Laparoscopic Ureterolithotomy for Upper Ureteric Calculi

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Abstract

Laparoscopic ureterolithotomy was performed on 10 patients with upper ureteric stones indicated for open ureterolithotomy after failed prior minimally invasive approaches. Stone size ranged from 7 to 15 mm. (mean 9.3). The routes of approach were all done transperitoneally except in one case in which the retroperitoneal route was initially attempted and later converted to transperitoneal route due to contracted space and unclear landmarks. Stones were all removed successfully with the operating time ranging from 120 to 270 min. (mean 181.5). The only significant complication encountered was urine leak interval postoperatively which were long in 4 patients in whom ureterotomy was not sutured. The longest urine leak interval was seen in a patient whose ureterotomy was neither sutured nor stented. Postoperative pain was rewarding in that seven patients required a single dose of 50 mg of pethidine, two required only oral paracetamol and one required no analgesic at all. Postoperative hospital stay ranged from 5 to 23 days which was actually overwhelmed by urine leak complication. Recovery period was satisfactory which ranged from 10 to 28 days (mean 18.1). Overall laparoscopic ureterolithotomy offers an alternative procedure to open ureterolithotomy with the advantages of minimal postoperative pain and short recovery period.

Key word : Ureteral Calculi, Laparoscopy, Ureterolithotomy

Before the development of endourology, most ureteral calculi were managed by open ureterolithotomy. With the introduction of extracorporeal shock wave lithotripsy (SWL) and improved endourological techniques, such as percutaneous nephrolithotomy (PCNL) and ureteroscopy, the need for open ureterolithotomy has markedly decreased. However, there remain some ureteral calculi such as large, hard impacted, obstructing and especially stones in the upper part of the ureter, which are refractory to minimally invasive approaches. Although percutaneous approach can be performed to reach

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some upper ureteral stones, however, this method with rigid nephroscope usually has not been successful in the stones located below the ureteropelvic junction. In addition, some centres have neither a SWL machine with fluorosope localization nor flexible endoscope and therefore, have less capacity in terms of minimal invasive approach to treat stones located in the mid and upper ureter. For these reasons, open ureterolithotomy is still neccessary in many circumstances.

Laparoscopic urologic surgery has evolved and expanded over the last seven years. Apart from laparoscopic lymphadenectomy[1], laparoscopic nephrectomy[2] and a number of different ureteric procedures, there were also small series of laparoscopic ureterolithotomy reported by many authors [3-9]. This series is an initial report of laparoscopic ureterolithotomy performed in patients whose indication was open ureterolithotomy.

PATIENTS AND METHODS

Laparoscopic ureterolithotomy was performed on seven men and three women with an age range of 24-56 years (mean 41.2) between 1993 and 1997. All stones were in the upper ureter of which four were on the right and six were on the left. The stone size ranged from 7 to 15 mm. (mean 9.4). The stones were all above the pelvic brim. The indications were large and impacted stones (4 cases), and stones that were refractory to stone push attempt and also unlilkely to be managed successfully by PCNL (6 cases). It was noted that the indication was alternative to open ureterolithotomy. All patients had hydronephrosis the degree of which was mild, moderate and severe in three, six and one patient respectively.

The patient data and operation details are shown in Table 1. It was noted that the approach of the third patient was initially retroperitoneal, however, this was finally converted to a transperitoneal approach due to restricted space and poor anatomical orientation. Therefore, the transperitoneal approach was solely used for the remaining cases. After general anesthesia was introduced, the patient was placed in a lithotomy position and a ureteral stent was passed up to the stone without any attempt to pass beyond the stone in order to prevent the possibility of perforation in particularly impacted stones. The patient was then turned to the full flank position and the first trocar was inserted by open technique lateral to rectus muscle at the level of the umbilicus. After the trocar was successfully inserted, pneumoperitoneum was established and a telescope was introduced to inspect the peritoneal cavity. Afterwards, the second and third trocar were inserted under vision above and below the first port at the midclavicular line level (Fig. 1). The fourth port, if necessary, was placed at the anterior axillary line which was normally between the second and third port. Ten mm. trocar was used in all ports for flexibility in using various instrumentations. The colon was reflected medially and the ureter was usually identified at the pelvic brim and then was traced in cephalad direction to the stone which was identified

Table 1. Patient data and operation details.

