenoscopy history. The calculi-free rate was 100%. Clavien grade 1 complications were seen in 11 (28.9%) cases. No major perioperative and postoperative complications were encountered. The average length of hospital stay was 3.24 ± 1.53 days.

Conclusion: The significant advances in medical technology and healthcare, lead a rising number of geriatric patients to take benefit of even complicated surgery. Although laparoscopy and its safety in the geriatric population pursues a challenge and the assessment of this procedure is hence obligatory, we think that stentless LU is safe, economical and less uncomfortable for elderly patients.

1 | INTRODUCTION

Urolithiasis is the third leading urological disease after urinary tract infection and prostate disorder in general.¹ Ageing is an unavoidable status with chronological, biologic and personal conditions. Because of the rise in life expectation and the rise in the geriatric people, the approach to aged people has got more value. In addition, significant advances in medical technology and healthcare are causing an increasing number of elderly patients to benefit from even complex surgical procedures, and we can expect the number of elderly patients to be electively or emergency operated to follow

the same trend. Urolithiasis is one of the varied urological problems that influence the aged and forms a substantial part of the problems that decrease their quality of life. Ureteral stones are seen 15% of general, and it constitutes 20% of all of urolithiasis patients.² Shock wave lithotripsy (SWL) and ureterorenoscopy (URS) seem to be the first choice to treat ureteral calculus. With the improving of contemporary lithotripsy and URS techniques, open or laparoscopic surgical interventions are less common. However, the use of these techniques in proximal large ureteric stones is still contentious.¹ URS is a minimally invasive option, but its effectiveness decreases, and complications ratio rises in proximal ureteral calculus larger than 2 cm.³ Laparoscopic and open ureterolithotomy indications are large multiple and/or impacted ureteral calculus that may not be treated with SWL or URS approaches.⁴ Because it is a minimally invasive surgery

and it has high accomplishment ratio in one session laparoscopic ureterolithotomy (LU) is preferred to treat large/impacted ureteral calculi generally. When compared with open approach, LU requires fewer analgesic, offers shorter hospital stays, promotes less blood loss, supports a shorter recovery time and is better cosmetically.⁵ Laparoscopic interventions have some deficits such as extended operative time and side effects of CO₂ pneumoperitoneum on respiratory and circulatory system.⁶ However, most of these side effects do not cause clinical significance. Minimally invasive surgeries have replaced open surgeries in the treatment of large upper ureteral stones because of significant advances in endourology. With the increase in elderly population, there is an increasing need for laparoscopic interventions in geriatric cases in the field of urology. However, a limited number of works have been carried out on laparoscopic surgery in geriatric cases with urological disease. To the best of our knowledge, there is no report about efficacy and safety of stentless laparoscopic ureterolithotomy in elderly patients in literature. In this study, we purposed to evaluate the safety and feasibility of stentless laparoscopic ureterolithotomy in geriatric patients for upper and mid ureteral stones. Patients of 60 years and older are defined as the geriatric patient group.⁷

2 | MATERIALS AND METHODS

We retrospectively evaluated the records of 38 patients over the age of 60 who underwent stentless transperitoneal LU at a tertiary academical between October 2011 and December 2019. All laparoscopic surgeries were applied by two urologists. A local ethics committee confirmed our study, and all patients signed consent forms. Our study also complied with the principles of the Declaration of Helsinki. Patients with radiopaque-impacted proximal ureteral calculi larger than 15 mm were involved in the study. Calculus placed between the ureteropelvic joint and the pelvic part of the ureter were considered proximal ureteral stones. Distal ureteral stones, stones smaller than 15 mm, radiolucent calculus, patients under the age of 18, dysfunctional kidney units and patients with acute renal failure were excluded. Routine physical examination, coagulation test, blood biochemistry, full urine analysis, and urine culture were performed on all patients prior to the operation. Patients with urinary tract infection underwent surgical treatment after appropriate antibiotic treatment. Non-contrast computed tomography (NCCT) and the kidney, ureter, and bladder X-ray were applied in all patients. Calculi sizes were measured as the sum of maximal diameters of all stones on X-ray graphy (Figure 1). The transperitoneal approach was applied in all patients.

