

Nutritional and Dietary Interventions for Patients with Acute Pancreatitis at Different Stages

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Abstract. Diet is the primary cause and controlling factor of acute pancreatitis. High sugar, high fat, and alcohol are high-risk factors for inducing acute pancreatitis, significantly increasing the risk of onset. After the onset, there is a high possibility of developing malnutrition. Diet management is extremely important and significant for the recovery and prognosis of patients with acute pancreatitis. Recent studies have confirmed that early oral feeding and early enteral nutrition can shorten hospital stay, and the Mediterranean diet can reduce the risk of acute pancreatitis onset. This article details the reasons and types of nutritional support for patients with acute pancreatitis, explores the dietary patterns of patients at different stages, and provides some comparisons and suggestions. Regarding the different characteristics and effects of low-fat diets and normal-fat diets, the similarities and differences between commercially prepared formulas and home-cooked diets, and the advantages of oral carbohydrate solutions. The results can provide data support and guidance for the dietary management of patients with acute pancreatitis. However, the individualized dietary patterns and long-term prognosis patterns still need further research. In the future, large-scale studies can be conducted to further analyze in depth, providing more options for the dietary ideas of acute pancreatitis.

Keywords: Acute pancreatitis, diet, enteral nutrition

1. Introduction

Acute pancreatitis (AP) is a common and severe digestive system disease, with a significant global incidence and mortality burden. Severe cases have a high mortality rate, and it is prone to recurrence and progression to chronic pancreatitis [1]. In the United States, it causes nearly 280,000 hospitalizations each year, with costs exceeding 2.6 billion US dollars, and the annual incidence rate has reached 3.07% [2, 3]. The main causes of AP include overeating, excessive alcohol consumption, and gallstones [3]. If a person consumes too much high-fat, high-sugar, and high-protein food at once, the pancreas secretes excessive digestive enzymes. If the patient also has gallstones, the digestive enzymes are likely to rupture the lumen, corroding the pancreas and capsule, and then flow out to corrode other organs, causing extremely serious consequences. Therefore, diet has a very significant impact on acute pancreatitis.

When an AP patient is diagnosed, they will experience sudden severe pain in the upper abdomen, which radiates to the back, accompanied by nausea, vomiting, abdominal distension, fever, shortness

of breath, and a drop in blood pressure. Severe pancreatitis, on the other hand, can lead to multiple organ failure. Once admitted to the ICU, there is a 30% mortality rate. Although clinical treatment methods have improved, AP remains a difficult-to-cure disease and is prone to recurrence, gradually developing into chronic pancreatitis, thereby increasing the physical and economic burden on patients. Therefore, providing patients with a healthy diet plan is particularly important. Currently, many medical staff do not have a systematic understanding of dietary adjustment after the onset of the disease. AP usually progresses rapidly. If it has already occurred, subsequent dietary adjustment is also crucial. Therefore, the current research aims to continuously explore better dietary patterns to provide patients with high-quality nutrition and help them recover faster with shorter hospital stays. Thus, this article focuses on analyzing the relationship between diet and AP, exploring the impact of different dietary patterns on AP patients, enabling relevant personnel to have a better understanding, and ultimately clarifying that diet has a significant role and effect in the recovery of AP patients. At present, there is a lack of unified understanding in clinical practice regarding the dietary management during the recovery period of patients with AP. In the following section, this article will explore the relationship between diet and AP, and clarify the significant importance of a scientific dietary pattern in promoting recovery and improving prognosis.

2. Reasons and types of nutritional support for AP patients

The pancreas is the "digestion factory" of the human body, playing a crucial role in the digestion and absorption of food. When AP occurs, due to the damage to the pancreas, pancreatic enzymes are abnormally activated, subsequently causing damage to pancreatic acinar cells and self-digestion as well as tissue necrosis, resulting in the activation of some key immune cells and the massive secretion of pro-inflammatory factors, leading to a local inflammatory response. And the duration of the local inflammatory response will rapidly develop into a systemic inflammatory response syndrome (SIRS) [2, 4]. The duration of SIRS determines the severity of AP patients. Mild AP patients' SIRS will alleviate within 48 hours and no organ failure will occur. If SIRS lasts more than 48 hours and there is temporary organ failure and local complications, it is a moderate severe AP patient. If SIRS does not improve and continues to worsen, accompanied by organ failure lasting more than 48 hours, it is a severe AP patient, with a mortality rate as high as 30%-40% [3].

