

The use of double-J catheter decreases complications of retroperitoneoscopic ureterolithotomy

O emprego do cateter duplo J diminui as complicações na ureterolitotomia retroperitoneoscópica

ALEXANDRE CAVALHEIRO CAVALLI¹; RENATO TAMBARA FILHO²; LUIZ EDISON SLOGO³; RAFAEL CAVALHEIRO CAVALLI⁴; LUIZ CARLOS DE ALMEIDA ROCHA⁵

A B S T R A C T

Objective: To evaluate the retroperitoneoscopic ureterolithotomy in the treatment of ureteral calculi and the need for double-J catheter to reduce the procedure-related complications. **Methods:** We conducted a retrospective study with 47 patients submitted to retroperitoneoscopic ureterolithotomy, of which 31 were selected and divided into two groups: Group 1, whose patients did not have double-J catheter placement, and Group 2, who underwent perioperative double-J catheter implantation. Data collected comprised pre-and post-operative excretory urography, operative time, postoperative analgesia, length of hospital stay and catheter removal. **Results:** The groups were similar as for age and gender, degree of dilation of the urinary tract, position and average size of the calculi (Group 1 = 15.5 ± 6.6 mm, Group 2 = 16.3 ± 6.1 mm). Operative time was also not significantly different (Group 1 = 130 ± 40.3 min, Group 2 = 136.3 ± 49.3 min). Group 1 had six patients (37.5%) with early (four cases of urinary fistula) and late complications (one case of stenosis of the ureter, one case of functional exclusion of the operated kidney), while Group 2 had no complications. This difference was statistically significant (p = 0.011). **Conclusion:** The use of double-J catheter was associated with significantly fewer complications in retroperitoneoscopic ureterolithotomy. Surgical time, postoperative analgesia and length of stay were similar between groups with and without catheter.

Key words: Ureteral calculi. General surgery. Urinary catheterization. Retroperitoneal space. Laparoscopy.

INTRODUCTION

Urinary lithiasis is one of the most common diseases of mankind. It is estimated that 12% of men and 6% of women present at least one episode of urinary calculi during their lifetime¹. In addition, around 50% will have a new episode within 10 years².

The treatment of ureteral calculi has evolved over the past 25 years with the advances of endourology, lithotripters and extracorporeal shock wave, making the approach of ureterolithiasis less invasive and replacing open surgery as the first therapy choice^{3,4}.

With technological advance, there was also an increase in treatment costs and the consequent restriction in its use, especially in developing countries⁵.

In 1979, there was the first description of a case of ureteral stones treated by retroperitoneoscopy⁶ and on the 90's it was considered a minimally invasive technique that reproduces the open operation⁷.

Many authors advocate laparoscopic ureterolithotomy as the primary treatment of proximal ureteral calculi, especially in stones larger than 1.5 cm, in obstructive impacted calculi, as well as second-line treatment to refractory calculi from either ureteroscopy or extracorporeal lithotripters wave shock^{8,9,10}.

The procedure-related complications were reported by some authors, but the number is small and usually easily treated. These are mainly the prolonged urine leakage through the drain and postoperative ureteral stenosis^{11,12,13}.

The double-J catheter use in this circumstance is not a consensus. Many authors advocate that the minimally invasive approach with careful handling of the ureter may be sufficient for proper healing of the body, without complications and without the use of a ureteral stent^{12,14,15,16}.

In the reported series of laparoscopic ureterolithotomy, many patients were treated without

From the Post-graduation Program in Surgery and discipline of Urology, Department of Surgery of Health Sciences Center, Federal University of Paraná, Curitiba, PR, Brazil.

1. Assistant Professor of Urology, State University of Ponta Grossa; 2. Associate Professor of Urology, Federal University of Paraná (UFPR); 3. Associate Professor of Urology, UFPR; 4. Resident in Urology at the Hospital de Clínicas da Universidade Federal do Paraná; 5. Professor of Urology, UFPR

the use of ureteral stent, with few complications reported.

