

Endourological Treatment of Renoureteral Lithiasis in Major Outpatient Surgery Regime

Tratamiento endourológico de litiasis renoureterales en régimen de cirugía mayor ambulatoria

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ABSTRACT

Introduction: The high prevalence of urinary lithiasis, together with medical advances and the need for efficiency in the consumption of healthcare resources, are driving the performance of procedures in major outpatient surgery without compromising the quality of care.

Objectives: To evaluate the efficacy of endourological procedures in the treatment of renoureteral lithiasis under major outpatient surgery in a series of cases.

Methods: Descriptive, longitudinal and retrospective review of 79 patients undergoing semi-rigid ureterorenoscopy and retrograde intrarenal surgery at the Hospital Universitario de Getafe between June-2018 and March-2020 for the treatment of urolithiasis in major outpatient surgery. A descriptive and multivariate statistical analysis of patient characteristics, urolithiasis, surgery and complications was performed.

Results: The 53.2 % (42/79) had a previous ureteral catheter. The stone-free rate was 81%, with a median number of procedures of 1(1 - 4). The mean stone size was significantly larger in those who were not stone free (11.6 mm) compared to those who were stone free (9.3 mm); (p = 0.04). Predictors of success were smaller stone size (OR = 0.850) and absence of previous catheter (OR = 0.25). Intraoperative complications occurred in 15.2% (12/79), and postoperative in 26.6 % (21/79), 100 % minor according to the *Clavien-Dindo* classification. Admission was required in 25.3 % (20/79) of patients. Only 5.1 % (4/79) were readmitted. Regarding complications, we found no significant differences in the variables analyzed or in the logistic regression model.

Conclusions: Endourological treatments of lithiasis in major outpatient surgery are safe and effective procedures. Smaller lithiasis size and absence of previous catheter are predictors of freedom from postoperative debris.

Keywords: urolithiasis; nephrolithiasis; ureterolithiasis; ureteroscopy; ambulatory surgical procedures.

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Introducción: La alta prevalencia de litiasis urinaria, junto a los avances médicos y la necesidad de eficiencia en el consumo de recursos sanitarios, impulsan la realización de procedimientos de cirugía mayor ambulatoria sin comprometer la calidad asistencial.

Objetivos: Evaluar la eficacia de los procedimientos endourológicos en el tratamiento de la litiasis renouretal bajo el régimen de cirugía mayor ambulatoria en una serie de casos.

Métodos: Revisión descriptiva, longitudinal y retrospectiva de 79 pacientes sometidos a ureterorrenoscopia semirrígida y cirugía intrarrenal retrógrada en el Hospital Universitario de Getafe entre junio-2018 y marzo-2020 para el tratamiento de la urolitiasis en cirugía mayor ambulatoria. Se realizó un análisis estadístico descriptivo y multivariante de las características de los pacientes, la litiasis, la cirugía y las complicaciones.

Resultados: El 53,2 % (42/79) tenía un catéter ureteral previo. La tasa de cálculos libres fue del 81 %, con una media de procedimientos de 1(1-4). El tamaño medio del cálculo fue significativamente mayor en los que no estaban libres de cálculos (11,6 mm) en comparación con los que sí lo estaban (9,3 mm); ($p = 0,04$). Los predictores de éxito fueron el menor tamaño del cálculo ($OR=0,850$) y la ausencia de catéter previo ($OR = 0,25$). Se produjeron complicaciones intraoperatorias en el 15,2 % (12/79), y posoperatorias en el 26,6 % (21/79), el 100 % menores según la clasificación de Clavien-Dindo. Se requirió ingreso en el 25,3 % (20/79) de los pacientes. Sólo reingresaron el 5,1 % (4/79). En cuanto a las complicaciones, no encontramos diferencias significativas en las variables analizadas ni en el modelo de regresión logística.

Conclusiones: Los tratamientos endourológicos de la litiasis en cirugía mayor ambulatoria son procedimientos seguros y eficaces. El menor tamaño de la litiasis y la ausencia de catéter previo son predictores de ausencia de restos posoperatorios.

Palabras clave: urolitiasis; nefrolitiasis; ureterolitiasis; ureteroscopia; procedimientos quirúrgicos ambulatorios.

