Effect of Early Enteral Nutrition Suspension Nutritional Support with Somatostatin on Serum Inflammatory Indices, Gastrointestinal-Related Indices and Prognosis in Severe Acute Pancreatitis

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The aim of the study was to analyze the effects of early enteral nutrition suspension combined with nutritional support and somatostatin in serum inflammatory indices, gastrointestinal function, and outcomes in patients with severe acute pancreatitis. Among 84 severe acute pancreatitis individuals admitted in intensive care unit between June 2021 and June 2022, an observation group and a control group were divided with 42 patients in each group. The observation group was given with early enteral nutrition suspension and somatostatin within 24 h of intensive care unit admission, whereas early parenteral nutrition support and somatostatin was given to control group. Both the groups were compared with clinical efficacy, inflammatory markers, gastrointestinal function and complications. No significant difference (p>0.05) in serum levels of prealbumin, transferrin, procalcitonin, and amylase was observed before treatment between the two groups. Meanwhile the observation group showed significantly higher prealbumin and transferrin levels as well as lower procalcitonin and amylase levels after the treatment when compared with the control group (p<0.05). The observation group also exhibited high levels of interleukin-10, low levels of interleukin-6 and tumor necrosis factor-alpha, the latter difference was not statistically significant (p>0.05). Additionally, the observation group had lower modified Marshall, multiple organ failure scores, and Acute Physiology and Chronic Health Evaluation scores post-treatment, with a statistically significant difference (p<0.05). The incidence of complications in the observation group (16.67 %) was significantly lower than in the control group (40.48 %) (p<0.05). Early enteral nutrition suspension combined with somatostatin improves inflammatory markers, gastrointestinal function, and clinical outcomes in individuals with severe acute pancreatitis, and reduces the incidence of complications.

Key words: Severe acute pancreatitis, early enteral nutrition suspension, somatostatin, inflammation, gastrointestinal function

Severe Acute Pancreatitis (SAP) is a type of pancreatitis characterized by quick onset, complex disease, a high mortality rate, and systemic and local consequences such as impaired immune function and malnutrition[1,2]. Although the recovery rate has increased in the past few years due to advancements in SAP therapies, the mortality rate remains as high as 17 %-20 %[3]. At present, nutritional support is generally used clinically to improve the immune function of the patient's gastrointestinal tract and reduce the necrosis of pancreatic tissue caused by the inflammatory response, thereby improving the condition. There are mainly two ways of nutritional support, parenteral and enteral; studies have shown that parenteral dietary support can lead to intestinal barrier dysfunction and the migration of bacterial endotoxins in the intestinal tract, affecting the patient's prognosis, and enteral nutritional support can meet the dietary needs of patients. At the same time, it can maintain the intestinal mucosa's barrier function and prevent intestinal bacteria's migration, which is of positive significance to the rehabilitation of patients and has a better prognosis[4,5]. The study participants were 84 Intensive Care Unit (ICU)

