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Justification Of Urine Culture Before Transurethral Resection Of The Prostate Gland: Clinical Feasibility And Optimization Of Preoperative Preparation

Adieva Aminat Magomedrasulovna[1], Ziyavutdinov Dzhamaludin Kamalovich[2], Shahbanov Murad Rustamovich[3], Abdulpatakhov Ramazan Akhmedovich[4], Musalaeva Aminat Khabibullaevna[5], Balgueva Patima Balguevna[6], Umarov Ilyas Absalamovich[7], Magomedov Gadzhimurad Shamilevich[8], Omarova Madina Abakarovna[9], Sullaeva Milana Gazievna[10], Guseynova Gunay Namikovna[11]

[*1,2,3,4,5,6,7,8,9,10,11] Dagestan State Medical University of the Ministry of Health of the Russian Federation

***Corresponding Author:**

Adieva Aminat Magomedrasulovna

Dagestan State Medical University

Email ID: medicinalife@mail.ru

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ABSTRACT

In this work, the clinical expediency of conducting microbiological urine culture before transurethral resection of the prostate gland (TURP) was investigated in patients with benign prostatic hyperplasia. The study included 75 patients divided into two groups: the main group with urine culture and targeted antibacterial therapy, as well as a control group with empirical prophylaxis without pre-sowing. The data obtained showed a high incidence of asymptomatic bacteriuria (44.7%) and significant antibiotic resistance of microorganisms, mainly Escherichia coli. The use of seeding results made it possible to reduce the incidence of postoperative infectious complications from 24.3% to 7.9%, as well as reduce the duration of hospitalization and reduce the need for repeated therapy. The results of the study confirm the importance of microbiological control of urine as a key stage of preoperative preparation for TURP, which contributes to improving the safety of surgical treatment and improving clinical outcomes.

Keywords: *transurethral resection of the prostate gland, microbiological culture of urine, asymptomatic bacteriuria, benign prostatic hyperplasia, antibiotic resistance, preoperative preparation, postoperative infectious complications, antibacterial prophylaxis.*

1. INTRODUCTION

Benign prostatic hyperplasia (BPH) is one of the most common urological diseases in elderly and senile men. According to statistics, signs of BPH are detected in more than 50% of men over 60 years of age and in 80% of men over 80 years of age. Transurethral resection of the prostate gland (TURP) remains the main method of surgical treatment of patients with clinically significant prostate hyperplasia, which is recognized as the "gold standard" of intervention in this pathology. Hundreds of thousands of TURP operations are performed worldwide every year, and their number continues to grow due to the aging of the population [1].

Despite extensive clinical experience and proven TURP techniques, this intervention remains invasive, which means it is associated with certain risks, including infectious complications. Among them, the most dangerous are acute prostatitis, epididymitis, pyelonephritis, bacteriuria, and in severe cases, urosepsis. According to various studies, the incidence of infectious complications after TURP can reach 6-25%, which significantly affects the duration of hospitalization, treatment costs and the overall quality of life of the patient in the postoperative period [2].

One of the factors predisposing to the development of postoperative infection is the presence of asymptomatic bacteriuria before surgery. In patients with BPH, it may go unnoticed due to the lack of a pronounced clinical picture. However, when performing transurethral resection, damage occurs to the urethral mucosa and prostate tissue, which creates conditions for

bacteria to enter the bloodstream and urinary tract, contributing to the development of the infectious process. In this regard, the question arises: how justified is it to perform routine urine culture before surgery to identify potential pathogens and then select antibacterial therapy [3].

To date, there is no consensus in urological practice regarding the need for mandatory microbiological examination of urine before TURP. Some clinical guidelines (for example, the AUA) do not insist on routine seeding in the absence of symptoms of infection, whereas European and domestic guidelines (including recommendations from the EAU and the Ministry of Health of the Russian Federation) emphasize the importance of identifying potentially pathogenic microflora, especially in patients at high risk of complications. However, even in these documents, there remain discrepancies regarding the risk group, patient selection criteria, and the clinical and economic consequences of abandoning preoperative seeding [4].