In series of the Hospital de Clínicas, Federal University of Paraná in Curitiba, Brazil, the ureterolithotomy through retroperitoneoscopy was done with and without the use of double-J catheter. Due to the lack of consensus on the criteria to indicate the use of the catheter, this study was developed with the objective to evaluate the early and late complications occurring after in retroperitoneoscopic ureterolithotomy done into two groups: 1) surgical patients using double-J catheter, and 2) patients submitted to surgery without its use. We compared operative time, postoperative analgesia and length of hospital stay between the two groups.

METHODS

This study was approved by the Ethics in Research Committee of Hospital de Clínicas, Federal University of Paraná, No. 1297-145/2006-10.

Forty-seven patients underwent ureterolithotomy via retroperitoneoscopy and data were retrospectively collected. They were separated into two groups: Group 1, in which no drainage was used; and Group 2, in which

a double-J catheter was routinely implanted during surgery.

The Inclusion criterion was the existence of proximal ureteral calculi treated by retroperitoneoscopic ureterolithotomy.

Exclusion criteria were patients not submitted to this method, impossibility to collect data from pre, intra or postoperative periods, as well as absence of follow-up (at least one visit) and / or excretory urography not performed in follow-up.

The surgical technique used was described by Gaur¹⁷ with some modifications, with general anesthesia and lateral position (position for lumbotomy). Open access in the lumbar region allowed reaching the retroperitoneum. A special craft balloon was inserted (Figure 1) using a two fingers of a latex glove fixed at the distal end of a 10-mm trocar, which was filled with 500 ml of saline solution in order to create a retroperitoneal space to work on. The portals were positioned (Figure 2) to permit ureteral dissection, ureteral opening and removal of calculi.

In cases in which a double-J catheter was used, the insertion of the guide was done by percutaneous renal puncture in a contraincision to the ureteral opening, positioning the double-J catheter anterogradely oriented by



Figure 1 - Balloon for retroperitoneal dissection.



Figure 2 - Position of the patient and surgical trocars insertion sites.
NOTE - Insertion point of a 4th trocar if needed (square mark)

the guide (Figure 3). The proximal end of the catheter was placed into the renal pelvis in retrograde fashion. In cases of lower ureteral incision due to a lower position of calculi we performed another incision in the proximal ureter, through which the device was introduced. Afterwards we closed the ureter with poligalactine 4-0 (Figure 3) sutures and left a laminar drainage of the retroperitoneal space and calculi removal from cavity.

All patients had negative urine culture.

Pre and postoperative serum creatine was measured. Pre and postoperative excretory urography was performed according to hospital radiology protocol and interpretation of the renal collecting system dilatation followed the principles proposed by Talner, O'Reilly and Roy¹⁸, graduated from 1 to 4. The postoperative examinations were obtained at six and 12 months.

Pain control was achieved with sodium dipyrone to all patients postoperatively until the end of the first day.

Ketoprofen or tramadol hydrochloride were used as intermediate analgesics. After the 2nd day analgesics were kept on demand and by oral intake. Morphine sulfate was necessary for cases of refractory pain.

Statistical analysis was performed using the Student's t test and the nonparametric Mann-Whitney, chi-square and Fisher exact tests. The significance level was less than 5% ($p < 0.05$).

RESULTS

We evaluated 31 patients with mean age of 45.1 \pm 14 years, ranging from 19 to 71; 61.3% were men and 38.7% women (Table 1).

In the evaluation of preoperative intravenous urography we predominantly observed excretion time d'' 15 minutes (67.7%), degree of expansion equal to four