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individuals with SAP who were hospitalized at our institution between June 2021 and June 2022. The patients were divided into two groups, the observation group and the control group with 42 in each. Inclusion criteria satisfies the requirements for a diagnosis of severe pancreatitis as 4th in the Guidelines for the Diagnosis and Treatment of Acute Pancreatitis in China (2021) published by the Pancreatic Surgery Group of the Surgery Branch of the Chinese Medical Association[6] and the patient gave informed consent and cooperated with the treatment. Unable to receive enteral nutrition or have contraindications for enteral nutrition; combined with autoimmune diseases, malignant tumours, etc.; combined with severe renal failure, cardiovascular and cerebrovascular conditions, etc.; received hormones or immunization inhibitor therapy 3 mo before the illness; those with poor compliance and those with mental illness were excluded from this study. There were 14 females and 28 males (28 y to 59 y) in the observation group, with an average age of (39.83±4.35) y. The time from the start of the disease to admission was (3-8) h, with an average time of (5.27±0.74) h. There were 19 females and 23 males (27 y to 56 y), with an average age of (37.52±5.19) y in the control group. Regarding fundamental variables there was no significant difference between both groups ($p>0.05$), indicating that they were equivalent. In the ICU, their vital signs were monitored. When the hemodynamics was stable, somatostatin (Sitamin, Chengdu Tiantaishan Pharmaceutical Co., Ltd., National Pharmaceutical Approval No: H20053010) was given *via* continuous infusion simultaneously at 0.25 mg/h for 7 d. On this basis, the control group received early parenteral nutrition, calculated the total calories needed according to the Harris-Benedict formula provided by the National Committee for the Evaluation of Scientific and Technical Terms, and used a complete nutritional mixture (Heyian, Liaoning Haisco Pharmaceutical Co., Ltd., National Drug Approval No: H20153094, including trace elements, glucose, vitamins, fat emulsion, amino acids, electrolytes and water) for infusion, the infusion time is >12 h; under the aid of fluoroscopy, a spiral nasointestinal tube was inserted to observe whether the nasointestinal tube ran in line with the upper end of the jejunum. Enteral nutrition suspension (Kanglili, Nutricia Pharmaceutical (Wuxi) Co., Ltd., National Drug Approval No: H20103536) was administered. The rate of administration is 50 ml/h. Once the patient tolerates the drug, slowly raise the amount being administered to 100 ml/h over 3 d, and then modify the dose and infusion rate to the specific requirements of the individual. In laboratory testing, an immunoturbidimetry kit (Beijing Xiolaibo Technology Co., Ltd.,) was utilized to calculate the concentrations of Procalcitonin (PCT) and Palmitic Acid (PA) in the serum of the two groups. The enzyme activity procedure (Shanghai Enzyme Biotechnology Co., Ltd.) was utilized to determine the level of Amylase (AMY) in the serum. The Enzyme-Linked Immunosorbent Assay (ELISA) kit (Guangzhou Orida Biotechnology Co., Ltd.,) was employed to quantify Transferrin (TF), Interleukin (IL)-6, IL-10, and Tumour Necrosis Factor-Alpha (TNF-α) levels in the serum. In prognosis, the both groups were assessed using the Acute Physiology and Chronic Health Evaluation II (APACHE II) (chronic health, age, and acute physiology score), Sequential Organ Failure Assessment (SOFA) (multiple organ failure scores), modified Marshall score, and adverse effects. The data were analysed through the Statistical Package for Social Sciences (SPSS) 22.0 software. The paired t-test and the independent sample t-test were applied to compare groups within the same group before and after therapy. Where Percent (%) denotes using the Chi-square (χ^2) test, $p<0.05$ indicates the statistical significance. Before treatment, there was no statistically significant difference in serum PA, TF, PCT, and AMY levels between both groups. However, following treatment, the levels in the observation group were substantially higher than in the control group. PCT and AMY levels were considerably lower (Table 1). Before treatment, there was no statistically significant difference between the group's serum IL-6, IL-10, or TNF-α levels. Following treatment, serum IL-6 and TNF-α levels in the observation group were considerably higher. The experimental group level of IL-10 was significantly higher than that of the control group (Table 2). Before the treatment, there was no statistically significant difference in both group's modified Marshall, SOFA and APACHE II scores. Although after therapy, the scores of the observation group were significantly lower than those of the control group (Table 3). The adverse reactions of the individuals during treatment mainly included acute peripancreatic fluid accumulation, peripancreatic abscess and acute necrosis accumulation. After treatment, the cumulative occurrence of complications in the control group (30.95 %) was higher than in the

observation group (9.52 %) (Table 4). Acute pancreatitis is a common emergency of the digestive system, and its etiology is complex, mainly including gallstones, biliary tract infection, excessive drinking, etc. Thus the disease is primarily seen in patients with biliary tract diseases, hyperlipidemia and overeating, and the incidence rate is (4.9~73.4)/100 000 people, with younger and younger onset, so it must be paid enough attention[7,8]. Among acute pancreatitis, mild acute pancreatitis accounts for the most significant proportion (80 %~85 %), generally recovered within 2 w, with a low fatality rate and ideal prognosis. Acute pancreatitis of moderate to severe degree is followed by temporary organ dysfunction or local consequences. If co-infected, the case fatality rate increases. Although SAP occupies a low proportion (5 %~10 %), it is the most severe case, usually accompanied by persistent organ dysfunction and a high fatality rate[9,10]. Studies have shown that SAP, as an intense stress stimulus, can activate several inflammatory responses in the body, thereby triggering the secretion of inflammatory factors such as IL-6, TNF-α, PCT and IL-10, among which IL-6 can promote acute phase response protein. TNF-α is involved in pancreatic tissue damage, and PCT is a reliable indicator of multiple organ failure related to inflammatory activities. At the same time, IL-10 mainly antagonizes inflammatory mediators and down-regulates after the inflammation disappears, it will gradually subside[11]. Because of the development of inflammatory reactions in the body, the basal metabolic rate increases in individuals with SAP, the body glycogen is destroyed in huge quantities, and the protein is absorbed excessively, resulting in a significant increase in the level of AMY. In contrast, serum PA and TF levels are significantly reduced[12]. Clinically, the markers of organ failure, infection necrosis, and local consequences are primarily used. The Marshall, SOFA, and APACHE II were utilized to determine the prognosis and impact of rehabilitation. The higher the score, the poorer the expected outcome. Studies have demonstrated inconsiderable variations between the scoring as mentioned earlier systems in determining the length of ICU stay, ICU admission rate, and the overall mortality rate of patients with acute pancreatitis, allowing for a thorough assessment to be undertaken[13]. SAP is a complex problem with multiple complications and involves disciplines. The clinical treatment mainly includes drug therapy and nutritional support. As a common drug for treating SAP, somatostatin can inhibit the exocrine pancreas and reduce the amount of pancreatic juice and the secretion of bicarbonate-digesting enzymes, which protect pancreatic cells to a certain extent[14]. According to studies, enteral feeding can preserve the epithelial function of the intestinal mucosa. The occurrence of multiple organ failure, death, and infectious complications, on the other hand, can be decreased[15]. The results show that the serum levels of PA, TF, and IL-10 in the observation group were significantly higher than those in the control group. The PCT, AMY, TNF-α, and IL-6 levels were also substantially decrease in the experimental group than in the control group. These outcomes suggest that early enteral nutrition support and somatostatin therapy for individuals with SAP may successfully minimize the body's inflammatory response and the secretion of pancreatic enzymes, safeguarding the pancreatic tissue from further damage. The observation group's modified Marshall, SOFA, and APACHE II scores were lower than the control group. Further, the overall complication rates in the observation group (9.52 %) were reduced compared to the control group (30.95 %). This suggests that, SAP in the ICU should be treated with early intestinal nutritional support with somatostatin administration can substantially enhance the prognosis and diminish the incidence of adverse effects. In conclusion, early enteral nutrition suspension nutritional support and somatostatin in ICU patients with SAP can not only reduce the inflammatory response and improve nutritional status but also improve patient outcomes and lower the incidence of problems, which requires clinical validation.

