

ORIGINAL ARTICLE

Treatment of ureteral calculi by ureteroscopy: experience of 100 cases at the Faculdade de Medicina do ABC (FMABC – Medical School)

Tratamento de cálculos ureterais por ureteroscopia: experiência em 100 casos da Faculdade de Medicina do ABC*

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ABSTRACT

Objective: To report the experience of treating ureteral calculi by ureteroscopy at the Faculdade de Medicina do ABC – SP, with an emphasis on the efficacy and safety of the method. **Methods:** A retrospective analysis of 100 ureteroscopies performed from January 2001 to August 2003 in 98 patients with ureteral calculi.

Results: A 91% success rate was observed with a single procedure using this technique. Intracorporeal lithotripsy was necessary in 61% of cases before removing the stone; in the remaining cases, it was extracted with no disintegration. Endoscopic approach was impossible in only one patient who required conversion to conventional open surgery. The double-J stent was inserted in 73.7% of procedures. Complications were observed in 8% of cases.

Conclusion: The present study demonstrated results comparable with those reported in large series in the literature. The high success rates, low morbidity, rapid convalescence and lack of esthetic consequences corroborate the role of ureteroscopy as an attractive alternative for treating ureteral calculi.

Keywords: Ureteral calculi/therapy; Ureteroscopy; Lithotripsy; Lithiasis/therapy; Ureter/pathology

RESUMO

Objetivo: Relatar a experiência no tratamento de cálculos ureterais por ureteroscopia na Faculdade de Medicina do ABC – SP, com ênfase em eficácia e segurança do método. **Métodos:** Análise retrospectiva de 100 ureteroscopias realizadas entre janeiro de 2001 e agosto de 2003 em 98 pacientes portadores de litíase ureteral. **Resultados:** Observamos taxa de sucesso de 91% com o

emprego desta técnica em um único procedimento. Em 61% dos casos foi necessária litotripsia intracorpórea antes da retirada do cálculo; nos demais casos houve extração sem auxílio de fragmentação. Em apenas um paciente a abordagem endoscópica não foi possível e foi necessária a conversão para a técnica aberta convencional. A aplicação de cateter duplo-J ocorreu em 73,7% dos procedimentos. Complicações foram observadas em apenas 8% dos casos. **Conclusão:** O presente estudo demonstra resultados comparáveis aos encontrados em grandes séries na literatura. As altas taxas de sucesso, baixa morbidade, rápida convalescença e nenhuma alteração estética ratificam o lugar da ureteroscopia como opção atraente no tratamento da litíase ureteral.

Descritores: Cálculos ureterais/terapia; Ureteroscopia; Litotripsia; Litíase/terapia; Ureter/patologia

INTRODUCTION

The therapeutical options for ureteral stones were expanded by the introduction of extracorporeal shock wave lithotripsy (ESWL) and the development of ureteroscopy (URS)⁽¹⁾.

The treatment of urolithiasis varies from simple clinical observation and waiting for spontaneous passage to use of refined endourologic techniques to extract the stone. The therapeutic armamentarium currently available comprises ureteroscopy and extraction of ureteral calculus with or without the need for intracorporeal lithotripsy, percutaneous

* Study carried out by the Urolithiasis and Endourology Sector of the Faculdade de Medicina do ABC - SP.

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Sponsors of the study: none

Received on December 2, 2003 – Accepted on February 10, 2004

nephrolithotripsy, open or laparoscopic ureterolithotomy, and ESWL. The choice of treatment depends on the clinical picture, site and size of the stone, associated conditions and availability of material.⁽²⁻⁴⁾

The introduction of minimally invasive procedures provides a less painful and faster recovery, as well as better esthetic results, justifying the preference for endourologic techniques over conventional surgeries.

We report our experience using ureteroscopy in the management of these cases at the Urology Service of the Faculdade de Medicina do ABC (FMABC).

METHODS

From January 2001 to August 2003, 100 ureteroscopies were performed in 98 patients with ureteral calculi at the Urology Service of FMABC. The age ranged from 19 to 68 years, median age=40 years. Males accounted for 55.1% of cases (table 1).