The issue of antibiotic resistance deserves special attention. Against the background of widespread and sometimes irrational use of antibacterial drugs, resistant strains of bacteria, including hospital-acquired ones, are being selected, which significantly complicates the treatment of urinary tract infections. An example is the resistance of Escherichia coli to fluoroquinolones, which in many regions of the Russian Federation exceeds 40%. In such a situation, prescribing empirical therapy without taking into account the sensitivity of the pathogen may be ineffective and even harmful, and conducting urine culture to determine sensitivity can significantly increase the effectiveness of prevention and treatment [5].

Microbiological culture of urine remains the most reliable method of detecting asymptomatic bacteriuria. It allows not only to identify microorganisms, but also to determine their sensitivity to antibiotics, which is crucial for the correct choice of antibacterial therapy in the preoperative period. Despite the time and resources required, this method is highly informative, especially in elderly patients with concomitant diabetes mellitus, chronic urinary tract infections, or a long history of catheterization [6].

An important aspect remains the clinical and economic justification. At first glance, the abandonment of routine seeding may be economically justified, however, with the development of postoperative infections, the cost of treatment, repeated hospitalization and antibacterial therapy may be many times higher than the cost of primary microbiological analysis. Thus, seeding can be considered as a measure not only clinically, but also economically feasible [7].

It should be noted that so far there are no large multicenter studies in Russia aimed at studying the relationship between preoperative microbiological control and the frequency of postoperative infections in TURP. Moreover, the existing protocols of preoperative preparation in a number of medical institutions vary significantly, which creates an additional problem — the lack of uniform standards and a lack of evidence base for decision-making [8].

The problem of latent infection also deserves attention, when, in the absence of clinical symptoms, potentially pathogenic microorganisms are detected in the patient. The question of whether to start antibiotic therapy in such cases remains open and requires scientific analysis. Preliminary data indicate that failure to correct latent infection may be a contributing factor to the development of complications after TURP, especially in debilitated patients [9].

Against the background of the above, it becomes obvious that the question of the expediency of performing urine culture before TURP is an important and urgent problem of modern urology. It requires a scientific approach, a clinical and economic analysis, a study of the microbiological background of patients and an assessment of the results of the postoperative period, depending on the tactics of preoperative preparation [10].

Thus, the present study is aimed at filling the existing gap in clinical practice, forming a scientifically based approach to preoperative diagnosis and prevention of infectious complications. The data obtained can serve as a basis for developing or adjusting clinical protocols, as well as improving the quality of medical care for patients with BPH [11].

In the context of the growing incidence of benign prostatic hyperplasia (BPH) and the active use of transurethral resection of the prostate gland (TURP) as the main method of surgical treatment, the issue of prevention of postoperative infectious complications is of particular importance. Timely and rational preoperative diagnosis, including microbiological examination of urine, can serve as an important tool in reducing the incidence of such complications, especially in conditions of increasing antibiotic resistance.

Despite the general clinical awareness of the threat of infections after urological interventions, the issue of the routine need for urine culture before TURP remains a subject of discussion. Many medical institutions use different approaches to preoperative preparation: some conduct a bacteriological examination for all patients, others only if there are clinical signs of infection or risk factors. This heterogeneity in tactics is due to the lack of clear, unified recommendations, supported by data from prospective studies. Therefore, there is a need for scientific analysis and substantiation of the role of microbiological urine culture as a method of preventing infectious complications in TURP.

In this regard, the main purpose of this study is to assess the clinical feasibility of conducting microbiological urine culture before transurethral resection of the prostate gland, as well as to develop approaches to optimize preoperative preparation of patients with BPH in order to prevent postoperative infections.

To achieve this goal, the following tasks are formulated:

1. To evaluate the frequency of detection of asymptomatic bacteriuria in patients referred for TURP, depending on age, the presence of concomitant diseases, urological anamnesis and previous antibacterial therapy.

