

Early Semielemental Diet via Nasogastric Tube Feeding in Severe Acute Pancreatitis: Preliminary Report

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Abstract

Objective: The objective was to study if early semielemental diet feeding is safe and effective in improving the systemic inflammatory response in severe acute pancreatitis.

Materials and Methods: A trial of nutritional support in patients with severe acute pancreatitis in the intensive care unit, Department of Surgery, Chiang Mai University Hospital, from October 2003 to December 2004 was conducted and analyzed. Acute pancreatitis was defined by clinical symptoms and signs and confirmed by serum amylase, urine amylase, and C- reactive protein, and then classified as severe acute pancreatitis by Ranson and APACHE II scores. Seven patients with severe acute pancreatitis were randomized into two groups. The conventional group was given total parenteral nutrition (TPN) and the interventional group was given partial parenteral nutrition (PPN), with early semielemental diet feeding via nasogastric tube when bowel function was present.

Results: Four of 7 patients were given TPN alone. Three patients were given PPN with early semi elemental diet until recovery. Etiologies of pancreatitis included biliary in 1 case and alcoholic in 6 cases. The Ranson and APACHE II scores were similar in both groups. Mean length of stay was 13.25 days in the conventional group, and 18 days in the interventional group. There were no serious complications or systemic inflammatory response syndrome in either group. One patient in the conventional group developed pancreatic pseudocyst with spontaneous regression. Another patient in the interventional group developed the same problem and was successfully managed by drainage procedure.

Conclusion: This study supported the safety and effectiveness of nutritional management for patients with severe acute pancreatitis by early semielemental enteral feeding.

Key word: Severe acute pancreatitis, Semielemental diet, Nasogastric tube feeding

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INTRODUCTION

Acute pancreatitis is the result of premature activation of the proteolytic digestive enzyme within the pancreatic acinar cells caused by autodigestion, a severe local and systemic cytokines-generated inflammatory response. The measurement of metabolic expenditure by indirect calorimetry and protein catabolism by urinary nitrogen excretion has shown that nutritional requirements are considerably elevated.¹⁻³ Nutritional depletion is expected to impair the recovery and increase the risk of complications; therefore, nutritional support is an essential part of management. However, enteral feeding may stimulate the production of new pancreatic enzymes and exacerbate the autodigestion that causes progression of the disease. Due to these concerns, in conventional management, it is necessary to place these patients on strict bowel rest, and to use total parenteral nutrition (TPN) to bypass the stimulatory effects of oral feeding until the serum enzymes become normal.¹

Although TPN is very effective in nutritional maintenance in almost all critically ill patients, it can cause serious complications, catheter sepsis and hyperglycemia in particular, which may require a high cost of treatment.^{4,5}

The above reasons have led to the search for a safer alternative method of feeding to reduce the complications and cost. Enteral nutrition, particularly feeding distal to the opening of the main pancreatic duct, does not affect the pancreatic enzyme. Transduodenal feeding increases the volume of pancreatic secretion, but does not affect protein or bicarbonate secretion. Jejunal feeding results in no significant increase in volume of protein or bicarbonate secretion.² Advantages of enteral nutrition include low mechanical, septic and metabolic complications compared with parenteral nutrition. In addition, enteral nutrition helps to maintain normal bacterial microflora in the gut. It also increases the height of the intestinal wall which would improve the microcirculation of the gut and counteract the atrophy of the intestinal mucosa. These positive effects of enteral nutrition suggest that no or minimal bacterial translocation and endotoxin take place.⁶ However, endoscopy or fluoroscopy is required for nasojejunal tube placement distal to the ligament of Trietz. This method is rather complicated. Inaccurate positioning of nasojejunal tube can cause variable pancreatic

secretion that may not improve the inflammatory process of pancreatitis.