case number	stone size (mm.)	stone site (lumbar level)	route of approach	ureterotomy sutured	condition stent	operation time (min.)	urine leak (day)
1.	8	L 4	TP	no	yes	180	7
2.	10	L 5	TP	no	yes	165	9
3.	8	L 3-4	RP+TP	no	no	240	22
4.	13	L 3-4	TP	no	yes	165	7
5.	8	L 3-4	TP	yes	yes	210	5
6.	7	L 3	TP	yes	yes	150	4
7.	7	L 2-3	TP	yes	yes	270	5
8.	15	L 4-5	TP	yes	yes	180	2
9.	8	L 3	TP	yes	no	120	3
10.	10	L 4-5	TP	yes	yes	135	2
	mean 9.4± 2.7					mean 181.5± 46.6	mean 6.6± 5.9

TP = transperitoneal , RP = retroperitoneal

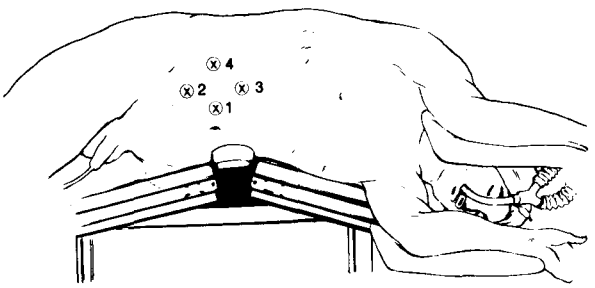

Fig. 1. Port position : 1st port at the level of umbilicus just lateral to rectus muscle, 2nd and 3rd port at midclavicular line above and below umbilicus, 4th port (if needed) at anterior axillary line between the 2nd and 3rd port.

by a bulge, and sometimes with the aid of ureteric catheter manipulation from below. The ureter was cauterized longitudinally over the stone with low current diathermy electrode applied in the first place and then was opened sharply by an endoscopic knife, and the stone was then removed with spoon forceps. Stones were removed from the abdomen with spoon forceps in all cases except in one large stone (15 mm.) which was initially placed in a small plastic bag and was removed *via* port wound at the end of the procedure. The stents could not be placed in two cases (case number three and nine in Table 1) due to dislodgement of the stents inserted at the beginning of the operation, and the stents could not be passed up to the ureterotomy again. The ureterotomy was closed in the last six cases with one or two interrupted 4-0 chromic cat gut sutures. The rubber tube drain was placed through the lateral port under vision and the port wounds were closed in layers with 2-0 polyglycolic acid sutures. Oral intake was resumed when bowel sound was present which was normally on the next day. The tube drain was removed when urine leakage ceased or was minimal and then the patient was discharged home. All patients were followed at 1, 3 and 6 months. Time to return to normal work was recorded and intravenous urography was repeated at 6 months postoperatively.

RESULTS

Laparoscopic ureterolithotomy was performed successfully in all cases. The operative time ranged from 120 to 270 min. with the mean of 181.5. There were three cases (3rd, 5th and 7th) which took significant longer operative time than others. In patient number three, much time was spent in retroperitoneal access which was frustrating due to restricted space and poor anatomical landmarks, and finally converted to transperitoneal route. It took considerable time in patient number five to find the lost needle during suturing of the ureterotomy and the needle was finally found between the bowel loop and was removed. The seventh case which took the longest time (4.5 hours) was quite an obese patient (80 kgs) and the ureter was surrounded by bulk of fat which caused nuisance bleeding while searching for it. There was no serious complication although the duration of urine leakage was rather long which ranged from 2 to 22 days with the mean of 6.6. The first four cases of which ureterotomies were not closed had a longer period of urine leakage than the last six cases of which the uretertomies were closed. The longest urine leakage interval was in patient number three whose ureterotomy was neither stent nor sutured. The stent reinsertion was attempted on the 7th day of leakage but failed, and percutaneous nephrostomy was not performed due to the lack of hydronephrosis. The patient did well and urine leakage ceased finally by conservative treatment. Among 10 patients, seven required only a single dose of 50 mg of pethidine, two required only oral paracetamal and one required no analgesic at all. Postoperative hospital stay ranged from 5 to 23 days (mean 9.2). The recovery period to resume normal work ranged from 10 to 28 days with the mean of 18.1. Hydronephrosis was resolved at least to some degree in all cases (Fig. 2). Wound scar was cosmetically acceptable to all patients (Fig. 3).

