

RETROPERITONEAL LAPAROSCOPIC TREATMENT OF LARGE URETERAL CALCULI NOT AMENABLE FOR LESS INVASIVE PROCEDURES

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ABSTRACT

The present work aims at the evaluation of retroperitoneal laparoscopic ureterolithotomy as an alternative line of treatment for ureteral stones not amenable for other less invasive procedures. Retroperitoneal laparoscopic ureterolithotomy was tried in 34 patients with impacted upper ureteral stones (27 patients) and middle ureteral stones (7 patients). Mean stone size was 16 mm. Twenty-six patients were males and 8 were females with a mean age of 36 years (range 18 – 54 years). The procedure was successful in 29 cases (85.3%), while 5 cases (14.7%) required open surgery. The mean operative time was 55 minutes (range 25-90 minutes). No major intraoperative complications were encountered. No blood transfusion was required. Mean hospital stay was 6 days. Postoperative complications in the form of prolonged urinary leakage and high-grade fever occurred in 2 patients (5.9%) and 1 patient (2.9%), respectively. In conclusion, retroperitoneal laparoscopic ureterolithotomy is a good minimally invasive alternative line of treatment for ureteral stones in cases not amenable for ESWL or endoscopy. However, it takes a long learning curve. Moreover, a careful case selection and good working instruments are necessary for success.

INTRODUCTION

Since the advent of shock wave lithotripsy (ESWL)¹ and ureterorenoscopy², the routine use of open surgery for removing ureteric stones has rapidly declined. Unfortunately, minimally invasive approaches are not uniformly successful. Moreover, large ureteric stones pose a significant challenge for modern minimally invasive techniques since they still demand open surgery.

The report of Clayman et al. and others^{3,4} on laparoscopic nephrectomy paved the way for laparoscopic ureteral stone management. This work reports the Assiut experience with retroperitoneal laparoscopic ureterolithotomy in patients whose remaining treatment option was open surgery.

PATIENTS AND METHODS

Between March 1997 and February 2000, 34 patients with impacted large ureteral stones (27 patients with upper ureteral stones and 7 patients with middle ureteral stones) were selected primarily for laparoscopic treatment. Twenty-six patients were males and 8 females with a mean age of 36 years (range 18 – 54 years). The mean radiological stone size was 16 mm (range 13 – 24 mm). At presentation, all patients had radiographic confirmation of the stone on excretory urography and abdominal ultrasonography.

All patients were treated via the retroperitoneal route with the patient in the flank position. At 15 mm, the incision was made in the lumbar (petit's) triangle between the 12th rib

Table 1: Outcome of Laparoscopic Ureterolithotomy in 34 Patients

Outcome	No. of Patients	%
Successful procedure	29	85.3%
Conversion into open surgery	5	14.7%
Postoperative prolonged urinary leakage	2	5.9%
Postoperative high fever	1	2.9%
Total	34	100%

and the iliac crest, bounded by the lateral edges of the latissimus dorsi and the oblique muscles. A tunnel was created down to the retroperitoneal space by blunt dissection using an artery forceps. This tunnel was dilated until the surgeon's index finger could be inserted to push the peritoneum forward, thus creating a small retroperitoneal cavity. In the first 20 patients, this retroperitoneal cavity was dilated using the modification of the Gaur's balloon. This modified dilatation balloon was fashioned by ligating an ordinary children's balloon to a 20 Fr. Nelaton catheter. In the last 14 patients, the retroperitoneal space between the lumbar fascia and Gerota's fascia was dilated exclusively with the index finger. Laparoscopic ports were placed as follows: port I (12 mm) in the petit's triangle at the site of the original 15 mm incision, port II (10 mm) in the mid-axillary line just above the iliac crest, port III (5 mm) in the mid-axillary line just below the last rib. An additional 5 mm port may be needed in some cases to be used as a retractor (port IV).

After establishing a pneumo-retroperitoneum using carbon dioxide at a maximum pressure of 12 mmHg, the retroperitoneal fascia was opened longitudinally to expose the most important landmark, the psoas muscle. Then the Gerota's fascia was incised longitudinally to find the other anatomical landmarks such as the lower pole of the kidney, the lumbar ureter and the gonadal vessels.

The ureter was easily identified in the back of the reflected peritoneum and dissected cautiously from up to down to avoid dislodging of the stone up to the kidney. The stone was identified by its bulging and the tactile sensation. The ureter was incised sharply over the stone using a laparoscopic endoscalpel (locally

designed). Then the stone was extracted via the 10 mm port (port II). The ureterotomy was closed with one or two 4-0 polyglactic acid sutures. A drain was routinely left in the retroperitoneal space through the inferior port (port II).

The patients were discharged after removal of the drain. After a 6-month period, plain U.T. was done for all patients together with abdominal sonography and/or IVU.

RESULTS

Retroperitoneal laparoscopic stone removal was successful in 29 of 34 patients (85.3%). (Table 1). In the initial experience, conversion into open surgery was required in 5 patients (14.7%). This was due to the lack of perfect orientation in 3 cases and improper localization of the stone in 2 cases (concomitant fluoroscopy was not available). The operative time ranged from 25 to 90 minutes (mean 55 minutes). No major intraoperative complications were encountered, and no blood transfusion was required. The mean hospital stay was 6 days (range 5 – 10 days). The patients returned to their normal activities within 20 to 35 days (mean 25 days).

