

Endoscopic Surgery for Urolithiasis: What does “Stone Free” Mean in 2012

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Rezumat

Intervențiile endoscopice pentru urolitiază: ce înseamnă “stone-free” în 2012

Dezbaterea continuă în ceea ce privește tratamentul optim al urolitiaziei, un parametru important fiind rata de “stone-free”. Totuși, în ciuda simplității unor noțiuni precum rată de “stone-free” sau rată de succes, atunci când analizăm datele din literatură constatăm că în spatele lor se află noțiuni complexe, intricate sau chiar controversate. Problema majoră rezidă în modul heterogen în care este definit succesul intervențiilor, intervalul de timp la care este verificat statutul de “stone-free” și lipsa unui protocol standardizat strict de evaluare postoperatorie a pacientului cu urolitiază. Am efectuat o trecere în revistă a datelor disponibile în literatură, cu scopul de a identifica metode de îmbunătățire a standardizării acestor noțiuni.

Cuvinte cheie: absența restanțelor litiazice, fragmente litiazice reziduale, urolitiază

Abstract

There is still an ongoing debate regarding the optimal endourological treatment of upper urinary tract lithiasis, a

significant parameter being the stone free rate. However, despite the apparent simplicity of notions such as stone free or success rate, when analyzing the available literature one may discover the complex, intricate and debatable issues behind them. The main problems reside in the heterogeneous way of defining intervention success, the timing at which a patient is considered stone-free and also in the lack of standard postoperative evaluation of patients with urolithiasis. A review of the literature in regard of these notions was performed, in order to identify methods to improve the standardization of these notions.

Key words: stone free, residual stone fragments, urolithiasis

Introduction

There is still an ongoing debate regarding the optimal endourological treatment of upper urinary tract lithiasis. In evaluating the existing three alternatives, shock wave lithotripsy (SWL), retrograde intrarenal surgery (RIRS) and percutaneous nephrolithotomy (PCNL), perhaps the most important parameters are represented by the stone free rate (or the intervention's success rate) and the morbidity. However, despite the apparent simplicity of notions such as stone free or success rate, when analyzing the available literature one may discover the complex, intricate and debatable issues behind them.

The standardization of analysis criteria is essential for the accuracy of any comparison. Unfortunately, regarding this aspect, there is an extensive variability in reporting the postoperative outcomes. The main problems reside in the hetero-

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geneous way of defining intervention success, the timing at which a patient is considered stone-free and also in the lack of standard postoperative evaluation of patients with urolithiasis. Also, the variability of preoperative characterization concerning stone disease may introduce additional bias to data produced by different studies.

Making the analysis criteria homogenous is a desirable goal in order to increase the accuracy of any study data and to offer the patient the best alternative for his pathology. However, when translating this issue into daily clinical practice, the objective seems more difficult to achieve. Technological differences between various urological departments worldwide (both regarding the treatment armamentarium and imaging possibilities) as well as concerns related to the perioperative quantity of ionizing radiations the patients are subjected to constitute only some of the reasons for this situation.

Defining the success of a procedure

What complicates the definition of successful endourological intervention for urolithiasis is the issue of residual fragments. There is no universally accepted cut-off size of these present residual stones allowing them to be included or not in the notion of success rate. When reviewing the literature, one can find authors defining the success of retrograde intrarenal surgery as stone free or presence of residual fragments ranging in size between 1 and 5 mm (1,2,3,4). Other papers are more restrictive, as only the complete absence of any stone in the upper urinary tract is considered acceptable (5, 6). To complicate the matter even more, some authors include residual stone fragments up to 5 mm within the definition of the stone-free status (7).

Finally, about one third of the published papers regarding the treatment of urolithiasis do not define the actual success of the procedure (8).

As far as the residual fragments secondary to PCNL are concerned, Raman et al. demonstrated that a size of 2 mm or smaller correlate with a significantly decreased risk of future stone events (9). There is no logical reason to believe that residual fragments after percutaneous surgery have a natural history different from that of those subsequent to RIRS or SWL. So, it would be only fair to ask why the standards for success vary from one procedure to another. The difference probably lies in the particularities of percutaneous surgery. The increased morbidity specific to the procedure is acceptable only because it yields better stone free rates, while usually dealing with larger stone bulks (10). Also, the second look flexible nephrolithotomy for residual fragments is a less invasive procedure than the initial one, usually through a preexisting access tract (9). In cases of SWL or RIRS, the residual fragments' retrieval implies a procedure with the same invasivity as the initial one, or even more aggressive (11).