DISCUSSION

Presently most ureteral calculi are treated by SWL, ureteroscopy and percutaneous nephrolithotomy which have markedly decreased the morbidity. The distal ureteral stones can be managed endoscopically with the success rate approaching 100 per cent. However, the managment of the upper ureteral calculi depends on facilities and expertise, and centres that have full facilities (such as those with a SWL machine with fluoroscopic localization, flexible endoscopic instruments together with powerful lithotriptors) could basically manage upper ureteric stones better than centres that have limited facilities. Therefore, the indication for open ureterolithotomy in the upper ureteral calculi varies from

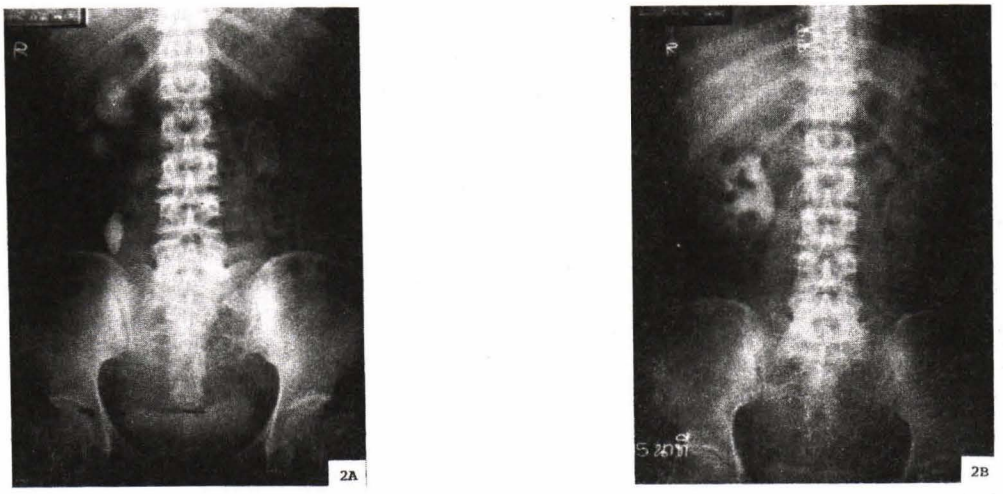

Fig. 2. Case 8. A. Preoperative intravenous urography, B. Postoperative intravenous urography at 6 months.

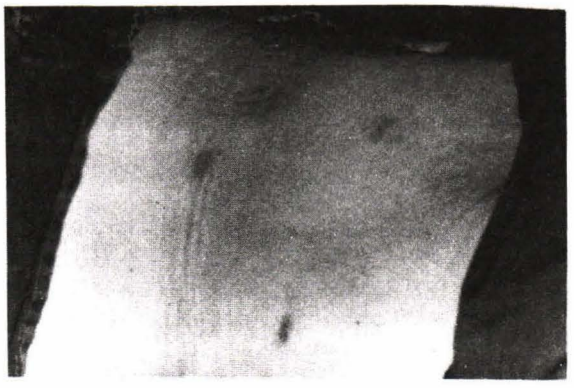

Fig. 3. Case 8. Minimal wound scar appearance 6 months postoperatively.

centre to centre but most are stones that failed, or likely to fail from available minimal invasive approach. Of 10 cases which adopted laparoscopic ureterolithotomy in this series, four were patients with large and impacted stones which obviously indicated open ureterolithotomy, and six were patients with stones that failed to push up and were unlikely to be managed by PCNL with rigid nephroscope. Actually the stones in the latter group could possibly have been managed by *in situ* SWL (SWL machine with fluoroscopic localization) or flexible endoscopic instruments. Unfortunately, our centre only has a SWL machine with ultrasound localization, and has neither a flexible nephroscope nor a flexible ureteroscope, therefore, all these upper ureteral stones needed to be removed by surgical ureterolithotomy.

Laparoscopic ureterolithotomy has been reported in some series with technical feasibility. Not only can they provide the same result as open surgery in terms of removing the stone, but also achieve the advantage of less morbidity and shorter convalescent period[3-9].

Having elected for laparoscopic ureterolithotomy, the decision to approach by transperitoneal or retroperitoneal is according to the individual. Most series of laparoscopic ureterolithotomy were performed transperitoneally[3,4,6,8,9] while the retroperitoneal route was the approach of choice by Gaur[5,7]. Basically with the transperitoneal approach, the working space is maximum and the anatomical landmarks are easier to identify. However, the retroperitoneal route is better if there is urine leakage and the chance of late complication such as bowel adhesion is considered. Harewood et al performed laparoscopic ureterolithotomy on 9 patients, 3 of which were done initially *via* the retroperitoneal route, but two failed and were converted to the transperitoneal route successfully[8]. The retroperitoneal approach was also attempted in one case in our series and the approach needed to be converted to the transperitoneal route due to contracted space and disorientation of the anatomical landmarks.

