

Considerations on the management of patients with residual stone material after active removal of urinary tract stones

İdrar yolu taşlarının aktif çıkarımı sonrası rezidüel taş materyali olan hastalar için tedavi yaklaşımları

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Abstract

The major concern following minimally invasive stone removal procedures is related to the presence of residual fragments, parts of the original stone or unaffected stones. There is definitely a consensus that symptomatic residuals need to be eliminated. On the other hand, for patients with asymptomatic residuals there are different attitudes. Some urologists propose an aggressive treatment aiming at a complete clearance of the renal collecting system, whereas others apply a conservative approach with or without a regular follow-up programme. The major question in this regard is whether all stone material residing after active stone removal - irrespective of symptoms - should be considered as failures in need of additional stone removing procedures. The answer to that question should be sought in long-term follow-up studies of such patients. The published data has clearly shown that majority of patients treated with non-invasive or low-invasive stone removing procedures, calcium stone residual fragments usually do not require aggressive re-treatment with the aim of removing every little fragment from the kidney. They need, however, metabolic and recurrence preventive considerations.

Key words: Follow-up studies; minimally invasive surgical procedures; urolithiasis.

Özet

Minimal invazif cerrahi işlem ile idrar yolu taşlarının çıkarımı sonrası en önemli sorun orjinal taşın parçaları ya da müdahale edilmeyen taşlardan oluşan geride kalan rezidüel fragmanlardır. Semptomatik rezidüel taşların ortadan kaldırılması yönünde ortak bir fikir birliği vardır. Diğer taraftan, asemptomatik rezidüel taşı olan hastalarda farklı yaklaşımlar söz konusudur. Bazı ürologlar renal toplayıcı sistemin tamamen temizlenmesine yönelik yoğun tedavi yaklaşımlarını benimserken, diğerleri düzenli izlem programı ile beraber olan ya da olmayan koruyucu yaklaşımları savunmaktadır. Burada esas sorun, aktif taş çıkarımı sonrası geride kalan taş materyalinin, semptomatik olmasından bağımsız olarak, tedavi başarısızlığı kabul edilip ek taş çıkarma girişimi gerektirip gerektirmediğidir. Bu sorunun çözümü bu hastaların uzun dönem izlem bulgularını içeren çalışmalarda aranmalıdır. Yayınlanmış veriler, invazif olmayan ya da en az invazif taş çıkarma işlemleri ile tedavi edilen hastaların çoğunun, böbrekten en küçük kalıntıyı bile çıkarmak amacıyla, kalsiyum taşı rezidüel fragmanlarına yönelik yoğun tekrar tedavi gerektirmediğini göstermektedir. Ancak bu hastalara metabolik ve rekürens önleyici yaklaşımlar uygulanmalıdır.

Anahtar sözcükler: İdrar yolu taşı; izlem çalışmaları; minimal invazif cerrahi işlem.

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During the past three decades, modern technology has given us methods for active stone removal that dramatically has changed the content of urological surgery. In a relatively short period of time, open surgical procedures were replaced by non-invasive or low-invasive treatment modalities. Today active stone removal from the kidneys and ureters is carried out almost entirely with extracorporeal shock wave

lithotripsy (ESWL), percutaneous nephrolithotomy (PNL), ureteroscopy (URS), and retrograde intrarenal surgery (RIRS).^[1] Undoubtedly, all these methods are gentle and efficient with few side-effects. The major concern is related to the presence of residual fragments, parts of the original stone or unaffected stones. There is definitely a consensus that symptomatic residuals need to be eliminated.^[1] On the other

hand, for patients with asymptomatic residuals, there are different attitudes. Some urologists propose an aggressive treatment aiming at a complete clearance of the renal collecting system, whereas others apply a conservative approach with or without a regular follow-up program.

During the pre-endoscopic era when open surgery was the only method for dealing with stones in the kidneys, stones of minor size-if without symptoms-usually were left in the kidney for surveillance. At the best, these patients were followed with radiological examinations on a regular basis. In other cases re-evaluation was carried out only when the stone(s) caused symptoms. Although several of these patients had subsequent complications as a result of stone growth, stone passage or infections, a substantial number remained symptom-free despite their presence of renal stones.

Today the situation is different. More patients than before are subjected to active stone removal, but with the low-invasive methods followed the concern of the residual stone material that was encountered in a significant proportion of the patients. Residual fragments are commonly seen after ESWL, but also following PNL and RIRS stone-material may remain in the renal collecting system.

