Extraperitoneal Versus Transperitoneal Approach of Laparoscopic Ureterolithotomy in Selected Patients

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Objective: *To evaluate laparoscopic ureterolithotomy between extraperitoneal and intraperitoneal approach in patients with failure for Extracoporeal shock wave lithotripsy (ESWL) and endoscopic procedure of stone removal.*

Material and Method: *A retrospective review was performed in 39 patients (40 stone units) underwent laparoscopic ureterolithotomy (extraperitoneal or intraperitoneal approach) in Ramathibodi Hospital between July 1997 and December 2007. The patients who had a large, impacted ureteric stone more than 1.5 cm or after failure of ESWL and endoscopic procedure were included. The data was collected and compared in operative time, estimated blood loss (EBL), duration of retaining drain (days) and complications.*

Results: *The EBL, operative time and duration of retaining drain were 100 cc, 125.8 minutes and 3 days in the extraperitoneal group and 51 cc, 128 minutes and 5.8 days in the intraperitoneal group, respectively. The duration of retaining drain in the transperitoneal group was significant longer than the extraperitoneal group (p = 0.002). The EBL, operative time and complication were not significantly different between the two groups.*

Conclusion: *There does not seem to be a clear advantage to using a transperitoneal versus extraperitoneal approach for laparoscopic ureterolithotomy, depending on physician preference.*

Keywords: *Laparoscopic ureterolithotomy, Extraperitoneal, Intraperitoneal, Outcomes*

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Recently, advancement of ESWL and endourological procedures have decreased the role of open surgery for management of ureteric calculi. The increasing of minimal invasive procedures including laparoscopic ureterolithotomy is an accepted alternative procedure for removal of ureteral stone in a single procedure[1]. Some large ureteric stones pose a significant challenge for modern endourological techniques, often requiring several endoscopic procedures as well as ESWL. In cases of large, hard and impacted ureteric stones after failure of ESWL or endoscopic procedure, the laparoscopic approach is an alternative to open surgery[2,3]. However, route of accessment in laparoscopic ureterolithotomy remains controversial depending on surgeon preferrence. Until now, there has been a small trial comparing extraperitoneal versus intraperitoneal approach, but its result remain controversial. The authors studied the outcomes of transperitoneal and extraperitoneal approach of ureterolithotomy and compared its outcomes in Ramathibodi Hospital.

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Material and Method

A retrospective review was performed of 40 ureteric stone units in 39 patients who required laparoscopic urteolthotomy at Ramathibodi Hospital between July 1997-December 2007. Inclusion criteria were ureteric stones with total stone size $\geq$ 1.5 cm or failure from ESWL (extracorporeal shock wave lithotripsy) or URS (Ureterorenoscopy). Exclusion criteria was those with urteric stone size $\leq$ 1.5 cm. Thirtynine patients were included in the analysis. These patients underwent laparoscopic ureterolithotomy dividing into transperitoneal approach (TLUL) 11 cases, 12 stone units and retroperitoneal approach (RLUL) 28 cases, 29 units stone, at Ramathibodi Hospital,

Thailand. The approach of operation depended on the surgeon preference. The stone burden was defined as the two-dimensional areas determined by measurement of the length and width of the stone on preoperative plain abdominal radiograph. Laparoureterolithotomy was performed under general anesthasia by three urologists who had worked together as a team since 1997. The data collected from medical record included

1. Demographic & clinical features: patient sex, age, previous operation

2. Characteristics of stone: location of stone, stone size

3. Detail of operation: operative time, estimated blood loss

4. Postoperative data: Duration of drainage, length of hospital stay, complications.

Techniques

Transperitoneal approach (Fig. 1). Patients were placed in flank position. Insufflation was performed by open "Hasson" technique. The first 10 mm port was placed at the umbilicus. The authors used three ports arranged in triangle configuration. A 0 degree telescope was used. The second 10 mm port was placed at the ipsilateral midclavicular line. The third 5 mm port was placed in the lower quadrant, about 6-8 cm laterally from the first trocar, as Fig. 1. The 2nd and 3rd port were for working instruments. The first step was reflection of the colon along the white line of Toldt. The next step the authors dissected to find the ureter which lay on psoas muscle and related to the gonadal vein. Then ureteric stone was identified. The ureterotomy incision was made on the stone site, and the stone was extracted by laparoscopic grasper with tenderness. The distal obstruction was ruled out by inserting the feeding tube no. 8 with saline injection. Ureteral incision was closed by interrupted intracorporeal suturing. The tube drain was placed in all patients at the end of the operation.