Introduction

A major outpatient surgery (MOS) is defined as a procedure in which the patient is admitted and discharged on the same day, with a hospital stay of less than 12 hours, without an overnight stay.⁽¹⁾

The modernization of anesthetic techniques allows surgeries to be performed on an outpatient basis. The decision to hospitalize a patient after elective surgery is based on the limitations of the patient's general health status, daily functioning and psychosocial status or the type of surgical procedure planned.^(2,3,4)

Ambulatory surgery is, by definition, a low-risk surgery and patients are usually American Society of Anesthesiologists (ASA) grade I or II anesthetic risk.⁽³⁾

One of the advantages of outpatient surgery is the reduction of economic costs, which is why it is encouraged in all countries by the different national health systems.^(1,5)

The incidence of urolithiasis depends on several factors: geographic, meteorological, genetic, ethnic, and dietary.⁽⁶⁾ It is three times more common in males, with a peak incidence between the fourth and fifth decade of life.⁽¹⁾ The risk of recurrence depends on the pathogenic disorder causing stone formation. Thus, prevalence rates of urolithiasis range from 1% to 20%;⁽⁷⁾ the prevalence rate is significantly higher (>10%) in countries with high socioeconomic status such as Sweden, Canada, or the USA.⁽⁶⁾

Advances in the development of biomedical technology have allowed rigid ureteroscopes to be used for the entire ureter, in addition to the wide availability of flexible ureteroscopes for those cases that require them.⁽⁶⁾

Endoscopic treatment of urolithiasis is a low morbidity procedure, with overall complication rates ranging from 5-25%.^(6,7) Most complications are minor and do not require intervention.^(6,8) This facilitates its application in the MOS regimen.

Given the need for efficiency in the consumption of healthcare resources, and the high prevalence of urinary lithiasis in this area, we studied the safety of endourological treatment of urinary lithiasis using semi-rigid ureterorenoscopy (URS) and retrograde intrarenal surgery (RIRS) in the MOS regimen.

Methods

Descriptive, longitudinal and retrospective review of 79 patients undergoing URS or RIRS for treatment of urolithiasis in MOS in Hospital Universitario de Getafe (Madrid, Spain), between June 2018 and March 2020.

The following variables were collected: age, sex, anesthetic risk (ASA), presence of previous ureteral catheter, size, number and composition of calculi, location and laterality of the procedure, type of intervention, surgical time and number of procedures, intraoperative and postoperative complications, need for conversion to inpatient surgery and readmissions, as well as free stone rate (FSR) (defined as absence of calculi remnants or presence of calculi remnants if <3mm) and calculi composition.

Descriptive and multivariate statistical analysis (binary logistic regression) was performed on patient characteristics, lithiasis, surgery and complications. The threshold for statistical significance was set at $p < 0.05$.

Results

Most patients were male (60.8%) and ASA II (65.8%). The 53.2% (42/79) had a previous ureteral catheter. Disaggregated data on patient characteristics are shown in [Table 1](#).

Table 1- Descriptive analysis of the patients

N	79
Sex	
Male	60.8% (48/79)
Female	39.2% (31)
AGE (median)	55.3 años
ASA risk	
I	19% (15/79)
II	65.8% (52/79)
III	15.2% (12/79)
Previous ureteral catheter	53.2% (42/79)

The median lithiasis size was 9mm. Most location was proximal ureter (38%) and left side (59.5%). About lithiasis composition, the most frequent was Calcium oxalate monohydrate (40.5%).

URS was the most frequent type of intervention (64.6%). The stone-free rate was 81%, with a median number of procedures of 1(1-4) and 58 minutes of median surgical time.

The 25.3% of interventions were converted to inpatient surgery due to haematuria (11.4%) and fever (13.9%).

The rest of the descriptive analysis of lithiasis and surgery are shown in [Table 2](#).

Table 2- Descriptive analysis of the lithiasis and surgery

Lithiasis size (median)	9 (4-22) mm
Lithiasis number (median)	1 (1-3)
Location	
Distal ureter	36.7% (29/79)
Proximal ureter	38% (30/79)
Kidney	25.3% (20/79)
Laterality	
left	59.5% (47)
right	36.7% (29/79)
bilateral	3.8% (3/79)
Composition lithiasis	
Calcium oxalate monohydrate	40,5% (32/79)
Calcium oxalate dihydrate	3,8% (3/79)
Uric acid	5,1% (4/79)
Calcium phosphate	8,9% (7/79)
Magnesium ammonium phosphate	2,5% (2/79)
Apatite carbonate	1,3% (1/79)
Mixed	20,3% (16/79)
No sample	17,7% (14/79)
Type of intervention	
URS	64.6% (51/79)
RIRS	31.6% (25/79)
Combined	3.8% (3/79)
Surgical time (median)	58 min
Number of procedures (median)	1 (1-4)
Conversion to in patient surgery	
Haematuria	11,4% (9/79)
Fever	13,9% (11/79)
Free stone rate	81%

The 15.2% of patients suffered intraoperative complications and 26.6% postoperative complications, all of them grade 1-2 of the Clavien-Dindo classification. The return rate was 5.1%.

The specifications of complications and return are shown in [Table 3](#).

