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REVIEW

Improving the compliance of the recurrent stone-former

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KEYWORDS

Urolithiasis;
Metaphylaxis;
Compliance;
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Abstract **Objective**To provide an overview of aspects of compliance by the recurrent stone-former, and to give recommendations for its improvement. About half of all stone-formers have one recurrence during their lifetime. To avoid recurrent stone formation it is necessary to use metaphylaxis, based on individual risks. However, all general and specific efforts are meaningless if patients are not willing or are incapable of following the proposed therapy in the long-term.

Methods: PubMed was searched for articles on urolithiasis, metaphylaxis, compliance and adherence, and relevant papers were reviewed.

Results: Compliance is a multidimensional phenomenon which is determined by the interaction of different factors, i.e. social and economic, therapy-related, patient-related, condition-related, and healthcare team and system-related factors. Subsequently there are several different interventional possibilities at the urologist's disposal to effect better compliance by the patient.

Conclusions: The treatment and metaphylaxis of the recurrent stone-former present a particularly pertinent challenge. Patient compliance has an immense influence on the success of the treatment with respect to metaphylaxis, which is the decisive factor for preventing stone recurrence.

Introduction

The lifetime risk of urolithiasis is calculated to be 5–12% in Europe; 13% of men and 7% of women are affected [1]. About half of all stone-formers have one recurrence during their lifetime. The recurrence rate is high in 10–15% of all stone-formers, depending on the stone type and the severity of the disease [2]. To avoid recurrent stone formation and the associated costs and risks of treatment, it is important to know the risk of recurrence

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to be able to use specific metaphylaxis. The European Association of Urology guidelines define the determinants for a patient to be considered at high or low risk for stone recurrence or (re)growth. For the correct classification a reliable stone analysis by infrared spectroscopy or X-ray diffraction, and basic analyses such as a medical history, clinical evaluation, blood and urine analyses, are needed. Particular attention should be paid to patients with recurrent stones that are refractory to pharmacological therapy, patients with early recurrence after complete stone clearance, or patients with a late recurrence after a long stone-free episode [3].

The high prevalence of stone disease, the high recurrence rate and the resulting high costs for the diagnosis and treatment of stones underline the demand for efficient metaphylaxis. All stone-formers, irrespective of their personal risk, should follow general preventive measures, which are adequate urine dilution, the normalisation of dietary habits, and a reduction of lifetime risks. High-risk stone-formers require an additional, usually pharmacological, treatment based on stone analysis and a precise metabolic evaluation for specific metaphylaxis. About 75% of patients could avoid a stone recurrence with general metaphylaxis consisting of changes in lifestyle and dietary habits. The other 25% of patients requires a specific pharmacological intervention depending on their particular risk level [4].

However, all general and specific efforts are meaningless if patients are not willing or are incapable of following the proposed therapy in the long term. Patient compliance is a significant factor for a successful treatment, especially for the recurrent stone-former. In this review we discuss the question of how the compliance of the recurrent stone-former can be ensured or even improved.

Methods

To acquire evidence we searched PubMed for original and review articles written in English using the terms ‘urolithiasis and compliance’ (identifying 116 articles), ‘urolithiasis and metaphylaxis’ (95 articles), and ‘urolithiasis and adherence; (43 articles). This search resulted in 254 articles from which we selected 21 based on a relevant contribution to the topic.

Results

Stone-specific metaphylaxis consists of a combination of long-term lifestyle changes and the regular intake of medication. The success of this concept for preventing stone recurrence depends largely on the cooperation of the patient and the ability of the patient to follow the treatment in an optimal manner. To achieve tolerable levels of compliance the ideal pharmacological agent for stone prevention should be free of side-effects, be easy to administer and, most importantly, stop the formation of stones [5]. However, as far as we are aware, neither the perfect pharmacological agent nor a ‘perfect’ patient exists. Investigations by the WHO in 2003 showed that half of all patients do not regularly take their medication [6]. The patients with low compliance can be separated into three different types, i.e. those patients who refuse to follow the treatment from the beginning and/or stop the treatment without advice, the patients who simply forget to take their medication, and the patients who stop the treatment because of adverse reactions or perceived recovery [7]. The ability of patients to follow the treatment correctly is compromised by a multitude of factors and several factors need to be targeted simultaneously to improve patient compliance. The WHO describes compliance as a ‘multidimensional phenomenon’, which is determined by the interaction of five different factors, i.e. social and economic, therapy-related, patient-related, condition-related, and healthcare team and system-related factors (Table 1) [6].

