

# Nutritional treatment in severe acute pancreatitis

Leczenie żywieniowe w ciężkim ostrym zapaleniu trzustki

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**Key words:** severe acute pancreatitis, parenteral nutrition, enteral nutrition.

**Słowa kluczowe:** ciężkie ostre zapalenie trzustki, żywienie pozajelitowe, żywienie dojelitowe.

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## Abstract

**Aim:** The aim of our study was to evaluate the results of nutritional treatment in patients with severe acute pancreatitis.

**Material and methods:** We analyzed the clinical course, duration of parenteral or enteral nutrition, period of hospitalization and complications. We analyzed the material of 32 patients treated for severe acute pancreatitis which required nutritional support.

**Results:** All patients were qualified for nutritional treatment. In 4 patients enteral treatment was possible to introduce from the beginning of the disease. The remaining 28 patients required parenteral nutrition. Average time of nutritional intervention was 15.75 days (12-21 days) in the enteral vs. 16.23 days in the parenteral nutrition group. Average energy supplied in the enteral nutrition group was 18.3 kcal/kg body weight vs. 22.4 kcal/kg body weight in the parenteral nutrition group. Overall mortality rate was 9.6%. Average length of hospitalization was 21.3 days in the enteral nutrition group vs. 23.5 days in the parenteral nutrition group. Ten patients (31.2%) had complications that could have been side effects of nutritional treatment.

**Conclusions:** In some cases of severe acute pancreatitis, parenteral nutrition remains the only way of feeding due to the serious condition of the patient and impossibility of introducing enteral feeding from the beginning of the disease. In some patients qualified as cases of severe acute pancreatitis it is possible to apply enteral nutrition, but under the condition that there is good access to the alimentary tract and that there are no disorders in the intestinal passage.

## Streszczenie

**Cel:** Celem pracy była ocena efektów leczenia żywieniowego u chorych leczonych z powodu ciężkiego ostrego zapalenia trzustki.

**Materiał i metody:** Zanalizowano przebieg kliniczny, czas leczenia żywieniowego drogą enteralną lub parenteralną, czas pobytu w szpitalu oraz liczbę powikłań u 32 pacjentów leczonych z powodu ciężkiego ostrego zapalenia trzustki, którzy wymagali interwencji żywieniowej.

**Wyniki:** Wszyscy pacjenci wymagali leczenia żywieniowego. U 4 chorych było możliwe zastosowanie żywienia dojelitowego od początku choroby. Pozostałych 28 pacjentów wymagało żywienia pozajelitowego. Średni czas interwencji żywieniowej wyniósł 15,75 dnia w grupie chorych żywionych dojelitowo oraz 16,23 dnia w grupie żywionej pozajelitowo. Energia dostarczona w żywieniu wyniosła w grupie chorych żywionych dojelitowo 18,3 kcal/kg m.c. oraz 22,4 kcal/kg m.c. w grupie żywionej pozajelitowo, natomiast całkowita śmiertelność 9,6%. Średni czas hospitalizacji w grupie żywionej dojelitowo kształtował się na poziomie 21,3 dnia, a w grupie żywionej pozajelitowo 23,5 dnia. U 31,2% chorych wystąpiły powikłania mogące mieć związek z leczeniem żywieniowym.

**Wnioski:** Według doświadczeń autorów niniejszego opracowania w części przypadków ciężkiego ostrego zapalenia trzustki całkowite żywienie pozajelitowe jest jedyną drogą żywienia. Wiąże się to z ciężkim stanem ogólnym chorego oraz zaburzeniami funkcji przewodu pokarmowego. U niektórych chorych na ciężkie ostre zapalenie trzustki możliwe jest zastosowanie żywienia dojelitowego od początku choroby pod warunkiem dobrego dostępu do przewodu pokarmowego oraz braku zaburzeń pasażu jelitowego.

