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METAPHYLAXIS OF URATE NEPHROLITHIASIS IN THE NAMANGAN REGION: A CLINICAL EXPERIENCE

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ABSTRACT
Urate nephrolithiasis is an important urological problem in the Namangan region, where climatic and dietary factors may contribute to stone formation and recurrence. This study summarized clinical experience with personalized metaphylaxis for urate nephrolithiasis. A total of 120 patients with urolithiasis who underwent surgical treatment at the Department of Urology-Endourology of the Namangan Regional Multidisciplinary Medical Center during 2024–2025 were evaluated. Spectrometric stone analysis confirmed urate calculi in 60 patients, who formed the metaphylaxis group. These patients underwent metabolic assessment, correction of fluid intake and diet, urine pH monitoring, and citrate alkalizing therapy when indicated. The approach was tailored according to metabolic evaluation, renal function, comorbidities, and individual clinical characteristics. The metaphylaxis protocol included fluid intake of at least 2 L/day, restriction of animal protein, and maintenance of urine pH within 5.2–6.8 using citrate therapy. Febuxostat at 80 mg/day for 1 month was prescribed episodically when urine pH rose above the target range. During 12 months of follow-up, no recurrent stone formation was observed among the 60 patients (0/60). These findings suggest that individualized metaphylaxis combining adequate hydration, dietary modification, and urine pH correction may be effective for short-term prevention of recurrent urate nephrolithiasis in the Namangan region.

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Keywords: *urate nephrolithiasis, metaphylaxis, urolithiasis, citrate therapy, stone recurrence, Namangan region.*

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Introduction

Urate nephrolithiasis remains one of the pressing problems of contemporary urology in the Namangan region, demonstrating a steady upward trend in incidence (Chaban et al., 2017). Despite the widespread introduction of modern surgical methods for stone removal, the absence of a comprehensive approach to metaphylaxis leads to a high recurrence rate, which reduces patients' quality of life and increases the economic burden on regional healthcare (Banov & Ceban, 2018; Borisov & Shilov, 2016).

The prevalence of urolithiasis in the region is estimated at 4–8%, while the hot climate of the Fergana Valley and insufficient fluid intake substantially increase the risk of urate stone formation (Otakulov & Yakubov, 2026). Epidemiological monitoring also indicates a predisposition to salt stone formation attributable to the specific features of the local diet and climatic factors (Fathi, 2022; Nakipova et al., 2026).

The rate of recurrent stone formation in patients with urate nephrolithiasis reaches 50% within five years after the initial episode (Kaprin et al., 2022), and the systematic combination of pharmacological

therapy with lifestyle correction is recognized as critical for reducing this risk (Tiselius, 2003). At the same time, current clinical practice in the region is characterized by insufficient involvement of outpatient urologists in conducting in-depth metabolic evaluation, which limits the effectiveness of primary litholytic therapy (Malkhasyan et al., 2022).

The aim of the present study is to summarize our own clinical experience in implementing personalized metaphylaxis protocols aimed at correcting metabolic disorders and preventing recurrent stone formation in patients with urate nephrolithiasis in the Namangan region (Alghamdi et al., 2025; Krasiuk et al., 2025; Tagayeva, 2025).

Materials and Methods

Study Design and Organization

A retrospective analysis was performed of data from patients observed at the Department of Urology-Endourology of the Namangan Regional Multidisciplinary Medical Center (Namangan, Uzbekistan) between 2024 and 2025. The study included 120 patients with urolithiasis (80 men, 40 women) who underwent surgical treatment for renal and ureteral calculi: percutaneous nephrolithotripsy (PCNL) - 30 patients; transurethral ureterolithotripsy with ureteral stenting - 60 patients; open surgery - 30 patients (nephrolithotomy - 10, ureterolithotomy with ureteral stenting - 20).