2. To determine the spectrum and frequency of microorganisms detected by urine culture in this category of patients, with special emphasis on the level of resistance to the most commonly used antibacterial drugs.

3. To compare the data of microbiological examination of urine with the frequency of postoperative infectious complications in various clinical scenarios: in the presence of sowing and without it, when prescribing empirical therapy and therapy based on the results of sowing.

4. To analyze the clinical and cost-effectiveness of performing routine urine culture before surgery, including an assessment of the cost of analysis, the cost of treating complications, the duration of hospitalization and the need for repeated antibiotic therapy.

5. To develop a clinical and diagnostic algorithm for preoperative microbiological examination of patients referred for TURP, taking into account individual risk factors and local data on antibiotic resistance.

The implementation of these tasks will make it possible not only to assess the need and practical benefits of routine microbiological urine monitoring before surgery, but also to formulate proposals for the unification of approaches to preoperative preparation in urological practice.

2. MATERIALS AND METHODS

The study was conducted on the basis of the urology department. The prospective observational study included 75 patients hospitalized with a diagnosis of benign prostatic hyperplasia (BPH) and referred for transurethral resection of the prostate gland (TURP).

Inclusion criteria:

- Over the age of 50;
- The presence of clinically confirmed BPH;
- Planned hospitalization for tourists;
- Informed consent to participate in the study.

Exclusion criteria:

- The presence of an acute urinary tract infection at the time of hospitalization;
- Recent (within 14 days) use of antibacterial therapy;
- Malignant neoplasms of the prostate gland;
- Severe renal insufficiency (GFR < 30 ml/min/1.73 m2);
- Bladder catheterization for more than 30 consecutive days before surgery.

The patients were randomized (by alternating when switched on) and divided into two main groups:

- Group 1 (main group) consisted of 38 patients who underwent microbiological urine culture on the eve of surgery. Antibacterial therapy in this group was prescribed based on the results of seeding, taking into account the sensitivity of microorganisms.
- Group 2 (control) — 37 patients who did not have urine culture. Preventive antibacterial therapy was performed empirically, according to the standards of the clinic (most often once before surgery).

All patients were treated at admission:

- General blood and urine analysis;
- Biochemical blood test (creatinine, urea, CRP);
- Ultrasound of the genitourinary system;
- TRUSSES of the prostate gland;
- Determination of residual urine volume;
- International IPSS Symptom Questionnaire;
- Assessment of sexual health (if necessary).

2. Microbiological examination

The average portion of morning urine collected in a sterile container before starting antibacterial therapy was analyzed in patients of the first group. Sowing was carried out on nutrient media with subsequent determination:

- Species of microorganisms;
- Quantitative composition (CFU/ml);
- Antibiotic sensitivity (disk method or automated VITEK system).

The growth of one or more bacterial species in an amount of $\geq 10^5$ CFU/ml was considered positive.

3. Antibacterial prevention

- In group 1, the drug was selected individually based on the results of seeding, with the start of therapy 1-2 days before surgery.
- Empirical prophylaxis was used in group 2, usually a single injection of second-generation cephalosporin or fluoroquinolone 30-60 minutes before surgery.

4. Assessment of postoperative complications

All patients were monitored:

- During hospitalization (5-7 days);
- Re-examination 14 and 30 days after discharge.

Infection criteria:

- Temperature rise >38°C;
- Leukocytosis >10×10⁹/l;
- Symptoms of dysuria or pain;
- Positive urine culture after surgery;
- Indications for additional antibacterial therapy.

Cases of epididymitis, pyelonephritis, prostatitis, urosepsis, and repeated hospitalization were also recorded.

3. RESULTS

The study included 75 patients with clinically confirmed benign prostatic hyperplasia who were hospitalized for routine TURP. The average age of patients was 68.4 ± 7.2 years, with no statistically significant differences between the groups ($p > 0.05$).