We aimed to study the benefit of nasogastric enteral feeding, due to its simple enteral route and less invasive method when compared to nasojejunal feeding. Semielemental dietary formula, which was predigested and consisted of simple sugars, unbound amino acids, and short chain peptides was used for this enteral route, along with relatively small amounts of long chain fatty acids that affect the pancreas.^{2,4}

MATERIALS AND METHODS

Seven patients with the diagnosis of severe acute pancreatitis between October 2003 and December 2004 at Chiang Mai University Hospital were included in this study. Acute pancreatitis was diagnosed by clinical findings. It was excluded from other acute abdominal conditions and was confirmed by serum and 24 hour-urine amylase, C reactive protein and CT scan. Severe degree of acute pancreatitis was defined by the Ranson score or APACHE II score. Patients were randomized into 2 groups by block randomization; the conventional or TPN (total parenteral nutrition) group, and the interventional or EN (enteral nutrition) group. After stabilizing the patients and within 72 hours, TPN was started in both groups whenever bowel function was present. When enteral nutrition was started in the interventional group, TPN was tailed off. Energy and nutritional requirements were based on basal energy expenditure. TPN was administered by the multi-bottle system via subclavian catheter.

Enteral nutrition was administered with semielemental diet (Peptamen) via continuous nasogastric tube feeding. Gastric content was evaluated every 6 hours. Patients with organ failure, pulmonary insufficiency, renal failure, shock, gastrointestinal bleeding or requiring any surgical intervention were excluded from this study before randomization and were treated on an intention-to-treat basis. Other interventions were similar in both groups. Demographic and collected data included clinical outcomes, serial serum amylase, 24-hour urine amylase, C-reactive protein and serum albumin. Descriptive statistics and demographic data were analyzed. Mean difference was evaluated in all parameters. This study was approved by the Ethical Committee, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand.

RESULTS

Nutritional management in seven Thai patients with severe acute pancreatitis was evaluated. The intervention took 14 days or until the patients recovered. Four patients were randomized into a

conventional group and three patients an interventional group. Age varied from 24-67 years. The clinical characteristics are presented in Table 1.

Systemic inflammatory response was evaluated by the change of APACHE II score. APACHE II scores

Table 1 Characteristics of patients

Case No.	TPN group				Enteral group		
	1	2	3	4	1	2	3
Gender	Female	Male	Female	Male	Male	Female	Male
Age (yrs)	67	32	24	38	29	48	34
Etiology	Alcohol	Alcohol	Biliary	Alcohol	Alcohol	Alcohol	Alcohol
Body Weight Start (kg)	45	63	50	70	83	69	51
Body Weight End (kg)	38	59	48.5	66	79	62	45
Ranson Score	5	5	5	5	4	8	5
APACHEII Score	13	3	2	11	10	16	5
Length of Stay	10	13	14	16	11	22	21
ICU day	5	-	-	4	-	7	-
Cost/day (Baht)*	4,441	1,035	1,555	3,076	840	2,601	980

*cost per day: calculated only on nutritional support and additional treatment such as antibiotic cost

