

Nasogastric or nasointestinal feeding in severe acute pancreatitis

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Received: February 23, 2010 Revised: May 14, 2010

Accepted: May 21, 2010

Published online: August 7, 2010

Abstract

AIM: To assess the rate of spontaneous tube migration and to compare the effects of naso-gastric and naso-intestinal (NI) (beyond the ligament of Treitz) feeding in severe acute pancreatitis (SAP).

METHODS: After bedside intragastric insertion, tube position was assessed, and enteral nutrition (EN) started at day 4, irrespective of tube localization. Patients were monitored daily and clinical and laboratory parameters evaluated to compare the outcome of patients with nasogastric (NG) or NI tube.

RESULTS: Spontaneous tube migration to a NI site occurred in 10/25 (40%) prospectively enrolled SAP patients, while in 15 (60%) nutrition was started with a NG tube. Groups were similar for demographics and pancreatitis aetiology but computed tomography (CT) severity index was higher in NG tube patients than in NI (mean 6.2 vs 4.7, $P = 0.04$). The CT index seemed

a risk factor for failed obtainment of spontaneous distal migration. EN through NG or NI tube were similar in terms of tolerability, safety, clinical goals, complications and hospital stay.

CONCLUSION: Spontaneous distal tube migration is successful in 40% of SAP patients, with higher CT severity index predicting intragastric retention; in such cases EN by NG tubes seems to provide a pragmatic alternative opportunity with similar outcomes.

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Key words: Acute pancreatitis; Enteral feeding; Tube migration; Nasogastric; Safety

Peer reviewers: Pascal Bucher, MD, Chef de Clinique (FMH), Service de Chirurgie Viscérale et Transplantation, University Hospital Geneva, 4, Rue Gabrielle Perret Gentile, Geneva, 1211, Switzerland; Ibrahim A Al Mofleh, Professor, Department of Medicine, College of Medicine, King Saud University, PO Box 2925, Riyadh 11461, Saudi Arabia

Piciucchi M, Merola E, Marignani M, Signoretti M, Valente R, Cocomello L, Baccini F, Panzuto F, Capurso G, Delle Fave G. Nasogastric or nasointestinal feeding in severe acute pancreatitis. *World J Gastroenterol* 2010; 16(29): 3692-3696 Available from: URL: <http://www.wjgnet.com/1007-9327/full/v16/i29/3692.htm> DOI: <http://dx.doi.org/10.3748/wjg.v16.i29.3692>

INTRODUCTION

Acute pancreatitis (AP) is an acute inflammatory process which has different grades of severity and is characterized by high mortality rates in the case of infected pancreatic necrosis^[1].

Severe AP (SAP) with pancreatic necrosis is therefore a hard challenge for clinicians, and its management is still debated. The aim of treatment is to prevent necrosis

infection and to manage the hypercatabolism secondary to extended pancreatic and extrapancreatic inflammation with an adequate nutritional, volumetric and hydroelectrolytic support. Nutritional support is presently considered a key issue in patient management. Enteral nutrition (EN) should be preferred to total parenteral nutrition (TPN) in patients with SAP^[2,3], as also suggested by current guidelines^[1,4-6]. EN is indeed associated with reduced mortality, lower septic complications, reduced surgical procedures and hospital stay^[2,3], possibly owing to a trophic action on the intestinal wall and prevention/reduction of bacterial translocation.

However, in clinical practice EN is employed far less frequently than it should. A recent survey conducted by the Italian Society of Pancreatology has reported that only about 20% of SAP patients received EN, either as single nutritional support, or in combination with TPN^[7]. This figure is slightly more encouraging in Holland where some 50% of patients with SAP received EN in an observational multicentre study^[8].

The main obstacle to EN diffusion is that it is considered complicated, and to require specific skills. Indeed, to ensure full pancreatic rest, nutrition tubes should be placed in the jejunum^[9,10]. Although spontaneous transpyloric migration of tubes after gastric positioning, and subsequent localization in the distal duodenum or jejunum, is possible, few studies have specifically addressed this issue in patients with AP. Endoscopic placement of a nasojejunal tube is a possible alternative, but it is troublesome, potentially risky, and variable success rates have been reported^[11]. Other techniques and devices have been proposed to improve tube positioning beyond the ligament of Treitz^[12-14], but results, although appealing, are preliminary and sometimes out of reach in daily clinical practice.

In the past few years, it has been proposed that EN through nasogastric (NG) tubes may be a simple, safe and equally valid alternative to nasojejunal tubes, with the potential advantage of earlier administration of nutrients^[15-17]. However, NG feeding cannot be recommended at this time, and it is not clear if a subgroup of SAP patients may benefit more from this approach.

We speculated that a pragmatic possibility in real-world clinical practice would be to employ NG feeding whenever tube migration does not occur spontaneously.

The aims of this study were therefore to assess the rate of spontaneous distal migration of EN tubes in patients with predicted SAP, to identify possible factors associated with it, and to compare the safety and tolerability of EN with an elemental formula in patients who started nutrition with a “proximal”, NG or a “distal”, naso-intestinal (NI) tube, depending on the success of spontaneous tube migration.

MATERIALS AND METHODS

Patients

This is a pragmatic (“real world”) study, prospectively evaluating patients with predicted SAP admitted to our Institution from January 2006 to November 2009. AP was defined by the presence of typical abdominal pain associated

with serum amylase levels > 3 times normal value. Patients with predicted SAP, as defined by a Ranson’s score of 3 or higher and/or by a CT severity index of 4 or higher (as reviewed in 1), were included.

