Flexible and/or semirigid ureteroscopy and holmium laser lithotripsy for kidney stones larger than 2 cm and smaller than 4 cm: success rate and complications


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Abstract

Aims: To evaluate the efficacy of flexible ureteroscopy, semirigid ureteroscopy, or a combination of the two, and holmium laser lithotripsy in the elimination of kidney stones larger than 2 cm and smaller than 4 cm in diameter, the number of procedures necessary for success, and the associated complications.

Methods: A retrospective analytic study was conducted using the medical histories of the patients diagnosed with lithiasis and treated at our hospital within the time frame of 2010 to 2013. Patients diagnosed through computerized axial tomography (CAT) that had stones larger than 2 cm and smaller than 4 cm were included in the study.

Results: Seven patients (6 women and 1 man) with a mean age of 38 years (range: 22-54) and a mean stone diameter of 2.57 cm (range: 2-4cm) were included in the study. Mean surgery duration was 98.57 min (range: 60-120 min) and the mean number of procedures for achieving a stone-free rate was 1.14 (range: 1-2). The success rate was 86% for the first procedure and 100% for the second. Only 2 (28.5%) patients presented with transitory fever of 38.3° C and grade I on the modified Clavien-Dindo complication scale.

Conclusions: Endoscopic retrograde management is an excellent option for patients with comorbidities and is an alternative to percutaneous nephrolithotomy in carefully selected patients.
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menos de 4 cm de diámetro, así como determinar número de procedimientos para lograrlo y las complicaciones asociadas.

Material y métodos: Estudio retrospectivo, analítico. Se llevó a cabo con historias clínicas de los pacientes atendidos en nuestro Hospital, desde el 2010 hasta el 2013, con diagnóstico de urolitiasis. Se incluyeron los pacientes diagnosticados por tomografía axial computarizada (TAC), con litos de más de 2 cm y menos de 4 cm.

Resultados: Se incluyeron 7 pacientes. Edad media de 38 años (rango: 22-54 años), 6 mujeres y un hombre, diámetro medio de lito de 2.57 cm (rango: 2-4 cm). El tiempo operatorio promedio fue de 98.57 minutos (rango: 60-120 min), número promedio de procedimientos para lograr tasa libre de lito 1.14 (rango: 1-2). Tasa de éxito del 86% en el primer procedimiento; a 100% en el segundo evento quirúrgico. Sólo 2 (28.5%) pacientes presentaron fiebre transitoria de 38.3°C, grado I en escala de complicaciones Clavien-Dindo modificada.

Conclusiones: El manejo retrógrado endoscópico es una opción excelente en pacientes con comorbilidades. Es una alternativa a la nefrolitotomía percutánea, en pacientes cuidadosamente seleccionados.

Introduction

Urolithiasis is a multifactorial disease that involves epidemiologic, racial, geographic, and hereditary aspects of the populations studied. Worldwide prevalence varies from 4 to 17 cases/1,000 inhabitants. Hypercalciuria, hyperuricosuria, urinary volume per day, diet, and genetic factors are among the risk factors described for urolithiasis. The economic impact of the disease is considerable, given the recurrence of urinary infections, the need for surgical extraction or lithotripsy, and in the worst of cases, progression to chronic renal disease. Few epidemiologic studies on urolithiasis have been conducted in Mexico. This disease comprehends 13% of all hospitalizations due to renal disease on a national level at the Instituto Mexicano del Seguro Social (IMSS). Another national survey carried out by the same Institute reported a prevalence of 2.4 cases of urolithiasis/10,000 insured inhabitants, and mentioned the states of Yucatán, Puebla, and Quintana Roo as endemic areas, with the greatest prevalence at 5.8 cases/10,000 insured inhabitants in Yucatán.1 Current urolithiasis guidelines recommend percutaneous nephrolithotomy as first-line treatment for stones larger than 2 cm in diameter. Despite the fact that the reported success rate exceeds 95%, significant complications include urine leakage (7.2%), hemorrhage with the need for transfusion (11.2%-17.5%), postoperative fever (21%-32.1%), septicemia (0.3%-4.7%), colon injury (0.2%-0.8%), or pleural damage (0.0%-3.1%). The majority of urologists now attempt retrograde intrarenal surgery thanks to the technologic improvements in the design of the new flexible ureteroscopes, such as the incorporation of working channels with smaller diameters and better resolution, as well as better luminosity in the field of vision,2 increased flexibility of the ureteroscope, better accessories, and improved Holmium laser technology. This procedure has been regarded as an alternative to percutaneous treatment for large stones, with a stone-free success rate comparable to that of percutaneous nephrolithotomy.3

The aim of our study was to confirm the efficacy of single flexible ureteroscopy and/or semirigid ureteroscopy, plus Holmium laser lithotripsy, in the elimination of kidney stones larger than 2 cm and smaller than 4 cm in diameter, as well as the number of procedures necessary for achieving stone resolution, together with the associated complications.