Table 3. Complications and return

Intraoperative complications	15,2% (12/79)
Ureteral injuries	8,9% (7/79)
Fever	2,5% (2/79)
Catheter calcification	1,3% (1/79)
Haematuria	2,5% (2/79)
Postoperative complications	
Clavien-Dindo 1-2 (100%)	26,6% (21/79)
Haematuria	6,3% (5/79)
Fever	11,4% (9/79)
Pain	7,6% (6/79)
Urinary retention	1,3% (1/79)
Return	5,1% (4/79)
Pyelonephritis	3,8% (3/79)
Pain	1,3% (1/79)

The mean lithiasis size was significantly larger in those who were not free of lithiasis (11.6 mm) compared to those who were (9.3 mm); ($p=0.04$). No significant differences were observed in the rest of the variables analyzed.

Analyzing the presence of complications, we found no significant differences in the variables analyzed (related to the type of surgery, patient characteristics or lithiasis). The logistic regression model was not significant either.

The predictor variables for success were smaller lithiasis size ($OR=0.850$) and the absence of a previous catheter ($OR=0.25$).

Discussion

MOS is a widely used clinical practice in countries such as France, where its application experienced a 21 % increase between 2007 and 2010,^(9,10) or the United States, where between 1981 and 2005, the number of MOSs nationwide increased almost tenfold, from 3.7 million to more than 32.0 million,⁽¹¹⁾ accounting for more than 60 % of all surgeries in 2011, compared to 19 % in 1981.^(3,11)

One of the advantages of outpatient surgery is the reduction of economic costs, which is why it is promoted in all countries by the different health systems.^(1,10) In an American study, it was found that the outpatient regimen could generate savings of \$363 to \$1,000 per outpatient case.⁽¹¹⁾

In Urology, several procedures can be performed on an MOS basis, such as surgery for stress urinary incontinence in women, male genital surgery and prostate surgery using lasers.⁽¹⁾ Other interventions such as adrenalectomy,^(12,13) prostatectomies,^(14,15,16) and radical⁽¹⁷⁾ or partial nephrectomies⁽¹⁸⁾ are being investigated. Even, there is a study published in 2021 that showed their experience in different case-day urological robot assistant surgeries: simple nephrectomy (n= 7), radical nephrectomy (n= 15), radical nephrectomy with para-aortic lymphadenectomy (n= 5), and adrenalectomy (n= 5), pyeloplasty (n= 9), ureteroureterostomy (n= 1), and bladder diverticulectomy with ureteric re-implantation (n= 1); all of them on an outpatient basis, with no major complications (Clavien-Dindo grade > I) and 0% readmission rates.⁽¹⁹⁾

Treatment of urolithiasis by URS or RIRS is another procedure performed as MOS in many institutions. URS is indicated for the treatment of ureteral stones, especially if they are larger than 1 cm and can be performed urgently outside of an infectious episode. RIRS is indicated in the treatment of kidney stones smaller than 2 cm, in overweight, anticoagulated, or antiplatelet patients, with a urinary stone density greater than 1,000 HU, in a lower calyceal position or in abnormalities of renal anatomy such as horseshoe kidney.⁽¹⁾

The first published work on URS with outpatient Holmium laser lithofragmentation dates to 1998, by Yip et al.,⁽²⁰⁾ who collected data on 69 patients (40 men and 29 women) with a mean age of 46.7 (range 21-73) years and an ASA I or II risk who underwent this procedure, data similar to this series. The mean operative time was 61 minutes, also very similar to this investigation, with a success rate of 91% (63/69) slightly higher than analysis reported in this study. The complication rate was 10% (7/69), with four unscheduled readmissions (6%), a rate very similar to this study.

In 2002, Taylor et al.⁽²¹⁾ published his experience of 63 URS: a mean age of 47 years (19 ± 78) like this investigation; they obtained a FSR of 98%, higher than in this analysis. Nine patients required immediate admission, seven for pain, somewhat higher rates than in this series. Seven patients required late admission (1 ± 13 days after the procedure), three for ureteral catheter-related symptoms and three for infection. No significant predictors of immediate or delayed admission were identified, although antibiotic prophylaxis was associated with a lower admission rate.

Chen et al. in 2003⁽²²⁾ showed the following review of 210 patients undergoing URS, 95 of whom were ambulatory, all of whom were ASA I or II. The mean operative time was statistically significantly shorter in outpatient than inpatient procedures: 37 minutes for outpatient procedures and 57 minutes for inpatient procedures (p< 0.01). Complications were rare in outpatients, with six unplanned readmissions, mostly for minor complications, rates like this investigation.