The major question in this regard is whether all stone material residing after active stone removal-irrespective of symptoms-should be considered as failures in need of additional stone removing procedures. The answer to that question should be sought in long-term follow-up studies of such patients. In order to elucidate this issue, a number of publications were re-visited, and as is evident from Fig. 1, a wide range of fragment growth was reported.^[2-13] When those studies were excluded that only comprised infection stones^[2,12], stone growth obviously occurred in between 2% and 65% of the patients. As expected, the fraction of patients with fragment growth increased with time, but even after 6 and 6.5 years two studies showed fragment/stone-growth in only 10% and 26% of the patients, respectively.^[5,7] The course of stone disease expressed in terms of new stone formation derived from single and recurrent stone formers in the author's patients^[14,15] are indicated in Fig. 1, and if we assume that half of the treated patients were single stone formers and the other half recurrent stone formers at start of the follow-up, it is evident that in 7 of the 14 studies growth of fragments was

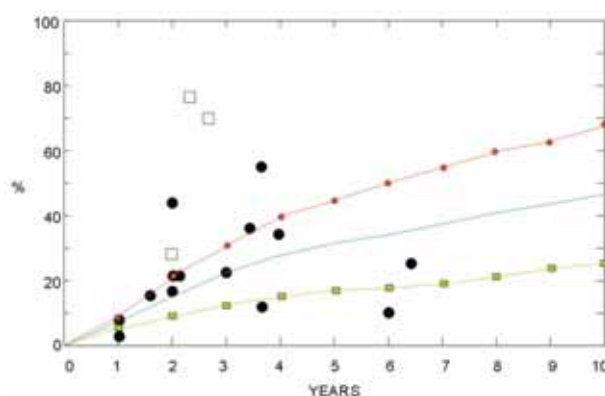


Figure 1

Growth of residual fragments as reported in the literature.^[2-13] The open squares represent findings in patients with infection stones and the closed circles those in whom calcium stones were the dominating stone constituent. The red line (small filled circles) shows the rate of recurrent stone formation (new stones) in patients with a history of recurrent stone formation but considered stone-free at the start of follow-up. The green line (small squares) shows the corresponding rate of new stone formation in patients who had a history of only one stone. The blue line represents the expected rate of recurrent stone formation provided that half of the patients were single stone formers and the other half recurrent stone former. These curves are derived from the author's experience.

observed in percentages roughly corresponding to the expected recurrence rate. In the others there was a higher growth rate, but apparently in only two studies exceeding that expected for patients with a previous history of stone formation.

The author's experience from a 4-year follow-up of patients with residual calcium stone fragments (≤ 4 mm) after ESWL as judged with kidney-ureter-bladder radiography, are shown in Table 1. Among these patients any clinically significant kind of activity was demonstrated in only 38% of the patients, when those 12% were excluded in whom new stones had formed, apparently without any relationship to the residuals. In only 12% of the patients was it necessary to proceed with additional stone removing procedures because of appearing or remaining symptoms.

Needless to say, all patients rendered stone-free by active stone removal do not remain stone-free irrespective of method used for stone removal. Fig. 2 summarizes some literature data on new stone formation.^[2,3,5,10,13,16-24] It is of note that as many as 20% of patients treated with open surgery had formed new stones after 18 months.^[16] In up to 42% of the patients

Table 1. The author's experience for the course of residual fragments during the first 4 years after ESWL of renal stones

	Percent of patients
No growth	29%
Almost undetectable growth	21%
Obvious growth, no symptoms	21%
Consolidation, no symptoms	5%
Development of symptoms related to residuals, new treatment	12%
New stone formation	12%

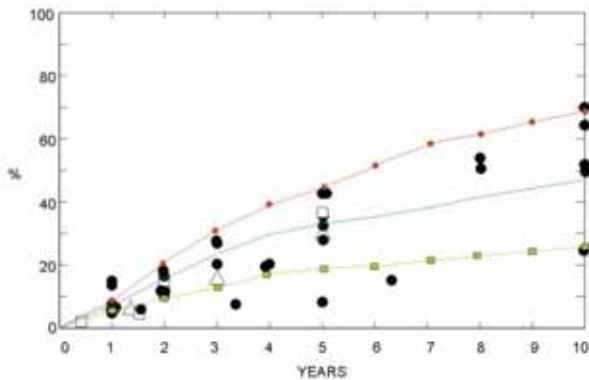


Figure 2

New stone formation as reported in the literature. [2,3,5,10,13,16-24] Large open squares represent patients with infection stones and open triangles recurrent stone formation following open surgery. The red line (small filled circles) shows the rate of recurrent stone formation in patients with a history of recurrent stone formation but considered stone-free at the start of follow-up. The green line (small squares) shows the corresponding rate of new stone formation in patients who had a history of one stone. The blue line represents the expected rate of recurrent stone formation provided that half of the patients were single stone formers and the other half recurrent stone former. These curves are derived from the author's experience.

additional stones had formed at a follow-up of 5 years. After 8 years new stones were found in 51-53% of the patients. In more extensive long-term studies recurrent stone formation in as many as 70-80% of the patients was recorded after 10-20 years.^[25-29] The conclusions from all these observations are that even following meticulous clearing of the renal collecting system, new stone formation cannot be avoided, and the data in Fig. 2 has close resemblance to the percentage of patients with new stone formation seen in the author's department and apparently ESWL did not result in an accelerated recurrence risk caused by minor residual fragments not detected on plain radiograms.

