

Role of Enteral and Parenteral Nutrition

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Abstract

As previously demonstrated, acute pancreatitis can be regarded as a hyper catabolism state and nutrition plays a key role in the treatment of this disease. When patient's food intake is limited because of pancreatic pain, organ failure or other, an adapted nutrition support should be initiated early in the management of acute pancreatitis in order to decrease mortality and morbidity. Numerous meta-analyses addressing this issue have been published and the most appropriate modalities for artificial nutrition are now well-established. Compared to parenteral nutrition, enteral nutrition has been shown to have a greater clinical benefit in patients with acute pancreatitis reducing the risk of developing both, pancreatic infections and multiple organ failure. Enteral nutrition may attenuate the mucosal barrier breakdown and subsequent bacterial translocation. It also may increase the intestinal motility and decrease bacterial overgrowth. The international guidelines recommend that enteral nutrition in acute pancreatitis should be administered via either the nasojejunal or nasogastric route but the choice of the location should not delay the nutritional support. Either elemental or polymeric enteral nutrition formulations can be used in acute pancreatitis.

1. Introduction

As previously demonstrated, acute pancreatitis can be regarded as a hyper catabolism situation

and nutrition plays a key role in the treatment of this disease. When patients food intake is limited because of pancreatic pain, organ failure or other complications, an adapted nutrition support should be initiated early in the management of acute pancreatitis in order to decrease mortality and morbidity. Numerous studies and meta analysis are now available and the most appropriate modalities for artificial nutrition are well established (24, 47).

2. Pathophysiology

The importance of providing nutritional support in patients with severe acute pancreatitis has been well demonstrated and leads to decreased morbidity and mortality rates (17, 31). The main objectives are to provide adequate calories in this condition of hypercatabolism and to decrease the infection of pancreatic necrosis.

In acute pancreatitis, the concept of "pancreatic rest" was developed many decades ago in order to decrease pancreatic inflammation. It suggested prolonged fasting in cases of mild pancreatitis and parenteral nutrition in case of severe pancreatitis to prevent stimulation of exocrine function and release of proteolytic enzymes. However, it is now well known that parenteral nutrition leads to electrolyte and metabolic disturbances, gut barrier alteration, and increased intestinal permeability. Moreover, parenteral nutrition is not cost effective and may increase the risks of sepsis complications (8, 9, 23, 48).

Pancreatic infection and organ failure are determinants of severity in acute pancreatitis. Gut barrier dysfunction and increased bacterial translocation are implicated in the development of secondary infection, sepsis, multiple organ failure, and death in acute pancreatitis. Studies have shown that microorganisms responsible for sepsis and pancreatic infection originate mainly from the digestive tract. Moreover, dysfunction of the gut barrier and the translocation of digestive bacteria into the portal venous system may cause multiple organ failure. Gut barrier dysfunction is characterized by damages of the gut epithelium and intestinal cell junctions, resulting in increased intestinal permeability (3, 4, 40, 41). Splanchnic hypoperfusion and ischemia/reperfusion injury have been postulated as possible causes of this increased intestinal permeability. A decrease in splanchnic perfusion results in a concomitant decrease in oxygen delivery to the intestinal mucosa; this coupled with the consequences of reperfusion leads to histologic evidence of mucosal ischemia (21, 50). Loss of cell membrane integrity and cytoskeletal alterations during hypoperfusion results in the leakage of cytoplasmic proteins. In the literature, only enteral nutrition has been shown to have a significant clinical benefit in patients with acute pancreatitis in reducing the risk of developing both pancreatic infections and multiple organ failure. Enteral nutrition may attenuate the mucosal barrier breakdown and subsequent bacterial translocation. It also may increase the intestinal motility and decrease bacterial overgrowth thanks to a better clearance of bacteria in the digestive tract (36).

