

Current Indications for Open Stone Surgery in Singapore

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Abstract

A 3-year retrospective study (January 1995 to December 1997) of all treatment modalities for urinary stone disease done in the Department of Urology, Singapore General Hospital was documented, and open stone surgery identified. Patient's characteristics, stone burden, surgical factors, indications and outcome were reviewed for each patient.

Of the 2651 procedures performed for urinary stone disease, the majority had extracorporeal shockwave lithotripsy (78% (n = 2075)), while 11% (n = 298) had percutaneous nephrostolithotomy and 9% (n = 228) ureteroscopy. Open stone surgery rate was 2% (n = 50) which included 16 anatomic nephrolithotomies, 5 pyelolithotomies, 18 ureterolithotomies and 11 nephrectomies. There were 28 males and 22 females varying in age from 26 to 63 years (mean 48 years). The most common indications for open stone surgery were complex stone burden (38% (n = 19)), failure of minimally invasive modalities (16% (n = 8)), non-functioning kidneys [20% (n = 10)], concurrent open surgery (8% (n = 4)), co-morbid medical condition [4% (n = 2)], patient preference for open procedure (8% (n = 4)), anatomic abnormality (4% (n = 2)) and obesity [2% (n = 1)]. Stone-free rate of 90% was achieved, morbidity of 8% (n = 4) mostly wound infections and a pneumothorax.

Majority of patients with urinary tract calculi can be treated with less invasive modalities. Complex stone burden, failure of less invasive modalities, non-functioning kidney, concurrent open surgery, co-morbid medical problems, patients' preference, anatomic abnormality and obesity are factors to be considered in a small cohort of patients who may still benefit from treatment using open surgical technique.

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Introduction

The treatment of urinary calculi has changed tremendously since the introduction of extra corporeal shockwave lithotripsy (ESWL), percutaneous nephrostolithotomy (PCNL), and ureteroscopy over the past decade in our hospital.¹⁻⁴ Patients previously requiring open surgical procedure are now treated successfully with these new therapeutic modalities.⁵⁻⁷ The interest generated by these development and use has left the current role of open surgery somewhat ill defined.

We review our experience with open stone surgery for a 3-year period to determine the current rate of open surgery in our setting, to identify our indications, its associated morbidity, and stone free rate. We also wanted to determine the clinical situation where open surgery is deemed a good alternative procedure to the less invasive therapy and might even represent the preferred treatment approach.

Materials and Methods

Over a 3-year period from January 1995 to December

1997, the database of patients with urinary tract calculi at the Singapore General Hospital was reviewed. The total number of stone procedures (ESWL, PCNL and ureteroscopy) was documented and open stone surgery identified. The case sheet, anaesthesia records and X-rays of patients requiring open stone surgery were reviewed. Factors assessed were age, sex, medical history, indication for surgery, type of surgery, blood loss, size of stone, anatomic abnormality associated, complication and length of hospitalisation. Stone free status was evaluated base on plain abdominal radiograph, or ultrasound performed 6 to 8 weeks postoperatively.

Results

A total of 2651 procedures (Fig. 1) were performed for the treatment of urinary stone disease during the 3-year period. Majority underwent ESWL [78% (n = 2075)], 11% (n = 298) underwent PCNL and 9% (n = 228) underwent ureteroscopy. During the study period, 50 (2%) open stone surgery were performed which included 16 anatomic nephrolithotomies, 5 pyelolithotomies, 18 ureterolithotomies and 11 nephrectomies. Patients in-

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cluded 28 males and 22 females with an age range of 26 to 63 years (mean 48 years). A summary of the indications for all open stone procedures is shown in Table I.

A total of 21 patients, 10 males and 11 females aged 33 to 63 years old (mean 47 years) underwent anatomic nephrolithotomy and pyelolithotomy. Mean operative time of 93 minutes (range 35 to 165 minutes), blood loss of 480 ml (range 100 to 650 ml), only 1 patient needed transfusion (2 units). Hospital stay ranged from 5 to 17 days (mean 10 days); two minor complications were encountered which resolved with conservative management, one with superficial wound infection and the other had pneumothorax of less than 10%. Stone free rate was 91%; 2 patients had residual stone on follow up that resolved with ESWL.