## Introduction

Acute pancreatitis is related to premature activation of proteolytic enzymes within the organ and leads to self-digestion which causes extensive damage of the pancreas. In the majority of cases (about 80%) the course of pancreatitis is mild and it does not require nutritional intervention in the course of treatment. Mortality in this group is less than 1%. However, some patients develop severe acute pancreatitis with inflammatory system reaction and multiorgan failure, leading to considerable disturbances in the state of nutrition. According to the Atlanta classification, acute pancreatitis is characterized by two periods: the first one is systemic inflammatory response syndrome (SIRS), which sometimes leads to septic complications and to death in consequence of multiorgan failure [1, 2]. Usually the first period of acute pancreatitis lasts up to 14 days. In the second period pancreatic necrosis develops, initially aseptic but then infected. Attenuation of the intestinal barrier and translocation of bacteria and their toxins from the intestinal lumen to the peritoneal cavity are believed to be the main mechanism of pancreatic necrosis [3]. In both periods of acute pancreatitis, nutritional treatment is an important part of the therapeutic process, in view of fast development of malnutrition and protein catabolism. The basic level of metabolism increases due to the inflammatory response and pain. In the majority of patients with severe acute pancreatitis we have to deal with a negative nitrogen balance, sometimes with daily nitrogen loss which surpasses 40 g/day [4]. It leads to considerable deterioration of the patient's nutritional state and speeds up the development of the disease. One important decision to make is to choose the way of nutritional treatment. Patients can be fed via the gastrointestinal tract (enteral nutrition) or intravenously (parenteral nutrition). Some authors think that enteral nutrition is the one which should be indicated in acute pancreatitis, on account of its positive influence on the maintenance of correct function of the alimentary tract, including the intestinal barrier, making bacteria translocation impossible, as well as on the decrease of the inflammatory response. All of that can prevent adverse results of SIRS [2]. The most common way of access to the alimentary tract is using a nasojejunal tube placed below the Treitz ligament. However, it often happens that it is not possible to introduce enteral nutrition, because of symptoms of paralytic ileus (especially in the case of severe acute pancreatitis). In some patients it does not allow sufficient supply of energy and substrates; therefore it requires supplementation with parenteral nutrition.

## Aim

The aim of our study was to evaluate the results of nutritional treatment in patients with severe acute pancreatitis. We analyzed the clinical course, duration of parenteral nutrition, period of hospitalization and complications.

## Material and methods

The material comprised 32 patients (26 men and 6 women) with severe acute pancreatitis, treated in the Department of General and Colorectal Surgery of the Medical University in Lodz, in the years 2003-2007. On admission to hospital patients were evaluated with the Ranson scale (Table I). Patients with 3 or more points according to the scale were qualified for the analysis. Computed tomography of the abdominal cavity was performed in all patients and the level of acute pancreatitis was evaluated using the Balthazar scale (Table II). It was not possible to employ the Ranson score in all patients, because it can only be used within 48 h from the onset of symptoms, and some patients were

**Table I.** Characteristics of the analyzed group  
*Tabela I. Charakterystyka analizowanych grup*

	Women	Men	Total
Number	6	26	32
Weight [kg]	62.8	71.4	69.6
Height [cm]	160.4	176.4	173.2
BMI [kg/m <sup>2</sup> ]	24.4	22.8	23.1
Age	41.8	49	47.52

**Table II.** Stage of the disease according to Balthazar scale

*Tabela II. Zaawansowanie choroby wg skali Balthazara*

Degree on Balthazar scale	Number of patients diagnosed according to Ranson score	Number of patients without diagnosis according to Ranson score	Total
A	0	0	0
B	5	0	5
C	9	8	17
D	5	2	7
E	3	0	3
Total	22	10	32

**Table III.** Ranson score  
**Tabela III.** Skala Ransona

Age > 55
WBC > 16 on admission
Glucose > 200 (US) > 10 (SI) on admission
LDH > 350 on admission
AST > 250 on admission
Hct drop > 10% within 48 h of admission
BUN increase > 5 US (> 1.79 SI) within 48 h of admission
Ca < 8 (US) < 2 (SI) within 48 h of admission
Arterial pO <sub>2</sub> < 60 within 48 h of admission
Base deficit (24 – HCO <sub>3</sub> ) > 4 within 48 h of admission
Fluid needs > 6 l within 48 h of admission