The immediate postoperative complications consisted of prolonged urinary drainage in 2 patients (5.9%) and high-grade fever in one patient (2.9%), both of which resolved with conservative management. Of the 29 successful procedures, only 21 patients were available for 6 months follow-up. All these patients were asymptomatic, stonefree and without obstruction at follow-up. An example case is demonstrated in Fig. 1.



Fig. 1: A: Preoperative KUB film of an adult male showing a big right upper ureteric stone. B: Preoperative IVU of the same patient. C: IVU film of the same patient 6 months postoperatively.

DISCUSSION

Extracorporeal shock wave therapy, ureteroscopy and percutaneous stone removal have markedly decreased morbidity for patients with ureteral calculi. Nevertheless, some patients may still require open ureteral stone surgery, including those in whom minimally invasive approaches fail or who need simultaneous treatment of other urinary tract pathology or in patients with big stones not amenable for less invasive procedures. In recent years, new techniques have been developed allowing for successful reconstructive surgery and laparoscopic stone surgery⁵⁻⁹.

The first series of laparoscopic ureterolithotomy was reported by Gaur and associates^{10,11} who pioneered the retroperitoneal approach for a variety of laparoscopic procedures. However, laparoscopic access to the retroperitoneum did not find wide acceptance¹²⁻¹⁴. The main reason was the suboptimal endoscopic view and the narrow working field. Moreover, CO₂ insufflation was unable to break the dense areolar tissue and fat in the retroperitoneum. Therefore, one had to dissect the retroperitoneal space endoscopically which was time consuming¹⁵. Traditionally, the open route to remove urinary calculi has been via a complete retroperitoneal

approach. This approach was used to mimic the open surgical technique.

The application of balloon dilatation as described by Gaur¹⁶ allowed a safe establishment of the retroperitoneoscopic operating field. Excellent results could be achieved with this method in the first 20 cases of this study. However, in the last 14 cases, a modified technique described by Rassweiler and associates in 1998¹⁷ was used. The index finger is introduced through the 15 mm incision in petit's triangle to peel the peritoneum forward, thus creating a retroperitoneal space which could be widened endoscopically. This method of dilatation of the retroperitoneum was found to reduce the operative time by 10 – 15 minutes. Moreover, this method obviates the mishaps that may occur, if the balloon ruptures. Rupture of the balloon occurred once in this series; as a consequence, the retroperitoneum became edematous and bullous which rendered the procedure very difficult. In this case open surgery was required to complete stone removal.

Gaur claimed that the operative time could be reduced if the Gerota's fascia was incised longitudinally before placement of the balloon because this makes the lumbar ureter readily clear and obvious¹⁶. In this series, the digital

dissection used to dilate the retroperitoneum in the last 14 patients proved to be sufficient for an adequate exposure of the retroperitoneal space.

The disadvantage of the retroperitoneoscopic approach compared to the transperitoneal approach is the smaller surgical field. However, the use of a 30° telescope can compensate for this disadvantage. In addition, the wide longitudinal incision of the renal fascia (described by Rassweiler et al.¹⁷) at the beginning of the procedure helps to enlarge the working space.

A distinct advantage of laparoscopic ureterolithotomy for large upper and middle ureteric stones is the high probability of removing the entire stone in one procedure. This eliminates the risk of leaving a patient with residual fragments in the kidney or the ureter. The success rate in this series was 85.3% which compared favourably with the report of Micali and associates¹⁸ who successfully treated 15 out of 17 patients (88%) via the transperitoneal approach. However, our success rate was lower than that reported by Keely et al.¹⁹ who reported a success rate of 100% in treating 14 patients with upper ureteral stones. This actually reflects the significance of the learning curve in the first experience.

The rate of conversion into open surgery in this series was 14.7% (= 5 out of 34 patients); it mainly occurred in the first 20 cases treated. Rassweiler et al.¹⁷ reported a similar rate; they resorted to open surgery in 14% of their first 50 retroperitoneal procedures. With increasing experience, fewer complications and, thus, fewer conversions into open surgery will be anticipated.

In this series, no major intraoperative complications were encountered. Minor intraoperative complications included high-grade fever in 1 case (2.9%) and prolonged urinary leakage in 2 patients (5.9%). This complication rate is comparable to that reported by other authors¹⁷⁻¹⁹.

With increasing experience, retroperitoneal laparoscopic ureterolithotomy resulted in a more tangible decrease in postoperative morbidity compared to transperitoneal laparoscopic ureterolithotomy and open surgery. This finding was also confirmed by McDougall and Clayman²⁰.

In conclusion, retroperitoneal laparoscopic ureterolithotomy offers an effective alternative to open surgery. However, the success of the procedure will to a great extent depend on the surgeon's experience and the quality of his armamentarium and illumination.

Laparoscopy remains still to be popularized among urologic surgeons to be scheduled routinely in the daily operative lists.

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