Social and economic factors

For socio-economic status there are several factors reported to have a significant effect on patient compliance, e.g. poverty, illiteracy, a low level of education, unemployment, long distance from the treatment centre, the high cost of medication, culture, and lay beliefs about illness and treatment. Published articles do not provide substantive information on these factors, and therefore these topics are speculative. Nonetheless, all efforts undertaken to improve compliance (that is poor due to social and economic factors) are most probably cost-effective. In industrial and fast-developing countries these factors might not be the important ones for a low patient compliance, as drinking water is cheaply available, medication is paid by insurance, informational material on stone disease and metaphylaxis is ubiquitous in medical papers and the Internet, the distances to the treatment centres are short, and most patients have a high motivation for improving their medical condition. However, economic reasons are certainly important in industrial and fast-developing countries. Stone-formers are a heterogeneous group of patients with many different underlying diseases, e.g. cystine stones only form in a small fraction of patients with urolithiasis, and the economic incentive for research and development of new pharmacological agents is accordingly low, even in industrial countries. Thus there has been very little progress in our methods to effectively manage this group of patients. This is the explanation given by Tiselius [8] as to why compliance with measures to prevent recurrence is poor in patients with cystinuria, and probably lower than in other groups of recurrent stone-formers. According to

Table 1 Improving the patients compliance.

Group	Factors	Specific measures
Social and economic factors	Poverty, illiteracy, low level of education, long distance to treatment centre, culture and lay beliefs about illness and treatment	• Provide different forms of information material. • Increase of the fluid intake as simple, cheap and omnipresent part of the metaphylaxis
Therapy-related factors	Complexity of the medical regimen, duration of treatment, previous treatment failures, frequent changes in treatment, the immediacy of beneficial effects and side effects	• Keep the treatment-protocols as simple as possible • Prescribe and adjust treatment-protocols for long-term application • Adjust follow-up intervals to risk of recurrence • Direct/indirect monitoring of patients
Patient-related factors	Resources, knowledge, attitudes, beliefs, perceptions and expectations of the patient	• Provide different forms of information material • Intense information of patients about individual risk, chances and prevention
Condition-related factors	Severity of symptoms, level of disability, comorbidity and the availability of effective treatments	• Information about possible chances and risks • Children, disabled and elderly patients need support from their family/relatives
System-related factors	Patient-provider relationship, qualification of the physician, poor medication distribution and short consultations	• Treatment in specialised stone clinics • Close patient-provider relationship • Repeated and supporting information

Tiselius, improved and better-tolerated therapeutic methods are highly desirable.

Therapy-related factors

The most notable therapy-related factors are the complexity of the medical regimen, the duration of treatment, previous treatment failures, frequent changes in treatment, and the immediacy of beneficial effects and side-effects.

The complexity of the medication is related to the severity of the disease. Simple protocols with simple measures result in high compliance, leading to low recurrence risks. Siener et al. [9] examined the efficacy of a selective treatment according to the guidelines for preventing recurrence in patients with calcium oxalate stones. They prospectively investigated the effect of specific diagnostic and therapeutic measures in 124 recurrent stone-formers. In recurrence-free patients the significant increase in urinary volume, and in urinary pH, potassium and citrate excretion, resulted in a significant decrease in the calculated risk of calcium-oxalate stone formation. According to the authors, the high compliance with drinking advice and alkalinisation therapy was one reason for a reduced risk of recurrence. Patients at low risk of recurrence can be managed with lifestyle changes in most cases. A sufficient fluid intake and drinking the right fluids are easier tasks than changes in nutrition or increases in physical activity. Higher-risk patients, e.g. those with cystinuria, often need complex treatment protocols, and low compliance frequently leads to a rapid recurrence. However, the conclusion is not to keep the metaphylactic protocols simple, but to keep them as simple as possible.