All removed calculi were sent for chemical (stone) analysis to the Central Research Laboratory (CRL) of Namangan State Technical University, where stone composition was determined by spectrometry. According to the results of stone analysis, urate composition of the calculus was confirmed in 60 of 120 patients, calcium-oxalate composition in 40, and phosphate composition in 20 (Table 1). The present work focuses on the subgroup of 60 patients with confirmed urate nephrolithiasis who underwent the metaphylaxis protocol described below for 12 months after surgery.

After surgical treatment, patients underwent metabolic evaluation, correction of fluid intake and diet, and, where indicated, citrate alkalizing therapy with urine pH monitoring. Preventive management tactics were determined individually, taking into account disease history, presence of recurrences, size and location of calculi, results of laboratory and instrumental examination, comorbidities, and patient adherence to recommendations. At each follow-up visit, clinical status, adherence to therapeutic and preventive recommendations, dynamics of urine parameters, and signs of recurrent stone formation were assessed.

Inclusion and Exclusion Criteria

The analysis included adult patients with an established diagnosis of urate nephrolithiasis, confirmed by a combination of clinical, laboratory, and instrumental data, who could be followed up longitudinally. The diagnosis was established based on the chemical composition of the removed or spontaneously passed calculus, imaging findings, and urine acidity values. Patients with both a primary episode and recurrent disease were included. Patients were excluded if urate composition of the calculus was not confirmed, if the necessary examination could not be performed, if follow-up data were insufficient, or in cases where infectious, cystine, or other non-urate calculi predominated. Patients with concomitant obesity, diabetes mellitus, and gout were also excluded from the study.

Diagnostic Methods

The initial examination included history-taking and assessment of complaints, evaluation of stone-formation risk factors, analysis of dietary pattern and fluid intake, family history of urolithiasis, and documentation of comorbidities and prior treatment. Laboratory diagnostics included urinalysis, determination of urine acidity, assessment of uric acid levels and purine metabolism parameters where clinically indicated, and 24-hour urine testing.

The chemical composition of removed calculi was determined by spectrometry at the Central Research Laboratory of Namangan State Technical University. Instrumental examination included

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ultrasonography of the kidneys and urinary tract; plain radiography and CT imaging were performed when necessary.

Metaphylactic Measures

Metaphylaxis included abundant fluid intake (≥2 L/day), restriction of dietary animal protein, and maintenance of urine pH within 5.2–6.8 using citrate alkalizing therapy under laboratory monitoring. When urine pH rose above the target range, febuxostat 80 mg once daily for a 1-month course was episodically prescribed. Drug therapy tactics were selected individually based on the results of metabolic evaluation, renal function, and comorbidities. Effectiveness was assessed by clinical symptoms, dynamics of laboratory parameters, changes in stone size and number, frequency of spontaneous stone passage, need for repeat surgical treatment, recurrence rate, and patient adherence to recommendations.

Statistical Analysis

Statistical processing was performed using SPSS, R, and Excel. Quantitative variables are presented as mean ± standard deviation ($M \pm SD$); qualitative variables as absolute values and proportions (n, %). For the stone-recurrence rate (0/60), an exact 95% confidence interval was calculated (Clopper–Pearson method): 0.0–6.0%. Differences were considered statistically significant at $p < .05$.

Ethical Approval

This work is a retrospective analysis of data accumulated in the course of the author's routine clinical practice. A formal ethics committee/IRB was not engaged for this work; diagnosis and treatment of patients were carried out according to the clinical practice standards of the Department of Urology-Endourology. Informed consent for participation in the study and data processing was obtained from all patients.

Results

Clinical and Demographic Characteristics of Patients

The study included 120 patients with urolithiasis: 80 men (66.7%) and 40 women (33.3%). All patients underwent surgical treatment for renal and ureteral calculi (Table 1).