3. Indications of Artificial Nutrition

In mild pancreatitis, artificial nutrition is often not initiated. After pain relief, oral nutrition can be indicated. Usually, patients recover and are discharged after a few days. The recently published International Association of Pancreatology guidelines recommend oral feeding in predicted mild pancreatitis once abdominal pain

is decreasing and inflammatory markers are improving (47). A clinical trial showed that immediate oral refeeding with a normal diet is safe in predicted mild pancreatitis and leads to a shorter hospital stay (4 vs 6 days) (15). Feeding can be started with a full solid diet without needing to first start with a liquid or soft diet (28). A normalization of lipase levels before restarting oral feeding is not required (44). Finally, international guidelines from gastroenterologic and pancreatic societies, state that, regardless of disease severity, nutrition support is indicated when patients are not able to tolerate oral food for up to 7 days (5, 47).

Patients who can eat do not require additional enteral nutrition via a feeding tube. However artificial nutrition support can be supplemented in specific situation of mild pancreatitis, notably in case of severe malnutrition, which is frequent in alcoholic patients. This nutrition support has to be performed by nasoenteric tube feeding to minimize i.v. catheter infections and should be added to the *per os* intake.

In patients with predicted severe pancreatitis, nutritional support should be the primary therapy and may begin within 48 hours. A recent clinical trial in 60 patients found improved outcomes when nutrition was started within 48h as compared to after 7 days of fasting (43).

4. Type of Artificial Nutrition: Parenteral Versus Enteral Nutrition

Previously parenteral nutrition used to be the preferred option for the treatment of acute pancreatitis, but it placed patients on strict bowel rest and bypassed the stimulatory effects of oral feeding. The lack of the stimulatory effects of oral feeding results in gastro-intestinal atrophy with decreased villous thickness in the intestinal tract, which leads to bacterial translocation across the gut barrier, sepsis, and organ failure.

The comparison of total parenteral nutrition and total enteral nutrition in patients with predicted severe acute pancreatitis was studied in more than

eight randomized controlled trials (1, 14, 16, 18, 20, 37, 38, 46). Several meta-analyses have demonstrated the benefits of enteral over parenteral nutrition: a significant 2.0-fold reduction in the risk of systemic and pancreatic infectious complications, a decrease of multi-organ failure, a reduction of the need for surgical interventions and finally a 2.5-fold reduction in the risk of mortality in patients receiving exclusively enteral nutrition (2, 26, 34, 35, 39, 49).

Regarding the international guidelines published recently parenteral nutrition can be used in acute pancreatitis as second-line therapy if nasojejunal tube feeding is not tolerated and nutritional support is required (47). However, the authors proposed that parenteral nutrition should only be started if the nutritional goals cannot be reached with oral or enteral feeding. A delay up to 5 days in initiation of parenteral nutrition may be appropriate to allow for restarting of oral or enteral feeding (2, 27).

5. Optimal Route of Enteral Nutrition Delivery

This issue has been debated regarding the “pancreatic rest” theory. It was suggested that prepyloric delivery would stimulate pancreatic secretion and, consequently increase the severity of acute pancreatitis. However, a postpyloric tube (mainly naso jejunal location) usually requires the help of an endoscopic or a radiological procedure. This may delay the nutritional support and can impact on the clinical outcome. In contrast, a nasogastric feeding tube can be inserted in every day practice immediately and does not require specific assistance. A prepyloric feeding (gastric location) can be started without delay (31).

Pancreatic Exocrine Function and Route of Enteral Nutrition Delivery

In healthy patients studies have demonstrated that all types of oral feeding stimulate exocrine pancreatic secretion. In enteral nutrition it was shown that the exocrine pancreatic response was different regarding the location of the nutrition

delivery. Trypsin and lipase secretion was significantly lower in response to nutrition delivered into the jejunum in comparison with the duodenum; this secretion was not different in the group of patients with distal jejunum delivery and in the fasting group (30, 31).

In acute pancreatitis it was shown that pancreatic exocrine function is not normal and the level of pancreatic secretions decreased compared with healthy subjects. This pancreatic “stunning” is correlated with pancreatitis severity and a lower secretion of trypsin and lipase was found in patients with severe pancreatitis. These data suggest that during acute pancreatitis acinar cells are not able to respond normally to a secretory stimulus. It explains why no study demonstrated that nasogastric tube could increase inflammation and the severity of acute pancreatitis (7).