TABLE 1: DIFFERENCE IN SERUM LEVELS OF PA, TF, PCT, AND AMY BEFORE AND AFTER THERAPY (x̄±s)

Group (n=42)	Time	PA (mg/l)	TF (g/l)	PCT (μg/l)	AMY (U/l)
Observation	Before treatment	80.70±7.99	42.07±3.95	8.53±1.33	938.09±194.14
	After treatment	119.09±9.53[a]	51.40±4.57[a]	2.46±1.15[a]	252.33±47.89[a]
Control	Before treatment	76.07±6.37	40.29±4.55	8.32±1.41	965.40±160.61
	After treatment	112.52±9.45[a]	54.78±4.04[a]	3.77±0..85[a]	384.38±72.75[a]

t	3.269[b]	4.341[b]	4.132[b]	9.88[b]
p	0.002[b]	<0.001[b]	<0.001[b]	<0.001[b]

Note: [a]p<0.05, compared with before treatment within the group and [b]p<0.001, comparison between the two groups after treatment

TABLE 2: COMPARISON OF SERUM IL-6, IL-10, AND TNF-α LEVELS IN BOTH GROUPS (x̄±s, ng/l)

Group (n=42)	Time	TNF-α	IL-10	IL-6
Observation	Before treatment	38.95±3.49	8.24±1.08	18.27±2.33
	After treatment	11.52±2.35	15.65±2.03	4.57±1.02[a]
Control	Before treatment	40.44±4.27	7.87±0.86	18.94±2.21
	After treatment	16.67±2.05	12.03±1.52	7.50±1.39[a]
t		10.641[b]	9.301[b]	11.082[b]
p		<0.001[b]	<0.001[b]	<0.001[b]

Note: [a]p<0.05, compared with before treatment within the group and [b]p<0.001, comparison between the two groups after treatment

TABLE 3: COMPARISON OF ASSOCIATED SCORES BEFORE AND AFTER THERAPY (x̄±s, POINTS)

Group (n=42)	Time	Modified Marshall	SOFA	APACHE II
Observation	Before treatment	3.11±0.84	4.19±1.23	14.87±2.46
	After treatment	0.71±0.23[a]	2.14±0.81[a]	6.52±1.58[a]
Control	Before treatment	2.85±0.60	4.02±1.19	15.20±2.04
	After treatment	1.12±0.34[a]	2.69±0.70[a]	9.08±1.85[a]
t		6.372[b]	2.775[b]	6.845[b]
p		<0.001[b]	0.008[b]	<0.001[b]

Note: [a]p<0.05, compared with before treatment within the group and [b]p<0.001, comparison between the two groups after treatment

TABLE 4: COMPARISON OF COMPLICATIONS IN BOTH GROUPS (CASES (%))

Group (n=42)	Acute peripancreatic fluid accumulation	Peripancreatic abscess	Acute necrosis accumulation	Total incidence
Observation	1 (2.38)	3 (7.14)	1 (2.38)	4 (9.52)
Control	3 (7.14)	8 (19.05)	2 (4.76)	13 (30.95)
χ^2		5.974		
p		0.015		

Conflict of interests:

The authors declared no conflict of interests.

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