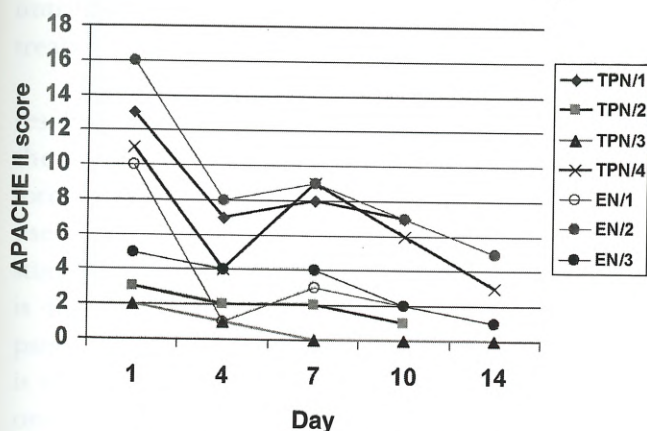


Figure 1 APACHE II score in all patients declined in 2 weeks

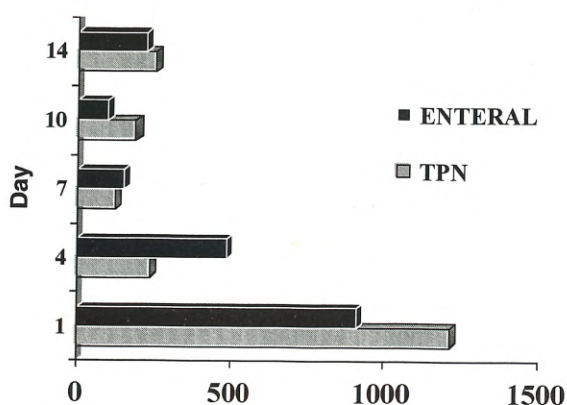


Figure 2 Mean serum amylase level rapidly declined in 2-week period in both groups

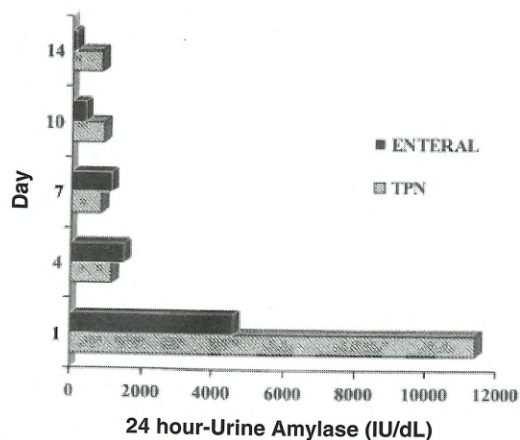


Figure 3 Mean 24 hour-urine amylase level declined gradually in both groups

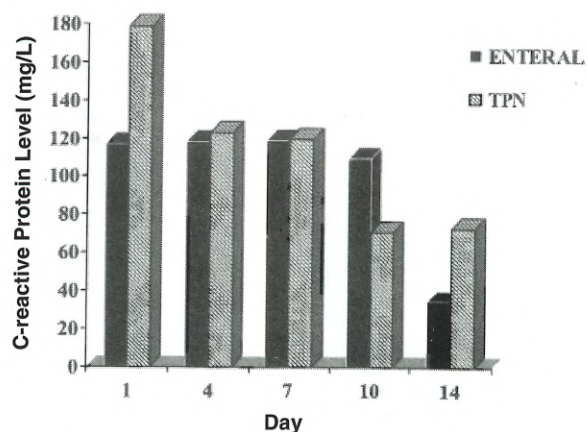


Figure 4 Mean serum C-reactive protein level in Enteral group at second week was lower than in TPN group.

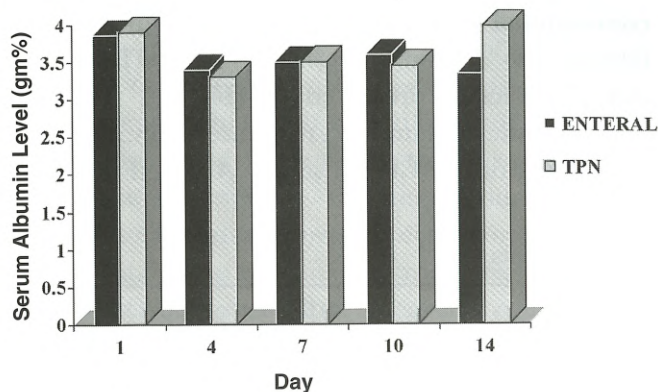


Figure 5 No obvious alteration of serum albumin level in both groups in acute period after nutritional therapy was supplemented

were high in most patients at the time of diagnosis and declined in later days (Figure 1). At the beginning of the study, all of the patients had a high level of serum and urinary amylase and serum C reactive protein, but the level declined to average normal by the end of the study (Figure 2, 3, 4). After two weeks of intervention, serum albumin did not change significantly (Figure 5). No serious complications occurred in either group. The mean cost per day in the enteral group seemed to be lower than that in the conventional group. Complications in the conventional group included peripheral phlebitis and hospital-acquired pneumonia, while urinary tract infection occurred in one patient in the interventional group due to prolonged urinary