The long-term compliance is very important. Parks et al. [10] found that only 15–40% of patients with urolithiasis complied with the follow-up requirements and presumably adhered to long-term treatment regimens. The metaphylactic protocol is as follows: patients are evaluated with 24-h urine collection for stone-risk factors and treated appropriately. The treatment success for reversing risk factors is re-evaluated after 6–8 weeks and dosing or drugs are altered as needed. Thereafter, the goal is to have annual follow-up urinary studies to be sure that the treatment remains effective, and that changes in lifestyle, diet or other factors have not led to an increase in risk factors that could promote stones. This cycle of diagnosis, treatment, short-interval initial follow-up, and annual surveillance is a commonly accepted protocol. According to Parks et al. [10], a consequent protocol close to that published leads to a successful reduction of recurrence. Protocols exceeding the extent of these measures and follow-up intervals do not lead to higher recurrence rates, but probably lead to an even lower compliance of the patients. The main tasks of the treating urologist are to offer this follow-up cycle and to motivate the patient to undergo it.

Patient-related factors

Patient-related factors refer to the resources, knowledge, attitudes, beliefs, perceptions and expectations of the

patient. The effect of participative pedagogy was recently reported for an average group of patients with severe stone formation [11]. The expectations of patients must be balanced with their risk of recurrence. Patients need to be informed about their individual risk and, more importantly, about the fact that metaphylactic measures often do not remove but only reduce their risk of recurrence. Even in patients with calcium-oxalate stones and with high compliance rates, recurrence rates were 43% within a follow-up of 2 years. Overwhelming expectations could lead to disappointment and subsequently to a reduction in the patients' motivation.

Condition-related factors

Condition-related factors roughly describe the severity of symptoms, level of disability, comorbidity and the availability of effective treatments. The severity of symptoms is a crucial factor. Patients with recurrent stone formation and recurrent renal colic episodes will develop a high motivation for adhering to metaphylactic protocols. Patients with no spontaneous passage of the stones and a high stone burden gain their motivation from experiences with active stone-treatment measures. However, in times of effective anaesthesia patients forget the stone-associated suffering more easily, leading to lower compliance. Van Drongelen et al. [12] reported on the characteristic features of compliant and noncompliant patients. They reported that therapy-compliant patients were older and had more treatments and more lithiasis-related complaints. These characteristics suggest that the patients' awareness of their disease might improve the compliance. In children, disabled patients and older patients with high comorbidity, support from relatives is essential for reducing the risk of recurrence.

System-related factors

Important points that depend on the healthcare team and system-related factors are the patient-provider relationship, the qualifications of the physician, poor distribution of medication, and short consultations. Specialised outpatient 'stone centres' can provide detailed programmes for metaphylaxis, strict follow-up protocols and adequate timing of measurements, and more time for patient consultation. It has been suggested that a successful treatment can best be accomplished when a specialised stone clinic is available for these patients. In an especially dedicated clinic for patients with cystinuria, the number of annual surgical interventions was 0.40, compared with 0.74 before the cystinuria clinic was started [13]. Such clinics are obviously very useful both for the careful surveillance of the patients and for repeated and supporting information on their disease.

