

URETERORENOSCOPY : FACTORS INFLUENCING SUCCESS

T Ravintharan, P H C Lim, H C Chng

ABSTRACT

The first 100 patients with ureteric calculi to undergo planned ureteroscopy and lithotripsy were retrospectively studied to evaluate the factors which influenced the success of the procedure. All 75 males and 25 females who underwent this procedure had surgical indications to treat the stones. The factors influencing a successful outcome were studied over four different time frames. It was found that the procedure was more successful in females, and lower ureteric stones. The stone size did not affect the outcome as expected. The learning curve was very evident as increased experience produced higher success rates for ureteric access and lithotripsy, less morbidity, shorter operating time and lower open surgery rates. The introduction of the miniscope and laser lithotripsy was however the most significant factor in ensuring a successful outcome.

Keywords : ureterorenoscopy, lithotripsy, miniscope, experience, factors influencing success

SINGAPORE MED J 1991; Vol 32: 151-153

INTRODUCTION

Since the reintroduction of ureterorenoscopy (URS) in the early 80's, there has been significant changes in the management of ureteric stones. In many Urological Centres it has become the main mode of treatment for lower ureteric stones and in some cases for middle and upper ureteric stones.

This procedure was first performed in late 1985 at Toa Payoh Hospital and since then, more than 170 procedures have been carried out. As in most centres where this procedure was available, the success rate appears to be reaching a peak. At Toa Payoh Hospital this has been the experience and motivated us to examine the factors which influenced the success rate.

PATIENTS & METHODS

We conducted a retrospective study of the first 100 patients on whom this procedure was carried out for ureteric stones only. The standard equipment used were the Wolf ureteroscope and the Candela miniscope which was made available in 1989. Ureteric access was obtained with metal, Teflon and balloon dilators. The accessories included ultrasound probes, stone forceps, dormia basket and laser light guides.

All patients had definite indications for surgical intervention. The study was focused on the patient, stone, surgeon and equipment characteristics.

The study period was divided into four time frames so as to observe how the various factors influenced success over these time frames.

Patients operated between Nov 1985 to Dec 1986 were in

Group 1, Jan to Dec 1987 in Group 2, Jan to Dec 1988 in Group 3, and Jan to Aug 1989 Group 4.

Patient Characteristics

Of the 100 patients, 75 were males and 25 females. The age group ranged from 20 to 79 years, with a mean age of 44 years. 68 patients presented with pain/colic, 13 with hematuria, 15 with urinary tract infection, 4 were asymptomatic.

Nine patients had no obstruction demonstrated on investigation, 75 had partial and 16 had complete obstruction.

Operation Characteristics

Out of 100 patients who were put up for ureterorenoscopy (URS), 86 had successful passage of the scope beyond the uretero-vesical (U/V) junction. In 14 cases, access to the ureter was not possible because of failed U/V dilatation. Of the 86 who had successful passage of the scope, 56 had complete fragmentation and 20 had failed lithotripsy. In the remaining 10, there was either spontaneous passage of the stone following URS or stone migration into the renal pelvis occurred.

In the 56 successful cases, the modalities used are shown in Table I. Laser lithotripsy was only available towards the end of the study period.

Table I: Modalities Used in Lithotripsy

Forceps/Dormia	27
Ultrasound/EHL	21
Laser	8
Total (Nos)	56

Of the intra-operative complications shown in Table II, failed localisation, impacted stones (Pre-laser period) and bleeding were the most common problems. There were also 4 cases where ureteric perforation or extravasation of the urine were noted intraoperatively. Two more cases of perforation were diagnosed in the post-operative period (Table II).

RESULTS

Factors Influencing Success

Patient's Sex

Female patients enjoyed a higher success rate as noted in Table III.

Department of Surgery
Toa Payoh Hospital
Toa Payoh Rise
Singapore 1129

T Ravintharan, PBM, M Med(Surg), FRCSE
Registrar

P H C Lim, M Med(Surg), D Urol(Lond)
Consultant Urologist

H C Chng, M Med(Surg), FRACS
Senior Consultant & Head

Correspondence to : Dr H C Chng

Table II: Intra & Post-Operative Complications

	Intra-Operative	Post-Operative
Impacted Stones	10	-
Failed Localisation	13	-
Bleeding	7	-
Failed Equipment	4	-
Ureteric Perforation	4	2
Urinary Infection	-	6
Ureteric Stricture	-	1

Table III: Influence of Sex on Success

	Females (25)	Males (75)
Failed Ureteric Access:	8%	16%
Success	92%	84%
Stone Free Rate	72%	64%

Stone Size & Site

From Table IV, it appeared that stone size did not influence the success rate as was expected. However, lower ureteric stones were easier to deal with than upper ureteric stones.

