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ORIGINAL ARTICLE

Assessment of tissue damage due to percutaneous nephrolithotomy using serum concentrations of inflammatory mediators☆

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Percutaneous nephrolithotomy;
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Abstract
Objectives: To determine the percutaneous nephrolithotomy (PCNL) effects on the tissues using the quantification of inflammatory mediators, and to assess their impact on the development of postoperative complications.
Patients and methods: Prospective observational non-randomized study on 40 patients who underwent to PCNL. 50 patients with kidney stone who were treated by extracorporeal shock wave lithotripsy (ESWL) were used as control group. Interleukin-1beta (IL-1β), tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6) and C-reactive protein (CRP) were determined at baseline (T0: before treatment), and after 2, 6 and 24 h (T1, T2 and T3).
Results: No relevant changes on IL-1β and TNF-α were found. IL-6 showed two peaks at 2 and 6 h post-PCNL (median 17.8 and 15.8 pg/mL, respectively). At 24 h CRP had reached its peak value (3.4 mg/L). The group treated with ESWL showed no significant changes in any of the markers.
The serum concentration of IL-6 and CRP at 24-h post-NLP is different depending on the occurrence of complications ($p = 0.001$ and $p = 0.039$, respectively). IL-6 showed a good predictive power for the development of complications (AUC .801).

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Conclusions: Tissue damage caused by the PCNL is low. This damage increases significantly in those cases showing postoperative complications. IL-6 at 24 h has been shown to be a good predictive tool for the development of complications.

PALABRAS CLAVE
Nefrolitotomía percutánea;
Citoquinas;
Respuesta de fase aguda;
Cálculos urinarios

Evaluación del daño tisular producido por la nefrolitotomía percutánea mediante la determinación sérica de mediadores inflamatorios

Resumen

Objetivo: Determinar los efectos producidos por la nefrolitotomía percutánea (NLP) sobre los tejidos mediante la cuantificación de mediadores de respuesta inflamatoria, así como la influencia del desarrollo de complicaciones postoperatorias en el daño tisular.

Pacientes y métodos: Estudio observacional, prospectivo, no aleatorizado en 40 pacientes intervenidos mediante NLP. Como grupo control se empleó una cohorte de 50 pacientes con litiasis renal tratada con litotricia extracorpórea por ondas de choque. Determinación previa al tratamiento (T0) y a las 2, 6 y 24 h (T1, T2 y T3) de interleuquina-1beta (IL-1β), factor de necrosis tumoral-alfa (TNF-α), interleuquina-6 (IL-6) y proteína C-reactiva (PCR).

Resultados: No se observaron cambios en los niveles de IL-1β y TNF-α. IL-6 presentó un pico sérico entre las 2 y 6 h de la NLP (mediana de 17,8 y 15,8 pg/ml, respectivamente), mientras que el valor pico de PCR fue de 3,4 mg/l a las 24 h. En el grupo tratado con litotricia expracorpórea por ondas de choque no se apreciaron variaciones significativas en ninguno de los marcadores.

La concentración sérica de IL-6 y PCR a las 24 horas post-NLP es diferente en función de la aparición de complicaciones (p = 0,001 y p = 0,039, respectivamente). IL-6 presentó una buena capacidad predictiva para el desarrollo de complicaciones (AUC de 0,801).

Conclusiones: El daño tisular producido por la NLP es de baja intensidad. Este daño aumenta significativamente en aquellos casos que desarrollan complicaciones en el postoperatorio. La determinación de IL-6 a las 24 h post-NLP parece ser un buen marcador predictivo para el desarrollo de complicaciones.

Introduction

In recent years we have witnessed the development, implementation, and advance of minimally invasive surgery in the different areas of surgery, after demonstrating a clear benefit to the patient by reducing the damage caused by the surgical aggression.

In the particular case of urolithiasis, this search for minimally invasive alternatives is of particular interest, given that this is a chronic disease with high tendency to recur, so it is possible that patients receive multiple treatments throughout their life.[1]

Until the 1980s, the treatment of renal lithiasis required major surgery, with high perioperative morbidity and high risk of loss of the treated renal unit. From that date, a revolution occurs in the therapeutic approach of urinary lithiasis with the development of percutaneous nephrolithotomy (PCNL) and extracorporeal shock wave lithotripsy (ESWL), less invasive alternatives. More recently, retrograde intrarenal surgery (RIRS) joined the therapeutic arsenal. The development and implementation of these procedures has replaced open surgery of the lithiasis, which has virtually no indications at present.[2,3]

When determining the actual invasiveness of these techniques surrogate markers of surgical aggressiveness are generally used, such as hospital stay, postoperative pain, or incidence of complications, given their simplicity. However, we have methods to determine tissue damage caused by a surgical procedure more precisely. Several authors have shown that the extent of injury caused by the intervention correlates with serum cytokines concentration and with the intensity of the acute-phase response (APR).[4–7]

To date the works that use this approach to evaluate the effects on the tissues of the different alternatives of interventionist treatment of lithiasis are scarce. Published results have shown that open surgery is the technique that produces increased aggression, whereas the other options (ESWL, PCNL, and RIRS) are causing low or negligible damage, with no clear differences between them.

Although the primary objective guiding the process of therapeutic decision making in renal lithiasis is the probability of achieving the complete removal of the stone, the actual knowledge of the invasiveness of the different options can be a support in guiding our indications. In this regard, the goal of this study is to determine the effects on tissues caused by PCNL by means of quantifying inflammatory response mediators, as well as the influence of the development of perioperative complications in tissue damage.

Material and methods

An observational, prospective, non-randomized study was performed in patients with renal lithiasis undergoing PCNL