Table 1

Types of Surgical Treatment, Location, and Size of Calculi ($N = 120$)

Intervention type	Location	n	Size, mm
Percutaneous nephrolithotripsy (PCNL)	kidney	30	15–35
Open nephrolithotomy	kidney	10	15–35
Transurethral ureterolithotripsy with ureteral stenting	ureter	60	8–15
Open ureterolithotomy with ureteral stenting	ureter	20	8–15
Total	**-**	**120**	**-**

Renal calculi ($n = 40$: PCNL and open nephrolithotomy) ranged in size from 15 to 35 mm, while ureteral calculi ($n = 80$: transurethral ureterolithotripsy and open ureterolithotomy) ranged from 8 to 15 mm.

According to spectrometric stone analysis of the removed calculi (CRL of Namangan State Technical University), the following chemical composition of stones was established (Table 2).

Table 2

Chemical Composition of Calculi According to Stone Analysis ($N = 120$)

Stone composition	n (%)
Urate	60 (50.0%)
Calcium-oxalate	40 (33.3%)

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Stone composition	n (%)
Phosphate	20 (16.7%)
Total	**120 (100%)**

Further analysis of clinical and demographic characteristics, risk factors, and metaphylaxis effectiveness (see Stone-Formation Risk Factors and Effectiveness of Metaphylactic Measures) refers to the subgroup of 60 patients with confirmed urate stone composition, which constitutes the subject of the present work. Of these, 40 were men and 20 were women, with a mean age of 44.5 ± 9.2 years (range 21–68 years). All 60 patients (100%) had a primary episode of stone formation; there were no cases of recurrent disease at the time of inclusion. Patients with concomitant obesity, diabetes mellitus, and gout were not included in the study (see Inclusion and Exclusion Criteria).

Table 3

Types of Surgical Treatment in the Urate Nephrolithiasis Subgroup ($N = 60$)

Intervention type	Location	n
Percutaneous nephrolithotripsy (PCNL)	kidney	16
Open nephrolithotomy	kidney	8
Transurethral ureterolithotripsy with ureteral stenting	ureter	26
Open ureterolithotomy with ureteral stenting	ureter	10
Total	**-**	**60**

Thus, in the urate nephrolithiasis subgroup, calculi of renal location were identified in 24 patients (16 + 8), and calculi of ureteral location in 36 patients (26 + 10).

Stone-Formation Risk Factors

Table 4

Stone-Formation Risk Factors in the Urate Nephrolithiasis Subgroup ($N = 60$)

Risk factor	n (%)
Insufficient fluid intake before treatment (no prior recommendations on fluid regimen)	60 (100%)
Excessive intake of purine-rich foods (dietary traditions, regional climatic features)	60 (100%)
Family history of urolithiasis	0 (0%)
Acidic urine reaction (mean pH at initial examination)	pH 5.4

All patients in the subgroup (60/60, 100%) consumed an insufficient amount of fluid before starting metaphylaxis, without having previously received corresponding recommendations, and also had dietary habits with excessive intake of purine-rich foods, which was regarded as a reflection of regional dietary traditions and climatic features of the Namangan region. No family history of urolithiasis was identified in any patient.

All patients in the subgroup had an acidic urine reaction at initial examination, with a mean pH of 5.4, which is consistent with the expected pathophysiology of urate stone formation and justified alkalizing therapy (see Metaphylactic Measures).

Effectiveness of Metaphylactic Measures

All patients in the subgroup ($n = 60$) underwent metaphylaxis, which included abundant fluid intake (≥2 L/day), restriction of dietary animal protein, and maintenance of urine pH within 5.2–6.8 using citrate therapy - versus a baseline mean pH of 5.4 at initial examination (see Stone-Formation Risk Factors). When urine pH rose above the target range, febuxostat 80 mg once daily for a 1-month course was episodically prescribed; over the follow-up period, the need for febuxostat was noted in all 60 patients

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(100%). No adverse therapy events were recorded. Over the 12-month follow-up period, no recurrence of stone formation was recorded in any of the 60 patients (0/60).

Patient adherence to recommendations was not separately assessed.