Concomitant diseases (hypertension, diabetes mellitus, chronic prostatitis, obesity, coronary heart disease) were detected in 61.3% of patients; 28% of them had two or more chronic diseases. Bladder catheterization before hospitalization (within ≥7 days) occurred in 11 patients (14.7%).

Group distribution:

- Group 1 (with urine culture): 38 patients;
- Group 2 (without seeding, empirical prophylaxis): 37 patients.

2. Results of microbiological examination of urine (group 1)

From 38 patients of the first group, asymptomatic bacteriuria was detected in 17 patients (44.7%) with microbiological culture. The most frequently encountered:

Microorganism	Frequency (n)	Share (%)
Escherichia coli	9	52,9%
Klebsiella pneumoniae	4	23,5%
Enterococcus faecalis	2	11,8%
Proteus mirabilis	1	5,9%
Pseudomonas aeruginosa	1	5,9%

Table 1. Frequency of detected microorganisms in urine culture (Group 1).

Sensitivity analysis revealed resistance to fluoroquinolones in 47% of E. coli strains, while all strains remained sensitive to nitrofurantoin and aminoglycosides. In one case, a strain of K. pneumoniae resistant to cephalosporins of the II–III generation was identified.

Patients with positive culture underwent targeted antibacterial therapy (most often third-generation cephalosporins, aminoglycosides, fosfomycin) for 3-5 days before TURP.

3. Frequency of postoperative infectious complications

Postoperative infectious complications (fever, pyuria, dysuria, laboratory-confirmed infection) were reported in:

• 3 patients (7.9%) in the culture group;

• 9 patients (24.3%) in the non-seeding group.

The difference between the groups was statistically significant ($\chi 2 = 4.48$; $p = 0.034$), indicating a reduced risk of infectious complications with the use of culture and individualized therapy.

3.2 Structure of postoperative infectious complications.

Type of complication	Group 1 (n=38)	Group 2 (n=37)
Febrile fever (>38°C)	2	6
Pyelonephritis	0	2
Acute prostatitis	1	1
Epididymitis	0	1
Urosepsis	0	0

Table 2. Structure of postoperative infectious complications.

4. Re-prescribing antibiotics

Repeated antibacterial therapy after TURP was required:

- in 2 cases (5.3%) in group 1 (due to subfebrility and positive seeding);
- in 7 cases (18.9%) in group 2 (including 2 cases requiring day hospital admission).

5. Hospital and postoperative period

Average duration of hospitalization:

- Group 1: 6.1 ± 1.2 days;
- Group 2: 7.4 ± 2.6 days ($p = 0.047$).

No severe complications requiring resuscitation were reported in any case. However, group 2 patients had a significantly higher need for additional outpatient consultations and therapy.

Results of the analysis

1. 45% of patients referred for TURP have asymptomatic bacteriuria, most often caused by E. coli with a high level of antibiotic resistance.

2. Conducting microbiological seeding of urine before surgery can significantly reduce the incidence of infectious complications (up to a 3-fold decrease compared to the group without seeding).

3. The hospital period is shorter in the group with completed seeding and targeted therapy.

4. Targeted antibacterial prophylaxis based on sensitivity data reduces the risk of treatment ineffectiveness and the need for repeated therapy.

4. DISCUSSION

The data obtained in the course of this study confirm the high clinical significance of conducting microbiological urine culture before transurethral resection of the prostate gland (TURP). The detection of asymptomatic bacteriuria in almost half (44.7%) of patients referred for surgery demonstrates the urgency of the problem and the justification for screening this pathology in the preoperative period.

Conclusion

Analysis of the results of this study allows us to state with a high degree of confidence that conducting microbiological urine culture in patients with BPH before TURP:

• allows timely detection of asymptomatic bacteriuria;

• provides a choice of effective antibacterial therapy based on resistance;

• significantly reduces the frequency of postoperative infectious complications;

• reduces the duration of hospitalization;

• can be considered as a clinically and economically sound strategy.

The results confirm the need to review the tactics of preoperative patient preparation, including the revision of existing clinical protocols towards a broader recommendation for performing urine culture before transurethral interventions.

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