Table 1. Distribution of patients by age group and sex

Age	Sex
19 to 68 years (median: 40 years)	Male 54 (55.1%) Female 44 (44.9%)

The size of stones was measured by plain abdominal X-ray and varied from 10 mm² to 400 mm², median size = 50 mm², as shown in table 2.

Table 2. Distribution of calculi by ureteral segment

Segment	N. of calculi	%
Proximal	6	6
Mid-ureter	18	18
Distal	76	76

A 7.5-Fr semi-rigid ureteroscope (Storz) with a 4-Fr working channel was utilized. When necessary, a pneumatic device (Lithoclast[®]) was used to disintegrate the calculi. All procedures were performed in the operating room, under strict asepsis and antimicrobial coverage. The patients were submitted to spinal block and placed in the lithotomy position; the leg ipsilateral to the calculus was straightened and kept in a lower position, whereas the contralateral leg was in an elevated and hyperabducted position (figure 1).

The procedures started with videocystoscopy and retrograde introduction of a 0.035 mm guide wire in the appropriate ureter under radiological control (fluoroscopy). Next, the ureteroscope was inserted guided by the wire and flushed with a continuous flow of saline solution. It is worth mentioning that in no occasion was previous ureteral dilation needed to insert

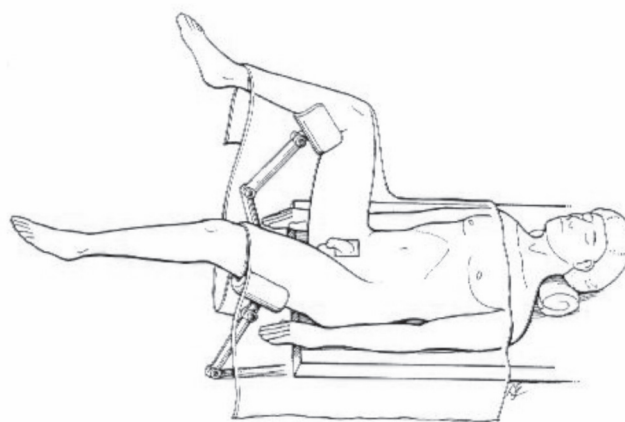


Figure 1. Position of patients for ureteroscopy on the left ureter.

the scope, which was carefully advanced until identification of the calculus and visual estimate of its size. Depending on the approximate size and estimated compatibility with the ureteral lumen, we decided upon direct extraction or intracorporeal lithotripsy and fragment extraction. Bladder emptying during the procedure was performed by means of a plastic urethral catheter to prevent bladder overdistension.

The use of ureteral double-J stent at the end of the procedure depended on the local conditions and on the extent of dilation in the upper urinary tract. Hence, in cases of extensive manipulation, ureteral injury, intense mucosal edema or very dilated excretory systems, we routinely used a double-J stent, which was kept for a variable period, depending on the extent of ureteral injury and upstream dilation. These patients were discharged within 24 hours, and followed up for clinical, laboratory (analysis of urine sediment and urine culture) and radiological assessment (plain abdominal radiography and ultrasound of the urinary tract). In cases of suspected residual calculi or persistent urinary tract dilation, an excretory urography was requested in the third postoperative month.

RESULTS

In 38 (38%) calculi, we performed only endoscopic extraction, and disintegration was not required. In this group, the size of calculi varied from 10 mm² to 100 mm² (median=30 mm²). In the remaining 61 (61%) calculi, disintegration was needed before extraction, and the size ranged from 25 mm² to 400 mm² (median=66mm²). Endoscopic approach was not possible in just one (1%) calculus due to intense edema close to the calculus, which prevented further progression of the guide wire and endoscope. Therefore, conventional open ureterolithotomy was

Table 3. Correlation of method used for treatment and affected segment

Segment	Endoscopic extraction	Disintegration with lithotripter
Proximal	1	5
Mid-ureter	4	14
Distal	32	43

Note: One case converted to open surgery.

performed. The treatment method used for each ureteral segment affected is shown in table 3.

A success rate of 91% was achieved with complete resolution of ureteral calculi, with a single ureteroscopy. A second endoscopic procedure had to be performed for complete resolution of two (2%) calculi. The ureteral calculi pushed up to the renal pelvis in 6 (6%) ureteroscopies. A double-J stent was placed in these cases, and ESWL was performed later in three patients. The other three individuals spontaneously passed their calculi two days later. The results are presented in table 4.