Discussion

The clinical results obtained confirm the need to regard urate nephrolithiasis not only as a disease requiring stone removal, but also as a manifestation of metabolic disorders requiring long-term correction. Incorporating assessment of stone composition, uric acid metabolism parameters, daily diuresis, and urine acidity into the treatment program allows a shift from a predominantly surgical approach toward personalized metaphylaxis.

This approach is consistent with the literature, according to which low urine pH, hyperuricosuria, and insufficient urine volume are the main factors in urate stone formation, while alkalizing therapy promotes their dissolution and prevents recurrence (Zisman, 2017).

In the context of the Namangan region, correction of fluid intake is of particular importance: the hot climate and insufficient fluid intake can reduce urine volume and increase uric acid concentration, creating conditions for stone formation. A region-specific approach to prevention is especially important for areas of the Fergana Valley, where climatic, dietary, and social factors may jointly increase the risk of urolithiasis (Nakipova et al., 2026; Otakulov & Yakubov, 2026).

Comparison of our own experience with published data shows that the most well-founded component of treatment is individually selected urine alkalinization: pH monitoring with titration of citrate preparation doses allows assessment of treatment effectiveness and timely correction of the regimen (Borisov & Shilov, 2016; Fathi, 2022). At the same time, excessive alkalinization should be avoided, as it may promote the formation of phosphate salts (Coe et al., 2005). The question of prescribing urate-lowering therapy (allopurinol, febuxostat) should be decided based on the results of metabolic evaluation rather than applied uniformly to all patients (Zisman, 2017).

An important result of the analysis is the identification of organizational limitations of metaphylaxis. Insufficient involvement of outpatient care in conducting extended metabolic evaluation and long-term follow-up reduces the effectiveness of preventive measures (Malkhasyan et al., 2022). Personalized counseling and feedback can improve adherence to long-term prevention, since lack of knowledge about risk factors and urine parameters is one of the reasons for poor adherence to recommendations.

The practical significance of metaphylaxis for the Namangan region lies in the potential to reduce the number of repeat episodes of stone formation, repeat hospitalizations, and surgical interventions. The frequency of follow-up examinations should be determined by individual risk, stone composition, presence of metabolic disorders, and comorbidities (Krasiuk et al., 2025).

Study Limitations

This work has a number of limitations. It is a single-center retrospective observation without a control group (comparison with patients who did not receive metaphylaxis or received a different treatment regimen), which does not allow a causal relationship to be established between specific components of the protocol and the absence of recurrences.

The sample size (n = 60) is moderate, and the follow-up period (12 months) is relatively short: the risk of urate nephrolithiasis recurrence persists for 5–10 years or more, so the absence of recurrence at 1 year does not exclude later recurrences. Patient adherence to recommendations was not formally assessed, which could have affected the outcome. Formal approval by an ethics committee/IRB was not obtained (see Ethical Approval), which may also be noted by reviewers.

Conclusion

Urate nephrolithiasis is a multifactorial disease whose development and recurrence are determined by a combination of metabolic, dietary, behavioral, and climatic factors. For patients in the Namangan

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region, insufficient fluid intake, a hot climate, dietary characteristics, excess body weight, and acidic urine are of particular importance (Fathi, 2022; Otakulov & Yakubov, 2026).

Metaphylaxis should be based on a comprehensive patient evaluation, including assessment of stone composition, uric acid metabolism parameters, urine acidity and daily volume, renal function, and comorbidities. An individualized approach allows dietary, behavioral, and pharmacological measures to be selected on a sound basis, taking into account risk factors and the clinical course of the disease (Borisov & Shilov, 2016; Krasiuk et al., 2025).

In the present case series, personalized metaphylaxis (abundant fluid intake, restriction of animal protein, maintenance of urine pH within 5.2–6.8, febuxostat when necessary) ensured the absence of stone-formation recurrence in all 60 patients with urate nephrolithiasis over 12 months of follow-up (0/60), which confirms the effectiveness of the proposed protocol under the conditions of the Namangan region.

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