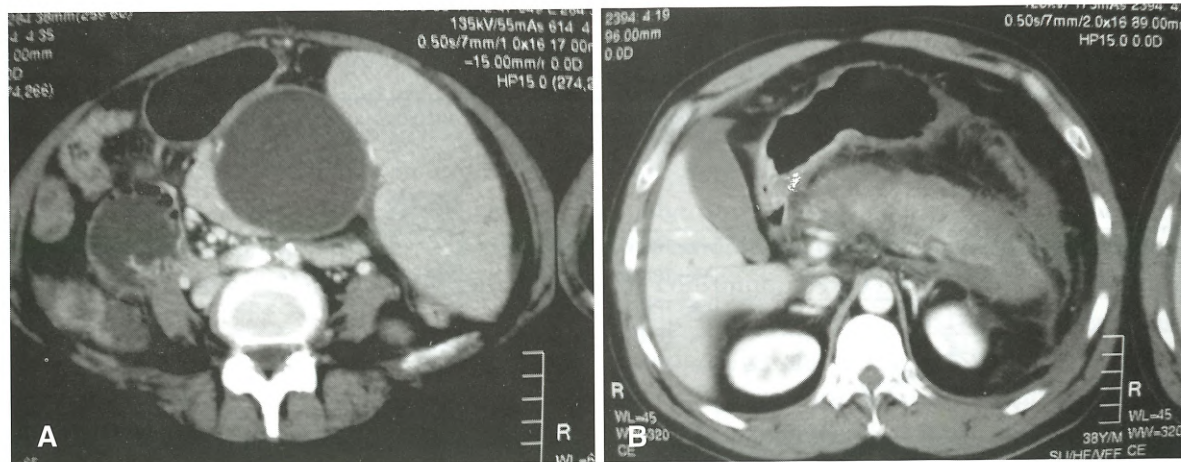


Figure 6 CT-scan showing a pancreatic pseudocyst in the first patient in the conventional group.
A at the beginning of the intervention
B after the intervention at second week

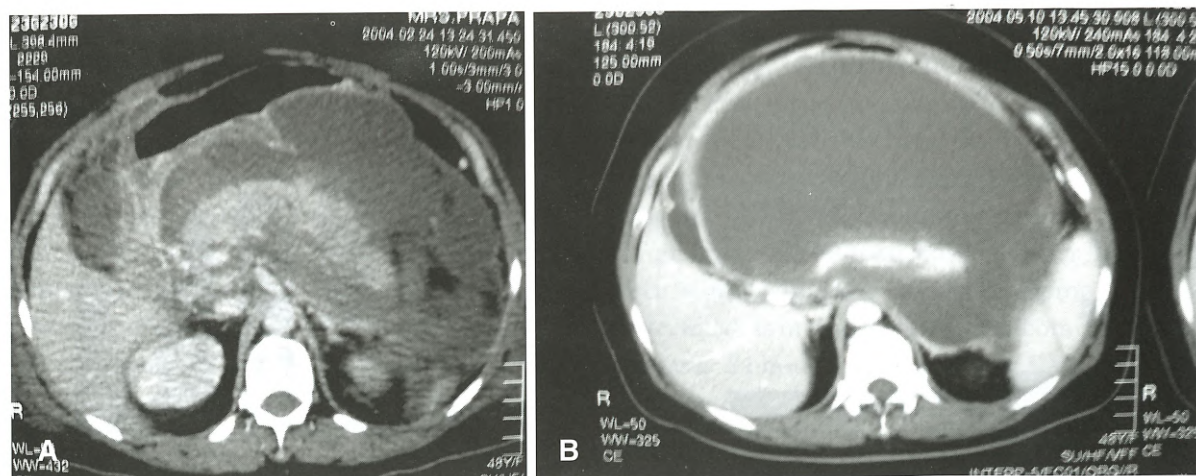


Figure 7 CT-scan showing a pancreatic pseudocyst in the first patient in the interventional group.
A at the beginning of the intervention
B after intervention at second week