Two points concerning urine leakage are stenting of the ureter and suturing the ureterotomy after the stone is removed. There is no doubt that the ureteral stent will provide drainage of urine across the ureterotomy and allow proper healing around it. This was confirmed by many series in which the stents were always inserted and no problem of prolonged urine leakage was reported even though some ureterotomies were not sutured(3-9). These two points may be synnergistic in this series as patient number three whose ureterotomy was neither stented nor sutured had the longest urine leakage period and patient number nine had only 3 days of urine leakage, while the ureterotomy was sutured but not stented. In addition, the period of urine leakage was shorter in the group whose ureterotomies were sutured.

Analgesic requirement in this series was small, two patients needed only oral paracetamal to relieve pain, and remarkably one patient required no analgesic at all. The postoperative recovery period was also short and comparable to the report by Micali(9). This confirmed the advantage of laparoscopic surgery over open surgery.

In conclusion, laparoscopic ureterolithotomy is feasible in patients with an upper ureteric stone which failed or was likely to fail from an available minimally invasive procedure. Apart from the urine leakage problem which should be overcome by proper stenting and suturing of the ureterotomy after the stone has been removed, laparoscopic ureterolithotomy offers a safe and effective alternative treatment to open ureterolithotomy with the advantages of minimal postoperative pain and short recovery time.

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การผ่าตัดนิ่วในท่อไตส่วนบนโดยการเจาะผ่านผิวหนัง

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ผู้ป่วยโรคนิ่วในท่อไตส่วนบนทั้งสิ้น 10 ราย ที่มีข้อบ่งชี้สำหรับการทำผ่าตัดเปิด (open ureterolithotomy) เพื่อเอานิ่วออกจากท่อไต หลังจากล้มเหลวจากการพยายามรักษาโดยวิธีอื่นที่รุนแรงน้อยกว่าการผ่าตัดเปิด ในที่สุดผู้ป่วยดังกล่าวได้รับการผ่าตัดเอานิ่วออกโดยวิธีเจาะผ่านผิวหนัง (laparoscopic ureterolithotomy) แทนการผ่าตัดเปิดโดยเป็นการเจาะผ่านช่องท้อง (transperitoneal approach) ทั้งหมด ยกเว้นในผู้ป่วย 1 ราย ที่เริ่มจากการเจาะผ่านหลังช่องท้อง (retroperitoneal approach) แต่ได้รับการเปลี่ยนเป็นเจาะผ่านช่องท้องในที่สุด เนื่องจากเนื้อที่ในการผ่าตัดน้อย และลักษณะกายวิภาคที่เห็นไม่ชัดเจน การผ่าตัดได้รับผลสำเร็จทุกราย ระยะเวลาการผ่าตัดมีตั้งแต่ 120 ถึง 270 นาที (เฉลี่ย 181.5) มีข้อแทรกซ้อนที่สำคัญคือ มีระยะเวลาที่น้ำปัสสาวะรั่วซึมจากแผลผ่าตัดในผู้ป่วย 4 รายซึ่งนานกว่าปกติ โดยมีระยะนานที่สุดในผู้ป่วยที่แผลที่ท่อไตไม่ได้รับทั้งการเย็บปิดและใส่ท่อระบายไว้ในท่อไต ความเจ็บปวดหลังการผ่าตัดน้อยเป็นที่น่าพอใจ โดยมีผู้ป่วย 7 รายที่ใช้ยาฉีด pethidine เพียง 1 ครั้ง, ผู้ป่วย 2 ราย ได้รับเพียงยา paracetamal รับประทานบรรเทาปวดเท่านั้น และมีผู้ป่วย 1 ราย ไม่จำเป็นต้องได้รับยาแก้ปวดเลย ระยะเวลาในการอยู่โรงพยาบาลมีตั้งแต่ 5 ถึง 23 วัน ซึ่งมีอิทธิพลจากการที่มีข้อแทรกซ้อนของการรั่วของปัสสาวะ ระยะเวลาการฟักฟื้นหลังผ่าตัดจนกระทั่งพอทำงานปกติได้ มีตั้งแต่ 10 ถึง 28 วัน (เฉลี่ย 18.1) โดยสรุปการผ่าตัดนิ่วในท่อไตส่วนบนโดยวิธีเจาะผ่านผิวหนัง สามารถใช้เป็นทางเลือกอีกทางหนึ่ง นอกจากการผ่าตัดเปิด โดยมีข้อดีคือ การเจ็บปวดหลังผ่าตัดน้อย และระยะเวลาในการฟักฟื้นสั้น

คำสำคัญ : นิ่วในท่อไต, การผ่าตัดโดยการเจาะผ่านผิวหนัง

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