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Review Article

Chain of Stones in Distal Ureter: Is there any Role of Open Ureterolithotomy in Era of Endourological Intervention?

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Keywords Open ureterolithotomy; ureteric stones; ureteroscopy

Key Messages Open ureterolithotomy still has a role in a management of multiple distal ureteral stone with large stone bulk that are not amenable to ureteroscopy, SWL or laparoscopic ureterolithotomy

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Abstract

Aim: To highlight the role of open ureterolithotomy in the management of ureteral stones in the era of minimally invasive therapies.

Material and Methods: Between January 2008 and August 2014, 18 patients (mean age 38.7 years) with multiple impacted mid and lower ureteral stones with large stone bulk (mean size 7.8 cm, mean number of stones- 6.3) and normal renal function underwent open ureterolithotomy. Ten patients had stones on left side and the remaining eight had on the right side.

Results: The open extraperitoneal ureterolithotomy was successful with complete clearance in all cases. The mean operating time was 63.7 minutes (range 56–82 minutes). The mean blood loss was 89.5 ml (range 67-102 ml) with a mean hemoglobin drop of 0.82g/dL (range 0.5-1.1 g/dl). Mean dose of diclofenac required in post-operative period for pain relief was 187.3 mg. Prolonged urine leakage from drain occurred in one patient and post-operative fever occurred in two patients. The mean hospital stay was 3.6 days. The mean convalescence period was 12.3 days. No major intraoperative or post-operative complications were observed. All patients were stone free, asymptomatic and without stricture formation or obstruction after mean follow-up period of 29.3 months.

Introduction

With the advent of endoscopy, management of ureteral stones by ureteroscopy and laparoscopy led to apromptdecrease in the use of open approach [1] in 1982, Chaussy et al [2] introduced Shock Wave Lithotripsy (SWL), which is currently most extensively used for ureteral stone disease. This further reduced the indications for open ureterolithotomy. Open ureterolithotomy is now a second or third line option for treatment of ureteral stones. At fully equipped centres with expertise in surgical stone management, the rate of open surgery has been reported to be1.0 to 5.4% [3-6]. However, open surgery for ureteral stones may still be needed for multiple impacted ureteral stones with large stone bulk that are treated poorly by minimally invasive methods [3,7,8].

Subject and Methods

This retrospective study was done from January 2008 to August 2014. Eighteen patients were included (11men and 7 women), mean age 38.7 years (range 21-56 years) with multiple, impacted ureteral stones, large stone bulk with mean size of 7.8 cm (range 6.5-9.7 cm) and mean number of stones 6.3 (range 5-9). All patients had stones in mid and lower ureter i.e. located between upper end of sacroiliac joint and ischial spine (Figure 1). All patients had marked ipsilateral hydroureteronephrosis. Ten patients had stones on left side and the remaining eight had on the right side. One patient had multiple ureteral stones on right side with associated bilateral renal stones, single stone in left ureter and single bladder stone (Figure 2). All patients had normal renal-function test (normal serum urea and creatinine). All patients underwent X-ray Kidney, Ureter and Bladder (KUB), abdominal ultrasound and Intra Venous Urograms (IVU). On IVU, the ipsilateral kidney was excreting and the ureter was dilated upto the stone. Patients who were excluded hadeither non-excreting ipsilateral kidney on IVU, or raised serum creatinine (>1.4mg/dl).

Surgical Technique

A KUB film was done just before the procedure to reconfirm the location of stones. The patient was placed in supine position. Oblique muscle cutting Gibson incision was given in lower quadrant. All three muscle layers were divided with cautery along the line of incision. Entry into retro peritoneum was made by pushing the peritoneum medially. The ureter was identified where it crossed the iliac vessels. Ureter was dissected towards the bladder and stabilised above and below with vessel loop. Ureterotomy was done by giving longitudinal incision on stones and removal was done by stone removal forceps. Most distal stones were removed by milking the stones proximally. In case this failed, a second ureterotomy was made followed by removal of distal stones. Patency of

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Figure 1: X-ray KUB (Kidney, Ureter and Bladder) showing multiple (nine) stones in left mid and lower ureter.

the ureter was assured by placement of infant feeding tube distally. Stent was not placed and ureterotomy was closed with 3-0 polyglactin interrupted suture. Haemostasis was achieved and drain was placed. Wound was closed in layers. Plain X-ray film and ultrasound KUB (Kidney, Ureter and Bladder) was obtained on day 1 to confirm complete clearance of stones. The drain was removed on postoperative day 2 if there was no urine leakage. (Figure 3) shows chain of stones which was removed from right ureter of a patient whose X-ray is shown in (figure 2).

Figure 2: X-ray KUB showing multiple (six) stones in right mid and lower ureter; with single stone in left lower ureter, single bladder stone and bilateral renal stones.

Figure 3: Photograph of stones removed from the patient whose X-ray KUB is shown in figure 2.

Results

Open extraperitoneal ureterolithotomy was successful with complete clearance in all cases. One patient who had multiple ureteral stones on right side with bilateral renal stones, single stone in left ureter and single bladder stone underwent transurethral cystolitholapaxy and left side ureteroscopic stone removal in the first sitting, followed by open ureterolithotomy of right multiple impacted ureteral stones in second sitting and sequential percutaneous nephrolithomy for bilateral renal stones in the third sitting. The mean operating time was 63.7 minutes (range 56-82 minutes). The mean blood loss was 89.5 ml (range 67- 102 ml) with a mean hemoglobin drop of 0.82g/dL (range 0.5- 1.1 g/dl). Mean dose of non-steroidal anti-inflammatory drug (diclofenac) required in post-operative period for pain relief was

Table 1: Baseline and post-operative parameters of all patients.