Table 4. Results

Method	Interventions (n) (%)
Success after a single endoscopic intervention	91 (91)
Success after two endoscopic interventions	2 (2)
Endoscopic treatment not possible (conventional open ureterolithotomy required)	1 (1)
URS with push-up followed by spontaneous passage	3 (3)
URS with push-up, resolution with ESWL (one session)	3 (3)

The success rate by calculus site varied as shown in table 5. The surgical duration ranged from 10 minutes to 180 minutes, median = 65 minutes. There were two (2%) ureteral perforations and one conversion to open surgery; five patients (5.1%) had pyelonephritis in the postoperative period and were successfully treated with drugs. Therefore, there were 3 (3%) complications directly related to the technique and 5 (5.1%) infectious complications.

Table 5. Results by stone site

Site	N. of cases	Success rate
Proximal	6	50%
Mid-ureter	18	84%
Distal	76	98%

The double-J stent was placed in 73 ureteroscopies (73.7%) and kept for a period between 2 and 60 days. The stents that were kept for longer periods were those used in cases of ureteral perforations; however some patients had the stent placed longer than expected owing to difficulty in making appointments for follow-up visits. Out of 38 endoscopic procedures performed extracting calculus with no previous disintegration, a

double-J stent was placed in 26 (68.4%); whereas in the remaining 62 procedures using a lithotripter, a double-J stent was placed in 47 (75.8%) cases.

DISCUSSION

The rapid advances in endourology including improved ureteroscopes, new complementary instruments and development of new techniques applied to ureteral lithotripsy, have resulted in less frequent use of traditional methods to treat ureteral lithiasis⁽⁵⁾. The development of semi-rigid and flexible ureteroscopes with a working channel, through which forceps and instruments are handled, makes endoscopic treatment of ureteral calculi a feasible, safe and effective procedure⁽⁶⁻⁷⁾.

There are several types of lithotriptors available for endoscopic disintegration of ureteral calculi: electrohydraulic, ultrasonic, laser and pneumatic ballistic lithotripter. The electrohydraulic lithotripter was the first model available for clinical practice. It may cause considerable tissue damage since its principle is based on a spark generated in a fluid medium, originating a cavitation bubble that makes a shock wave. It is less efficient in resistant calculi. The contact with the urinary tract may cause thermal lesion, and shock wave may cause local mechanic lesion⁽⁸⁻⁹⁾. Ultrasonic lithotripsy is very effective in hard stones, but it is less effective than the pneumatic device. It is based on conversion of electrical into acoustic energy, and its vibrations are transmitted from the probe pole to the calculus, fragmenting it⁽⁸⁾. The laser lithotripsy is an attractive alternative for endoscopic treatment of urolithiasis, because it is efficient and may be applied with flexible and semirigid thin ureteroscopes. However, this technique has a very high initial cost. The pneumatic ballistic lithotripter uses an extremely simple method with compressed air, at lower cost and providing excellent results⁽⁹⁻¹⁰⁾. Whenever necessary, we used this type of lithotripter due to its advantages, such as simplicity, reliability, easy handling, lower initial and operational cost.

Together with ureteroscopy, extracorporeal shock wave lithotripsy (ESWL) is another therapeutic option widely used to treat ureteral calculi. There are several

comparative studies in the literature trying to define which technique provides the best results. Many authors report a significantly lower stone-free rate after ESWL as compared with ureteroscopic extraction⁽¹¹⁻¹³⁾. Kupele⁽¹⁴⁾ assessed 1970 patients comparing ESWL and ureteroscopic treatment of ureteral stones and reported a 91.4% success rate of ureteroscopy versus 58.3% of ESWL. This author achieved similar success rates of both procedures only after three ESWL sessions. This information demonstrates that retreatment rate or the number of auxiliary procedures needed for patients to be considered stone-free are higher in ESWL. Pearle⁽¹⁵⁾ reports the same stone-free rate after ESWL and ureteroscopy, 91% in each group; however, the author does not specify the number of retreatments or auxiliary procedures needed for resolution of lithiasis. Nonetheless, he prefers ureteroscopy due to earlier recovery and satisfaction of patients, low incidence of complications and fewer retreatments. Despite these results favoring ureteroscopy, a meta-analysis comparing the efficacy of these methods and did not find any statistically significant difference in success rates⁽¹⁾. Thus, on analysis of the best method to treat urolithiasis, we should take into account not only the number of patients considered stone-free, but also the number of procedures needed for this purpose, morbidity rate and costs.