Majority of the indications (66%) were due to large complex stone burden filling a majority or all of the renal collecting system. Two patients had multiple ESWL sessions with poor results. One of whom had severe skeletal dysmorphism, while the other defaulted for several years then presented with complex stone burden. Two patients opted for single open procedure due to the possibility of multiple session of minimally invasive treatment. One patient who weighed 135 kg was not a suitable candidate for ESWL, the surgeon opted for open surgery over a technically difficult percutaneous nephrostolithotomy. Two patients with anomalous renal anatomy (horseshoe kidney and complete duplication of collecting system) underwent open surgery after preoperative assessment that percutaneous technique would be fraught with injury to adjacent organs.

Six patients (33%) had failed ureteroscopy, due to the following factors: tortuosity of the ureter, severe oedema of the orifice, false passage, ureteral perforation and bleeding. Three patients had concomitant open surgical procedure (prostatectomy, bladder diverticulectomy and cystolithotomy). Two patients had high risk co-morbid condition, and another 2 desired a single surgical procedure. While in 5 patients (27%) the indication was a long

standing, impacted, large ureterolithiasis (2.3 x 2.8 cm mean size) judged to be at increase risk with endoscopic treatment. There were 13 males and 5 females aged 32 to 54 years old with an average stone size of 2.0 x 2.5 cm. Estimated blood loss was less than 100 ml and a mean hospital stay of 5 days. Complication noted was wound infection in 2 patients that resolved with daily dressing. All patients were rendered stone free on follow-up radiographic studies.

Eleven nephrectomies were performed. There were 5 males and 6 females, aged 26 to 60 years old (average 55 years). In all cases, the kidneys had minimal function demonstrated either by nuclear scintigraphy or poor urine output after a percutaneous nephrostomy for pyonephrosis. Histopathologic findings were acute on chronic pyelonephritis, average blood loss 416ml, hospital stay of 5 days and no complications noted.

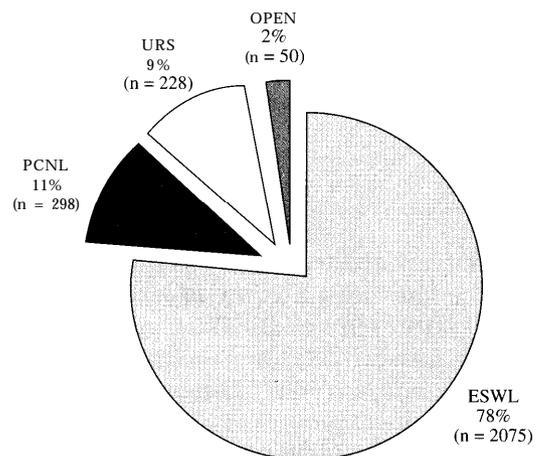


Fig. 1. Treatment modalities for urinary stone disease, Department of Urology, Singapore General Hospital, 1995 to 1997.

ESWL: Extracorporeal Shockwave Lithotripsy

PCNL: Percutaneous Nephrostolithotomy

URS: Ureteroscopy

OPEN: Open Stone Surgery

TABLE I: SUMMARY OF INDICATIONS FOR OPEN STONE SURGERY

Indication	Anatomic nephrolithotomy	Pyelolithotomy	Ureterolithotomy	Nephrectomy	Total (%)
Complex stone burden	13	1	5		19 (38)
Failed endourological procedures		2	6		8 (16)
Non-functioning kidney				11	11 (22)
Co-morbid medical problem			2		2 (4)
Concurrent open surgery			3		3 (6)
Desire for single procedure	2		2		4 (8)
Anatomic abnormality		2			2 (4)
Obesity	1				1 (2)
Total	16	5	18	11	50

