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ORIGINAL ARTICLE

Single-session extracorporeal shock wave lithotripsy for urinary calculi: Factors predicting success after three weeks of follow-up☆

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KEYWORDS
Urolithiasis;
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Abstract
Introduction: The aim of this study was to identify predictive factors of success following a single-session of shock wave lithotripsy (SWL) at 3 weeks of follow-up in our center.
Material and methods: The medical records of 116 patients with solitary urinary calculi who underwent single-session SWL in our department between October 2007 and August 2009 were reviewed. All preoperative unenhanced computed axial tomographies were reviewed by two radiologists blinded to clinical outcome. Success was defined as complete clearance or the persistence of fragments $\leq$2 mm on a plain film at 3 weeks of follow-up. The impact of clinical and radiological factors on success was assessed by univariate and multivariate analyses.
Results: The single-session SWL success rate at 3 weeks was 49.1%. Stone size <8 mm, stone area <30 mm^2, stone location (mid- and distal ureter), stone density <1000 HU and intraoperative fragmentation showed a significant association with SWL success in the univariate analysis ($p < 0.05$). Stone area (OR 2.9), ureteral stone location (OR 3.4) and intraoperative fragmentation (OR 4.2) were the only predictors of success in the multivariate analysis.
Conclusions: Stone area and ureteral stone location provide important information when deciding about the indication of a SWL in a patient with stone disease. However, successful resolution of only half of the cases after a single session at 3 weeks in our series undermines the relevance of informing patients about the potential need for additional treatment.

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PALABRAS CLAVE
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Factores predictivos de éxito tras una sesión única de litotricia extracorpórea de cálculos urinarios a las tres semanas de seguimiento

Resumen

Objetivo: Identificar factores predictivos de éxito después de una sesión única de litotricia extracorpórea por ondas de choque (LEOC) a las tres semanas de seguimiento.

Material y métodos: Se revisaron los registros clínicos de 116 pacientes con cálculos urinarios únicos sometidos a LEOC entre octubre 2007 y agosto 2009. Las tomografías axiales computarizadas preoperatorias de todos los pacientes fueron revisadas por dos radiólogos en desconocimiento del desenlace clínico. El éxito fue definido como la desaparición completa del cálculo o la persistencia de fragmentos $\leq$ 2 mm en la radiografía simple realizada durante las tres primeras semanas de seguimiento. El impacto de factores clínicos y radiológicos fue evaluado utilizando regresión logística.

Resultados: La tasa de éxito de LEOC a las tres semanas de seguimiento fue del 49,1%. Tamaño < 8 mm, área del cálculo < 30 mm^2, localización en el uréter distal, densidad < 1.000 UH y fragmentación intraoperatoria demostraron una significativa asociación con éxito en el análisis univariado ($p < 0,05$). Área del cálculo < 30 mm^2 (OR: 2,9), localización en uréter distal (OR: 3,4) y fragmentación intraoperatoria (OR: 4,2) fueron factores predictivos de éxito en el análisis multivariado ($p < 0,05$).

Conclusiones: El área del cálculo y la localización en el uréter distal son útiles en el momento de decidir acerca de la realización de una LEOC. Sin embargo, la resolución exitosa de solamente la mitad de los casos bajo los criterios evaluados recalca la relevancia de informar al paciente de la eventual necesidad de tratamientos adicionales después de una sesión única de LEOC.

Introduction

Extracorporeal shock wave lithotripsy (ESWL) continues to be one of the most accepted and used therapies for the treatment of urinary lithiasis.[1] Computed axial tomography (CT) without contrast is the method of choice for the evaluation and selection of the patients who will eventually be subjected to this procedure. The decision will be determined mainly by the size and location of the stone.[2,3] Numerous studies have described predictive factors of preoperative success for ESWL, mainly based on the findings of the CT without contrast.[4] The distance skin-calculus (DSC), the density of the calculus (determined in the CT without contrast), and the body mass index (BMI) have been described as success factors.[5,6] However, as a result of a great heterogeneity in the definitions of outcome, different success rates (46–91%) have been published depending on the number of sessions and time of follow-up.[6,7] Moreover, and most importantly, there is no consensus in the definition of success. Some authors have defined the success of ESWL as the absence of stones or insignificant residual fragments on plain X-ray at 6 weeks after a single session.[8,9] Others have defined it as the absence of stones or fragments under 4 mm after the third month from the last treatment, with a maximum of three sessions.[4] The aim of this study was to identify clinical and radiological predictive factors of success after a single session of ESWL for the three weeks of follow-up.

Material and methods

We conducted a retrospective review of records of patients who underwent ESWL between October 2007 and August 2009 in our center. We identified patients with solitary radiopaque urolithiasis, confirmed by CT without contrast, and controlled with simple vesical and renal X-ray during the first three weeks after the intervention. In this period, 207 ESWL were performed at our center, considering 116 patients with complete data for the analysis. The reason for this loss of patients is that our center works as a simple procedure operator on a great number of occasions, treating patients, the beneficiary of welfare schemes of the armed forces living in other regions of the country, therefore, performing follow-ups in those places. On the other hand, a significant number of procedures are performed to patients who are not beneficiaries and who continue their check-ups in other health centers. It should be noted that the Military Hospital of Santiago is one of the leading centers for ESWL in Chile since it was the first center to have this technology in 1990.

During the ESWL session, patients received conscious sedation with intravenous midazolam and fentanyl. The calculus was found using biplanar fluoroscopy. We used a 60 Hz frequency and the intensity was increased according to the tolerance of the patient. Until April 2009, we used a conventional electromagnetic lithotripter (Modulith® SLK; Storz Medical); and since then, the equipment used was a dual focus electromagnetic lithotripter (Modulith® SLX-F2; Storz Medical).

The demographic and clinical characteristics were obtained from clinical records. All diagnostic (CT) and control imaging (plain X-rays) were reassessed by two radiologists who were blinded to the clinical outcome.

The CTs without contrast were performed on two helical multi-slice CT scanners: 64-channel Somatom Sensation and 16-channel Somatom Emotion (Siemens). With the technique of 120 kV and 160 mA, 5-mm cuts, 0.6-mm cutting collimation, 0.75-mm reconstruction, 1.4-mm pitch, and 5.0-s rotation time. In order to determine the density in