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Optimization of Empirical Treatment of a Complicated by Pyelonephritis

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Abstract: Complicated upper urinary tract infection is considered if the patient has internal factors that make it difficult to cure, compared to the usual uncomplicated forms. Pyelonephritis is a nonspecific infectious and inflammatory kidney disease, in which the renal pelvis, calyx and renal parenchyma are involved in the process with damage primarily to the connective tissue. Upper urinary tract infections are less common than bladder infections.

Keywords: Pyelonephritis, antimicrobial therapy, cephalosporin.

At the same time, it is a more complex problem for the patient and the doctor due to its variable manifestations and clinical course, as well as difficulties in establishing a microbiological and pathological diagnosis. Although the classic symptoms of acute onset, such as fever, chills, and flank pain, usually indicate a kidney infection, some patients with these symptoms do not have upper urinary tract inflammation. Conversely, severe inflammation can either manifest with nonspecific local or systemic symptoms or be completely asymptomatic. Therefore, for a correct diagnosis, high clinical alertness and appropriate radiological and laboratory studies are necessary. Complicated upper urinary tract infection is considered if the patient has internal factors that make it difficult to cure. These factors include: obstruction anywhere in the urinary tract; urinary tract infection in men; the presence of any foreign body in the urinary tract; pregnancy; chronic urinary retention; diabetes; vesicoureteral reflux; immunosuppression; history of urological interventions; hospital infection [2, 3, 4, 5].

The clinical picture of complicated upper urinary tract infection can vary from severe obstructive acute pyelonephritis with inevitable urosepsis to a catheter-associated infection that may resolve spontaneously immediately after catheter removal. It must be taken into account that symptoms, especially of the lower urinary tract, are caused not only by infection, but also by other urological disorders (for example, benign prostatic hyperplasia and neurogenic urinary disorders in patients with spinal lesions). Concomitant diseases such as diabetes mellitus, immunodeficiency, urolithiasis and renal failure, which may be associated with urological disorders, are also often referred to as treatment complicating factors. Special attention is traditionally paid to gestational pyelonephritis, also referred to as an initially complicated urinary tract infection.

The main diagnostic techniques for any form of upper urinary tract infection are the same. They include general clinical analysis of blood and urine, culture of urine, ultrasound, magnetic resonance (MRI) or X-ray (MSCT) computed tomography (contraindicated in pregnancy) of the urinary tract [3, 4].

The spectrum of pathogens in complicated infections is much greater than in uncomplicated infections, and bacteria are more likely to be resistant (especially in nosocomial infections). Escherichia coli, Proteus, Klebsiella, Pseudomonas, Serratia, and Enterococcus families are the most frequently detected pathogens [3, 4]. Enterobacteria predominate (60-75%), and the most common

pathogen in primary infection is Escherichia coli. However, the spectrum of bacteria in a particular patient may change over time, including when changing medical institutions [6].

The main principle of treatment of complicated pyelonephritis is to eliminate the complicating factor. Correction of glycemia, diversion of urine in ureterohydronephrosis, immunocorrection, removal of foreign bodies, etc. Optimal antimicrobial therapy depends on the severity of the disease, as well as on antibiotic resistance in the region and specific patient factors (for example, allergies). In addition, after receiving the result of a culture study of urine, a correction of treatment should be carried out.

Patients who develop symptoms of a systemic disease are usually admitted to a hospital, and initially antibacterial drugs (aminoglycosides, amoxicillin, or a second or third generation cephalosporin) are administered parenterally. Carbapenems, fourth-generation cephalosporins, fluoroquinolones, or combinations of drugs from different groups are used less frequently [2]. The mode of application should be adapted based on the average resistance in the region, as well as the characteristics of the patient's parameters (severity of inflammation, assessment of renal function, etc.) [7]. The use of fluoroquinolones monotherapy in Russia in urological patients with complicated infection is limited by a high level of resistance (more than 10%) [8, 9]. The total duration of antimicrobial therapy should be at least 7-14 days [10].

PURPOSE OF THE STUDY. Analysis of the effectiveness of empirical therapy in patients with established complicated infection of the upper urinary tract (complicated pyelonephritis) to build a prognostic model of treatment success depending on the complicating factor.