Our results regarding success of ureteroscopy in the treatment of ureteral calculus were similar to those in the literature. A series of 378 patients was described with a success rate of 88.3% after a single endoscopic procedure⁽¹⁶⁾. After one more ureteroscopy and ESWL, 11.6% passed the stone and the success rate increased to 99.5%. Only two (0.5%) cases required open ureterolithotomy. These data are comparable with our series reporting 90.81% of success after one URS; ureterolithotomy was needed in only (1%) one case. Other series demonstrated excellent results with URS, as shown in table 6^(14,16-17).

Table 6. List of large series in the literature and their success rate in treating ureteral calculus

Author	Success rate
Puppo ⁽¹⁶⁾	88.3%
Kupeli ⁽¹⁴⁾	80.1%
Jeromin ⁽¹⁷⁾	86.6%
Our series	91%

The resolution rates are considerable when the calculus is located in the lower ureter. This was demonstrated in our series since stones were cleared in 98% of patients. Table 7 displays the experience of

Table 7. List of large series in the literature and their success rate in treating distal ureteral calculus

Author	Success rate
Netto ⁽¹⁸⁾	95.6%
Jeromin ⁽¹⁷⁾	93.3%
Harmon ⁽¹⁹⁾	97%
Tawfik ⁽⁶⁾	100%
Hollenbeck ⁽²⁰⁾	99%
Our series	98%

other centers corroborating these findings. Therefore, there is a strong tendency to perform URS in such cases as compared with ESWL.

Extracting small calculi in the lower ureter using only a Dormia basket was described⁽¹⁸⁾ as a safe, effective and less complex method, achieving a success rate of 98.1%. We observed that stones measuring up to 100mm² could be extracted by this technique provided they were in the ureteral lumen. Moreover, these are small calculi and instrument handling in this segment is simpler.

The objective of several studies was to define if placing a double-J stent after ureteroscopy is necessary in order to prevent pain and obstruction in the postoperative period and to facilitate passage of residual fragments⁽¹⁹⁾. Chen et al⁽²⁰⁾ advocated no ureteral stenting after ureteroscopic procedures. They reported cases with ureteral calculi < 10mm, with no tissue damage in the ureter, and brief manipulation. Hosking⁽²¹⁾ supported routinely stenting the ureter, because this practice is thought to reduce the incidence of ureteral strictures and to minimize postoperative pain. A series of 295 procedures randomized into two groups – one submitted to stenting and the other not was reported⁽²²⁾, and concluded that ureteral stent should be placed in cases with edema, ureteral mucosa injury and intense manipulation. In our sample, ureteral stenting is less frequent in cases of endoscopic extraction (68.4%) than in disintegration using a lithotripter (75.8%), demonstrating that endoscopic extraction is a method that causes less damage to the ureter. Based on the learning curve in our service, the use of double-J stents in cases submitted only to endoscopic extraction has decreased due to good progression of these patients.

The literature shows a varied incidence of complications due to many factors, such as the criteria adopted as complication and the training phase of ureteroscopy⁽²³⁻²⁵⁾. Our complication rates are similar to those of other groups. Immediate postoperative infection in 3% of procedures, and in 7% after the fourth postoperative day was also reported⁽²⁶⁾. In our study, 5.1% of patients presented pyelonephritis; there were only two (2%) cases of ureteral perforation, which is statistically similar to the results described by Jeromin⁽¹⁷⁾, that is, 2.3% of perforations in 1982 procedures.

CONCLUSION

Ureteroscopy is a highly effective, safe and feasible treatment option for ureteral calculi, demonstrating high success rates and low complication rates. Our sample procedure is similar to the literature, presenting data that make us feel confident to treat ureterolithiasis using this method.

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