Parameters	Value
No of patients (n)	18
Age (in years) Mean (range)	38.7 (21-56)
Sex Male (n) Female (n)	 11 (61.2%) 07 (38.8%)
Laterality Right (n) Left (n)	 08 (44.5%) 10 (55.5%)
Size stones (in cm) Mean (range)	7.8 (6.5-9.7)
No of stones Mean (range)	6.3 (5-9)
Failed attempt of ureteroscopy (n) Previously attempted laparoscopic ureterolithotomy (n) Failed attempt of shock wave lithotripsy (n)	4 (22.2%) 5 (27.8 %) 2 (11.1%)
Operating time (min) Mean (range)	63.7 (56-82)
Blood loss (in ml) Mean (range)	89.5 (67-102)
Post-operative hemoglobin decline (in g/dl) Mean (range)	0.82 (0.5-1.1)
Dose of post-operative diclofenac Mean (range)	187.3 (150-262.5)
Post-operative fever (n)	2 (11.1%)
Prolonged urine leakage (n)	1 (5.5 %)
Hospital stay (in days) Mean (range)	3.6 (2-4)
Post-operative convalescence period (in days) Mean (range)	12.3 (10-13)
Follow up (in months) Mean (range)	29.3 (7-43)

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187.3 mg (range 150 - 262.5 mg). Prolonged urine leakage from drain occurred in one patient which lasted for 8 days and was managed by DJ stenting with antibiotic coverage. Postoperative fever occurred in two patients (lasted for 2 days) who responded to antipyretics and antibiotics. The mean hospital stay was 3.6 days (range 2-4 days). The mean convalescence period was 12.3 days(range 10-13 days). No major intraoperative or postoperative complications were observed. Laparoscopic ureterolithotomy was tried in five patients but was successful in removing stones from proximal half of distal ureter only (3 stones in three patients and 4 stones in two patient). Ureteroscopy was tried in 4 patients but we were unable to achieve clearance in a single sitting. Two patients underwent SWL on distal most stone (two sessions). However, stone fragmentation could not be achieved. These patients underwent open ureterolithotomy 1 week later. The results aresummarized in [Table 1] the mean follow-up period was 29.3 months (range 7-43 months). Follow-up was done by abdominal ultrasonography and plain films after 6 weeks and intravenous urography after 3 months. All patients were stone free, asymptomatic and without stricture formation or obstruction. There was no renal function deterioration in the postoperative period.

Discussion

SWL and ureteroscopy are undoubtedly the best treatment modalities for ureteral stones. These are minimally invasive and hence less morbid. However, 2-7% cases of ureteral calculi treated with ureteroscope may require reintervention [9,10] literature reports a success rate of SWL as 74-82% and retreatment is required in about 12-27% of cases [10-12]. Therefore, for ureteral stones requiring more than one ureteroscopic intervention or multiple sessions of SWL, removal of stones in single surgery may be a valid option [13]. This can be achieved by laparoscopic or open ureterolithotomy. In our series, ureteroscopic intervention and SWL had failed in 4 and 2 patients respectively.

Laparoscopic ureterolithotomy is best out of both as it provides the benefits of SWL along with those of endourological procedures such as low morbidity, less postoperative pain and short hospital stay [14] still it is not an alternative to ureteroscopic procedure or SWL. It only provides a reasonable option when these techniques fail or are unsuitable. In some casescomplete clearance with laparoscopic ureterolithotomy may be difficult to achieve when there are multiple impacted ureteral stones with large stone bulk (> 3 cm^2). According to American urological association/European association urology 2007 Guidelines for the Management of Ureteral Calculi, laparoscopic ureterolithotomy is somewhat less successful in the distal ureter than in the middle and proximal ureter [11,15] in our series, laparoscopic ureterolithotomy had been tried in five patients but we were unable to remove stones from the most distal part of ureter because there was difficulty in milking the stones proximally and also it was difficult to access distal ureter with laparoscopy.

Laparoscopic ureterolithotomy or ureteroscopic intervention was done in patients treated during first half of the study period. However, all these patients required open ureterolithotomy for complete stone clearance. We think that these patients will be best managed by open extraperitoneal ureterolithotomy as it gives complete clearance in single sitting with acceptable morbidity. Hence, we directly offered open ureterolithotomy to the patients treated in second half of study period. Prolonged urine leakage was observed in one patient for 8 daysand was managed by DJ stenting with antibiotic coverage. However, this leakage of urine into retroperitoneum was drained out of the body via drain and hence did not add to morbidity. Literature regarding stenting the ureter after stone removal and suturing the ureterotomy is still controversial. Some authors neither close the ureterotomy, nor stent the ureter, but still have favourable results [16]. The urine leakage through drain becomes critical if there associated distal obstruction. If the distal ureter is patent (as in our study), the leakage tends to decrease and stops over sometime. In our study, ureterotomy was closed in all patients without stenting the ureter.

Open ureterolithotomy can be considered in cases where simultaneous open surgery is needed for another purpose, in high-risk patients restraining general or major regional anaesthesia, associated long-segment ureteral stricture, difficulty in patient positioning for minimally invasive procedure, poor expertise in endoscopy or large stone burden demanding single procedure [15,17,18].

Conclusion

We conclude that in modern era, open ureterolithotomy still has a role in the management of multiple distal impacted ureteral stones with large stone bulk that are not amenable to ureteroscopy, SWL or laparoscopic ureterolithotomy.

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