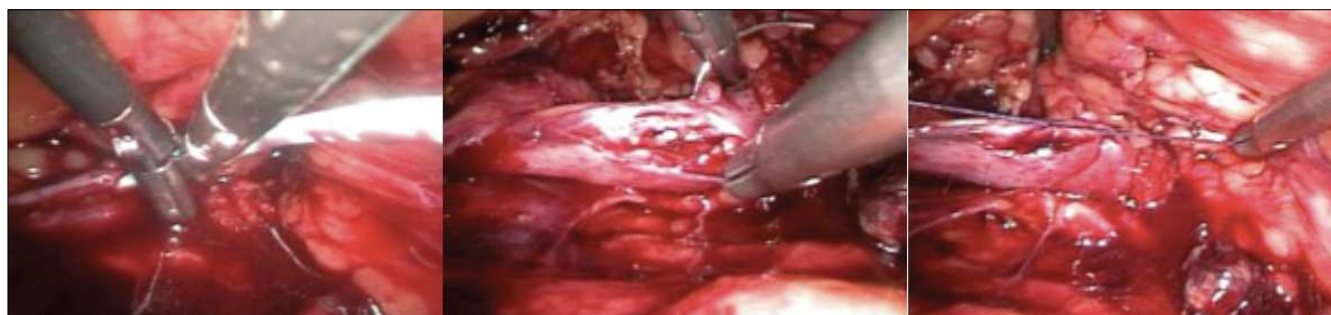


Figure 3 - Implant of double-J catheter and ureteral closure.

Table 1 - Data of patients and results of excretory urography.

| Data | Group 1 (N = 16) | | Group 2 (N = 15) | | Total (N = 31) | | p Value |
|---------------------------------------|------------------|-----------|------------------|-----------|----------------|-----------|----------------------|
| | N | % | N | % | N | % | |
| Gender | | | | | | | 0.609 ⁽¹⁾ |
| · Male | 11 | 68.8 | 08 | 53.3 | 19 | 61.3 | |
| · Female | 05 | 31.2 | 07 | 46.7 | 12 | 38.7 | |
| Age (min-max) | 42 | (19 - 71) | 45 | (30 - 69) | 44 | (19 - 71) | 0.251 ⁽²⁾ |
| Excretion (min) | | | | | | | |
| · Normal (Até 5) | 01 | 6.2 | 01 | 6.6 | 02 | 6.5 | 0.617 ⁽³⁾ |
| · d'' 15 | 11 | 68.8 | 10 | 66.7 | 21 | 67.7 | |
| · > 15 | 04 | 25.0 | 04 | 26.7 | 08 | 25.8 | |
| Degree of expansion | | | | | | | |
| · 1 | - | - | 01 | 6.7 | 01 | 3.3 | |
| · 2 | 02 | 12.5 | 03 | 20.0 | 05 | 16.1 | |
| · 3 | 04 | 25.0 | 04 | 26.6 | 08 | 25.8 | |
| · 4 | 10 | 62.5 | 07 | 46.7 | 17 | 54.8 | |
| · 1 - 2 | 02 | 12.5 | 04 | 26.7 | 06 | 19.4 | 0.295 ⁽³⁾ |
| · 3 - 4 | 14 | 87.5 | 11 | 73.3 | 25 | 80.6 | |
| Position of the calculi in the ureter | | | | | | | 0.675 ⁽³⁾ |
| · Average | 02 | 12.5 | 02 | 13.3 | 04 | 12.9 | |
| · Proximal | 14 | 87.5 | 13 | 86.7 | 27 | 87.1 | |
| Size of calculi (mm) | 15.5 | (9 - 27) | 16.3 | (8 - 30) | 15.9 | (8 - 30) | 0.647 ⁽³⁾ |

(1) chi-square, (2) Mann-Whitney test, (3) Fisher.

(54.8%) and calculi position on the proximal ureter (87.1%).

The calculi size was on average 15.9 ± 6.3 mm (range 8 to 30 mm) and there was no significant difference between groups. The affected side showed a slight predominance for the right ureter (54.8%).

The average value of preoperative creatinine was 1.07 ± 0.24 mg/dl.

All patients in both groups showed ureteral impaction of the calculi for more than two months.

The operating time was 130 ± 40.3 min in Group 1 and 136.3 ± 49.3 min in Group 2 (Table 2).

Group 1 patients were discharged on average 4.1 ± 2.3 days after the operation, while in Group 2, 3.6 ± 0.9 days postoperatively. Although the difference was not statistically significant, patients in Group 1 had in average one extra day in hospital (Table 2).

