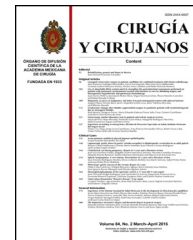




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## ORIGINAL ARTICLE

# Stone free rate assessment after percutaneous nephrolithotomy using nephrolithometric nomogram<sup>☆</sup>



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Received 20 May 2016; accepted 17 March 2017

Available online 7 February 2018

### KEYWORDS

Kidney calculi;  
Percutaneous  
nephrolithotomy

### Abstract

**Background:** Percutaneous nephrolithotomy remains the standard of care for kidney stones larger than 2 cm. Therefore, setting a prognosis for complete stone resolution through this method is essential. The prognostic tools available have limited prediction.

**Objectives:** To evaluate the stone-free rate in patients undergoing percutaneous nephrolithotomy with the Clinical Research Office of the Endourological Society nomogram and suggest modifications to improve the classification.

**Material and methods:** We analyzed a retrospective cohort of patients undergoing percutaneous nephrolithotomy applying the nephrolithometric nomogram specified. We modified the scale dividing the patients into 3 groups: I from 80 to 110 points, II from 111 to 170 points, and III more than 170 points, respectively assessing the stone-free rate (Kruskal–Wallis test was performed,  $p < 0.05$ ).

**Results:** A total of 126 patients were included. According to the nephrolithometric nomogram the stone-free rate was 12.5% for patients with fewer than 111 points and 70.9% for those with 111 points or more. In the modification proposed for groups I, II and III the stone-free rate was 12.5%, 50% and 80% respectively ( $p = 0.000$ ).

**Conclusions:** Evaluation using the nephrolithometric nomogram demonstrated accurate stone-free rate prediction for complex and simple stones, with a lack of discrimination for patients with intermediate scores. Our modification enabled better differentiation of the intermediate groups from the high and low stone-free rate groups.

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PII of original article: S0009-7411(17)30010-5

<sup>☆</sup> Please cite this article as: Landa-Salas JD, Torres-Anguiano JR, Maldonado-Alcaraz E, Lopez-Samano VA, Serrano-Brambila EA, Moreno-Palacios J. Evaluación de la tasa libre de litos posterior a la nefrolitotomía percutánea mediante el nomograma nefrolitométrico. Cir Cir. 2017;85:510–514.

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**PALABRAS CLAVE**

Litiasis renal;  
Nefrolitotomía  
percutánea

**Evaluación de la tasa libre de litos posterior a la nefrolitotomía percutánea mediante el nomograma nefrolitométrico****Resumen**

*Antecedentes:* La nefrolitotomía percutánea es la cirugía de elección para litos mayores de 2 cm. El establecer un pronóstico para la resolución de la litiasis por este método es crucial.

*Objetivo:* Evaluar la tasa libre de litos por nomograma nefrolitométrico de la Clinical Research Office de la Endourological Society en pacientes tratados con nefrolitotomía percutánea y proponer modificaciones para mejorar la clasificación.

*Material y métodos:* Evaluamos una cohorte retrospectiva de pacientes intervenidos mediante cirugía percutánea aplicando el nomograma nefrolitométrico especificado. Realizamos una modificación para mejorar su predicción dividiendo a los pacientes en 3 grupos: I de 80 a 110 puntos, II de 111 a 170 puntos y III de más de 170 puntos, con el cálculo respectivo de tasa libre de litos (se realizó la prueba de Kruskal-Wallis  $p < 0.05$ ).

*Resultados:* Se incluyeron 126 pacientes. Por nomograma nefrolitométrico, la tasa libre de litos fue de 12.5% para pacientes con menos de 111 puntos y de 70.9% con 111 puntos o más. En la modificación propuesta para los grupos I, II y III la tasa libre de litos fue 12.5, 50 y 80%, respectivamente ( $p = 0.000$ ).

*Conclusiones:* La evaluación con nomograma nefrolitométrico demostró predicción de la tasa libre de litos para litos complejos y simples, sin poder discriminar los pacientes con puntuaciones intermedias. Nuestra propuesta permite diferenciar mejor al grupo intermedio de los grupos de alta y baja tasa libre de litos.

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**Background**

Percutaneous nephrolithotomy (PNL) is the standard of care for stones larger than 2 cm, for patients for whom extracorporeal lithotripsy has failed, and for those with specific anatomical conditions (horseshoe kidney, ectopic, calyceal diverticulum, etc.).<sup>1-3</sup> A prognosis for resolution of the disease needs to be established; to that end, 3 tools to determine the stone-free rate (SFR) have recently been published.<sup>4-7</sup> The last of these was developed by the Clinical Research Office of the Endourological Society, and proposes the analysis of 4 variables for the characteristics of the stone (size, location, number and presence of staghorn calculus), the clinical picture (previous treatment) and of another variable that evaluates the experience (number of cases attended in the centre where the procedure was undertaken). These variables are a summation and the final score crosses a line graphically that gives the SFR as a percentage. A 76% diagnostic accuracy is reported for this nomogram. However, predictions based on this nomogram are clinically useful if a 60% SFR threshold is applied to determine treatments auxiliary to PNL. At present, there are few series that have evaluated the application of this nomogram.<sup>8</sup> The objective of this paper was to evaluate the capacity of the CROES nomogram to stratify patients treated with PNL according to SFR in our centre and to propose modifications to better differentiate the treatment response groups.

**Material and methods**

With the approval of the local research committee, we assessed a cohort of 126 clinical records of patients diagnosed with kidney stones, who underwent NLP in our institution from December 2010 to January 2015, and who had a full medical history and sufficient radiographic tests to enable appropriate categorization according to the CROES nomogram.

An experienced urologist was asked to calculate the CROES nomogram score taking into account the 6 variables it uses to calculate SFR. The population was divided into 2 groups (SFR  $\geq 60\%$  and  $< 60\%$ ) according to the original proposal of the CROES nomogram. In order to better distinguish the intermediate response group, we divided the population according to their CROES nomogram score and their corresponding SFR (score/SFR) into 3 groups: group I from 80 to 110/0% to 59%, group II 111 to 170/60% to 79% and group III more than 170/ $\geq 80\%$ , in order to establish 3 prediction levels with at least 20% difference between them.

A SFR was considered when the radiographic studies (computed axial tomography or plain abdominal X-ray) revealed either no stones or stones smaller than 4 mm (clinically insignificant). All patients who required treatment for kidney stones 90 days after the previous treatment were considered new kidney stone cases. Secondly, the operating time, blood loss, days of hospital stay and complications were assessed according to the modified Clavien scale.<sup>9</sup>

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