SELECTIVE DECONTAMINATION OF THE INTESTINE AND THE INTERSTITIAL ELECTROPHORESIS IN PREVENTION AND TREATMENT OF PURULENT COMPLICATIONS IN ACUTE PANCREATITIS

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Abstract

This paper presents the methods of prevention and treatment of infectious complications in patients with acute pancreatitis. It contains literature data on bacterial translocation from the intestine into the pancreas and a parapancreatic space. At the Department of Surgery SEI CPE KSMA, 86 patients were examined for bioelectric activity of their gastrointestinal tract; the 24 patients (18 men, 6 women; 43±13 years) with an average severity on a scale of Dzhanelidze St. Petersburg Research Institute had the dynamics of the inflammatory response according to laboratory and clinical data. In case of evidence of adverse acute pancreatitis, these patients were prescribed a selective intestinal decontamination by introducing antibiotics through the probe or orally (Ciprofloxacin 500 mg 2 times a day), and 36 patients (27 men, 9 women, 44±7 years) were prescribed galvanization during intravenous antibiotic therapy with third-generation Cephalosporin (Ceftriaxone). The comparison group consisted of 26 patients (22 men, 2 women; 44±14 years) with moderate severity and 2 (2 men, 43±6 years) with high severity, who received conventional conservative treatment with intravenously administered antibiotics.

According to the results, the use of selective intestinal decontamination, and galvanization of intravenously administered antibiotics in the study group reduced the frequency of purulent complications from 34.6% in the control group to 13% in the study group with a predominance of localized forms. The use of intestine decontamination and electrophoresis during antibiotic administration reduced the mortality from 15% to 10%.

Keywords: Acute pancreatitis, intestinal decontamination, galvanization, bioelectrical activity, antibiotic therapy.

Introduction: The methods of treatment of acute pancreatitis are currently being revised [1-7], and the main one in the treatment of aseptic pancreatitis today is the conservative intensive case management. An effective treatment of

sterile pancreatic necrosis has led to an increase in supporters of non-surgical treatment of patients with non-infected pancreatic necrosis [8-10, 5, 11, 12, 6]. All the more so that, according to the authors having conducted the experimental study, high mortality in infected pancreatic necrosis is indirectly associated with the performance of laparotomy [13]. The experience of German colleagues [7] is interesting enough: from 1987 to 2002, they used conservative tactics of management of patients with pancreatic necrosis and found that the majority of patients can be cured without surgery. Bradley and Allen were among the first who described the successful treatment of patients with non-infected pancreatic necrosis by intensive therapy [5]. Conservative treatment was performed in the intensive care unit, using intravenous infusion, an auxiliary pulmonary ventilation, hemofiltration, and hemodialysis. Treatment efficacy in critical patients was monitored on APACHE 2 scale. Despite the fact that conservative treatment is accompanied by low (2-11%) mortality rate, the use of this approach has been limited to patients with clinical signs of sepsis. Infectious complications are the most frequent and serious complications of acute destructive pancreatitis, with a mortality rate up to 80% [14], caused by the bacteria of intestinal origin [15]. Bacterial dissemination mechanism remains unknown [13], although it was established the ability of bacteria to migrate through the intestinal wall and infect the surrounding tissues, including the pancreas [15, 16].

The leading role in the treatment of pancreatic necrosis belongs to antibiotic treatment [17]. Destructive pancreatitis increases the risk of infection of the pancreas, resulting in significantly worsened prognosis [6]. A particular interest in terms of translocation of bacteria across the intestinal wall is aroused by the selective intestinal decontamination (SID) in acute pancreatitis [18]. The positive results of SID in acute pancreatitis in the experimental studies [19] and the successful prevention of septic complications in aseptic pancreatitis allowed us to apply this method of treatment for infected pancreatitis [18]. However, this technique is a "non-traditional" and "non-recognized" in the treatment of acute pancreatitis. Subject to the above, the clinic of the Department of Surgery SBEI CPE KSMA of the Federal Service on Surveillance in Healthcare has set an objective to develop the preventive and therapeutic measures for infectious complications and set tasks to study the functional disorders of the gastrointestinal tract in acute pancreatitis, develop the correction methods for data on disorders by using a selective intestinal decontamination, and electrophoresis at intravenous antibiotic therapy.

Materials and methods:

Eighty-six patients with moderate and severe acute pancreatitis on the scale of Dzhanelidze St.-Petersburg Research Institute [20], hospitalized since 2002 to the clinics of the Department of Surgery SEI CPE KSMA were divided into

groups. The first group included 24 patients with moderate acute pancreatitis (18 men, 6 women; 43±13 years) underwent the study of gastrointestinal bioelectric activity. The patients with adverse laboratory and clinical signs and high levels of bioelectrical activity were prescribed a selective intestinal decontamination by introducing antibiotics through the probe or orally (Ciprofloxacin 500 mg 2 times a day), and 36 patients (27 men, 9 women, 44±7 years) were prescribed galvanization during intravenous antibiotic therapy with third-generation Cephalosporin (Ceftriaxone). Twenty-four patients with adverse signs of acute pancreatitis and high levels of bioelectrical activity (18 men, 6 women, 42±12 years) were prescribed a selective intestinal decontamination by introducing antibiotics through the probe or orally (Ciprofloxacin 500 mg 2 times a day), and 36 patients (27 men, 9 women, 44±7 years) were prescribed galvanization during intravenous antibiotic therapy with third-generation Cephalosporin (Ceftriaxone). The control group consisted of 26 patients (22 men, 2 women; 44±14 years) with moderate severity, and 2 (2 men, 43±6 years) with high severity according to Dzhanelidze St.