Methods

A retrospective, analytic study was conducted using the data from the clinical case records of patients treated at our hospital within the time frame of 2010 to 2013 that were diagnosed with urolithiasis, acute renal colic, and nephrolithiasis. Inclusion criteria were patients that had been diagnosed with urolithiasis through computed axial tomography (CAT) scans (fig. 1), with stones measuring from 2 cm to 4 cm that were located in the renal pelvis or in the calyces, patients that had undergone treatment, whether by semirigid and/or flexible ureterolithotripsy with Holmium laser, and patients that had follow-up and available imaging studies, CAT scan or plain abdominal x-ray, for evaluating residual stones. Exclusion criteria were patients with stones

Figure 1  Tomographic image showing a stone larger than 2 cm in the right kidney.
not in the inclusion range (smaller than 2 cm and larger than
4 cm), diagnoses made by imaging methods other than CAT
scan, and patients that did not have adequate follow-up.
The variables studied were: stone size, location, number of
procedures necessary for a stone-free status, use of a
flexible ureteroscope, a semirigid ureteroscope, or both.

Results

Of the 15 case records with urolithiasis diagnosis, only 7 met
the inclusion criteria. Mean age was 38 years (range: 22-54
years), 6 women, and one man; mean stone diameter was
2.57 cm (range: 2-4 cm), mean surgery duration was 98.57
min (60-120 minutes), and the mean number of procedures
to achieve a stone-free rate was 1.14 (range: 1-2). In
relation to location, one case was in the lower pole calyx, 2
in the midpole calyx, 2 in the upper pole calyx, and 2 in the
renal pelvis. The preferred instrument for stones in an
intrarenal location was the flexible ureteroscope with a 200
μ laser fiber. In some cases a semirigid ureteroscope was
used for stones in the upper calyx if the stone was within its
reach; a semirigid ureteroscope with a 360 μ fiber was used
in the renal pelvis, when possible, and in the case of
fragment repulsion toward the renal cavities, a FLEX-X2™
Storz flexible ureteroscope was used (tables 1 and 2). It was
standard procedure to use the fluoroscope as an auxiliary in
all cases for placing the guidewire and locating the displaced
fragments (figs. 2 and 3). A plain abdominal x-ray was taken
before double-J catheter removal and a control CAT scan
was carried out 3 months after the procedure in all of the
patients. Stone-free status was documented in 6 of the 7
cases. A second procedure was needed in one case (a 4 cm
stone) because a residual stone measuring approximately 1
cm was found that was completely fragmented. The first
surgical procedure had a success rate of 86% and it was
almost 100% for the second procedure.

Only 2 (28.5%) cases presented with transitory fever of
38.3 °C, which is a grade I complication on the modified
Clavien-Dindo scale (table 3).

Discussion

For kidney stones larger than 2 cm, endoscopic treatment is
currently regarded as better than extracorporeal lithotripsy.
Percutaneous nephrolithotomy has an excellent success
rate, but it is an invasive procedure with a minimum, albeit
significant, complication rate. Recent studies report higher
complication rates that include bleeding in 7.8% of patients,
collecting system perforation in 3.4%, and hydrothorax in
1.8%; during the surgical procedure the prone position also

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increases the anesthetic risk. With the development of semirigid ureteroscopes and ureteroscopes with active deflection, it is possible to manage the upper urinary tract through endoscopic retrograde lithotripsy. Holmium laser not only fragments the stones, but also vaporizes and pulverizes them, creating a dust that can freely run through the ureter. Grasso et al. showed that when percutaneous nephrolithotomy is contraindicated, retrograde therapy is safe and effective. The success rate with flexible ureterolithotripsy is 85.7%. Percutaneous nephrolithotomy may have complications or possibly be contraindicated due to stones in the upper pole, morbid obesity, or hemorrhagic diathesis of the patient. Success is defined as complete fragmentation or residual stones ≤ 2 mm at 3 months after treatment.

Primary ureterolithotripsy is a genuine treatment option and should be considered in all patients regardless of the location and size of the kidney stone. Like our analysis, there have been studies that used flexible ureteroscopy alone, or in combination with semirigid ureteroscopy, or with semirigid ureteroscopy alone, with a stone-free rate of 92%, treating stones of 21 to 50 mm and achieving that success rate after as many as 3 procedures. The combination of retrograde ureteroscopy and Holmium laser lithotripsy is an adequate tool for disintegrating stones larger than 2 cm.

Our study had a limited number of patients for reaching definitive conclusions, but even so, with the number of patients treated, the success and complication rates were similar to those reported in the literature, the most common complication being postoperative fever, corresponding to grade I on the Clavien-Dindo scale, that was managed symptomatically. As mentioned above, location, obesity, hemorrhagic diathesis, and anesthetic problems resulting from the prone position make it necessary to attempt other options in select patients in order to have a less invasive alternative with high success and low complication rates.

Conclusions

Endoscopic retrograde management is an excellent option in those patients with comorbidities, specifically hemorrhagic diathesis, obesity, or stones in the upper pole. It is an alternative to percutaneous nephrolithotomy in carefully selected patients that have a high risk for morbidity from percutaneous management. The endoscopic procedure has been associated with a lower complication rate and a similar success rate for complete kidney stone elimination.

Conflict of interest

The authors declare that there is no conflict of interest.

Financial disclosure

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References