Extraperitoneal approach (Fig. 2). Patients were placed in full flank position. First incision was made just below the tip of the 12th rib and created space by balloon dilator or applied surgical glove. Subsequently, 10 mm trocar was inserted and pneumo-retroperitoneum was insufflated. A 0 degree telescope was inserted via the first port. The second 10 mm port was introduced under directed vision at two finger breadth above iliac crest in the anterior axillary line. The third 5 mm port was inserted at the junction of lateral border of paraspinal muscle and the 12th rib.

Then the authors dissected to find the ureter and continued the ureterolithotomy using the same technique as the transperitoneal approach.

Statistical analysis

Data entry and analysis were performed with SPSS (Chicago, Ill) version 10.0. Demographic data were summarized using descriptive statistics (mean, standard deviation). Clinical data were compared by using unpaired t-test for normally distributed continuous variables, χ^2 and Fisher's exact test for categorical variables and Mann-Whitney test for nonparametric statistical analysis. Statistical significance was considered when $p < 0.05$.

Results

All patients in both groups had successful stone removal, one patient in the extraperitoneal group

Fig. 1 The position and port sites in transperitoneal approach (picture from Ramathibodi Hospital)

Fig. 2 The position and and port sites of extraperitoneal approach (picture from Ramathibodi Hospital)

Table 1. Compared data between transperitoneal and retroperitoneal group

	Transperitoneal group	Retroperitoneal group	p-value
Age (yr)	42.1	44.2	0.593
Stone size (mm)	17.8	18.2	0.816
Operative time (min)	128.3	125.9	0.877
Duration of drain (days)	5.6	3.1	0.002
Hospital stay (days)	8.8	4.1	<0.001

was converted to open surgery. One patient in the transperitoneal group had two stone units and successful removal bilaterally. The mean operative time 126 minutes in the retroperitoneal group (range 75-270 minutes) and 128 minutes in the transperitoneal group (range 75-180 minutes), these was no significant difference between the two groups. The present study demonstrated significant difference in duration of drainage and length of hospital stay longer in the transperitoneal group (Table 1).

In the aspect of complications, there was one patient in each group with prolonged leakage of drainage, which was corrected by internal diversion with DJ stent. Longterm complications as the authors followed 18 months after the operation found that one patient in the extraperitoneal group had ureteric stricture.

Discussion

In the era of endourology, the large proximal ureteric stone treated by ureteroscope may be difficult, use several sessions, and lower rate of success. The opened ureterolithotomy is the standard treatment for large stone removal in a single operation. The laparoscopic ureterolithotomy is another choice that can substitute opened ureterolithotomy due to its advantage of minimal invasiveness[2,3].

Wickman et al reported the first laparoscopic retroperitoneal ureterolithotomy in 1979. The first transperitoneal laparoscopic ureterolithotomy was performed by Raboy et al in 1992[2] and revealed its advantage in better working space and clearer anatomic landmark[3,4]. However, the transperitoneal approach may compromise the peritoneum because of its need to mobilize the colon, eventually urine may leak into the peritoneal cavity[5-7]. The retroperitoneal approach may be more difficult to approach due to its narrower working space but it still has benefit in the aspect of urine leakage confined in the retroperitoneal space[8-12].

A few previous reports have been performed on transperitoneal approach versus retroperitoneal approach. Feyaerts et al reported 21 transperitoneal ureterolithotomy and 3 retroperitoneal approach. The mean operative time was 140 minutes and 107 minutes in retroperitoneal approach and transperitoeal approach, respectively. Postoperative complications in 2 patients in the transperitoneal group comprised of prolonged ileus and venous thrombosis.

In the present study, the authors collected data from both transperitoneal and retroperitoneal approach which is the largest series to date, the authors successfully removed stones in all cases and found no statistical significant difference in mean operative time, blood loss and stone size among two approaches. But the authors found that the duration of drain and hospital stay were significantly longer in the transperitoneal approach. In the surgeon's opinion, the prolonged leakage of urine is not associated with prolonged ileus in patients who underwent transperitoneal ureterolithotomy. However, limitation of the present study is that the authors didn't prove the content of drain whether it was urine or not. One patient in the transperitoneal group had postoperative prolonged urine leakage and ultimately the authors performed internal urinary diversion. One patient in the retroperitoneal approach, even with proper technique of suturing, urine still leaked for more than 7 days may be from prolonged impaction of stone[4,9], chronically inflamed and friable after infection.

For optimal outcomes, the authors suggest 3 techniques that can be used. One, in case of severe infection or prolonged impaction of stones, the DJ stent should be placed postoperatively for internal urinary diversion. Two, the ureteral incision could be closed with mucosa to mucosa (water-tight technique). Three, insert a feeding tube into the ureter via the laparoscopic port and inject normal saline to prevent undetected distal obstruction as open ureterolithotomy.