**Table IV.** Balthazar scale  
**Tabela IV.** Skala Balthazara

Balthazar scale:
A – normal pancreas
B – pancreas enlargement
C – peripancreatic inflammation
D – single fluid collection
E – numerous fluid collections

admitted after that period. These patients were qualified for the examination based on computed tomography, and evaluation according to the Balthazar scale (D or E degree). Patients without symptoms of bowel obstruction were qualified for enteral feeding, with an attempt to place a silicone tube into the small bowel with endoscopic assistance. They received elementary diet administered with gravitational infusion. In cases when it was impossible to reach the full energetic dose by enteral nutrition within 5 days, patients also received parenteral nutrition. Patients who required parenteral nutrition were fed via the central vein, using ready-to-use three-chambered bags, with supplementation of vitamins and trace elements. To cover the circadian water supply, solutions of 5% glucose, 0.9% NaCl, ANA or other crystalloids were given intravenously, separately, without adding them to the nutritional bag. While preparing the nutritional bag, special attention was paid to such parameters as amount of calories and nitrogen per kilogram of body weight, volume of administered mixture along with additional liquids, as well as the necessity of insulin injections. We analyzed body weight loss during hospitalization, and albumin level on admission and at the end of treatment. The number

of metabolic and septic complications potentially connected with nutritional treatment, mortality, length of hospitalization and period of nutritional treatment were also analyzed (Tables III, IV).

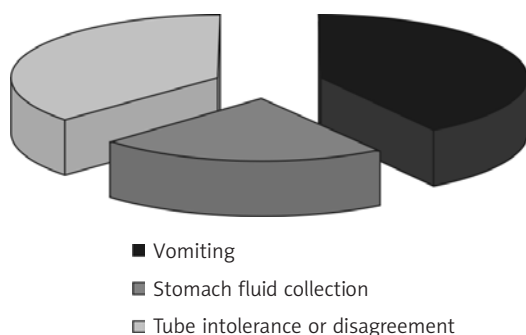
## Results

Within the analyzed group of patients ( $n = 32$ ) treated due to severe acute pancreatitis there were 6 women and 26 men. Mean age in the whole group was 48 years, in the group of women 41.8 years and in the group of men 49 years (Table I).

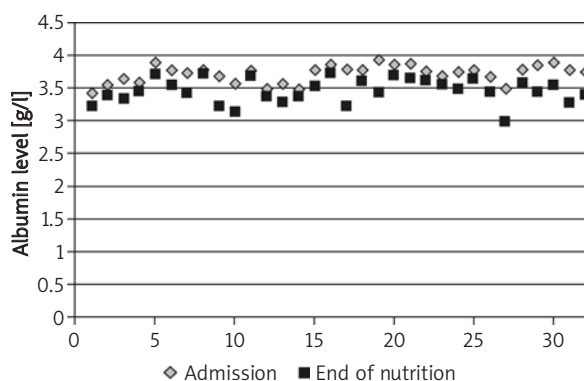
According to the Ranson score, severe acute pancreatitis was diagnosed in 22 patients. All patients in that group had 3 or more points – mean 4.3 (scores from 3 to 7). The remaining 10 patients were placed in the Department over 48 h from the onset of symptoms, which made using the Ranson score impossible. Based on computed tomography, those patients were qualified as suffering from severe acute pancreatitis. Degrees C, D and E on the Balthazar scale were assumed as severe acute pancreatitis. In the remaining group of 10 patients 2 were with D and 8 with C. No patient in that group had E on the Balthazar scale. Scores in both groups of patients according to the Balthazar scale are presented in Table II.

All patients were qualified for nutritional treatment. In 4 patients (12.5%) it was possible to introduce enteral treatment from the beginning of the disease. The remaining 28 patients (87.5%) required parenteral nutrition, but in 3 patients enteral nutrition was introduced after a few days of parenteral nutrition, and after reaching a sufficient caloric dose with enteral nutrition, parenteral nutrition was stopped. The decision to start parenteral nutrition without trying enteral feeding was made in all cases of bowel obstruction. The basic criterion qualifying for parenteral nutrition was insufficient stomach emptying. In 11 cases patients were vomiting on admission, and in the next 6 cases after placing a nasogastric tube there was retention of over 200 ml of stomach fluid. The remaining parenteral nutrition patients ( $n = 10$ ) were excluded from enteral feeding for the following reasons: in 2 cases patients did not agree to placement of the feeding tube; in 7 cases the tube could not be placed because of duodenal stenosis; and 1 patient, after proper placement of the feeding tube, removed it, and refused another attempt of tube placement (Figure 1).