Discussion

The high prevalence of urolithiasis results in enormous healthcare costs. In the USA the medical expenditure for urolithiasis is ≈$2 billion annually [14]. However, beyond medical expenses additional costs arise due to the loss of productivity, as the incidence of urolithiasis peaks between the ages 20 and 60 years [15]. The high prevalence of stone disease, high recurrence rates and the high costs of diagnosis and treatment of stones make a sufficient medical prophylactic programme both attractive and necessary. According to Lotan [16] one main area with the potential to reduce the huge costs of nephrolithiasis is the reduction of the overall stone burden by preventing new stones or recurrences. Areas for more effort include dietary recommendations, identifying barriers to evaluation and treatment of recurrent stones-formers, and improving compliance with the recommendations. As mentioned in the results, compliance is described as a 'multidimensional phenomenon' consisting of five different categories with several factors; all five determinants should be given attention to improve the patients' compliance.

There are several specific interventional possibilities available to improve compliance (Table 1). Education, monitoring, therapy adjustments and behavioural modification are basic methods to improve compliance. An extensive consultation or education about the disease and treatment can also improve compliance. Most patients follow the treatment more easily if they completely understand the advantages for their personal life. Moreover, the direct or indirect monitoring in terms of 'pill counting', a medication diary, drug monitoring, direct physician-patient dialogue and electronic monitoring systems can also be of great use. 'Cue dosing', i.e. the combination of drug intake with events in daily routine, the use of alarm clocks, or reminders from relatives or friends, can contribute to improving compliance. Simplifying the therapy, e.g. by using sustained-release preparations or combination preparations, can equally improve compliance [17,18].

About 75% of patients could avoid a stone recurrence with general metaphylaxis consisting of changes in their lifestyle, dietary habits and fluid intake [5]. However, for those interventions intended to change habits and/or lifestyles, the following barriers were especially significant: lack of information and skills for self-management, difficulty with motivation and self-efficacy, as well as lack of support for behavioural changes. Therefore patients need to be informed, motivated and trained in the use of cognitive and behavioural self-regulation strategies. The attending physician needs to be a motivator, a person to contact, and a person in whom the patient can confide. Also, patients' organisations can be supportive. The increase in fluid intake, as the most important therapeutic factor, can also cause a problem.

In such cases, behavioural modification, e.g. the combination of fluid intake with events in daily routine, or reminders from relatives or friends, can improve the compliance. In general, stone-formers should be extensively informed about the probability of recurrence and the possibilities available for prevention. Renal colic and the inconveniences of treatment are quickly perceived to be insignificant, because the level of suffering of a stone-former is assumed to be low in daily life. Patients must be aware of the high likelihood of recurrence. Furthermore, patients must recognise that the only possibility of avoiding or reducing the probability of recurrence is consistent metaphylaxis, comprising a comprehension of the general factors mentioned and of medical treatment. Poor communication or a lack of trust between the patient and the healthcare provider are major barriers to compliance. With regard to treatment, the benefit for the patient, including the mechanisms of action and the probability of side-effects, should be defined clearly to improve compliance.

The following recommendations can be made to improve the compliance of patients. The cheapest and most sustaining measure should be used first (information about the cause and origin of the disease, and about the risks of recurrence and chances of metaphylaxis), followed by the most effective and least harmful (drinking habits, amount per day, distribution over the day, correct beverages), followed by more ambitious measures for the patient (eating habits and lifestyle changes), and finally medication, which should be as simple as possible to maintain long-term compliance. For example, the most appropriate way to obtain a neutral urinary pH is not to prescribe alkalinising drugs but to inform the patient about the different amounts of bicarbonate in mineral water.

The main limitation of the present review is the lack of evidence in current publications. Although compliance with therapy is of the utmost importance in general, it has not been examined extensively in patients with urolithiasis. Many studies suggest that noncompliance is a major factor in success rates but its effect was not quantified. The study of van Drongelen et al. [12] is an exception; the authors not only ascertained the frequency of noncompliance with therapy but they also identified the characteristic features of compliant and noncompliant patients, and they studied the effect of noncompliance on recurrence. More studies on 'compliance' are warranted.

Conclusion

The treatment and metaphylaxis of the recurrent stone-former present a particularly pertinent challenge. Patient compliance has an immense influence on the success of metaphylaxis, which is the decisive factor for preventing stone recurrence.

Conflict of interest statement

None declared.

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