Table IV: Influence of Stone Position & Size on Success (86 Cases)

Stone size in mm (No)	<5 (37)	6-10 (45)	>10 (4)
Stone free rate %	78	73	75
Stone position (No)	Upper (18)	Middle (5)	Lower (63)
Stone free rate %	66	80	79

Surgeon Factor

Table V shows several factors as they varied over the four time frames. This highlighted how the learning curve affected the ability to pass the scope into the ureter, the stone free rate, the incidence of major complications, the operating time and the number who underwent open surgery. In general, familiarity with the procedure and the equipment allowed greater success rates and lower complications.

Table V: Surgeon Factor (Learning Curve)

Year	1986	1987	1988	1989*
No. per yr.	27	26	30	17
Successful ureteric access %	89	73	90	95
Stone free rate %	63	84	78	88
Ureteric perforations	3	1	1	1
Average operating time (min)	57	57	54	50
Open surgery (no. per yr.)	11	7	5	1

* Up to August 1989.

Reasons For Open Surgery

As shown in Table VI, failed U/V dilatation and endoscopy was the most common reason for precipitating open surgery. In 3 cases ureteric perforation was the exciting cause.

Table VI: Indication for Open Surgery

Indication	No.
Ureteric perforation	3
Technical difficulties	3
Impacted stones	5
Failed ureteric access	8
Bleeding	5
Total (out of 100 patients)	24

SUMMARY OF RESULTS

Eighty-six patients underwent successful ureterorenoscopy of which 56 had lithotripsy, 10 had spontaneous passage of stone post-URS, 16 had open surgery for failed URS or complication and 4 had no further treatment after failed lithotripsy/URS.

Fourteen had failed ureteric access (U/V dilatation) of which 8 had open surgery, 3 had spontaneous passage of stone, and 3 had no further procedures.

DISCUSSION

Since the introduction of endoscopic treatment of ureteric stones in the early 80's, it has now become the mainstay of treatment of lower and more recently middle and upper ureteric stones as well. Success in dealing with ureteric stones is now dependent on a variety of factors. Besides the equipment and the various modalities available, the patient and stone characteristics, the surgeon's experience and familiarity with the equipment also plays an important part in the outcome. We now discuss the influence of the various factors in influencing the success of ureteroscopic treatment of stones.

Patient Characteristics

Sex: Sex appears to be an important factor as in our study we found that higher stone free rates were possible in the females (Table III). This was also noted by several authors¹⁻³ who found greater difficulty in ureteric access and in the level to which they could pass the scope in the males as compared to females. The reasons given were a longer and relatively fixed prostatic urethra which permitted less manoeuvring.

Patient's Choice of Treatment Option: This was significant. In the early years of our practice, open surgery was decided upon if the URS failed. As our experience grew, and as patients became more aware of the procedure itself and its advantages less open surgery was done and repeat URS for initial failures became more common.

Stone Factors

Stone site has always been noted as an important determinant. Lower ureteric stones were more easily dealt with than upper ureteric stones primarily because of accessibility and anatomical reasons³⁻⁵. This was also the experience in our study although our higher success rate for middle ureteric stones was unexpected. Stones of 6mm or smaller in diameter were usually dealt with by dormia basket extraction. Larger stones had to be debulked with ultrasound (U/S), electrohydraulic (EHL) or laser lithotripsy and sometimes prior to extraction. In general, upper and/or larger stones were associated with greater morbidity^{4,6}. In this study however stone size did not seem to make a difference contrary to results elsewhere (Table IV).

Surgeon's Experience

Weinberg et al⁷ have reported that success and complication rates were lower in centres that performed more procedures.

than in those that did less. This learning curve was evident in this study (Table V) which showed lower open surgery and perforation rates, higher stone free and successful ureteric access rates and shorter operating times as more experience was gained.

Equipment & Modality

In our early practice, we used forceps and dormia baskets for extraction and U/S and EHL to break up large stones. We found U/S to be a good modality but in the third year, we encountered problems with our U/S equipment and broken probes which, despite higher ureteric access (90%), was accompanied by lower stone free rates (78%) (Table V).