catheterization. Pseudocyst formation occurred in high APACHE II score patients. The first patient in the conventional group had an APACHE II score of 13 (Figure 6) and the second patient in the interventional group had an APACHE II score of 16 (Figure 7). The former patient experienced spontaneous regression. The latter patient required internal drainage procedure eight weeks after pancreatitis had subsided. Other adverse effects of elemental diet included abdominal discomfort and diarrhea, which resolved spontaneously later.

DISCUSSION

The principal initial treatments in acute pancreatitis include the stabilization of the patient by intravenous fluid therapy, the correction of volume depletion and complete bowel rest. After stabilization, conventional nutritional therapy usually consists of total parenteral nutrition. However, elemental enteral nutrition has been proposed as another alternative treatment.^{1,6,7}

The initiation of oral feeding prior to the resolution of pancreatitis has been shown to reactivate the inflammatory process and increase abscess formation. However, certain enteral feeding has been used in patients with acute pancreatitis without stimulating disease progression.⁴ Nasojejunal feeding is the first route for enteral nutrition in acute pancreatitis. The standard approach for enteral feeding is to feed distal to the pancreatic secretion outlet in order to decrease the likelihood of aggravating the pancreatitis. Nowadays, enteral feeding formulas, especially semielemental diet (predigested formula with glutamine supplement) have been developed. Therefore, substantial pancreatic stimulation would not be needed for absorption of the product.^{4,8} The use of semielemental diet (Peptamen) via nasogastric enteral feeding to improve nutritional status and to lower complications in acute pancreatitis in this study was also supported by recent studies.⁹⁻¹²

In this study the systemic inflammatory response of the patients improved which could be observed by a decline in the APACHE II scores. After continuation of intervention, the curtailment of pancreatic enzyme was found in both the conventional and the interventional group. Hence, we can assume that there is no difference in systemic inflammatory response after

either total parenteral nutrition or enteral nutrition. This corresponds with the reduction of serum C-reactive protein that responses for the degree of inflammation. Serum albumin represents short-term nutritional status. There was no significant change in serum albumin, which reflects that either total parenteral nutrition or enteral nutrition can be used to stabilize nutritional status for severe acute pancreatitis. Concerning the cost of nutritional support, we found that the enteral nutrition seemed to cost less than total parenteral nutrition. These findings are congruent with the previous study which found that early enteral nutrition was safe and effective in promoting a more rapid improvement of clinical Systemic Inflammatory Response Syndrome (SIRS).³ Recently, only one randomized study on early nasogastric versus nasojejunal feeding in severe acute pancreatitis was published in 2005.¹³ However, this study was conducted between 1997-2000, and there was no TPN arm for control as standard treatment. They concluded that nasogastric tube feeding was as good as nasojejunal tube feeding in severe acute pancreatitis. Moreover, nasojejunal tube feeding needed more complex, expensive, and difficult monitoring for tube position comparing with nasogastric tube feeding.

CONCLUSIONS

There is a clinically improvement in terms of inflammatory response and safety in the use of semielemental diet via nasogastric tube feeding in severe acute pancreatitis. Therefore, semielemental diet via nasogastric tube feeding may be safe and effective as another alternative nutritional support. A randomized control trial with a much larger number of patients will be needed to verify the effectiveness of early semielemental diet via nasogastric tube feeding in patients with acute severe pancreatitis.

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