The natural history of residual stone fragments

While aiming to assess the safety of abandoning upper

urinary tract residual stone fragments of various sizes after endourological procedures, it is essential to evaluate their natural history.

Rebuck et al. studied 51 patients with stone fragments of 4 mm or smaller left in place after ureteroscopy and followed their growth and location, significant events (emergency department visits, hospitalization, and additional interventions) and eventual spontaneous passage. The conclusion of the study was that one in five of these cases will experience a stone event in the following 1.6 years, a similar proportion will pass the fragments spontaneously and the rest will retain stable-sized, asymptomatic fragments (11). When analyzing a series of cases with larger retained stone fragments (maximal size of up to 5 mm), the rate of stone events increased to 48.7% (12).

When studying the so-called clinically insignificant residual stone fragments, Osman et al. established that, in 78.6% of the cases, they cleared spontaneously within a few weeks and did not recur within 5 years. This aspect presents a practical impact concerning the moment when the presence of the residual fragments is assessed. Allowing time for the debris to clear permits a more accurate evaluation of the stone-free rate (13).

Predictive factors for stone events that will require active management in patients treated by either RIRS, PCNL or SWL with residual fragments seem to be constituted by the size of retained stones of 4 mm or larger, renal failure, metabolic hyperactivity, their location (such as lower pole), recurrent urolithiasis and soft matrix calculi (12,14,15).

Postoperative evaluation after endourological interventions for urolithiasis

There is a great variability regarding the postoperative evaluation of patients treated for urolithiasis. The main imaging modalities used for stone free assessment are represented by CT scan, plain abdominal x-ray (KUB), intravenous pyelography (IVP) and ultrasonography.

Each of these alternatives has its' own particularities. CT scan is universally accepted as the most accurate investigative method. It can be used for either radiolucent or radioopaque stones. However, it is more expensive and involves greater radiation exposure (7).

The quantity of ionizing radiations on which a urological patient is perioperatively exposed to is usually considerable (16). It includes not only exposure during imaging but also intraoperative fluoroscopy. Moreover, due to the recurrent character of this pathology, the chance of being exposed to supplementary doses in the future is significant. For these reasons, the urologist should be aware of the amount of radiation received by patients from multiple sources and to try to maintain it reasonably low, without sacrificing the safety of the patient (17,18).

There are also some technical particularities of the CT scan protocol such as the thickness of section slices, which may influence the accuracy of the measurements (19). This parameter is not (and probably cannot be) standardized and therefore may create a bias of the results.

Ultrasonography has the advantages of wide use and reduced costs. With no radiation exposure, it is safe to perform it even in special categories of patients such as pregnant women. By comparison to KUB, it may also detect indirect signs of obstruction such as hydronephrosis, absent ureteral jet or increased renal resistive index. However, it is strongly operator dependant and with a large error margin. These weak points may become even more acute when dealing with the very small size residual fragments.

KUB is cheap and practical but it can't be used for detecting radiolucent calculi and has a low sensitivity for small stones (7). In a study by Kupeli et al., residual stones missed by KUB were found by ultrasonography in 11.8% of the cases and by helical CT in 22.3% of the cases (20).

Of course, the available technology is always a very important parameter dictating which evaluation modality will be applied. A review of the existing literature showed that the most common imaging technique is KUB alone, followed by combined KUB and ultrasonography (8).

As far as the percutaneous procedures are concerned, the eventual residual stone fragments may be visually evaluated when using a flexible nephroscope. This procedure may improve detection of the retained fragments, thus enabling their immediate removal or planning of a necessary second-look nephroscopy (21,22,23). In this manner, the accuracy of stone free rate' determination is improved and may reduce the need for additional radiation exposure. However, it also augments the costs of the procedure(s), especially when performed as a second-look.

Pearle et al. compared the noncontrast helical computerized tomography and plain film radiography to flexible nephroscopy for detecting residual fragments after percutaneous nephrolithotomy. The sensitivity and specificity were 46% and respectively 82% for KUB and 100% and 62% for CT when using flexible endoscopy as the gold standard. The authors concluded that the selective use of flexible nephroscopy after percutaneous nephrolithotomy based on positive CT findings will avoid an unnecessary operation in 20% of patients (24).

Conclusions

So far, literature reports regarding the outcome of endourological treatment for urolithiasis lack standardization. Due to this fact, the comparative evaluation of various alternatives is biased.

Some of the standardization problems are impossible to surmount due to practical considerations, heterogeneous technical base, etc. However, other issues may be solved by creating widely accepted definitions of success rate and stone free rate, and using them when reporting the study data.

The natural history of small residual stone fragments should be further studied in order to better define what is acceptable and what is not at the end of a procedure.

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