Discussion

Since the advent of advance endourological technique and ESWL, there has been a drastic decrease in the number of open surgical procedure being done worldwide, with reports of 3.3% to 5.4% rate in leading endourological centres in America.⁵⁻⁷ The rate of 2% at our institution illustrates the degree to which such a procedure has been superseded by less invasive modalities. In centre with a complete array of endourological facilities the indication for open stone surgery has become limited. On the other hand, over-reliance on ESWL in large complex stones can give rise to increase morbidity.⁸

Failed endourological procedure as an indication for open stone surgery ranges from 29% to 43%.⁵⁻⁷ Where as such failure rate occurred in 16% in our series including ESWL. We believe that the low percentage of treatment failure could reflect improve selection of patients with increase proficiency and improve instrumentation for minimally invasive treatment.

Complex stone disease, defined in our series as stone burden involving the entire collecting system with or without hydronephrosis and ureteral calculi >2 x 2.5cm was the most common indication for open stone surgery occurring in 38% of patients. Although a combination of PCNL and ESWL is successful in the treatment of most staghorn calculi, its stone free rate is much lower than anatomic nephrolithotomy (12% versus 89%), and the need for multiple procedures is inevitable in order to obtain a stone free status.⁹ Our present series on anatomic nephrolithotomy has shown improvement compared to our previous series in terms of stone free rate (10% versus 50%), operative time (93 minutes versus 150 minutes), hospital stay (10 days versus 14 days) and complication rate (10% versus 32%).¹⁰ Despite the great success with less invasive modalities for even complex stone disease in our recent series,⁴ this study demonstrates that there are patients in whom open surgery can be performed with a high success rate and low morbidity.

Ureteral calculi are usually treated with ESWL in our institution as first line modality. Ureteroscopic manipulation with intracorporeal lithotripsy is highly effective for larger ureterolithiasis, but it is not without its inherent complication of ureteral perforation (7%), stricture (3.5%) and conversion to open surgery (1.6%).¹¹ We believe that large, impacted ureteral calculi of long standing duration should be approached with caution because there is an increase risk of complication during endoscopic treatment. The indications for open surgery in these would depend on the surgeon's judgement and experience.

Significant co-morbid medical problems were present in 4% of our series. Patients with multiple medical

problems and complex stone diseases, the risk of surgery increases with each additional minimally invasive procedure that is required. The benefit of achieving stone free status with a single procedure may outweigh the risk associated with each additional minimally invasive procedure. Also in our health care system where cost of treatment is borne by the patient, the option of a single open procedure is a viable option over repeated minimally invasive methods. Therefore in selected group of patients we believe that open surgery is a reasonable option. Nephrectomy is always an option in poorly functioning kidney with stone disease provided the opposite kidney has normal renal function.

Obese patient presents a unique management problem, as localization of the stone is difficult, thus are not good candidate for ESWL.¹² Percutaneous nephrolithotomy is fraught with difficulty especially if the distance from the skin to the renal pelvis exceed the limit of the nephroscope. The patient in our series was successfully treated with a single open surgery with minimal morbidity.

Concurrent open surgical procedure was the indication in 8% of our patients. None of them who had stone surgery at the same time of another major procedure experienced a complication. Simultaneous abdominal surgery would also provide justification for open stone surgery in which no additional incision is required.

As in any clinical situation in which many treatment modalities are available, it is our responsibility to inform our patient of all the risk and benefit of each possible treatment.⁸ Given the choice, some of them would prefer to undergo open surgery rather than risk the potential need for multiple less invasive procedures.

Conclusion

Despite the surge of minimally invasive surgery as the main treatment modality in urinary tract calculi, a small cohort of patient will still undergo open stone surgery. Endourological treatment failure, complex stone burden, co-morbid medical and anatomic problems, obesity, and patients' preference are factors that often need to be present for open surgery to be given proper consideration. In this highly selected group of patients, open surgery is a reasonable alternative that can be performed with high success and low morbidity.

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