2.1 | Surgical procedure

All patients were positioned at (70°) a modified lateral decubitus under general anaesthesia. Pneumoperitoneum was composed using a Veress needle. After the first port was placed, it was placed by

What's known

- There are several options for the management of proximal urteral stones.
- Conventionally, elderly patients have been treated with a less aggressive approach because of their comorbidities and higher surgical risk.
- Laparoscopic ureterolithotomy can be considered to be a feasible and safe alternative to conventional open surgery in elderly patients.
- Stentless laparoscopic ureterolithotomy surgery can be performed safely in geriatric patients, so no second surgery is required to remove the D-J stent.

What's new

- In the minimally invasive era, laparoscopic ureterolithotomy is a safe and viable option in elderly patients, with stentless laparoscopic ureterolithotomy having the advantage of avoidance of a second procedure under anaesthesia, with low requirements of analgesics and anticholinergics.



FIGURE 1 Preoperative image

seeing two extra 10 mm ports. One additional port could be placed for liver retraction on the right side, if needed. We felt the calculi via an atraumatic grasper and, a Babcock clamp was utilised to estop calculus migration. Ureterotomy was applied with laparoscopic scissors, and the calculus was taken from the body using grasper or a tissue and organ removal bag (Figure 2). The ureterotomy line was closed by a 4/0 polyglactin as an interrupted suture. The operative

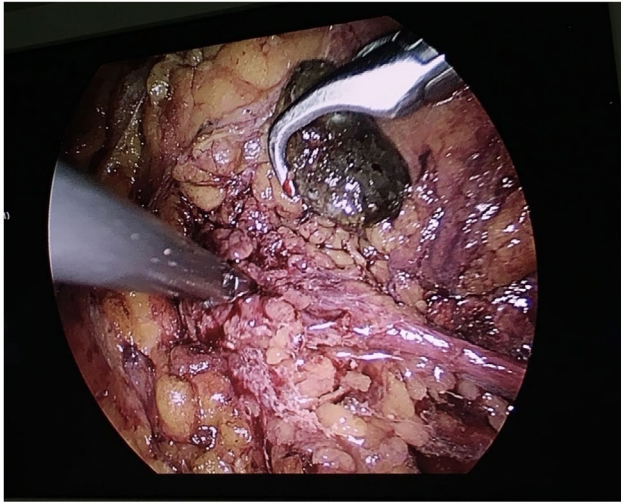


FIGURE 2 Preoperative image

area was visually checked at the end of the procedure, then, a 16-18 Fr soft drain was placed, and the port sites were sutured.

2.2 | Postoperative period

On the first postoperative day, all patients were mobilised and X-ray graphy was taken. We removed the drain if the 24-hour drainage was less than 50 mL. Postoperative analgesia was not performed routinely; however, paracetamol (500 mg orally) and/or diclofenac sodium (75 mg intramuscularly) were dispensed on patient request. Urine tests and serum creatinine were performed in the first postoperative month. We performed ultrasonography (USG) and/or NCCT between one to three months after the operation. Intraoperative-postoperative data and demographic data were enrolled. Complications were assessed as per Clavien-Dindo classification system.⁸

2.3 | Statistical analysis

Statistical analyses were performed by Statistical Package for Social Sciences (SPSS) software for Windows, version 15.0 (SPSS Inc, Chicago, IL). Continue variables were presented as mean \pm SD if they are normally distributed. Median (IQR) was used if they are not normally distributed. Categorical variables were presented as frequencies/percentages.