Undoubtedly the stone-activity might be higher in patients with residuals, particularly after ESWL, but it also is of note that a majority of those patients nevertheless remain without symptoms.

Three different stone-situations might be considered:

- A. Small or large collections of stone material (gravel) with a size of the individual fragments not exceeding 4 mm. Such fragments are likely to pass spontaneously without any need of active surgical intervention. Studies also have shown that passage of fragments can occur late after ESWL.^[3]
- B. Gravel collections or isolated stones where the largest fragments have a diameter exceeding 4 mm. When passing down the ureter such fragments might cause acute stone colic due to obstruction.
- C. Any residual stone material associated with symptoms such as pain, hematuria or infection.

For the last group, as stated above, active intervention is mandatory^[1] and that group of patients will not be further discussed.

Numerous reports have dealt with problem of residual stone material. It is, however, sometimes difficult to draw correct conclusions on the risk of fragment growth and/or new stone formation, because a number of underlying factors are either unknown or insufficiently reported. The further development of residual stones and fragments is determined by several factors:

1. Previous history (frequency) of stone formation as a reflection of stone forming propensity.
2. Chemical composition of the stone/fragments
3. Metabolic risk situation

It has been shown in previous reports that around 75% of patients remained stone-free 10 years after a single stone episode. In contrast only approximately 25% of patients who before the follow-up period had formed more than one stone remained without recurrences.^[14,15]

Patients who have formed infection stones (composed of magnesium ammonium phosphate and carbonate apatite or ammonium urate), uric acid stones or cystine stones are known to have a very high risk of new stone formation. In calcium stone

formers the presence or absence of metabolic risk-factors are highly important and it was accordingly shown that patients with residual stone fragments after PNL had a 55% growth if left without medical recurrence prevention, compared with 15% of those with such treatment.^[6]

Following the introduction of the term “clinically insignificant residual fragments” (CIRF) a number of authors have shown that such fragments are not at all insignificant and it is true that not all these fragments remain insignificant in the meaning that they are clinically unimportant. Nevertheless, a substantial number of patients with such fragments remain without symptoms for long periods and probably in many cases even life-long. It therefore is the author’s opinion that with the access to modern ESWL-which in most patients is a convenient and non-invasive treatment-other procedures with a more invasive character imply unnecessary and expensive over treatment in most of these patients. Careful surveillance and metabolic care of these patients will most certainly be both gentle to the patients and cost-effective.

It thus has been my routine to treat patients with asymptomatic residual fragments or small stones as follows:

For calcium stone patients referred to Group A (see above), a metabolic risk evaluation is recommended, particularly in patients with a previous history of stone formation^[1,19,30] because the further course of the disease seems to be related to the biochemical risk situation.^[15] When abnormalities in urine composition are demonstrated in patients who also have residual fragments, an appropriate recurrence preventive treatment should be started.^[1,30,31] These patients also need a follow-up programme with a first radiographic examination after one year. The stone situation at that time should determine the future follow-up intervals.

A more active attitude is necessary for patients with infection and cystine stone disease (Group C). In those patients other endourological procedures with or without chemolysis should be considered.^[32-36] For uric acid stones oral chemolysis in many cases is sufficient.^[37]

When the remaining stone residuals are larger, that is with a diameter of 5-6 mm or more (Group B), the likelihood of spontaneous passage is low and further disintegration is recommended in order to prevent

acute stone episodes. In the majority of these patients repeated ESWL-session(s) will turn these Group B patients to Group A patients.

Furthermore it is of course essential to make efforts to eliminate any residual fragments with non-invasive techniques, because the follow-up programme for the stone-free patient can either be avoided or carried out with longer intervals than for the patient with residuals. In this regard inversion and vibration treatment is an attractive approach, although so far it is poorly evaluated and applied technique. The results of such a step seem promising.^[38] A high diuretic and exercise regimen also might serve the same purpose and from some studies the use of potassium citrate has been recommended for facilitation of fragment elimination from the kidney,^[39] although contradictory results have been recorded with such a regimen.

In summary the risk of growth of residual fragments as well as the risk of new stone formation always need appropriate attention in patients with urolithiasis. Extensive invasive methods, however, do not seem to be necessary in a majority of these patients. The low-invasive approach and the principles outlined above have successfully been applied in more than 10,000 patients treated for stones in the kidney during the past 24 years. It is of note that also after endourological procedures, that usually are considered superior to ESWL, computed tomography examination have shown that as many as 46% of the treated patients had residual stone material after 1 year.^[10] Neither was there any statistically significant difference between stone-free rates following ESWL and URS in a multicentre study.^[40]

The bottom-line message of this short review is that in the majority of patients treated with non-invasive or low-invasive stone removing procedures, calcium stone residual fragments usually do not require aggressive re-treatment with the aim of removing every little fragment from the kidney. They need, however, metabolic and recurrence preventive considerations.

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