MATERIALS AND METHODS. A retrospective single center study was performed at the Urology Department of the Bukhara Regional Multidisciplinary Medical Center. Among those treated with an upper urinary tract infection in 2021, 51 patients with an established diagnosis of complicated pyelonephritis were selected. The obligatory methods of a comprehensive examination for establishing the correct diagnosis were considered: general clinical blood and urine tests; culture of urine and ultrasound of the urinary system. Additional diagnostic methods were used: survey and excretory urography, MSCT or MRI (in case of pregnancy), urography. The selection group included patients who completed the recommended amount of examination, and the diagnosis of complicated pyelonephritis was not in doubt.

The exclusion criteria were: incomplete examination; questionable diagnostic results. Patients with gestational pyelonephritis were excluded from the sample. Empiric therapy was considered successful with normalization of control clinical blood and urine tests, complete relief of symptoms of the disease.

The mean age of the patients was 55.9 ± 16.9 years. The harmonic mean duration of illness was 3.7 and the median was 7 (3; 244) days. The sex distribution was uneven: 16 (31%) men and 35 (69%) women ($p = 0.028$). Primary infection within six months was detected in 45 (88.2%) patients, and recurrent infection in 6 (11.7%) patients ($p < 0.0001$).

According to the results of the studies, the severity and localization of the inflammatory focus, as well as complicating factors, were determined. Unilateral complicated pyelonephritis was found in 37 (72.5%) patients, bilateral - in 14 (27.5%) patients ($p = 0.007$). A change in the color of urine was noted in 9 (17.6%), transparency - in 34 (66.6%) patients. A shift in urine pH to an alkaline form was detected in 3 (5.8%) patients. Minimal proteinuria (from 300 mg to 1 g) was detected in 6 (11.7%) patients. Significant leukocyturia (more than 10 leukocytes per field of view) was detected in 30 (58.8%) patients.

Cultural examination of urine obtained in the first 24 hours from the start of treatment was positive in 18 (35.2%) patients.

Based on the ultrasound examination, the following complicating factors were identified. Ureterohydronephrosis due to various causes was detected in 19 (37.2%) patients, urolithiasis - in 16 (31.3%), congenital anomalies of kidney development - in 5 (9.8%) patients. All patients with

urodynamic disorders underwent urine diversion using one of the following methods: bladder catheterization, stenting or kidney stoma.

Moderate hyperglycemia (8.3-11 mmol/l) was detected in 6 (11.7%) patients, and severe - in 2 (3.9%) patients. Uremia was detected in 13 (25.4%) patients, hyperbilirubinemia - in 1 (1.9%), and hyperuricemia - in 15 (29.4%) patients. Empirical therapy was carried out according to the standard scheme. 3rd generation cephalosporins were prescribed as monotherapy in 42 (82.3%) patients. Monotherapy with carbapenems was carried out in 4 (7.8%) patients, fluoroquinolones - in 2 (3.9%) patients. The combination of 3rd generation cephalosporins and aminoglycosides was chosen as initial therapy in 3 (5.8%) patients.

RESULTS. Successful empirical therapy was considered in the absence of correction of the treatment regimen and normalization of clinical blood and urine tests. Of the patients included in the study, empiric therapy was successful in 24 (47%) patients, requiring correction - in 27 (52.9%) patients. cephalosporins as

Table 1. Predictors of empirical therapy failure

Sign		Univariate analysis		multifactorial analysis	
	X^2	ОШ (95% ДИ)	*P*	OR (95% CI)	*p*
Age	0,19	0,007 (-0,02-0,04)	0,664	-	-
Male gender	0,44	0,444 (-0,87-1,7)	0,510	-	-
Disease duration	0,33	-0,0003 (-0,001-0,0009)	0,565	-	-
Recurrent infection	0,14	-0,336 (-2,068-1,395)	0,703	-	-
Two way process	0,27	-0,379 (-1,805-1,046)	0,602	-	-
Microhematuria	3,55	1,203 (-0,077-2,485)	0,066	1,016 (-0,3-2,3)	0,133
Piuria	1,18	-0,693 (-1,958-0,572)	0,283	-	-
Kidney stones	0,35	-0,405 (-1,752-0,941)	0,555	-	-
Ureterohydronephrosis	0,03	-0,113 (-1,347-1,120)	0,857	-	-
Anomalies in the development of MVS	0,14	-0,336 (-2,068-1,395)	0,703	-	-
hyperglycemia	0,94	0,148 (-0,181-0,477)	0,379	-	-
Uremia	3,15	1,272 (-0,208-2,754)	0,092	1,048 (-0,48-2,58)	0,181
Operations for ICD	1,56	0,916 (-0,537-2,369)	0,217	-	-
MVS drainage	1,57	0,788 (-0,459-2,036)	0,215	-	-

