ANALYSIS OF STRUCTURE AND ANTIMICROBIAL RESISTANCE PATHOGENS IN PATIENTS WITH ACUTE NECROTIZING PANCREATITIS

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Abstract

Infectious complications are observed in 40-70% of all patients with severe acute pancreatitis. Infections are associated with a significant increase in mortality rates. Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus spp. were the most common pancreatic infections. It is discussed the role of antimicrobial therapy and antibiotic resistance in patients with necrotizing pancreatitis.

Key words: Infected necrotizing pancreatitis, infection, antibiotics, antibiotic resistance.

Introduction: Despite intensive research and improved patient care, overall mortality still remains high, reaching up to 15-50% in cases with acute pancreatic necrosis. Pathogenesis of acute necrotizing pancreatitis remains elusive and includes abnormal biliopancreatic duct common pathway theory, pancreatic autodigestion theory, gallstone migration theory, enzyme activation theory, kinin and complement activation theory, microcirculation disturbance and endothelial dysfunction theory, and pancreatic acinar cell apoptosis and necrosis theory. Pancreatic abscess and infected pancreatic necrosis are the most devastating of the complications. Knowledge of spectrum and antibiotic sensitivity of bacterial infections in patients with necrotizing pancreatitis is incomplete. [1, 2, 3].

Material and Methods: retrospective study was performed on 103 patients (57 males, 46 females; mean age 41.3±14.6 years) with acute pancreatic necrosis who were treated in St. Joasaph Belgorod Regional Clinical Hospital between July 2011 and June 2015. It was used classification Savelev V.S., Filimonov M.I., 2001 for making diagnosis of infected necrotizing pancreatitis [4]. All patients were managed with standard antibiotic regimens for prevention of infectious complications. Antibiotic sensitivity was determined by disc diffusion method. Isolates were declared as sensitive or resistant based on the zone of inhibition following European Committee on Antimicrobial
Susceptibility Testing criteria. **Results:** The diagnosis of infected pancreatic necrosis was confirmed in 36 (35%) out of 103 patients. Out of 36 patients, 5 (13.9%) patients had an infection with 2 types of bacteria whereas 31 (86.1%) had an infection with single organism. In 24 (66.6%) patients, the microorganisms isolated from the pancreas, in 13 (36.1%) of the other loci: culture from the blood, urine, drain fluid, peritoneal fluid. The most frequent site where were detected the microorganisms was the drain fluid. Overall, 64.8% pathogens were gram-negative, 31.5% were gram-positive and 3.7% were fungi.

Gram-negative organisms were presented Enterobacteriaceae spp.: Escherichia coli and Klebsiella pneumoniae were the most common microorganisms (18.5% and 16.6%, respectively), followed by Proteus mirabilis (3.7%), Enterobacter aerogenes (1.8%), and Serratia marcescens (1.8%). Pseudomonas aeruginosa isolated in 11 cases (20.3%), Acinetobacter baumannii – in 2 cases (3.6%). Data from other studies on patients with infected necrotizing pancreatitis is similar to our finding [5, 6].

We found that all isolates of Enterobacteriaceae spp. were sensitive to imipenem, meropenem. In this study, the rates for extended spectrum beta-lactamases production were 50%, 77.7% and 50% for Escherihia coli, Klebsiella pneumonia, and Proteus mirabilis, respectively. These strains were resistant to cephalosporins. Our study, similar to others investigations, demonstrated low susceptibility of Escherihia coli, Klebsiella pneumoniae to ciprofloxacin, levofloxacin. Susceptibility to these agents was 68.4%. It may be due to the presence of both nosocomial and community-acquired strains of Enterobacteriaceae [6, 7, 8].

In comparison with the data of other authors, we found a high sensitivity to amikacin detecting strains of Enterobacteriaceae spp. It was showed susceptibilities to amikacin of 100% isolates, 88.8% and 50% for Escherihia coli, Klebsiella pneumoniae and Proteus mirabilis, respectively. Level of resistant organisms to gentamicin was 77.7% and 70% for Klebsiella pneumoniae and Escherihia coli, respectively. Proteus mirabilis was sensitive to gentamicin in 50% cases.

