



REVIEW ARTICLE

Why and how we must analyze urinary calculi[☆]

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Received 20 December 2010; accepted 17 January 2011

Available online 13 October 2011

KEYWORDS

Stone;
Analysis;
Stereoscopic
microscopy;
Infrared
spectrometry;
Morphoconstitutional
analysis

PALABRAS CLAVE

Cálculo;
Análisis;
Microscopía
estereoscópica;
Espectrometría de
infrarrojo;
Análisis
morfoconstitucional

Abstract

Context: There is heterogeneity of criteria on the utility of urinary stone analysis as well as on which is the most suitable methodology. This review presents the analysis of the lithiasis using the morphoconstitutional analysis technique based on the combination of the stereoscopic microscopy (SM) with infrared study (IRS).

Summary of the evidence: There are many techniques to analyze the stone: chemical analysis, electron microscopy, X-ray diffraction, SM and IRS. Reviewing each one of these techniques and through the study of several clinical cases, this review shows the usefulness of stone analysis and the pros and cons of each one of the mentioned techniques. Furthermore, it can be clearly seen how the morphoconstitutional analysis is the one that offers the most useful clinical information to the urologist. In addition, classification of the lithiasis based on this method and its clinical correlation with patients are presented.

Conclusions: Using the morphoconstitutional study to analyze the stone offers more information than the other techniques and it makes it possible to establish a stone classification of important clinical and diagnostic utility.

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Por qué y cómo hemos de analizar los cálculos urinarios

Resumen

Contexto: Existe una heterogeneidad de criterio sobre la utilidad del análisis del cálculo urinario, así como de cuál es la metodología más adecuada. En esta revisión se presenta el análisis de la litiasis mediante la técnica del estudio morfoconstitucional basada en la combinación de la microscopía estereoscópica (MEST) con el estudio de infrarrojos (EIR).

Resumen de evidencia: Existen múltiples técnicas de análisis del cálculo: análisis químico, microscopía electrónica, difracción por rayos X, MEST y EIR. Mediante la revisión de cada una

[☆] Please cite this article as: Gràcia-Garcia S, et al. Por qué y cómo hemos de analizar los calculos urinarios. Actas Urol Esp. 2011;35:354–62.

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de estas técnicas y el estudio de varios casos clínicos, el presente trabajo muestra la utilidad clínica del análisis del cálculo, así como las ventajas e inconvenientes de cada uno de los citados métodos. Por otro lado, se evidencia cómo el análisis mediante el estudio morfoconstitucional es el que más información clínica de utilidad ofrece al urólogo. Asimismo, se presenta la clasificación de las litiasis basadas en este método y su correlación clínica con el paciente. *Conclusiones:* El análisis del cálculo mediante la técnica del estudio morfoconstitucional aporta más información que el resto de técnicas y permite establecer una clasificación del cálculo de gran utilidad clínica y diagnóstica.

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Introduction

For years, the analysis of urinary calculi has been controversial, from the perspective of both the urologist and the clinical analyst, positions in which it was considered that their study provided no useful information and, therefore, should be abandoned not being weird.^{1,2}

Several factors contributed to it all. On the one hand, the emergence of techniques such as extracorporeal lithotripsy by shock waves and endoscopic procedures has facilitated the treatment of lithiasis, often leading to a trivialization of the disease. On the other hand, the current situation of clinical laboratories, with great pressure for automation, and where there is less and less room for manual methods that require a high degree of specialization, has encouraged the use of unsuitable analytical methods of calculus analysis that provide low-reliability information, with little or no clinical relevance and that sometimes can even lead into diagnostic errors.³ Both situations have led, both urologists and analysts, to a loss of interest in the analysis of the calculus, considering it of little use in the study of the disease. All these contrast with the increased frequency of lithiasis observed in recent years, with the increasingly widespread view of considering the disease a real health problem,⁴ and with the recommendation of the clinical guidelines published in the last years of analyzing the urinary calculus whenever possible.⁵⁻⁷

This article aims to: (a) show why the analysis of the calculus should be the initial and indispensable element in the study of the stones and (b) show the decisive role of the analytical methodology used as a main element of the clinical utility of the obtained information. For this, we will answer two key questions: why must we analyze calculi? and how must we analyze them? And we will illustrate, with 4 actual clinical cases, how the analysis of the calculus, performed by appropriate methodological standards, makes it possible to identify the etiopathogenic mechanisms of the lithiasis more clearly, and, accordingly, select the most appropriate therapeutic strategies for each patient.

Why must we analyze urinary calculi?

The exclusive removal of the calculus, without conducting an adequate study of the causes that led to its formation, is only the suppression of the expression of a disease that will repeatedly cause new episodes. Often, some bad eating habits explain why a calculus developed. However, at other times, the calculus is due to metabolic disorders, of

genetic origin or acquired, whose early diagnosis is of great importance not only to prevent relapses, but also to establish the most appropriate therapeutic measures to prevent or delay the appearance of associated renal,⁸ osseous,^{9,10} or cardiovascular^{11,12} complications.

The calculus is the true testimony of the alterations responsible for its appearance. Their study provides us with irreplaceable information about the causes of its formation, the conditions of its nucleation, its growth, old or recent activity of the lithiasis and the existence of particular lithogenic processes.

On certain occasions, the composition of the stone is conclusive about the cause of the lithiasis (cystine, 2-8 dihydroxyadenine, xanthine, struvite, medicines) or even about whether it really exists (false calculi). At other times, the components found guide us towards the possible etiopathogenic mechanisms responsible for its formation. For example, the major presence of calcium oxalate monohydrate (COM) advises towards the existence of hyperoxaluria, the calcium oxalate dihydrate (COD) towards a hypercalciuria, the uric acid to an increase in urinary acidity and /or hyperuricosuria.^{13,14}

Although some authors give more physical diagnostic value to the metabolic study of blood and urine than to the analysis of the calculus,^{1,2} alterations in the results of the tests that make up these studies are not always unequivocal proof of involvement in the lithogenic process. The calculus may have developed over several years and metabolic studies, conducted at the time of its finding, do not always reflect the initial cause of the lithiasis, which may have already disappeared and explain, by itself, the etiopathogenesis of the disease.

Thus, it is not surprising that different clinical guidelines on urolithiasis, which appeared in recent years, do not hesitate to point out the analysis of the calculus as an essential element and starting point in studying the disease.⁵⁻⁷

How must we analyze the calculi?

Although clinical guidelines include the need to analyze the calculi, they say little or nothing about what the methodology to be used is, and when they declare themselves on this aspect, infrared spectrometry (IRS) and X-ray diffraction are the most mentioned techniques.^{5,7} Two aspects to stand out: (a) the virtual absence of references to the study of the calculus with optical methods, (b) the fact that the recommended methodologies are not generally used in Spanish clinical laboratories, where the chemical analysis is

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