monotherapy was ineffective in 24 (57.1%) patients, carbapenems - in 1 (25%), fluoroquinolones - in all (100%). The best result was obtained with the use of aminoglycosides as a combination therapy with cephalosporins - 100% (n = 3) success rate.

Unsatisfactory results were demonstrated in all cases of using groups of drugs, except for the combination of third-generation cephalosporins with aminoglycosides. The sample size and representation of monotherapy with carbapenems and fluoroquinolones in it did not allow us to build a reliable prognostic model, therefore, an analysis was made of the failure of empirical therapy with 3rd generation cephalosporins.

Univariate and multivariate logistic regression analyzes were performed to determine the predictors of failure of empirical cephalosporin therapy. The selection of predictor variables was carried out according to the initial parameters. Information about the predictor factors for failure of carbapenem monotherapy (univariate and multivariate logistic regression analysis) is presented in Table 1. Taking into account the sample size and the presentation of factors, statistical accounting was performed at a significance of $p < 0.1$ for univariate analysis and $p < 0.2$ for multivariate analysis . When performing a simple (one-way) logistic regression analysis among 42 patients treated with monotherapy with 3rd generation cephalosporins, some indicators acquired particular significance in predicting the failure of empirical therapy. This required a correction treatment. These indicators were: microhematuria (OR = 1.203; 95% CI -0.077-2.485; p = 0.066) and uremia (OR = 1.272; 95% CI -0.208-2.754; p = 0.092).

The results obtained were used to build a forecast model in multivariate regression analysis (selection from predictor factors with a significance level of $p < 0.1$). Microhematuria (OR = 1.016; 95% CI -0.3-2.3; P = 0.133) and uremia (OR = 1.048; 95% CI -0.48-2) were also significant predictors of unsuccessful empirical therapy with 3rd generation cephalosporins. .58; p = 0.181). An odds ratio less than one indicates a protective effect, and more than one indicates a provocative effect of the identified predictor variables. Based on this ratio, the degree of influence of the predictor was calculated. Thus, the detection of microhematuria and uremia in clinical analyzes at the time of hospitalization increases the likelihood of failure of empirical monotherapy with 3rd generation cephalosporins by 20% and 27%, respectively.

DISCUSSION. The results obtained in the study allow us to draw several significant conclusions.

First, none of the empiric monotherapy regimens meets the criteria for high efficacy. The worst result was obtained with third-generation cephalosporins.

Secondly, many different factors (age, gender, anthropometric characteristics, duration of the disease, a wide range of comorbidities, previous surgeries, etc.) did not significantly affect the negative prognosis of treatment efficacy when prescribing monotherapy with third-generation cephalosporins. The only significant negative prognostic factors were impaired renal function and microhematuria, probably due to existing chronic kidney damage. This is quite logical, since the fact of the presence of renal failure has a significant impact on achieving the required concentration of the antimicrobial agent in the blood plasma, lengthening the half-life. The consequence of this is also the lengthening of the accumulation period of the drug to achieve the killing concentration in the renal parenchyma and pelvicalyceal system. Thirdly, the use of combined antimicrobial therapy regimens demonstrated the greatest efficiency. This requires a more detailed subsequent study due to the small representation in the statistical sample.

CONCLUSIONS. At the beginning of the study, the goal was to evaluate the effectiveness of empirical therapy in complicated pyelonephritis. None of the starting drugs in monotherapy (third-generation cephalosporins, carbapenems, fluoroquinolones) in the study group showed high efficiency. It is advisable to refrain from using monotherapy with fluoroquinolones and third-generation cephalosporins until more and more reliable information about the resistance of uropathogens in the population of the region is obtained. Patients with impaired renal function require particularly close attention of the clinician when choosing an empirical therapy regimen for complicated pyelonephritis.