In the enteral nutrition group, average time of nutritional intervention was 15.75 days (12-21 days). In parenteral nutrition patients, average time of parenteral feeding was 16.23 days (11-23 days), and in two patients the feeding was continued with a nasojejunal tube (after 12 and 14 days of parenteral



**Fig. 1.** Reasons for enteral nutrition failure  
**Ryc. 1.** Przyczyny niepowodzenia żywienia dojelitowego



**Fig. 2.** Albumin level on admission and at the end of nutritional support

**Ryc. 2.** Stężenie albumin przy przyjęciu oraz po zakończeniu leczenia żywieniowego

nutrition). Average energy supplied in the enteral nutrition group was 18.3 kcal/kg body weight, whereas in the parenteral nutrition group it was 22.4 kcal/kg body weight. Average weight loss during nutritional intervention was 3.6 kg (5.6%) in the enteral nutrition group, and 4.9 kg (7.1%) in the parenteral nutrition group. Mean albumin level on admission was 3.71 g/dl in the whole group, while at the end of nutritional support it was 3.45 g/dl (Figure 2). Overall mortality rate was 9.6% (3 deaths, all caused by multiple organ failure, in the parenteral nutrition group). Average length of hospitalization was 21.3 days in the enteral nutrition group vs. 23.5 days in the parenteral nutrition group. Ten patients (31.2%) had complications that could have been side effects of nutritional treatment. Elevated glucose levels were noted in 5 patients (15.6%), all from the parenteral nutrition group. Three (9.4%) patients suffered from diarrhoea, all in the enteral nutrition group. Finally, septic complications occurred in 2 patients (6.25%) in the parenteral nutrition group and in one of them after removing the catheter a positive bacteriological culture was found on its end part.

## Discussion

Severe acute pancreatitis is a difficult therapeutic problem, including pharmacological treatment, nutritional support and time of surgical intervention. Guidelines concerning nutritional treatment of patients with severe acute pancreatitis were established in 2006 by the European Society for Clinical Nutrition and Metabolism (ESPEN) [5, 6]. They suggest applying enteral nutrition in every case of severe acute pancreatitis if it is possible. However, in cases where enteral feeding cannot provide enough energy, supplementary parenteral nutrition should be

introduced. All patients able to tolerate enteral nutrition should be treated that way. ESPEN experts strongly recommend that parenteral nutrition should be limited only to patients with complete intolerance of enteral nutrition, or cases where there are no technical possibilities of introducing it. There are randomized trials proving the safety of enteral feeding application, improvement in treatment results and lowering of costs compared to parenteral nutrition [7–9]. The authors stress that despite a possible stimulating effect on the pancreas, enteral nutrition can bring important benefits to the patient, including alimentation of intestinal villi, preventing further development of multiorgan failure, or simply eliminating any possible complications on account of not applying parenteral nutrition. Some earlier papers even showed that parenteral nutrition is harmful in severe acute pancreatitis. A prospective study by Sax *et al.* where a parenteral nutrition group was compared to a group without any nutritional treatment showed longer hospitalization (16 vs. 10 days) and more frequent septic complications (10.5 vs. 1.5% respectively) in the parenteral nutrition group [10]. But that study concerned only patients with mild acute pancreatitis (less than 3 points on the Ranson score), and according to ESPEN guidelines such cases do not require nutritional support at all. So, improper qualification for nutritional treatment could be the cause of the worse result. Abou-Assi *et al.* also proved better results of enteral nutrition, while analyzing all cases of acute pancreatitis, including mild. Also interesting is the fact that a sufficient supply of calories was achieved only in 54% of patients fed by intestinal tube vs. 84% in the parenteral nutrition group [11]. Casas *et al.* compared albumin and prealbumin levels in the two groups (enteral and parenteral

nutrition) without finding any statistically significant differences. The length of hospitalization was also similar in both groups, although the authors reported a better clinical course in patients with enteral feeding [12].