However, according to a multicenter epidemiological study of antimicrobial resistance of nosocomial infections was revealed an increase resistance, in the most cases - K. pneumoniae, to meropenem, imipenem and ertapenem at 2.8%, 8.4% and 14.0% of isolates, respectively. At 3.7% of the isolates identified products carbapenemases groups OXA-48 (3.3%) and NDM-1 (0.4%). In addition, it was observed increase in the level of Enterobacteriaceae strains producing beta-lactamase extended spectrumwas detected in 78.2% of all isolates, including 90.6% of K. pneumoniae and 82.1% Escherihia coli. The level of resistance to gentamicin, ciprofloxacin and trimethoprim/ sulfamethoxazole
reached 60.4%, 70.5%, 63.7%, respectively. The most effective agent among the non-β-lactam antibiotic is amikacin, fosfomycin and tigecycline, which were resistant 36.1%, 14.1% and 15.9% of the isolates, respectively [9].

Enterobacter aerogenes (1 strains – 1.8%) in our study was sensitive to carbapenems, amikacin, gentamicin and showed resistance to cephalosporins. Serratia marcescens (1 strains – 1.8%) – was resistant to all tested agents, except carbapenems.

In this study it was observed increase in the resistance level of Pseudomonas aeruginosa to β-lactams. Thus, the resistant strains of Pseudomonas aeruginosa to ceftazidime, cefoperazone and cefepime was registered in 63.6%. Some more active antibiotics against Pseudomonas aeruginosa were carbapenems: resistant organisms proved 54.5% and 45.4% strains, to meropenem and imipenem, respectively. The current study was retrieved high susceptibility of Pseudomonas aeruginosa to aminoglycosides. We identified only 18.2% and 27.2% resistant isolates to amikacin and gentamicin, respectively. It was detected high level of antibiotic resistance to fluoroquinolones among strains of Pseudomonas aeruginosa. Isolated microorganisms were resistant to ciprofloxacin and levofloxacin in 72.7% cases and 81.8% cases, respectively. Data on the associated resistance carbapenemresistant strains revealed that 36.3% strains and 27.2% strains were sensitive to ceftazidime and cefepime, respectively. This is consistent with the others studies [10]. However, it was found a high level of resistance of carbapenemresistant strains to fluoroquinolones: all isolates were resistant to ciprofloxacin and levofloxacin. Aminoglycosides like Amikacin and Gentamicin showed sensitivity of 81.8% and 72.7% respectively where the resistant rates to aminoglycosides were less compared to another study conducted elsewhere. Acinetobacter spp. (3.8%) in our study was resistant to penicillins, cephalosporins, fluoroquinolones, amikacin, and gentamicin. In 50% cases was registered resistance of the agent to carbapenems. However, in contrast to our findings, level of antibiotic resistance of Acinetobacter spp. was below our data. This may be due to very less numbers of this isolate in our study (only 2 strains). Gram-positive isolates were Staphylococcus aureus, coagulase negative staphylococci in 31.5% cases. It was detected high level of methicillin-resistant staphylococci, which was 64.7% in contrast to other Russian researchers [7]. In 2% of cases, it was detected Enterococcus faecum, which was resistant to ampicillin and sensitive to vancomycin.

Identified two strains of Candida albicans (3.8%) were sensitive to fluconazole, amphotericin B, which is consistent with data from foreign authors [11].

**Conclusion:** Thus, data on the structure of pathogens in suppurative complications of acute pancreatitis, obtained in the surgical department of the Belgorod Regional Clinical Hospital are consistent with those of other Russian authors.
It was showed a high level of sensitivity Enterobacteriaceae spp. to carbapenems and lower sensitivity to cephalosporins III and IV generations. It was defined an increase resistance to fluoroquinolones. In contrast to data from other Russian researchers, it was shown sensitivity of Gram-negative strains to amikacin. It was revealed a relatively low incidence of staphylococci and high level of methicillin-resistant strains of staphylococci.

For initial therapy, when confirmed infected pancreatic necrosis, it is preferable to use carbapenems in severe acute pancreatic necrosis. It will ensure the effectiveness of antibacterial therapy for the most frequently isolated Gram-negative bacteria, including Pseudomonas aeruginosa and Enterobacteriaceae spp., which are producing extended spectrum beta lactamases.

However, it is necessary to carry out bacteriological research, to clarify sensitivity of Pseudomonas aeruginosa, because it were identified strains, which were resistant to carbapenems. The data from bacteriological studies have shown the possible use of cephalosporins III-IV generation in combination with metronidazole or aminoglycosides in case sensitivity of microorganism to these antibiotics. However, it is known low amikacin ability to penetrate into the pancreas, which limits the use of aminoglycosides for prophylactic purpose in acute necrotizing pancreatitis.

Considering frequency detection of methicillin-resistant staphylococcus strains vancomycin should be used in case receiving the relevant microbiological findings. According the high degree of fluoroquinolones penetration, their use is preferred for prophylactic purpose in combination with metronidazole or in case confirmation of their effectiveness, which is based on bacteriological examination.

References


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