All studied patients received dipyron postoperatively. In Group 1, five also received ketoprofen, other five tramadol (62.5%). In Group 2, two patients received ketoprofen and tramadol in other three (33.3%).

Morphine sulfate was needed in eight patients in Group 1 and in seven in Group 2. On average these patients received 18.5 ± 6.5 mg morphine, with no difference between the two groups in this parameter.

The removal of the calculi was done in 100% of the cases.

In Group 1, four patients required implantation of a double-J catheter in the postoperative period due to massive and prolonged urinary drainage (more than 500 ml of urine/day for longer than two days). In these patients, the catheter was implanted between 3 and 7 days after surgery and removed on average 6.3 ± 2.2 weeks postoperatively. In Group 2 it was removed on average 7.6 ± 5.5 weeks after the procedure.

Group 1 had four cases of early complication, all with urinary fistulas and two cases of late complications (one mild ureteral stenosis and one case of renal exclusion due to obstruction). In Group 2, there were no complications.

The groups complications were not significant, however it is noteworthy that all the early complications were reported in Group 1 ($p = 0.058$) (Table 3).

When assessing the overall complications (early + late), we noted that all of them occurred in Group 1 (37.5%) ($p = 0.011$), this difference being significant (Figure 4).

DISCUSSION

The use of minimally invasive techniques for treatment of ureteral stones is currently the gold standard, regardless of the situation. The intracorporeal ureterolithotripsy and the extracorporeal lithotripsy are the

Tabela 2 - Dados do tratamento e pós-operatório.

| Variables | n | Average | Standard Deviation | Mínimum | Maximum | p value ⁽¹⁾ |
|------------------------------|----|---------|--------------------|---------|---------|------------------------|
| Operating time (min) | 31 | 133.1 | 44.2 | 60.0 | 220.0 | 0.736 ⁽²⁾ |
| · Group 1 | 16 | 130.0 | 40.3 | 70.0 | 210.0 | |
| · Group 2 | 15 | 136.3 | 49.3 | 60.0 | 220.0 | |
| Removal of the drain in days | 31 | 3.1 | 1.1 | 2.0 | 6.0 | 0.584 ⁽²⁾ |
| · Group 1 | 16 | 3.1 | 1.4 | 2.0 | 6.0 | |
| · Group 2 | 15 | 3.0 | 0.7 | 2.0 | 4.0 | |
| Hospitalization in days | 31 | 3.9 | 1.8 | 2.0 | 10.0 | 0.885 ⁽²⁾ |
| · Group 1 | 16 | 4.1 | 2.3 | 2.0 | 10.0 | |
| · Group 2 | 15 | 3.6 | 0.9 | 2.0 | 6.0 | |

(1) Student t, (2) Mann-Whitney test.

Table 3 - Evaluation of early and late complications.

| Variables | Group 1(N = 16) | | Group 2(N = 15) | | Total (N = 31) | | p Value |
|--|-----------------|------|-----------------|-------|----------------|------|----------------------|
| | N | % | N | % | N | % | |
| Early complications | | | | | | | 0.058 ⁽²⁾ |
| · Yes (urinary fistulae) | 04 | 25.0 | - | - | 04 | 12.9 | |
| Late complications | | | | | | | 0.258 ⁽²⁾ |
| · Yes (1 ureteral stenosis. 1 exclusion of one kidney) | 02 | 12.5 | - | - | 02 | 6.5 | |
| Complications (general) | | | | | | | 0.011 ⁽²⁾ |
| · No | 10 | 62.5 | 15 | 100.0 | 25 | 80.6 | |
| · Yes | 06 | 37.5 | - | - | 06 | 19.4 | |

(1) chi-square, (2) Fisher.

