

Open mini-access ureterolithotomy: the treatment of choice for the refractory ureteric stone?

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OBJECTIVE

To report the experience in one centre of the efficacy and safety of open mini-access ureterolithotomy (MAU) and to discuss relevant current indications.

PATIENTS AND METHODS

MAU was undertaken in 112 patients (mean age 38 years, range 26–57) between 1991 and 2001; the details and outcomes are reviewed. The mean (range) stone size was 12 (8–22) mm, with 30 stones in the upper, 69 in the mid- and 13 in the lower ureter. In 15 cases the stones were impacted and there were signs of infection in the proximal ureter.

RESULTS

MAU was successful in 111 patients; the one failure was caused by proximal stone migration early in the series. The mean (range) operative duration was 28 (10–44) min and the hospital stay 42 (24–72) h; 33 patients were in hospital for 24 h, 72 for 48 h and seven for 72 h. The blood loss was minimal, at 50 (30–150) mL. The drain was removed after 5 (5–7) days. Patients reported using opioid or nonsteroidal anti-inflammatory analgesia for a mean of 4 (1–7) days after surgery. The mean time to resumption of work was 16 (8–35) days.

CONCLUSIONS

MAU is a safe and reliable minimally invasive procedure; its role is mainly confined to salvage for failed first-line stone treatments but in selected cases, where a poor outcome can be predicted from other methods, it is an excellent first-line treatment.

KEYWORDS

mini-access, ureterolithotomy, technique, complications, indications, surgeon

INTRODUCTION

Until the early 1980s open stone surgery (OSS) was considered the reference standard for treating renal and ureteric stones which required intervention. With the advent of ESWL and the various endourological stone-breaking and grabbing techniques, OSS has been supplanted as the first choice of treatment in the developed world [1]. However, OSS continues to be important in treating stones that are refractory to these minimally invasive methods [2,3]. It remains the technique with the highest success rate for removing the complete stone at one sitting [4], and in many parts of the developing world it is the only option for treating stone disease.

Recently there were reports advocating laparoscopic ureterolithotomy as the initial salvage procedure for difficult stones [5,6]. This method is technically demanding even for the experienced retroperitoneal laparoscopic surgeon. It requires specialized and relatively expensive equipment, and long operating times. Training is difficult as there are few such patients, and this option requires

significant training and experience before good results can be obtained [7].

We contend that by refining the technique of OSS to an almost 'percutaneous' approach, better and more cost-effective results are easily attained. This is achieved using an operating loupe ($\times 2.5$), a fibre-optic headlight, and adapted narrow and deep retractors, in a procedure which we term mini-access ureterolithotomy (MAU).

PATIENTS AND METHODS

MAU was used in 112 patients (mean age 38 years, range 26–57) between 1991 and 2001; the mean (range) stone size was 12 (8–22) mm, with 30 stones in the upper, 69 in the mid- and 13 in the lower ureter. In 15 patients the stones were impacted and there were signs of infection in the proximal ureter. Surgery was conducted with the patient under general anaesthesia; the patient's position on the table and the surgical approach are determined by the location of the stone on preoperative plain films. This varies from a subcostal flank approach (Fig. 1) for the upper and mid-ureteric stone, to a

modified (skin-crease) Gibson incision (Fig. 2) for the distal ureteric stone [8].

A 4 cm skin incision is used with a muscle-splitting approach to the ureter. In the standard flank approach, the peritoneum is mobilized anteriorly and the psoas muscle located. The ureter is identified on this muscle or adherent to peritoneum, and clamped with tissue forceps proximal to the stone to prevent dislocation. It is then opened longitudinally directly onto the stone with a 1-cm incision (depending on stone size) and the stone removed. The ureterotomy is left unsutured and an 18 F nasogastric tube placed as a drain in the retroperitoneal space; the ureter is not stented. One length of #0 polydioxanone suture is used to close the muscle layers and a 2/0 polypropylene subcuticular suture used to close the skin. The patient is discharged on the following day and the drain removed on about the fifth day during the ward review.

RESULTS

MAO was successful in 111 cases; it failed in one patient when the stone migrated

FIG. 1. The flank approach for upper stones.



FIG. 2. The lower quadrant approach for lower stones.



proximally. This occurred early in the series when the technique was still being developed. The mean (range) operative duration was 28 (10–44) min, and was longer when the stone was in the very distal ureter. Five patients had nausea and three both nausea and vomiting, and avoided oral intake until the following morning. The remaining patients were allowed a light diet and fluids on the evening of the operation.

The incision length was 4.0–5.2 cm; >75% of the patients had an incision of <4.5 cm. The mean hospital stay was 1.9 days; 33 patients were in hospital for 24 h, 72 for 48 h and seven for 72 h. The main reasons for delayed discharge were social. As with most muscle-splitting approaches, blood loss was minimal, at a mean of 50 mL. The drain was removed after 5 days; in seven patients this was prolonged to 7 days because of excessive leakage of urine.

The patients' requirement for analgesia varied, with most requiring NSAIDs for a mean of 4 days after surgery; 24 opted for opioid analgesia and 13 required both, but only for 2 days, after which a single drug was sufficient. Paracetamol was prescribed in all

suitable cases to reduce the requirement for stronger analgesia. The mean (range) time to resuming work was 16 (8–35) days.