Petersburg Research Institute scale, who received traditional conservative treatment with intravenously administered antibiotics. In these groups, their laboratory findings, the conducted surgeries, complications during treatment, and mortality were analyzed.

To investigate the gastrointestinal bioelectrical activity, we used electrogastroenterography (EGEG) [21], the method based on recording spectral and correlation characteristics of infra-low-frequency biopotentials of leads on the patient's extremities using the jointly developed with the Department of KSTU gastroenterograph [22, 23]. The reliability of the results was assessed by Student's t-test. The study and the control groups were compared by their laboratory (leukocytosis, LII, urine amylase) and clinical (temperature, respiratory rate, heart rate) indicators, the frequency of septic complications, and the mortality rates.

Results:

Eighty-six patients with moderate and severe acute pancreatitis on the scale of Dzhanelidze St.-Petersburg Research Institute [20], hospitalized since 2002 to the clinics of the Department of Surgery SEI CPE KSMA have managed to undergo a conservative therapy with dynamic ultrasound control and examination of their gastrointestinal bioelectrical activity. Twenty-four patients with moderate acute pancreatitis (18 men, 6 women; 43±13 years) were selected from 184 patients hospitalized to the department of urgent surgery with the diagnosis of acute pancreatitis. To study the functional changes in the gastrointestinal tract in acute pancreatitis, the laboratory parameters of the patients were studied, such as protein/LII, terms of normalization of peristalsis, indicators of bioelectrical activity

on day 7, 14, 21. The study of bioelectric activity (BEA) of the gastrointestinal tract was performed by electrogastrography.

Both clinical and laboratory data and the assessment of bioelectrical activity of various gastrointestinal regions are presented in Table 1.

Clinical and laboratory data and the assessment of bioelectrical activity of various gastrointestinal regions.

Clinical and laboratory indicators	Favorable clinical indicators	Unfavorable clinical indicators
Protein/LII (normal - 53-120)	Increased by 35.4±2.3% (p<0.05) by day 11±3	Decreased by 42.3±3.4% (p<0.05) by day 10±3
Flatus passage	day 3±1	day 9.4±3.4
Independent intestinal habits	day 4.5±1	day 10.5±2.5
Stomach BEA On day 7	460.3±21 – 21.4±3.1 µV	5219.5±421 – 420.4±3.1 µV
Duodenum BEA on day 7	622.8±31.4 – 29.2±4.1 µV	2828.45±341.4 – 323.2±4.1 µV
Small intestine BEA on day 7	630.6±7.3 – 38.3±6.3 µV	4666.6±77.3 – 346.3±6.3 µV
Colon BEA on day 7	618.7±36.7 – 19.8±3.1 µV	10213.4±766.7 – 518.8±3.1 µV
Stomach BEA On day 14-21	160.7±20.0 – 60.7±6.0 µV	9851.3±123 – 3273.4±303 µV
Duodenum BEA on day 14-21	40.7±5.0 – 22.7±5.0 µV	4424.3±413 – 1672.9±98 µV
Small intestine BEA on day 14-21	76.4±7.0 – 44.3±3.0 µV	7109.6±274 – 3311.5±167 µV
Colon BEA on day 14-21	86.4±7.0 – 54.3±3.0 µV	14874.1±288 – 6906.8±108 µV

According to clinical and laboratory data and evaluation of gastrointestinal bioelectrical activity shown in Table 1, we can distinguish the groups with a favorable or unfavorable prognostic course of acute destructive pancreatitis. At favorable course, the indicators of physical state severity, protein-to-LII ratio normalized, flatus passage occurred on day 3, and independent intestinal habits - on day 4. At favorable prognosis, the bioelectrical activity of the stomach on day 10 was 460.3±21 µV - 21.4±3.1 µV, duodenum - 622.8±31.4 µV - 29.2±4.1 µV, distal part of small intestine - 630.6±7.3 µV - 38.3±6.3 µV, colon - 618.7±36.7 µV - 19.8±3.1 µV. On day 14-21, these indicators normalized: stomach - 160.7±20.0 µV - 60.7±6.0 µV, proximal part of small intestine - in the range of 40.7±5.0 µV - 22.7±5.0 µV and distal part of small intestine - 76.4±7.0 µV - 44.3±3.0 µV. At unfavorable course, the indicators of PSS stabilization normalized by day 14, the protein-to-LII ratio decreased by 42.3±3.4% (p<0.05) by day 10±3, and the

flatus passage and intestinal habits occurred on day 10. Bioelectrical activity of the stomach on day 10 was