3 | RESULTS

Thirty-eight geriatric patients who underwent stentless transperitoneal LU involved in this study. Twenty-five (65.7%) of 38 patients in the study were male and 13 (34.3%) were female with a mean age of 64.60 ± 3.70 (60-77) years. Preoperative ASA score dispersions were ASA-I in 5 patients (13.1%), ASA-II in 11 patients (28.9%),

TABLE 1 Patient's demographic, operative and postoperative data

| | N = 38 |
|--------------------------------------|--------------------------|
| Mean age (y) | 64.60 \pm 3.70 (60-77) |
| Sex (male/female) (n, %) | 25 (65.7%)/13 (34.3%) |
| Body mass index (kg/m ²) | 26.538 \pm 1.23 |
| Stone size (mean \pm SD) (mm) | 19.42 \pm 1.41 |
| Stone side (right/left) (n, %) | 21 (55.3%)/17 (44.7%) |
| Failed SWL (n, %) | 3 (7.89%) |
| Failed URS (n, %) | 7 (18.42%) |
| ASA scores (n, %) | |
| ASA 1 | 5 (13.1%) |
| ASA 2 | 11 (28.9%) |
| ASA 3 | 19 (50%) |
| ASA 4 | 3 (7.8%) |
| Operative time (mean \pm SD) (min) | 93.82 \pm 13.14 |
| Clavian grade I complication (n, %) | 11 (28.9%) |
| Hospitalisation (mean \pm SD) (d) | 3.24 \pm 1.53 |

Note: The data were given as n (%), mean \pm SD.

ASA-III in 19 patients (50%), and ASA-IV in 3 patients (7.8%). Stones were localised on the right ureter in 21 patients (55.3%) and on the left ureter in 17 patients (44.7%). The mean stone size was 19.42 ± 1.41 mm. Three patients (7.89%) had unsuccessful SWL history, seven patients (18.42%) had unsuccessful URS history. The average operative time was 93.82 ± 13.14 min. The median hospital stay was 3.24 ± 1.53 days. No patient needed blood transfusion. No major peroperative or postoperative complication was observed in any patients. The operative and postoperative and demographic data are shown in Table 1. All surgeries were performed stentless. Our stone free accomplishment ratio was 100% and no patient was converted to open surgery. Prolonged urine leakage was seen in three patients and resolved spontaneously on the fifth and sixth day. We observed subileus in four cases and it was managed with conservative treatment. Subfebrile fever, which resolved with conservative treatment, was observed in four patients on the first postoperative day. Ureteral stenosis or severe ureteral hydronephrosis were not detected on the third month control in any patients in USG or NCCT.

4 | DISCUSSION

The elderly population is rising all over the world. The population of 65 and older was 703 million in 2019.⁹ According to World Health Organization estimates it will be over 1.5 billion people in 2050.⁹ Geriatric people represent a major part of the nominee patients for any surgical treatment, and the surgical need of this people is increasing day after day. Geriatric cases are generally treated with a less aggressive procedure because of their high surgical risks and comorbidities.