Safety and Tolerance of Enteral Nutrition Delivery Route

Several randomized controlled trials and the latest published meta-analyses have demonstrated the equivalence of nasogastric and nasojejunal tube feeding regarding safety and tolerance (10, 12, 13, 18, 19, 22, 25, 29, 32, 42).

In a recently published review, nasogastric and nasojejunal tube feeding were compared. Four randomized controlled trials and a cohort study were included and represented 131 patients who received nasogastric tube feeding for severe pancreatitis. In 107/131 (82%) patients, a total nasogastric nutrition was performed without withdrawal. In 18% of the patients, enteral nutrition was stopped because of gastric ileus, diarrhea or repeatedly dislocated feeding tubes. In a meta-analysis restricted to randomized studies, 82 patients with nasogastric administration and 75 patients with nasojejunal feeding were included. The risk of mortality and the number of nutrition-associated adverse events were similar between the two groups. In this review, nasogastric tube feeding was not associated with an increased risk of aspiration pneumonia (29).

Most recently, a meta-analysis reported data of 3

randomized controlled trials, involving a total of 157 patients. There were no significant differences in mortality, tracheal aspiration, diarrhea, exacerbation of pain and energy balance between the two groups. Nasogastric feeding was not inferior to nasojejunal feeding (10).

The international guidelines recommend that enteral nutrition in acute pancreatitis can be administered via either the nasojejunal or nasogastric route (47). The choice of the location should not delay the nutritional support. Nasogastric tube feeding is probably easier than nasojejunal tube feeding, however some patients will not tolerate nasogastric feeding because of delayed gastric emptying. It is known that patients with severe acute pancreatitis frequently present with gastric ileus because the pancreatic inflammation is close to the stomach. In addition, inflammation can lead to a transient duodenal stenosis (partial or complete). In this specific case, a nasojejunal tube feeding can be used and the tube should be placed endoscopically.

6. Type of Enteral Nutrition Formulations

More than 100 different enteral nutrition formulations are available, classified into three categories: elemental or semi-elemental, polymeric and immunoenhanced (immunonutrition and probiotics). In acute pancreatitis, (semi)elemental nutrition is usually preferred over polymeric formulation because this formulation is supposed to have a superior absorption from the intestine, less stimulation of pancreatic secretions and a better tolerance (11). A meta-analysis compared the safety and the tolerance of different enteral nutrition formulations used in acute pancreatitis. Twenty randomized controlled trials, including 1070 patients, were selected. No

significant difference was observed between the formulations regarding feeding tolerance: the use of (semi)elemental versus polymeric formulation or versus supplementation of enteral nutrition with probiotics or immunonutrition. The risk of infectious complications and death did not differ significantly in any of the comparisons. The relatively inexpensive polymeric feeding formulations were associated with similar feeding tolerance and appeared as beneficial as the more expensive (semi)elemental formulations in reducing the risks of infectious complications and mortality (33, 45). Probiotics should not be used in acute pancreatitis because they were associated with a higher complication rate and mortality in one randomized trial (6).

International published guidelines recommend that either elemental or polymeric enteral nutrition formulations can be used in acute pancreatitis (47).

7. Conclusion

Nutrition plays a key role in the treatment of acute pancreatitis. When patients food intake is impaired, an adapted nutritional support is required early in the management of the disease in order to decrease the mortality and morbidity. Several meta-analyses have been published and the most appropriate modalities of artificial nutrition are well-established. Compared to parenteral nutrition enteral nutrition has been shown to have a greater clinical benefit in patients with acute pancreatitis reducing the risk of developing both, pancreatic infection and multiple organ failure. The international guidelines recommend that enteral nutrition in acute pancreatitis can be administered via either the nasojejunal or nasogastric route but the choice of administration route should not delay the nutritional support. Either elemental or polymeric enteral nutrition formulations can be used in acute pancreatitis.

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