The most frequent complications arising from the procedure include: the risk of postoperative urosepsis, which is up to 5%, and can be minimized by using prophylactic antibiotics, limiting ureteral catheter stay and procedure time, and identifying and treating urinary tract infection; and ureteral avulsion and stricture with low frequency (< 1 %).⁽⁶⁾ Previous perforations, positive preoperative urine cultures and longer operative time are the most important risk factors for the development of complications.⁽⁶⁾

RIRS is also a widely used procedure, but studies on the safety and efficacy of this intervention in an outpatient setting are scarcer.⁽¹⁾

Oitchayomi et al. in 2016⁽¹⁾ studied the treatment of urinary lithiasis in the MOS regimen using URS or RIRS: the majority were male, with a mean age of 52.9 ± 15 years (23.4 - 82.4), similar to this study. Forty-four per cent of the surgeries performed were RIRS, 31% URS and 25% both associated. The mean stone burden was 10.1 ± 5.7 mm (2-30), median size like this analysis. The mean operative time was 58.3 ± 21.1 min (20-150), the same as in this series. There were 6 (6 %) postoperative complications: three *Clavien* stage 2 infections; three *Clavien* stage 3b complications (two renal colic requiring ureteral stent placement 48 h after discharge and one symptomatic perirenal urinoma 48 h after discharge). There was one intraoperative complication (1 %): a ureteral wound with contrast leakage. The conversion rate to hospitalization was 2.2%, much lower than this investigation. Stone size influenced FRS ($p < 0.0001$), as in this work.

Martínez-Corral, et al. in 2022⁽⁸⁾ showed their experience in the outpatient endourological treatment of lithiasis, with the following results: the mean age was 56 ± 14 years, 38 % had a pre-surgical double-J catheter. Median stone surface was 55 mm² (961 ± 323 Hounsfield Units). 73 flexible and 12 percutaneous procedures were performed. 8 patients required immediate unplanned admission and another 2 during the first month. 94% were stone-free at the third month. No intraoperative complications were detected, although 16.5% of the patients presented some type of postoperative complication.

As can be seen, there is some variability among the different studies regarding FSR, which may be partly explained by the absence of a standardized definition of FSR in the literature.⁽¹⁾

Currently, several centers are performing percutaneous treatment of urolithiasis on an outpatient basis, with adequate effectiveness and safety rates.

These data encourage taking the treatment of urolithiasis on an outpatient scheme a step further by also performing percutaneous interventions and not only ureterorenoscopies on an outpatient basis.

Schoenfeld et al. in 2019, Patients in the ambulatory group had a lower Charlson Comorbidity score (aPCNL CCS = 0.11, inpatient PCNL CCS = 0.62, $P = 0.002$). Seventy three percent of ambulatory patients and 62% of standard PCNL patients had no residual stone burden 6 weeks following PCNL ($p = 0.33$). The average residual stone fragment in our ambulatory and standard PCNL group was 3.5 and 3.2 mm, respectively. Five patients (11%) from the aPCNL group and 4 (9%) from the standard PCNL group presented to the emergency department ($P = 0.76$). One aPCNL (2%) and three standard PCNL (6%) patients were re-admitted to the hospital ($p = 0.62$).⁽²³⁾

Xiangkun et al. in 2019: 82 (95.4%) patients achieved same-day discharge or received overnight observation prior to discharge, and 4 patients (4.6%) required full admission (longer than 24 h). The readmission rate was 2.3% (2 patients). The postoperative complications occurred in 10 (11.6%) patients,

including 7, 2, 2 of grade I, II, III complications. The average operation time was 64 min. The stone clearance rate was 90.7%.⁽²⁴⁾

Ching et al. in 2021: The mean age of patients undergoing PCNL at the ASC was 57 (range: 16–86). ASA 1 (6.5%), ASA 2 (56.2%), ASA 3 (37.2%), and ASA 4 (0.1%). The mean stone burden was 30 mm (5–140). The mean operative time was 104 minutes (32–305). The predicted stone-free rate was 84%. Twelve patients (2.4%) required transfer to hospital, and the 30-day readmission rate was 4.2%.⁽²⁵⁾

A study published in January of 2023, shows the trends from 2010 to 2019 to performance more outpatient percutaneous urolithiasis surgery instead of inpatient: there was a substantial shift in the setting of initial PCNL, from 59.9% being inpatient in 2010 to 85.3% being outpatient by 2019 ($p < 0.001$).⁽²⁶⁾

Limitations of the study include its retrospective nature and the absence of data on complications that patients may have suffered at home or in another center.

Conclusions

The treatment of urinary lithiasis using URS and RIRS in the MOS regime are safe and effective procedures in this center. Smaller stone size and the absence of a previous catheter were associated as predictors of the absence of postoperative debris.

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