Regarding that complicated factors are seen more constantly in elderly people, determining the appropriate treatment for these cases and starting instantly is of serious significance to prevent potential important complications. Laparoscopic surgeries require less analgesics, offer shorter hospital stays, promote less blood loss, support shorter recovery times and are better cosmetically.⁵ Laparoscopic surgery and its safety in this population in a daily experience remains a difficulty and the assessment of this technique is therefore obligatory. The standard laparoscopy method is to form a pneumoperitoneum using a pressure regulating automatic insufflator. Maintaining high intra-abdominal pressure during the procedure is associated with a large number of side effects assigned to positive intraperitoneal pressure.^{10,11} Pneumoperitoneum can result in acid-base unbalance, changes in blood gas level, and changes of pulmonary and cardiovascular physiology.¹² Most of these effects do not cause clinical significance, they may be of great importance in patients with comorbid conditions, particularly in elderly patients, which are common in patients with decreased cardiopulmonary capacity.¹³ Regarding that complicated factors are seen more often in elderly patients, assessing the appropriate treatment for these population and starting immediately is of great matter to avoid possible major complications.¹⁴ One of the most widespread reasons of hospitalisation in the geriatric population is urolithiasis. Although, ureteral calculi are generally treated with URS or SWL, treatment hinges primarily on the size and location of the calculus, associated severity and period of pain, obstructed or non-obstructed drainage, and the charge and accessibility of the device.¹⁵ Laparoscopic surgery may be applied if the urologist has a sufficient grade of experience in surgery of upper and mid ureteral stone. In current guidelines, laparoscopic surgery is suggested for larger than 1.5 cm in selected cases, multiple or impacted ureteral calculus in which URS and SWL were unsuccessful or are likely to unsuccessful.¹⁶ Open surgery has the benefit of a superior-performance ratio in one period for such complex patients. However, laparoscopy, which is a minimally invasive surgery, is more preferred because it provides less analgesic use, short dated hospitalisation, less patient blood wantage, shorter recovery duration and better cosmos than open surgery.⁴ The most important advantage of LU is that it is possible to extracting the calculi in one session. LU could be exerted both thru the transperitoneal and retroperitoneal techniques. The first retroperitoneal LU was introduced in 1979 by Wickham,¹⁷ and Raboy implemented the first transperitoneal LU in 1992.¹⁸ Gaur et al stated retroperitoneal LU in 12 patients with impacted and large calculus in the upper/middle ureter.¹⁹ They were successful in nine patients, but three patients necessitated conversion to open operation because of device problems and relative lack of laparoscopic experience. The advantage of the transperitoneal route is that it provides a wider operation area and suitable vision, and better identifiable anatomic landmarks.²⁰ The hospital stay length and complications rate is lower in the retroperitoneal technique, but this technique provides a limited working area.²¹ In addition, retroperitoneal technique does not require colon mobilisation and has a lower risk of visceral organ damage and lower postoperative ileus rate. Main features of the choice of retroperitoneal and transperitoneal methods are the surgeon's knowledge and choice.²² Currently, routine ureteral stent

placement after LU is still debatable and has very different opinions. Some authors support the Double-J (D-J) placement after the surgery to prevent urine leak and ureteral stricture,^{18,23} but others contrast to this opinion, because D-J stent inserting has presented no relation with the complication rate and increases the number of discomfort to the patient, such as lower urinary tract symptoms, pain, and cost of removal of the D-J stent.²⁴ Karami et al compared patients with D-J stents to patients void of D-J stents, and declared that the presence of the D-J stent considerably reduced the complication rates without increasing operation time.²⁵ Hammady et al reported that stentless retroperitoneal LU is safe, cost effective, has a short operation time and does not require additional methods collated to retroperitoneal LU with the stent, which increases cost and inconvenience to the patient.²⁶ Kijvikai and Patcharatrakul recommended the insert of the D-J stent only in cases of intense ureteral mucosal inflammation in which ureteral sutures cannot be applied.²⁷ You et al assessed 41 patients who underwent retroperitoneal LU (stented [n = 17] vs stentless [n = 24]) retrospectively, demonstrated except for the duration of surgery, no significant differences existed in estimated blood loss, hospitalisation time and time to drain removal.²⁸ Srivastava et al assessed 98 paediatric patients who underwent transperitoneal LU (stented [n = 50] vs stentless [n = 48]) in the stented LU group, there was a higher analgesic requirement and a second procedure for stent removal, but there was no urine leak in both groups.²⁹ Ureteral stenosis is one of the major complications of LU. The aetiology of postoperative ureteral stricture is not clearly known. Noura et al, reported that the ureteral stricture rate was 2.5%.³⁰ In contrast to this study, Kijvikai and Patcharatrakul did not encounter ureteral stricture during the 6-month follow-up in their cases with watertight suturing.²⁷ In our study, we did not experience ureteral stricture three months after surgery. Our stone-free rate was compatible with the literature. Performing laparoscopic ureterolithotomy in elderly population in hospitals with sufficient laparoscopic surgery experience, like us, provides an important benefit in terms of operative duration of the large impacted stones. No patients had major perioperative or postoperative complications in our study. To the best of our knowledge, our study is the first report that assessed safety and efficacy of stentless laparoscopic ureterolithotomy in elderly patients in literature. The main limitation of our study is it is a retrospective design. Second, we did not have a control group, such as stented LU group, to compare pain scale or voiding symptoms. Another limitation is the small number of study and lack of cost analysis. Since most ureteral stones are already treated with SWL and URS, we think that our study is a large number of patients for this age group. In the future, long-term and large number of studies are needed.

