นิพนธ์ต้นฉบับ

Ureteroscopic removal of ureteric calculi: Six years' experience in Chulalongkorn Hospital.

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From January 1987 through December 1992,224 patients underwent transurethral ureteroscopic removal of ureteric calculi. The rate of success was 87 % for calculus in the lower ureter, and 62 % for calculus in the upper ureter ($p < 0.01$). Major complications that required operative intervention occurred in seven patients (3.1 %), most of these occurring while the surgeons were in the early stage of gaining experience with this technique.

Key words : *Ureteric Calculi, Ureteroscopy*

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ตั้งแต่เดือนมกราคม 2530 ถึงเดือนธันวาคม 2535 ได้ให้การรักษานิ่วในท่อไต (ureteric calculus) ด้วยวิธีการใช้กล้องส่องตรวจรักษาภายในท่อไต (transurethral ureteroscopy = URS). ได้ผลสำเร็จ 87 % ในรายที่นิ่วอยู่ในท่อไตส่วนล่างและ 62 % ในรายที่นิ่วอยู่ในท่อไตส่วนบน เกิดภาวะแทรกซ้อนรุนแรงที่ต้องให้การรักษาด้วยการผ่าตัดแก้ไขในผู้ป่วย 7 รายจากจำนวนผู้ป่วยทั้งหมด 224 ราย (3.1 %) ซึ่งไม่แตกต่างจากรายงานอื่น ๆ ส่วนใหญ่ของภาวะแทรกซ้อนที่รุนแรงเกิดในระยะแรกของการนำวิธีการรักษานี้มาใช้ การรักษานิ่วในท่อไตได้ด้วยวิธีการ URS นี้เป็นวิธีที่ได้ผลดีโดยเฉพาะนิ่วที่อยู่ในท่อไตส่วนล่าง

Transurethral management of intraluminal ureteric pathology with direct visualization has been made possible following the development by Perez - Castro in 1980[1] of a suitable, rigid and small - caliber operating ureterorenoscope with a working channel along with effective and safe techniques for dilating the ntramural ureter.[2] Since Huffman's initial enthusiastic report[3] of a 69 % success rate in removing distal ureteric calculi using the transurethral ureteroscopic approach, this technique has rapidly gained worldwide acceptance. The obvious advantages over conventional ureterolithotomy are in terms of lower morbidity (no surgical incision) and disability (shorter hospital stay and minimal loss of working time).[3-5] Chulalongkorn Hospital has implemented the transurethral ureteroscopic technique (URS) since January 1987, using rigid 12.5 F and later 11.5 F operating ureterorenoscopes for the removal of ureteric calculi. We report herein our experience with the use of this technique in 224 patients, its success rate and complications.

Patients and Technique

Records of 224 patients who underwent transurethral ureteroscopic procedures (URS) for removal of ureteric calculi from January 1987 to December 1992 were analyzed retrospectively. There were 123 males and 101 females (male : female = 1.2:1). They ranged in age from 18 to 88 years, with the average being 41 years (table 1).

Table 1. The patients.

Sex	No.	Age	Yrs.
Male	123	Youngest	18
Female	101	Oldest	88
Total	**224**	**Average**	**41**

The diagnosis of each ureteric calculus was based upon intravenous urographic findings, i.e. any calculus above the pelvic brim was designated as "upper" and that below the pelvic brim as "lower" ureteric calculus.

Two hundred and nine patients had one calculus each, eleven had more than one calculus each, and four had multiple calculus fragments impacted in the ureter (steinstrasse) following extracorporeal shockwaves lithotripsy (ESWL) of renal calculi.

In 119 patients the calculus was located in the right ureter and 105 patients in the left ureter (table 2). The calculus was classified as upper ureteric calculus in 48 patients, and as lower ureteric in 176 patients (upper : lower = 1:3.6). The mean stone burden (the largest diameter of the calculus) was 13.4 millimeters (range = 4 - 78 mm).

Table 2. The ureteric calculus.

Lateralization		Location		Number of calculi	
Ureter	No.	Proximity	No.		No.
Right	119	Proximal	48	Single calculus	209
Left	105	Distal	176	Multiple calculi	18
				Steinstrasse	4
Total	**224**	**Total**	**224**	**Total**	**224**