Another very important study showing advantages of enteral nutrition over parenteral nutrition is a meta-analysis by Marik *et al.* Six analyzed papers met their criteria, and on that basis they found out that the length of hospitalization, number of septic complications and need for surgical intervention were lower in the enteral nutrition group. They also showed that the number of serious non-infectious complications (such as respiratory failure or multiorgan failure) was similar in both groups [13]. Investigations carried out by Petrov *et al.* led to much the same conclusions, stressing the positive effect of enteral nutrition on reduction of mortality, septic complications and multiorgan failure. He also draws attention to the time of beginning of nutritional support – the best results of enteral nutrition were noted when it was introduced within 48 h from the diagnosis [14].

Therefore, we may come to the conclusion that parenteral nutrition should be a marginal procedure in patients with severe acute pancreatitis. So why is it that in our Department most patients required total parenteral nutrition?

If we decide on nutritional treatment, we have to choose a method of nutritional support. It seems that the safest choice is a nasojejunal tube, although there are reports showing that a nasogastric tube provides the same safety, without worsening clinical results or affecting CRP levels. According to our observations it is not always possible to attempt enteral nutrition, because of a massive inflammatory state in the pancreas and retroperitoneal space, which causes either functional obstruction of the upper alimentary tract or duodenal stenosis. Oleinikov *et al.* seem to confirm our observations. They showed that enteral nutrition is not possible in patients with a Ranson score result over 4.3 or over 17.2 on the Apache II scale (not used in our department) [15]. The Ranson score result is exactly the same as in our group. Our experience is very similar – it is difficult to introduce enteral nutrition when there are some inflammatory changes, and even if we technically manage to gain access to the alimentary tract, enteral feeding is not well tolerated by patients.

So, does it mean that enteral nutrition should be a method of choice in severe acute pancreatitis? Investigations carried out by Eckerwall *et al.* were aimed at evaluating the safety and effectiveness of early enteral nutrition in acute pancreatitis compared

with parenteral nutrition. Fifty patients were examined in a randomized trial, showing better glucose control in the enteral nutrition group, whereas the total number of complications was higher in that group. There were no differences in clinical outcome between the groups [16]. Merola *et al.* showed that in the early stages of the disease, patients with enteral feeding more often presented infected necrosis of the pancreas, and they were moved to parenteral nutrition. The length of hospitalization was also shorter in the parenteral nutrition group [17].

We have to agree with the common opinion that enteral nutrition is a safe and effective method in those groups of patients where it can be introduced. Some of the potential complications of enteral feeding can be avoided by slower administration of the diet or changing the type of preparation used. Our observations show that it is not always possible to introduce enteral nutrition at the beginning of the disease due to the patient's condition. It seems that sometimes it is better to start with total parenteral nutrition and continue with enteral feeding in the later stage of the disease. It is true that potential threats of parenteral nutrition (especially septic complications) are very dangerous, but we believe that using proper standards of management allows many of them to be avoided. Despite encouraging opinions pointing to the benefits of enteral nutrition in acute pancreatitis, attempts to use it in every case may lead to disappointing results. It also seems that good results of enteral feeding may be connected with the fact that the general condition of enteral nutrition patients is better than that of parenteral nutrition patients (although scoring numbers in acute pancreatitis scales are similar). Comparing these two groups may lead to a misjudged conclusion that it is the difference in nutritional support that influences the results of the treatment. According to our material, most cases of severe acute pancreatitis require parenteral nutrition at least in the initial stage of the disease.

## Conclusions

In some cases of severe acute pancreatitis, parenteral nutrition remains the only way of feeding due to the serious condition of the patient and impossibility of introducing enteral feeding from the beginning of the disease.

In the group of patients qualified as cases of severe acute pancreatitis it is possible to apply enteral nutrition, provided that there is good access to the alimentary tract and that there are no disorders in the intestinal passage.



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