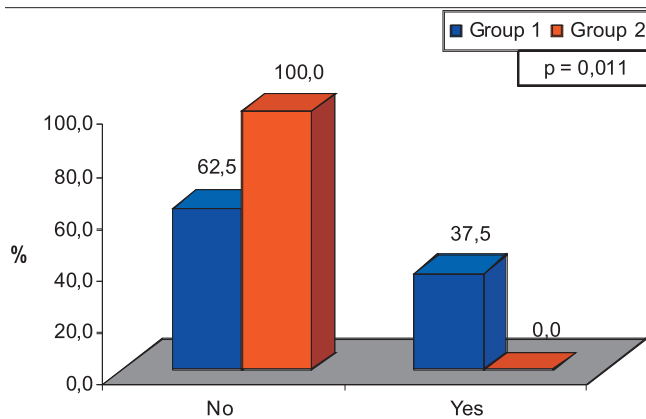


Figure 4 - Complications in the overall study groups.

first options in most cases¹⁹. Some situations, however, are not resolved with these procedures and require the classical approach (open surgery). In the past decade, laparoscopy has replaced open surgery in the treatment of this disease²⁰. Its results are reproducible and have the advantages of minimally invasive treatment, such as better analgesy control, shorter hospital stay and earlier return to usual activities²¹.

Retroperitoneoscopic ureterolithotomy was the first choice for middle ureter calculi in 39 cases (83%), and after lithotripsy with extracorporeal shock wave in eight (17%). The choice was due to the size of the calculus and time of obstruction, the position and anatomy of the urinary tract, and especially the fact that there was no usable flexible ureteroscopy and / or lithotripsy device, due to low socioeconomic status of the population. Gaur *et al.*¹² and Matthias *et al.*²² selected the retroperitoneoscopic ureterolithotomy as primary treatment in 59% and 55%, respectively. Both reinforce the socioeconomic status as a major factor in the therapeutic option.

The size of the calculus, of 16 mm on average, showed no difference between groups, and all cases had impacted stones in the ureter for more than two months. Other authors have reported that large calculus (> 15 mm) and especially those who are impacted for long periods are prime candidates for this technique, due to the high failure rate of other methods^{23, 24, 25}.

The operative time was 133 minutes in the global average, not statistically different between groups ($\alpha = 130$ min, $\beta = 136$ min). Bove *et al.*²⁶ and Fan *et al.*²⁷ published similar operation time in their series. Both point out that the reduced space in the retroperitoneum and lack of experience in early cases substantially contribute to the prolongation of the operation, and that the gain of skill and experience provide a reduction in operative time.

The patients stayed on average 3.9 days after the procedure and had the drain removed on the 3rd day on average. Compared with the findings of Basir *et al.*²⁴ and El-Moula *et al.*¹⁰, who reported lengths of stay of 5.8 and 6.4 days, respectively, it can be seen that this series

had a better hospitalization time. Also compared to Kijvikai Patcharatrakul and¹⁵ and Bove *et al.*²⁶, the time of drain removal of 2.8 and three days was similar to the one found here.

The use of common analgesics was the routine. Additional analgesy with ketoprofen and tramadol was required in 15 patients and morphine sulfate in 15, averaging 18.5 mg / patient. Other authors reported the use of analgesics in 52% to 66% (16, 23). Kijvikai Patcharatrakul and¹⁵ used 5.6 mg of morphine in their cases. Although there is no uniformity in the literature regarding the type and dose of the analgesics used, and considering that in this study we used greater amounts of analgesy than in the series in the literature, the authors consider the effective control of pain the reason for shorter hospitalization time^{20, 28}.

The removal of double-J catheter was on average seven weeks after the procedure, which is near the four to six weeks recommended by most authors^{25, 29}.

Finally, the group without catheter had prolonged drainage of urine through the wound on four of 16 of the patients (25%), which were considered as early complications. All these patients required double-J catheter, which meant a new invasive procedure. In contrast, in the catheters group no case of early complication was observed.

Similarly, there were two cases of late complications, both in Group 1. One patient presented with ureteral stenosis, which was treated with ureteroscopy and dilatation, and remained four weeks with the double-J catheter. Another case involved a patient who had functional kidney exclusion seen by the post-operative urography, with ultrasound revealing hydronephrosis and narrowing of the large renal parenchyma; he underwent laparoscopic nephrectomy.