Due to the damage to the pancreas and the impaired exocrine function of the pancreas in patients with AP, there are not enough digestive enzymes to break down food and provide energy for the body [1]. Secondly, during the acute phase of AP, patients experience severe upper abdominal pain, nausea, and vomiting, making it impossible to consume sufficient nutrients. At the same time, the systemic inflammatory response puts the body in a state of high metabolism and high protein breakdown, consuming an enormous amount of energy and accompanied by intestinal function absorption disorders, significantly reducing the body's ability to absorb nutrients [1, 3]. Therefore, multiple factors make it extremely likely for AP patients to suffer from malnutrition. And according to statistics, 30% of AP patients already have malnutrition at the time of their first attack. Thus, providing adequate nutritional support to patients during treatment is particularly important to prevent the condition from worsening further [1, 5].

In the early clinical practice, nutritional support for patients with AP should follow parenteral nutrition. However, later studies have found that early parenteral nutrition can lead to serious complications in patients and indicate that early enteral nutrition is superior to parenteral nutrition. Windsor et al. conducted a study on 34 patients with AP, dividing these 34 patients into two groups based on mild/moderate and severe conditions. The mild/moderate patients in the first group were randomly assigned to receive peripheral parenteral nutrition (11 patients) and oral nutritional

supplements (10 patients), while the severe patients in the second group were randomly assigned to receive total parenteral nutrition (7 patients) and enteral nutrition (6 patients). Then, they received nutritional support and observation for seven days. The results showed that all patients in the enteral nutrition group tolerated tube feeding, and the rate of decrease in serum C-reactive protein and APACHE-II score was faster than that of the parenteral nutrition group. Moreover, five patients in the parenteral nutrition group stayed in the intensive care unit for a median of 10 days, but this situation did not occur in the enteral nutrition group [4]. Another study screened 166 patients with AP. Most patients were able to resume oral feeding after non-oral nutritional support. The remaining 33 patients needed further treatment to recover, so these 33 patients were randomly assigned to total parenteral nutrition (16 patients) and enteral nutrition (17 patients). The results showed that the patients in the enteral nutrition group had shorter hospital stays (15.2 days enteral vs. 20.8 days parenteral), shorter nutritional support (6.2 days enteral vs. 11.8 days parenteral), and fewer nutritional costs and complications. The patients in the parenteral nutrition group had more cases of sepsis (6 cases parenteral vs. 0 cases enteral) and hyperglycemia (6 cases parenteral vs. 1 case enteral). There was no difference in mortality between the two groups [4]. In several other meta-analysis experiments, it was shown that enteral nutrition has lower nutritional costs, fewer complications, and shorter hospital stays compared to parenteral nutrition. Therefore, for patients with AP, nutritional support should be preferred as enteral nutrition, and parenteral nutrition should only be considered for patients who cannot tolerate enteral nutrition for a long time [1, 2].