5 | CONCLUSION

While ureteral stones are usually treated with URS or SWL, LU can be applied when these techniques fail or when the stone is impacted or large. Nowadays, laparoscopic procedures have been considered a minimally invasive surgery to lower morbidity after

traditional surgery. Laparoscopic surgery has some risks and complications for geriatric patients in major and long-term operations, in these patients it can be safely and effectively performed in the treatment of ureteral stones. LU is a safe and feasible alternative in the elderly, stentless LU has the advantage of avoiding a second operation under anaesthesia, has low analgesic and anticholinergic requirements. We think that stentless LU is safe, economical and less uncomfortable for patients.

DISCLOSURE

We declare that there was no conflict of interest.

AUTHOR CONTRIBUTIONS

CA contributed to study design, drafting, reviewing, approved the final version of manuscript and submission the final manuscript. AA contributed to data collection, statistical analysis, data collection at hospital information system, reviewing the manuscript and approved the final version of manuscript. ZBA contributed to data collection at hospital information system, reviewing the manuscript and approved the final version of manuscript.

ETHICAL STATEMENT

This study was conducted in accordance with the Declaration of Helsinki in its latest version. This article does not contain any studies with animals performed by any of the authors.

DATA AVAILABILITY STATEMENT

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REFERENCES

- Lopes Neto AC, Korkes F, Silva JL II, et al. Prospective randomized study of treatment of large proximal ureteral stones: extracorporeal shock wave lithotripsy versus ureterolithotripsy versus laparoscopy. *J Urol*. 2012;187:164-168.
- Dellabella M, Milanese G, Muzzonigro G. Randomized trial of efficacy of tamsulosin, nifedipine and phloroglucinol in medical expulsive therapy for distal ureteral calculi. *J Urol*. 2005;174:167-172.
- Fang YQ, Qiu JG, Wang DJ, Zhan HL, Situ J. Comparative study on ureteroscopic lithotripsy and laparoscopic ureterolithotomy for treatment of unilateral upper ureteral stones. *Acta Cir Bras*. 2012;27:266-270.
- Huri E, Basok EK, Ugurlu O, et al. Experiences in laparoscopic removal of upper ureteral stones: multicenter analysis of cases, based on the Turk Uro Lap Group. *J Endourol*. 2010;24:1279-1282.
- Tugcu V, Simsek A, Kargi T, Polat H, Aras B, Tasci AI. Retroperitoneal Laparoendoscopic single site ureterolithotomy versus conventional laparoscopic ureterolithotomy. *Urology*. 2013;81:567-572.
- Caglia P, Tracia A, Buffone A, et al. Physiopathology and clinical considerations of laparoscopic surgery in the elderly. *Int J Surg*. 2016;33:97-102.
- World Health Organization. Global age-friendly cities: a guide. World Health Organization; 2007. <https://apps.who.int/iris/handle/10665/43755>
- Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg*. 2004;240:205-213.
- United Nations, Department of Economic and Social Affairs, Population Division. [Internet]. World Population Ageing: Highlights (ST/ESA/SER.A/ 430); 2019. <https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Report.pdf>
- Jakimowicz J, Stultiens G, Smulders F. Laparoscopic insufflation of the abdomen reduces portal venous flow. *Surg Endosc*. 1998;12:129-132.