5219.5±421 µV - 420.4±3.1 µV, duodenum - 2828.45±341.4 µV - 323.2±4.1 µV, distal part of small intestine -

4666.6±77.3 µV - 346.3±6.3 µV, and colon - 10213.4±766.7 µV - 19.8±3.1 µV. By day 14-21, the BEA levels

differed from those of the group with favorable outcome by 2-10 times, and were in the stomach - 9851.3±123 µV -

3273.4±303 µV, duodenum - 4424.3±413 µV - 1672.9±98 µV, distal part of small intestine - 7109.6±274 µV -

3311.5±167 µV, and colon - 14874.1±288 µV - 6906.8±108 µV.

 Thus, for the purpose of objective assessment of the dynamics of acute pancreatitis and the effectiveness of the

 treatment we have developed an integrated assessment, including clinical, laboratory and electrophysiological

 indicators of various parts of a gastrointestinal tract.

Twenty-four patients with adverse signs of acute pancreatitis and high levels of bioelectrical activity (18 men, 6

women, 42±12 years) were prescribed a selective intestinal decontamination by introducing antibiotics through the

probe or orally (Ciprofloxacin 500 mg 2 times a day), and 36 patients (27 men, 9 women, 44±7 years) were

prescribed galvanization during intravenous antibiotic therapy with third-generation Cephalosporin (Ceftriaxone).

The control group consisted of 26 patients (22 men, 2 women; 44±14 years) with moderate severity, and 2 (2 men,

43±6 years) with high severity according to Dzhanelidze St. Petersburg Research Institute scale, who received

traditional conservative treatment with intravenously administered antibiotics. In these groups, their laboratory

findings, the conducted surgeries, complications during treatment, and mortality were analyzed.

Laboratory and clinical findings, such as fever, leukocytosis, heart rate, respiratory rate, leukocyte intoxication index,

and urine amylase were compared at the time of admission and at the completion of the conservative therapy. If at the

time of treatment the laboratory parameters do not differ, then, ten days after, there is a considerable improvement

established in the values of body temperature, white blood cells, Kalf-Kalif LII with respect to the values of control

group (p ≤ 0.05). The dynamics of laboratory and clinical findings in the study and control groups is shown in Table

2.

Dynamics of laboratory and clinical indicators in the study and control groups.

Indicator	At admission		On day 10 of treatment	
	Study group	Control group	Study group	Control group

Body temperature,	38.4±0.02	38.7±0.1	36.8±0.12	37.3±0.27
Blood leukocytes, 10^9/l	19.11±1.18	21.3±2.17	8.52±1.21	12.05±3.05
Kalf-Kalif LII, units	1.9±0.3	1.8±0.2	1.2±0.23	1.5±0.34
HR, bpm.	113±17	118±10	76±11	87±13
Respiratory rate, min.	24±2	25±2	17±1.2	18±2
Urine amylase, g/l*h	376.2±22.8	293.2±17.3	151.5±13.11	188.37±17.95

Discussion:

Four patients (13%) of study group had complications observed, predominantly - localized infections (3 patients had acute fluid pockets, which further transformed into omental abscess, 1 patient had retroperitoneal abscess). The total and postoperative mortality was the same in the study and control groups - 10% (3 patients), and 15% (4 patients), respectively. One death in the study group was caused by the development of intestinal fistula and erosive bleeding that required a laparotomy. This complication occurred due to the revaluation of the capabilities of the minimally invasive treatment.

Summary:

Thus, the determination of indicators of bioelectrical activity in combination with the dynamic ultrasound examination allows monitoring the course of pancreatic necrosis and predicting possible complications. We have developed an integrated assessment, including clinical, laboratory and electrophysiological indicators of various parts of a gastrointestinal tract. The continuing high levels of bioelectric activity during the first 3 days with the indicators of systemic inflammatory response syndrome requires to carry out the intestinal decontamination, galvanization with intravenously administered antibiotics, and the prescription of carbapenems.

The proposed selective intestinal decontamination by introducing antibiotics through the probe or orally (Ciprofloxacin 500 mg 2 times a day), and the prescribed galvanization during intravenous antibiotic therapy with third-generation Cephalosporin (Ceftriaxone) contribute to the improvement of both laboratory and clinical indicators. In particular, the use of selective intestinal decontamination, and galvanization of parenterally administered antibiotics in the study group reduced the frequency of purulent complications from 34.6% in the control group to 13% in the study group with a predominance of localized forms. The mortality reduced from 15% to 10%.

Based on the obtained laboratory data on and clinical results of the use of the selective intestinal decontamination and the interstitial electrophoresis as a part of a combination treatment contributes to reduction in the frequency of septic

complications, to predominance of localized infections, which requires minimally invasive methods of treatment and reduces mortality in patients with acute destructive pancreatitis.

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