Thus, the rate of complications in the group without catheter was significantly higher than the group with it, considering overall complications. It should be noted that, although not statistically significant in separated evaluation, there is a tendency for more complications when the double-J catheter is not used, which probably would be confirmed with a greater number of patients.

Reviewing the literature, we found only three relevant publications that compare the use or absence of ureteral catheterization in this procedure. They did not employ double-J catheters in their series. Sinha and Sharma³⁰ concluded that the use of the device decreases the time of drainage and promotes earlier discharge.

On the other hand, Goel and Hemal¹¹ concluded that meticulous suture can replace the use of ureteral stent, except when there is reduced renal function and calculi impacted by more than three months, situations in which the stent must be used. Gaur *et al.*¹² described the largest series operated by retroperitoneoscopic approach. The authors stressed that the use of ureteral stent reduces the leakage of urine, but did not recommend this type of drainage routinely, only in special situations, such as chronic inflammation, marked edema, friability and ureter calculus

impacted for a long period.

Among the papers in the literature there are descriptions of two methods, with or without double-J catheter insertion. However, there is no clarity in comparing the results between them. Thus, in this study we attempted to assess whether the use of the catheter is advantageous for the patient. As for complications, there are similarities with the literature^{12,14,13,23,24,10,25,22}, pointing to the fact that the use of the catheter likely reduces the appearance of complications.

The retroperitoneoscopic ureterolithotomy procedure is still under debate, but it has obtained space as a minimally invasive treatment of ureteral calculi, either as a second-line option or even as the first choice in selected cases.

This study shows that the number of early and late complications was lower in patients operated with the use of double-J catheter. In relation to operative time, analgesy and length of hospitalization, both groups were similar.

So, the authors of this paper recommend the routine use of double-J catheter in order to reduce complications, but new studies should clarify the situations in which the double-J catheter is really essential.

In conclusion, the use of double-J catheter was associated with significantly fewer complications in retroperitoneoscopic ureterolithotomy. Surgical time, postoperative analgesia and length of stay were similar between groups, with and without catheter.

R E S U M O

Objetivo: Avaliar os resultados da ureterolitotomia retroperitoneoscópica no tratamento do cálculo ureteral e a necessidade do cateter duplo J para reduzir complicações relacionadas ao procedimento. **Métodos:** Estudo retrospectivo comparativo de 47 pacientes operados pela técnica de ureterolitotomia retroperitoneoscópica, dos quais 31 foram selecionados e divididos em dois grupos: Grupo 1, cujos pacientes não receberam cateter duplo J, e Grupo 2, que foram submetidos ao implante de cateter duplo J transoperatório. Foram coletados dados de urografia excretora pré e pós-operatória, tempo cirúrgico, analgesia pós-operatória, tempo de internação e retirada do dreno. **Resultados:** Os grupos foram semelhantes quando comparados na idade e sexo, grau de dilatação do trato urinário, posição e tamanho médio do cálculo (Grupo 1= 15,5 ± 6,6mm; Grupo 2= 16,3 ± 6,1mm). O tempo operatório também não teve diferença significativa (Grupo 1= 130 ± 40,3min; Grupo 2= 136,3 ± 49,3min). O Grupo 1 apresentou seis pacientes (37,5 %) com complicações precoces (quatro casos de fístula urinária) e tardias (um caso de estenose de ureter, um caso de exclusão funcional do rim operado), enquanto o Grupo 2 não teve complicações, sendo esta diferença estatisticamente significativa ($p=0,011$). **Conclusão:** O emprego do cateter duplo J foi associado a um número significativamente menor de complicações na ureterolitotomia retroperitoneoscópica. Tempo cirúrgico, analgesia pós-operatória e tempo de internação foram semelhantes entre os grupos com e sem cateter.

Descritores: Cálculos ureterais. Cirurgia geral. Cateterismo ureteral. Espaço retroperitoneal. Laparoscopia.

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Correspondence:

Alexandre Cavalheiro Cavalli

E-mail: alexandrecavalli@hotmail.com