- Windberger U, Siegl H, Ferguson JG, et al. Hemodynamic effects of prolonged abdominal insufflation for laparoscopic procedures. *Gastrointest Endosc*. 1995;41:121-129.
- Safran DB, Orlando R III. Physiologic effects of pneumoperitoneum. *Am J Surg*. 1994;167:281-286.
- Bates AT, Divino C. Laparoscopic surgery in the elderly: a review of the literature. *Aging Dis*. 2015;6:149-155.
- Akbari NR. Percutaneous nephrolithotripsy complication in the elderly. *Aging Male*. 2007;10:77-87.
- Rabani SM, Moosavizadeh A. Management of large proximal ureteral stones: a comparative clinical trial between transureteral lithotripsy (TUL) and shock wave lithotripsy (SWL). *Nephrourol Mon*. 2012;4:556-559.
- Türk C, Petřík A, Sarica K, et al. EAU guidelines on interventional treatment for urolithiasis. *Eur Urol*. 2016; 69:475-482. <https://doi.org/10.1016/j.eururo.2015.07.041>.
- Wickham JEA, ed. The surgical treatment of renal lithiasis. In: *Urinary Calculus Disease*. New York, NY: Churchill Livingstone; 1979:145-198.
- Raboy A, Ferzli GS, Ioffreda R, Albert PS. Laparoscopic ureterolithotomy. *Urology*. 1992;39:223-225.
- Gaur DD. Retroperitoneal endoscopic ureterolithotomy: our experience in 12 patients. *J Endourol*. 1993;7:501.
- Harewood LM, Webb DR, Pope AJ. Laparoscopic ureterolithotomy: the results of an initial series, and an evaluation of its role in the management of ureteric calculi. *Br J Urol*. 1994;74:170-176.
- McAllister M, Bhayani SB, Ong A, et al. Vena cava transection during retroperitoneoscopic nephrectomy: report of the complication and review of the literature. *J Urol*. 2004;172:183-185.
- Sancaktutar AA, Bozkurt Y, Atar M, et al. Urological laparoscopic surgery: our experience of first 100 cases in Dicle University. *J Clin Exp Invest*. 2012;3:44-48.
- Kiyota H, Ikemoto I, Asano K, et al. Retroperitoneoscopic ureterolithotomy for impacted ureteral stone. *Int J Urol*. 2001;8:391-397.
- Demirci D, Gulmez I, Ekmekcioglu O, Karacagil M. Retroperitoneoscopic ureterolithotomy for the treatment of ureteral calculi. *Urol Int*. 2004;73:234-237.
- Karami H, Javanmard B, Hasanzadeh-Hadah A, et al. Is it necessary to place a Double J catheter after laparoscopic ureterolithotomy? A four-year experience. *J Endourol*. 2012;26:1183-1186.
- Hammady A, Gamal WM, Zaki M, Hussein M, Abuzeid A. Evaluation of ureteral stent placement after retroperitoneal laparoscopic ureterolithotomy for upper ureteral stone: randomized controlled study. *J Endourol*. 2011;25:825.
- Kijvikai K, Patcharatrakul S. Laparoscopic ureterolithotomy: its role and some controversial technical considerations. *Int J Urol*. 2006;13:206.
- You JH, Kim YG, Kim MK. Should we place ureteral stents in retroperitoneal laparoscopic ureterolithotomy? Consideration of surgical techniques and complications. *Korean J Urol*. 2014;55:511-514.

29. Srivastava A, Dhayal IR, Rai P. Laparoscopic ureterolithotomy in children: with and without stent—initial tertiary care center experience with more than 1-year follow-up. *Eur J Pediatr Surg.* 2017;27:150-154.
30. Nouira Y, Kallel Y, Binous MY, Dahmoul H, Horchani A. Laparoscopic retroperitoneal ureterolithotomy: initial experience and review of literature. *J Endourol.* 2004;18:557-561.

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