In case of prolonged leakage of drain, the authors suggest prooving its content by sending the content for creatinine. If the content is not urine, the drain can be off and discharge the patient. Although, the transperitoneal approach seems to prolong the drainage, the learning curve of this method is shorter than the retroperitoneal approach and suitable for the beginner[13,14].

Conclusion

Laparoscopic ureterolithotomy may be another choice in some suitable cases, due to its advantage in aspects of postoperative pain, short hospital stay and cosmetic result. There is no clear advantage between retroperitoneal and transperitoneal approach for laparoscopic ureterolithotomy. The use of both techniques mainly depend on surgeon preference. Further randomized studies are still to be investigated.

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การศึกษาเปรียบเทียบผลของการผ่าตัดนิ่วบริเวณท่อไตด้วยกล้อง ผ่านทางผนังหน้าท้องระหว่างการใช้กล้องผ่านทางช่องท้อง (Transperitoneum) และกล้องที่ผ่านทางหลังช่องท้อง (Extra peritoneum)

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วัตถุประสงค์: *เพื่อศึกษาเปรียบเทียบผลของการผ่าตัดรักษานิ่วท่อไต โดยการส่องกล้องผนังหน้าท้อง (Laparoscopic Ureterolithotomy) ซึ่งมี 2 ช่องทาง (approach) คือ 1) การส่องกล้องเข้าช่องท้อง (Transperitoneal approach) และ 2) ภายนอกช่องท้อง (Extra peritoneal approach)*

วัสดุและวิธีการ: *เป็นการเก็บข้อมูลผู้ป่วยในโรงพยาบาลรามาธิบดี ตั้งแต่เดือน กรกฎาคม พ.ศ. 2540 ถึงธันวาคม พ.ศ. 2550 ซึ่งเป็นนิ่วบริเวณท่อไต ซึ่งมีขนาดใหญ่มากกว่า 1.5 เซนติเมตร หรือนิ่วท่อไตที่ประสบความล้มเหลวในการรักษาจากการสลายนิ่วด้วยคลื่นเสียง (ESWL) หรือ การส่องกล้องผ่านท่อไต (URS) แยกผู้ป่วยในการเก็บข้อมูลเป็น 2 กลุ่ม ตามเทคนิคของการเข้าผ่าตัดคือ 1) การส่องกล้องผ่านช่องท้อง (Transperitoneal approach) 2) การส่องกล้องผ่านนอกช่องท้อง (Extraperitoneal approach) ผลข้อมูลจากการผ่าตัดเก็บรวบรวมในด้าน 1) ปริมาณการเสียเลือด (ลูกบาศก์เซนติเมตร) 2) ระยะเวลาในการผ่าตัด (นาที) 3) ระยะเวลาในการใส่ท่อระบายเลือด (วัน) โดยนำมาเปรียบเทียบกันระหว่าง 2 เทคนิค*

ผลการศึกษา: *จากการศึกษาเก็บข้อมูลเปรียบเทียบการผ่าตัดนิ่วท่อไตด้วยกล้องผ่านช่องท้อง (Trans peritoneal approach) และนอกช่องท้อง (Extra peritoneal approach) พบว่าปริมาณการเสียเลือด (cc) = 51:100 ระยะเวลาในการผ่าตัด (นาที) = 128:125, ระยะเวลาที่ใส่ท่อระบายเลือด (วัน) = 5.8:3 จะเห็นได้ว่าระยะเวลาการใส่ท่อระบายเลือดจะยาวนานกว่าในผู้ป่วยที่เข้ารับการผ่าตัดแบบส่องกล้องผ่านช่องท้อง (Trans peritoneal approach) อย่างมีนัยสำคัญ ($p = 0.002$) ส่วนเรื่องระยะเวลาการผ่าตัดการสูญเสียเลือดระหว่างผ่าตัดไม่แตกต่างอย่างมีนัยสำคัญ นอกจากนี้พบว่า ปัญหาแทรกซ้อนที่พบได้ไม่แตกต่างกันในแต่ละกลุ่ม*

สรุป: *การรักษานิ่วบริเวณท่อไตที่มีขนาดใหญ่มากกว่า 1.5 เซนติเมตร หรือนิ่วท่อไตที่ล้มเหลวจากการรักษาด้วยคลื่นเสียง(ESWL) หรือ การส่องกล้องผ่านท่อไต (URS) โดยใช้การผ่าตัดด้วยกล้องผ่านผนังหน้าท้องไม่ว่าจะเป็นการส่องกล้องผ่านช่องท้องหรือนอกช่องท้อง พบว่าได้ผลการรักษาที่ดีทั้ง 2 อย่างใกล้เคียงกันโดยขึ้นอยู่กับความถนัดของศัลยแพทย์ผู้นั้น*