ANTIBIOTIC RESISTANCE OF MICROORGANISMS IN PATIENTS WITH INFLAMMATORY PROCESSES OF THE URINARY SYSTEM

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АНТИБИОТИКОРЕЗИСТЕНТНОСТЬ МИКРООРГАНИЗМОВ У БОЛЬНЫХ С ВОСПАЛИТЕЛЬНЫМИ ПРОЦЕССАМИ МОЧЕВЫДЕЛИТЕЛЬНОЙ СИСТЕМЫ

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Annotation. Urinary system infections are one of the most common diseases in outpatient and hospital practice. The article discusses the monitoring of the landscape of microorganisms isolated from patients with diseases of the urinary system. Cultural and disk diffusion research methods were used.

Key words: antibiotics, microorganisms, urinary system, antibiotic resistance.

Аннотация. Инфекции мочевыделительной системы одни из самых распространенных заболеваний в амбулаторной и госпитальной практике. В статье рассматривается мониторинг пейзажа микроорганизмов, выделенных у пациентов с заболеваниями мочевыделительной системы. Использовались культуральный и диско-диффузионный методы исследования.

Ключевые слова: антибиотики, микроорганизмы, мочевыделительная система, антибиотикорезистентность.

Introduction. The microbial landscape in each medical and preventive institution is the result of complex processes of interspecific relationships between micro- and macroorganisms, taking into account the influence of various environmental factors. Bacteria are constantly subject to selective pressure from various chemical agents, such as antibiotics [3, 4, 5]. The etiological structure of microorganisms changes and resistance increases; in connection with these processes, the effectiveness of etiotropic treatment deteriorates, so constant monitoring of the microbial landscape and an antibiogram is required.

Materials and methods: the material for diagnosis was urine. The material was selected from therapeutic patients with diseases of the urinary system, such as pyelonephritis, glomerulonephritis, nephritis, cystitis, urethritis. Urine examination by bacteriological method is aimed at isolating the causative agent of the disease and quantifying the degree of bacteriuria. The number of microbial cells in 1 ml of urine was determined.

The cultural method was used, the advantage of which is its relatively high specificity and the possibility of laboratory modeling of the therapeutic effect on microorganisms and taking into account its effectiveness. The disadvantages are the duration of the study, high requirements for collecting material, and increased requirements for the qualifications of laboratory personnel. Sampling, primary culture and identification of pathogens were carried out in accordance with approved regulatory documents [3, 6, 10, 16]. The following solid media were used: nutrient agar - a general purpose medium for determining the degree of contamination of urine, 5% blood agar - a differential diagnostic medium for the primary identification and establishment of pathogenicity factors (hemolysins), Endo agar - a selective medium for enterobacteria [2, 7, 15].

The number of microbes was assessed on nutrient agar by inoculation using the Gold method (sector inoculation method). The basic principle of this technique is to apply a strictly defined amount of the test sample to the nutrient medium, which can be done with a calibrated loop of known volume or a micropipette. The colonies growing in different sectors were counted.

Antibiotic sensitivity was determined according to guidelines and clinical recommendations using the disk diffusion method. The technology is one of the oldest and remains the most common method for assessing antibiotic susceptibility in conventional bacteriological laboratories. It is suitable for the study of most bacterial pathogens, including the most common bacteria with complex nutritional requirements. The method is universal for a wide range of antimicrobial drugs and does not require the mandatory use of special equipment. To assess the sensitivity of bacteria with normal nutritional requirements, use Mueller-Hinton agar without additional additives. For bacteria with complex nutritional needs, use Mueller-Hinton agar supplemented with 5% mechanically defibrinated horse blood and 20 mg/L β-NAD. In practice, the most acceptable method for assessing the concentration of a bacterial suspension is to measure its optical density. The optical density of a bacterial suspension with a concentration of 1.5 × 10 CFU/ml during visual inspection corresponds to the McFarland turbidity standard of 0.5. The optical density of the suspension can also be monitored spectrophotometrically (densitometrically).

It should be said that the principle of the disk diffusion method is based on the phenomenon of antibiotic inhibition of surface, visible growth of microorganisms on a solid (agar) nutrient medium. The concentration gradient of the antibiotic in the nutrient medium is created as a result of its diffusion from the carrier (cardboard disk). A disk with an antibiotic is placed on the surface of the nutrient medium immediately after inoculation (inoculation) of the culture of the microorganism under study. In this case, two processes begin almost simultaneously: the diffusion of the antibiotic from the disk and the growth of microorganisms on the surface of the medium.

Gram-negative bacilli, represented by Escherichia coli and Klebsiella pneumoniae, dominated in the urine. This leadership is due to the proximity of the natural biotope - the distal part of the intestine, from where they enter the vagina, periurethral area, or the foreskin, anatomical features in women, physiological abnormalities that impede the normal evacuation of urine, for example, urethral stenosis.

Next, non-fermenting gram-negative rods predominated: Pseudomonas aeruginosa and coccobacilli Acinetobacter baumannii. They are usually the causative agents of nosocomial infections [1, 8, 9]. Gram-positive cocci play a certain role: bacteria of the genus Enterococcus and Staphylococcus aureus. Their number is small.

Bacteriological culture of urine allows us to understand what pathogen we are dealing with and which drug should be most effective. Even for recurrent infections, doctors begin treatment with empirical therapy. After receiving the culture results, therapy is adjusted, taking into account the pathogen and its sensitivity to antibiotics.

Результаты и обсуждение. The results obtained indicate the predominance in the urine of adult patients of microorganisms of the family Enterobacteriaceae, non-

glucose-fermenting bacteria, gram-positive cocci of the families Streptococcoceae, Micrococcoceae.

The main causative agent of genitourinary infections, Escherichia coli, is in most cases (72%) sensitive to cephalosporins: cefepime and cefotaxime and in 84.6% to ceftazidime. Escherichia coli also shows sensitivity to carbepenems in 94% of cases. Another opportunistic enterobacteria present in the landscape, Klebsiella pneumoniae, is sensitive to cephalosporins in only 46.5% of cases. Although in almost all cases (96%) it is sensitive to carbopenems. All isolated strains of Acinetobacter baumannii are sensitive to IV generation cephalosporins, such as cefepime. Enterococcus faecium is susceptible to vancomycin in 100% of cases. The study revealed the resistance of Enterococcus faecium to penicillins and cephalosporins. Consequently, the prescription of these antibiotics is irrational in the treatment of infectious diseases of the genitourinary system caused by Enterococcus faecium. At the same time, another representative of the gram-positive microflora Enterococcus faecalis is 100% sensitive to beta-lactams. One strain of Staphylococcus aureus was sensitive to oxacillin. Pseudomonas aeruginosa is 71.4% sensitive to the group of carbopenems (imenopenem and meropenem), similarly sensitive to ceftazidime, but exhibits low sensitivity to cefepime and cefotaxime, which is 28.5%.

Выводы. The level of sensitivity of the isolated cultures to antimicrobial drugs has been established. Identified, even low levels of resistance can pose a serious problem in the treatment of urological patients. It is necessary to continue monitoring pathogens, carefully select antibiotics for a particular patient, taking into account the antibiogram, and develop algorithms for rational antibiotic therapy. All results of our study are confirmed by objective data taken from literary sources, publications [1, 12, 13] and regulatory documentation on microbiology. Knowing the microbial landscape, you can prescribe effective drugs with proven effectiveness and safety.

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