3. Nutritional support during the treatment period of AP patients

3.1. The dietary patterns of patients with mild AP (including the timing and types of food consumed)

The characteristics of patients with mild AP are generally without organ failure and without local or systemic complications. In order to find methods to help patients with mild AP recover faster, some scholars have conducted research on the time and materials for patients to resume eating orally, exploring which method is more beneficial for the patients compared to early oral refeeding (EORF), conventional oral refeeding (CORF), full solid diet or soft food (QID) feeding, and stepwise refeeding (SID). A study on the time and materials for oral refeeding in AP patients selected 388 patients and conducted a meta-analysis using abdominal pain, nausea/vomiting, and length of hospital stay as evaluation indicators [6]. The results showed that for the group with oral feeding time, EORF significantly shortened the hospital stay (mean difference [MD] -1.97; 95% confidence interval [CI] -3.32 to -0.62; $P = -0.004$), but compared with CORF, there was no significant difference in abdominal pain (relative risk [RR] -1.17; 95% CI -0.69 to 2.00; $P = -0.56$) or nausea/vomiting (RR -1.30; 95% CI -0.19 to 8.82; $P = -0.79$) with EORF. This indicates that it does not increase the risk of adverse reactions. For the group with oral feeding materials, QID and SID showed no significant differences in hospital stay (MD -0.88; 95% CI -2.24 to 0.48; $P = -0.20$), abdominal pain (RR -0.86; 95% CI -0.53 to 1.40; $P = -0.54$), or nausea/vomiting (risk difference -0.01; 95% CI -0.19 to 0.18; $P = -0.94$). This indicates that EORF can shorten the hospital stay of patients, and the individual use of EORF or QID will not cause harm to the patient's body [6].

Based on this, the time for patients to start oral feeding can be determined by the appearance of bowel sounds, subjective hunger sensation, or relief of abdominal pain. If any of these conditions occur, a combined nutritional support approach of EORF and QID can be adopted for the patients, which can shorten their hospital stay without increasing the probability of abdominal pain, nausea, or vomiting. It is more conducive to the physical and psychological recovery of the patients [6, 7].

However, if the patients experience oral intolerance, enteral nutrition should be initiated as early as possible within 24-72 hours [2].

3.2. Dietary patterns of patients with moderate to severe AP

The characteristics of patients with moderate to severe AP are usually the occurrence of organ failure and local complications. For patients with moderate to severe AP, after their vital signs stabilize, the intestinal sounds and the presence of intestinal function contraindications (such as intestinal obstruction, intestinal ischemia, etc.) should be evaluated. Then, based on the actual situation, enteral nutrition should be initiated as soon as possible. If the patient can take oral food, EORF [6] should be implemented as soon as possible for the patient. If the patient is unable to take oral food, enteral nutrition should be provided through tube feeding within 48 hours. If there is gastric outlet obstruction or gastroparesis and a nasogastric tube cannot be used, a nasojejunal tube feeding can be adopted; however, enteral nutrition through parenteral route is generally not used for AP patients, and only when there are contraindications for enteral nutrition or long-term intolerance to enteral nutrition is short-term parenteral nutrition considered. However, the therapeutic effects of probiotics, glutamine, antioxidants, and pancreatic enzyme replacement therapy on AP patients have not been confirmed, and a large amount of experimental data is needed for further verification [2, 6, 8].

4. Diet for AP patients during the gradual recovery period

After being discharged from the hospital, the AP patient's condition has stabilized. However, to avoid complications, it is still necessary to strictly control the diet as per the doctor's advice and follow an anti-inflammatory diet to facilitate rapid recovery of the body [9]. The patient should consume more fruits, vegetables, whole grains, lean protein, and avoid fried, spicy, creamy, strong tea, coffee, and alcohol. Eat small meals frequently, 5-6 times a day, without overeating each meal to reduce pancreatic pressure. Choose low-fat diets and light meals, and avoid binge eating [9]. High lean protein sources such as lean beef, chicken breast, low-fat fish, and low-fat milk are good choices. Lipids can be selected from olive oil, soybeans, corn, etc., and drink plenty of water to maintain adequate body hydration. All of these are beneficial for the patient to recover as soon as possible [9]. At the same time, alcohol consumption should be prohibited. Alcohol causes significant damage to the pancreas, especially for AP patients, which will further aggravate the damage to the pancreas. Injuries can lead to a series of complications such as infection. Therefore, for patients with AP, avoiding alcohol consumption should be the top priority [9].