A pre-operative plain abdominal (plain KUB) film was obtained in every patient to verify the exact location of the calculus. All URS procedures were performed under spinal anesthesia without fluoroscopic guidance and with patients in standard dorsal lithotomy position. Following routine cystoscopic examination of the bladder interior, a flexible-tipped guide - wire, 0.035 - 0.038 mm in diameter, was introduced under direct vision through a 23 F cystoscope into the orifice of the designated ureter and advanced well beyond the location of the calculus. The gradual dilation of the intramural ureter up to 14 F size was accomplished by using metal dilators backloaded via the guide - wire. Under direct vision, an 11.5 F or 12.5 F rigid operating ureteroscope ("International" Uretero - Renoskop 8954 by Richard Wolf GMBH, Knittlingen, Germany) was then introduced over or alongside the guide - wire up the ureteric lumen and gradually advanced toward the calculus. Normal saline solution, suspended not higher than 60 centimeters above the level of the patient's kidney, was

used as an irrigation fluid throughout the procedure. Small ureteric calculi were removed by using a calculus extraction basket or grasping forceps via the working channal, the larger calculi were removed with the assistance of an ultrasonic lithotriptor. Success meant complete removal of the calculus or residual calculus fragments with a diameter of less than 3 mm that remained after the procedure (these minute fragments usually pass through spontaneously in a few days' time). After the successful removal of the calculus, the ureter was inspected as far proximally as possible for residual calculus fragments and any possible ureteric perforation. As the ureteroscope was gradually withdrawn, a # 5 F ureteric catheter was inserted and left in place as a stent. This stent was brought out alongside a # 16 F urethral foley catheter, both usually removed at no later than 48 hours after the procedure. The student t-test was used for statistical analysis.

Result

The success rates of lower and upper ureteric calculus removal were 87 % and 62 %, respectively ($p < 0.01$), with a total success rate of 82 % (183 of 224). Of 183 patients from whom the calculi were successfully removed , 28 cases (15 %) required a second attempt.

The procedure was considered a failure in 41 patients (18 %), 10 as a result of being unable to dilate the intramural ureter, 20 from being unable to reach the calculus with the ureteroscope,six from the immediate recognition of complications in which continuation of ureteroscopic procedure would not be feasible (four ureteric perforations, one trapped dilator and one trapped stone basket), and five from upward migration of the calculus.

Major complications occurred in seven patients, necessitating operative intervention as follows: ureteric perforation (4 cases), trapped dilator (1 case), trapped calculus extraction basket (1 case), and ureteric mucosal sleeve eversion (1 case). For the latter, a ureteric stent catheter was applied initially; however, the patient developed distal ureteric stenosis requiring ureteric reimplantation four months later.

There were five minor complications in this study. These included three cases of minute ureteric perforation perforation which were successfully managed by inserting a ureteric stent catheter, two cases of delayed post-operative ureteric bleeding in one of whom blood transfusion was administered.

Discussion

The success rate of 62 % in removing upper ureteric calculus was significantly lower than that of 87 % for removing lower ureteric calculus (table 3). This experience is similar to previous observations.[5-10] The main obstacle appears to be the inability to advance the ureteroscope over the point where the ureter crosses the iliac vessels. The success rate in our series is comparable with that of others (table 4).

Table 3. Success vs location of calculus.

Location	No. Success / Total case (%)	
Upper	30/48	(62)*
Lower	153/176	(87)*
Total	**183/224**	**(82)**

* Upper vs lower $p < 0.01$

Table 4. Causes of failure.

Causes	No.
Inability to insert ureteroscope	10
Inability to reach the calculus	20
Intraoperative complication	
- ureteral perforation	4
- trapped dilator	1
- trapped extraction basket	1
Upward migration of calculus	5
Total	**41**

Failure of the ureteroscope to reach the calculus in 25 patients of this series (table 4) could be explained as follows: first , the size of the ureteroscope used was slightly larger than those used by other investigators, and second, our experience and skill in handling the procedure might have been limited.

The major complications (table 5) in seven patients (3.1 %) were also comparable with those of other investigators. [6-10] All of these complications occurred within the first year of our experience with this technique.

Table 5. Complications of ureteroscopic calculus removal.

Complications	(No. of patients)
Major : Redquiring operative intervention	(7)
Immediate recognition	
Ureteric perforation	4
Trapped dilator	1
Trapped extraction basket	1
Delayed recognition	
Ureteric stenosis	1
Minor: Manaed conservatively	(5)
Ureteric perforation	3
Secondary bleeding	2

Table 6. Success of ureteroscopic calculus removal related to calculus location.

References	Proximal	(%)	Distal	(%)	Total	(%)
Lingeman JE.[4]	15/29	(52)	72/77	(94)	87/106	(83)
Politis G.[5]	28/34	(82)	57/61	(93)	85/95	(89)
Weinberg JJ.[6]	5/8	(62)	99/119	(83)	104/127	(81)
Patterson DE.[7]	51/77	(66)	191/213	(90)	242/290	(87)
Carter MF.[8]	17/25	(68)	62/75	(99)	94/105	(89)
Bagley DH.[9]	25/35	(71)	69/70	(99)	94/105	(89)
Koatakopoulos A.[10]	67/141	(48)	827/859	(95)	894/1000	(89)
Laornuan S. (1994)	30/48	(62)	153/176	(87)	183/224	(82)

In conclusion, transurethral ureteroscopy is an effective method for the management of ureteric calculi, especially those located in the lower ureter. Appropriate instrumentation and immaculate surgical technique are required to achieve a high success rate and to avoid serious complications.

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