Complications were few and minor in all cases (bleeding and haematoma formation in two, wound infection in three, prolonged drainage in seven and ileus in three). The bleeding and haematoma required no re-operation, resolving with conservative management. No blood transfusions were given. The wound infections were in patients with impacted stones, one also being diabetic, and resolved on antibiotics. The mild ileus resolved with no need for nasogastric drainage or excessive fasting.

DISCUSSION

There is little question that the first-line treatment for routine ureteric stone disease should be either ESWL or endourological [1]. However, there are limitations to these procedures. The effectiveness of ESWL is increasingly limited as the stone size increases, and it may be limited by the type of imaging locator used. Certain stone types are exceedingly difficult to break using conventional treatments, although predicting which are the difficult stones is presently unreliable [9]. This leads to multiple treatments, which increases cost and time lost from work.

Holmium:YAG lithotripsy combined with the flexible ureteroscope has become a formidable method for treating ureteric stones [10]. Stone-free rates of >97% in all parts of the ureter have been reported, and it appears to be safe, causing little if any damage to the genitourinary tract. However, ureteroscopy can be limited by difficult ureteric access, which can result from stricture formation, severe intravesical inflammation or extensive carcinoma *in situ*, previous ureteric implantation or difficulty in negotiating the prostatic median lobe in men [11]. The operational cost and particularly maintenance of the finer flexible ureteroscopes might limit the availability of this procedure [12].

The debate on the current indications for OSS continues; Ather *et al.* [4] included anatomical abnormalities, failure of the first-line treatment, patient preference, an impacted large stone, and a concomitant open procedure to be appropriate indications. Until the late 1990s, we used MAU as the first-line

treatment for all ureteric stones that did not pass spontaneously.

Ureterolithotomy has traditionally used a large muscle-cutting incision, which resulted in longer operating times and increased morbidity. The operating surgeon's technique of ureterolithotomy requires the use of loupe magnification and an operating headlight. Although these aids are not used routinely by urologists, they are considered an absolute necessity by some surgeons for radical retropubic prostatectomy. The surgeon's view is greatly enhanced, allowing him or her to work comfortably in a very confined space. Foley [8] described the muscle-splitting anatomical approach used as early as 1935; it is well recognized to provide a quicker and less painful recovery, with minimal ileal distension and minimal blood loss. The ureter is left unsutured after ureterotomy, as this avoids difficult and time-consuming suturing, and it makes little difference to the outcome [13]. Because of these factors, as shown in the present series, the patient can ambulate early and be discharged early from hospital with minimal morbidity. No significant problems were reported with the drain or drain site, although admittedly it must have been a source of minor inconvenience to the patient. Only one patient required a second treatment to become stone-free. ESWL and ureteroscopy have been introduced into our practice since 1998 but the operating surgeon retains a low threshold for OSS, as our results using MAO have been excellent in well selected cases.

Laparoscopic ureterolithotomy was first described by Wickham in 1979 [14]. Gaur *et al.* [5], having developed an innovative balloon dissection technique, have since described the largest series of >100 cases over 10 years. These results are admirable although, from the present series, MAU would appear to be quicker, cheaper and require far less specialized equipment. The cosmetic results could be considered comparable, given that on average only a 4-cm incision is used, plus a small puncture site for the drain.

There are small unrandomized studies comparing conventional open ureterolithotomy with laparoscopic ureterolithotomy [7,15], which seem to favour the latter. However, we feel that this has little bearing on the 'mini' approach, which results in far less morbidity than the conventional operation. In all probability, a more valid comparison is available in several reports

comparing mini approaches for cholecystectomy and laparoscopic cholecystectomy [16]. In a large randomized single-blinded control Swedish study of >700 patients, there was no difference between the mini and laparoscopic cholecystectomy, apart from the laparoscopic approach being more expensive [17]. The results would probably be similar and even more likely to favour MAU. Retroperitoneal laparoscopy is considered more difficult and there are fewer cases from which to gain experience, unlike the omnipresent cholecystectomy [18].

Small-access open approaches to the ureter have been described previously [19–21] but the technique was generally considered only suitable for the experienced endourologist and was confined to stones in the mid-ureter [19]. Specialized instrumentation is also recommended [20,21]. We consider that the technique described is relatively simple and can be easily adapted with minimal expense. The operating surgeon can relatively easily remove stones throughout the ureter, although it is accepted that stones in the very distal ureter pose a significant challenge to the uninitiated.

In conclusion, the specific indications for OSS are becoming fewer but when an open approach is required, MAU might be considered the best option. Certainly in the developing world, where extensive endourological facilities, ESWL and laparoscopy are not readily available, MAU is an attractive choice. There is little doubt that as the technology improves and becomes cheaper, stone-free rates after minimally invasive procedures will continue to increase for all types of stone [2]. However, at present there are patients who would benefit from OSS; it could be argued that in a smaller selected group it may be advisable to use MAU in the first instance.

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Abbreviations: MAU, mini-access ureterolithotomy; OSS, open stone surgery.