LITERATURE

1. Geerlings SE, van den Broek PJ, van Haarst EP, Vleming LJ, van Haaren KMA, Janknegt R, et al. Optimisation of the antibiotic policy in the Netherlands. X. The SWAB guideline for antimicrobial treatment of complicated urinary tract infections. *Ned TijdschrGeneeskd.* 2006; 150(43): 2370-2376.
2. Hooton TM, Bradley SF, Cardenas DD, Colgan R, Geerlings SE, Rice JC, et al. Diagnosis, prevention, and treatment of catheter-associated urinary tract infection in adults: 2009

International Clinical Practice Guidelines from the Infectious Diseases Society of America. *Clin Infect Dis.* 2010; 50(5): 625-663. doi: 10.1086/650482

3. Peterson J, Kaul S, Khashab M, Fisher A, Kahn JB. Identification and pretherapy susceptibility of pathogens in patients with complicated urinary tract infection or acute pyelonephritis enrolled in a clinical study in the United States from November 2004 through April 2006. *Clin Ther.* 2007; 29(10): 2215-2221. doi: 10.1016/j.clinthera.2007.10.008
4. Olimova N. I. Analysis of the somatic and reproductive history of women with genital inflammatory diseases due to hiv infection //Актуальные вопросы экспериментальной микробиологии: теория. – 2022. – Т. 1. – №. 2. – С. 30.
5. Jalilovna K. D. Modern Approaches to the Treatment of Back Pain and Radiculopathy //Annals of the Romanian Society for Cell Biology. – 2021. – С. 5216-5223.
6. Alimovich E. V. Comparative character of osteomyelitis'microbial landscapes studied depending on age of patients, forms and causes of the disease //European science review. – 2017. – №. 7-8. – С. 79-83.
7. Nazarov J., Sharipova M. A. The Immune System in Childrenwith Differentincidence Rates Ard //Central asian journal of medical and natural sciences. – 2021. – С. 5-7.
8. Nazarov Z. S. E. Using brainstorming and case-study method in practical classes of microbiology //Новый день в медицине. – 2021. – №. 1. – С. 79-85.
9. Sahu MK, Siddharth B, Choudhury A, Vishnubhatla S, Singh SP, Menon R, et al. Incidence, microbiological profile of nosocomial infections, and their antibiotic resistance patterns in a high volume Cardiac Surgical Intensive Care Unit. *Ann Card Anaesth.* 2016; 19(2): 281-287. doi: 10.4103/0971-9784.179625
10. Bader MS, Hawboldt J, Brooks A. Management of complicated urinary tract infections in the era of antimicrobial resistance. *Postgrad Med.* 2010; 122(6): 7-15. doi: 10.3810/pgm.2010.11.2217
11. Абдуллаев Ш. и др. Complications in the treatment of mandibular fractures Literature review //in Library. – 2021. – Т. 21. – №. 1. – С. 684-691.
12. G. A. Arashova, M. Kh. Gulamov Morphological and Functional Aspects of the Lymphatic System and its Current Problems | e-ISSN: 2792-4025 | http://openaccessjournals.eu | Volume: 1 Issue: 5
13. Азимов С.И., Гуламов М.Х., Каримов Б.С.У. Комплексное патогенетическое лечение больных с сахарным диабетом, осложненным эректильной дисфункцией // Вестник науки и образования, 2020. No 23-2 (101).
14. Азимов С.И., Гуламов М.Х., Каримов Б.С.У. Роль универсального урологического вопросника в мониторинге урологической патологии у больных туберкулезом // Вестник науки и образования, 2020. No 23-2 (101).
15. Муратова Н. Ю., Хасанов І. І., Юсупов Ш. Ш. Застосування ультразвукової кавітації для лікування гнійних ран щелепно-лицевої ділянки.
16. Ganiev A. A., Abdullaev S. Y., Abdurahmonov S. Z. Combined treatment for early-stage skin cancer of the head and neck area //World Bulletin of Public Health. – 2021. – Т. 4. – С. 3-6.