5. Suggestions

5.1. Low-fat diet vs normal fat diet

For a long time, low-fat diet (LFD) has been used as a dietary pattern for patients with AP during the recovery period and has been widely applied in clinical practice. A recent study compared the efficacy and safety of LFD and normal diet (NFD) for patients with mild to moderate non-high triglyceride blood pressure AP. This study included 65 patients with mild to moderate non-high triglyceride blood pressure AP and randomly divided them into two groups: LFD (32 patients) and NFD (33 patients). The study compared the daily energy intake, QoL, complications, hospital stay (LOS), and 90-day readmission rate of the two groups. The results showed that patients in the

normal fat diet group had a better taste experience and quality of life. There were no significant differences between the two groups in terms of energy intake, abdominal pain, complications, hospital stay, and 90-day readmission. Therefore, compared with low-fat diet, normal fat diet does not increase the risk of adverse events. Traditional low-fat diet has a poor taste and insufficient nutrition, which may reduce the quality of life of patients. Normal fat diet can provide patients with more nutrition without increasing the risk of adverse events. Therefore, for patients with mild to moderate non-high triglyceride blood pressure AP, NFD can bring better quality of life and ensure nutritional intake, and is a better choice [10].

5.2. The selection of enteral nutrition

Early enteral nutrition includes semi-elemental diets and polymeric formulas. Compared with the former, the latter can shorten the hospital stay and better improve the patient's condition. Therefore, it is more widely used in clinical practice [11]. Besides this commercial polymer formula, homemade meals in the kitchen are another type of polymeric formula. Compared with the commercial polymer formula, homemade meals in the kitchen are cheaper in price and have better taste. However, the effects of the two need to be compared. A study compared the differences between the commercial polymer formula and homemade meals, selecting 60 patients with moderate to severe AP, randomly divided into the commercial polymer formula group (30 people) and the homemade diet group (30 people), comparing the re-feeding pain, tolerance, infectious complications, mortality, total hospitalization/ICU stay time; as well as changes in serum C-reactive protein (CRP), transferrin and prealbumin. The results showed that there were no significant differences in all indicators between the two groups, and the recovery effect of the patients was comparable. The difference lies in that the probability of diarrhea in the homemade diet group is lower, and it is also cheaper and more palatable. Therefore, for patients with moderate to severe AP and severe AP, homemade meals in the kitchen is also a good choice, providing a new idea for dietary strategies [11].

5.3. Special diet

Different patients, due to their varying conditions, need to choose the appropriate nutritional support plan at certain times. Oral carbohydrate solution (OCS), as a new type of early enteral nutrition method, may provide new ideas for patients with limited oral feeding in the early stage. A study conducted by the College of Medicine, Yonsei University, Seoul, on 364 patients divided them into the OCS group (182 patients) and the CD group (182 patients) after matching their tendencies. The research results showed that compared with the conventional diet, the recurrence rate of abdominal pain was lower in the OCS diet group (3.8%) than in the CD group (13.2%), and it did not increase the risk of adverse events. There was no significant difference in the length of hospital stay (8.7 days for OCS and 9.2 days for CD). However, the OCS diet was more effective for patients with moderate to severe AP. Therefore, for patients with regular diet intolerance and prone to abdominal pain, the OCS diet can be regarded as a beneficial option [12].

6. Conclusion

This article focuses on the relationship between AP and diet, clarifying the crucial role of diet management in the treatment and prognosis of AP patients. If a good diet pattern is adhered to, it will have a twice the effect with half the effort for the patient's recovery. During the treatment period

of the patient, if the patient can tolerate oral intake, they should choose oral solid food as soon as possible. If oral intake is intolerable, in the absence of contraindications for enteral nutrition, early enteral nutrition should be prioritized. Only when there are contraindications for enteral nutrition and long-term intolerance to enteral nutrition should short-term parenteral nutrition be considered. At the same time, normal fat diet, homemade diet in the kitchen, and oral carbohydrate solutions are more applicable for some patients, providing new ideas for dietary strategies. However, the final dietary management plan should be tailored to the individual situation of the patient, ensuring that each patient has a diet plan that suits them and benefits them the most and is discharged as soon as possible for recovery. There are still certain limitations in this field. The sample size of the research is insufficient, and the universality of the conclusion needs to be further verified. In the future, the sample size can be expanded to conduct stratified controlled studies to further refine the dietary plans for different types of AP patients. In the future, medical staff should also be trained in dietary knowledge to provide patients with more scientific, comprehensive and personalized dietary plans, and establish a more standardized dietary guidance system to reduce patients' complications and recurrence probability, and enable patients to recover as soon as possible.

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