Laser lithotripsy was introduced to us in 1989 and we found this modality to be excellent. We used the Candela miniscope and laser light guides in the 8 cases included in this series and all were successful. This modality owed its success to the narrow calibre miniscope (French 7.2). This enabled URS to be done with no need for ureteric dilatation, minimum morbidity and shorter operating time as compared to the conventional methods. It was also easier to treat impacted stones and those in the upper ureter. The biggest drawback was the cost of owning and operating a laser machine.

Table VII: International vs TPH Experience

Author/ No. of cases	Successful Ureteric Access#	Successful lithotripsy*	Stone Free Post-URS*	Stric- ture#	Perfor- ation#
Ramsey ⁽¹⁾ 49	81%	67%	-	-	28%
Wickham ⁽⁴⁾ 119	85%	66%	-	4%	3%
Bishop ⁽³⁾ 73	-	62%	73%	3%	14%
Kappany ⁽¹⁾ 120	-	78%	-	-	7%
Schultz ⁽²⁾ 100	75%	69%	72%	1%	4%
TPH 100	86%	66%	76%	1%	6%

* Percentages based on number of cases with successful ureteric access.

Percentages based on the total number of cases undergoing ureterorenoscopy.

A review of the literature on influence of scope size and rigidity^(8,10,11) reveals that the short rigid ureteroscope is most suited for treating lower ureteric stone. The longer conventional scopes (size 11.5) can be used for lower ureteric and in some cases stones in the upper ureter if the ureter could be negotiated. These larger calibre scopes also require U/V dilatation which was responsible for the higher morbidity. It is in this respect that the smaller calibre semirigid miniscope and its accompanying laser probes have a distinct advantage as mentioned earlier. Our experience at Toa Payoh Hospital has shown that patient's sex, stone position and size, the surgeon's experience and the conventional modalities available did alter the outcome. Presently, the state of the art is such that laser lithotripsy is used in the management of most lower and impacted upper ureteric stones.

ACKNOWLEDGEMENT

This paper was presented as a free paper of the same title at the 23rd Annual Combined Surgical Meeting, 1989.

REFERENCES

- 1 El-Kappany H, Gaballah MA, Gloncim MA. Rigid Ureterorenoscopy for the treatment of ureteric calculi: Experience in 120 cases. *Br J Urol* 1986; 58: 499-503.
- 2 Schultz A, Kristensen JK, Bilde T, Eldrup J. Ureteroscopy: Results and complications. *J Urol* 1987; 137: 865-6.
- 3 Hosking G, Ramsey EW. Rigid transurethral ureteroscopy. *Br J Urol* 1986; 58: 621-4.
- 4 Carter C, Cox R, Wickham JEA. Complications associated with ureteroscopy. *Br J Urol* 1986; 58: 625-8.
- 5 Bishop MC, Lawrence WT, Lemberger RJ. Ureteric stone surgery in practice. *Br J Urol* 1987; 59: 137-41.
- 6 Copitcoat MJ, Webb DR, Kellett MJ, Whitfield HN, Wickham JEA. The treatment of 100 consecutive patients with ureteral calculi in British Stone Centre. *J Urol* 1987; 137: 1122-3.
- 7 Weinberg JJ, Ansong K, Smith AD. Complications of Ureteroscopy in relation to experience: Report of surgery and author experience. *J Urol* 1987; 137: 384-5.
- 8 Watson G, Murray S, Dretler SP, Parrish JA. The Pulsed Dye laser for fragmenting urinary calculi. *J Urol* 1987; 138: 195-8.
- 9 Watson G, Murray S, Dretler SP, Parrish JA. An assessment of the Pulsed Dye laser for fragmenting calculi in the Pig Ureter. *J Urol* 1987; 138: 199-202.
- 10 Miller RA, Ramsay JWA, Crocker PR et al. Ureterorenal endoscopy: Which instrument, what cost? *Br J Urol* 1986; 58: 610-6.
- 11 Aso O, Ohtawara Y, Fukuta K et al. Fiberoptic nephroureteroscopy: Removal of upper ureteral and renal calculi. *J Urol* 1987; 137: 629-32.

25th Annual Combined Surgical Meeting

The Chapter of Surgeons, Academy of Medicine, Singapore, is organising the 25th Annual Combined Surgical Meeting with the participation of the Royal Australasian College of Surgeons from 8-10 November 1991.

The theme of the meeting is "Teamwork in Surgery" and topics include :

- Metastases to Bone
- Management of Soft Tissue Sarcomas
- Transplantation

For details contact :

The Academy of Medicine
16 College Road #01-01
College of Medicine Building
Singapore 0316