Treatment protocol

SAP patients received appropriate fluid support, antibiotic prophylaxis with iv imipenem (500 mg every 8 h), antisecretory therapy with iv pantoprazole (40 mg once daily), and were offered EN. The EN protocol included positioning of a feeding tube (10 F Flexiflo tungsten-weighted polyurethane feeding tube, Abbott, Baltimore, USA). After lubrication with 20 mL of water, intubation was performed at the bedside in all cases and, once completed and verified by X-ray, the guide-wire was withdrawn and the tube fixed to the nose. Prokinetics (metoclopramide 10 mg) were administered twice a day for 3 d after intubation. Tip position was radiologically assessed after 24 (day 1) and 72 h (day 3). Position was considered “proximal” (NG) if the tube tip was in the stomach or in the duodenum, proximal to the ligament of Treitz, and “distal” (NI) if in the duodenum beyond the ligament of Treitz or in the jejunum. At day 4 EN was started irrespectively of tube position (either “NG” or “NI”). An elemental formula (Survimed[®]) was employed at increasing volumes, from 20 mL/h up to an energetic target of 2000 kcal per day (100 mL/h).

Measured outcomes

Patients were monitored daily by measurement of clinical and laboratory parameters, and pain through a quantitative score, based on the subjective evaluation and the need for analgesic drugs (0 = no pain, 1 = pain with no need of analgesics, 2 = pain responding to low dose analgesics, 3 = pain responding to high dose analgesics, 4 = pain not responding to high dose analgesics).

Pain recurrence, biochemical changes (amylase, lipase and C-reactive protein), side effects (such as nausea, vomiting or diarrhoea), success of EN in terms of caloric target and days necessary to reach it, as well as possible need to TPN switching, were recorded. Patients received further appropriate clinical and radiologic investigations when needed. Occurrence of pancreatic (infected necrosis) and/or extrapancreatic complications (renal and/or respiratory failure, bleeding) were also recorded, as well as the patients’ clinical outcome (mortality, need for surgery) and length of hospital stay.

Statistical analysis

Categorical data (percentages) were compared by means of Fisher’s exact test, and continuous data by means of *t*-test for independent samples. Possible associated risks were evaluated by logistic regression analysis.

RESULTS

Patients

During the study protocol, 116 patients with AP were admitted to our unit. Their demographics and clinical features are detailed in Table 1. Among them, there were 28 pa-

Table 1 Characteristics of the 116 patients with acute pancreatitis hospitalized in the study period *n* (%)

Gender (female/male)	53/63
Median age (range, yr)	55.5 (17-92)
Mild/severe pancreatitis	88/28
Etiology	
Biliary	59 (50.9)
Alcoholic	28 (24.1)
Drug-induced	4 (3.4)
Idiopathic	8 (6.9)
Hypertriglyceridemia	3 (2.6)
Iatrogenic	6 (5.2)
Autoimmune	1 (0.9)
Traumatic	1 (0.9)
Pancreas divisum	4 (3.4)
Intrapapillary mucinous tumour	2 (1.7)

Table 2 Demographics and clinical features of the 25 patients with predicted severe acute pancreatitis who received enteral nutrition, according to tube position at nutrition start

	Nasogastric (<i>n</i> = 15)	Nasointestinal (<i>n</i> = 10)	<i>P</i>
Sex (female, %)	6 (40)	4 (40)	1
Median age (yr)	56 (31-83)	63 (36-89)	0.3
BMI (kg/m ²)	24.8 (21.4-28.2)	25.4 (21.8-29.1)	0.7
Amylase at entry (U/L; <i>nv</i> < 110)	1045.5 (592.2-1498.8)	1141.6 (127.7-2155.4)	0.8
Lipase at entry (U/L; <i>nv</i> < 300)	8559.8 (3676.4-13443.2)	14037 (2026.1-30100.1)	0.4
CT severity index	6.2 (5.1-7.2)	4.7 (3.5-5.8)	0.04
Ranson's score	3.8 (3.1-4.6)	3 (1.6-4.3)	0.2
CRP at 72 h (mg/L)	149.1 (82.5-215.6)	138 (27-249)	0.8
White blood cells count at entry	13620 (10476-16760)	9940 (5200-14675)	0.1
LDH at entry (mU/mL)	841.8 (608.8-1074.7)	862.6 (244.8-1480.4)	0.9
Hematocrit at entry (%)	38.6 (33.9-43.2)	39.6 (35.9-43.2)	0.7
Etiology: biliary/ alcoholic or other	6/9	5/5	0.6

Values expressed as total number (percentage) or as mean (95% CI), but for age. BMI: Body mass index; CT: Computerized tomography; CRP: C reactive protein; LDH: Lactate dehydrogenase.

tients with predicted SAP (24.1%) who were offered EN as part of their treatment. Two patients refused tube positioning and received TPN, another patient spontaneously withdrew the tube on day 1 and refused further invasive treatments. Data concerning the remaining 25 patients were analysed.

Rate of spontaneous nutrition tube migration

Plain abdominal X-ray evaluation at day 3 demonstrated successful transpyloric tube migration and “NI” positioning in 10 (40%) patients. The tube did not migrate and remained “NG” in the other 15 patients (60%). As shown in Table 2, the two groups were similar in terms of sex, age and pancreatitis etiology. The predicted severity was not different according to Ranson’s score, C-reactive protein or other biochemical values, but the CT severity index

Table 3 Tolerability and success of nutrition according to tube position *n* (%)

	Nasogastric (<i>n</i> = 15)	Nasointestinal (<i>n</i> = 10)	<i>P</i>
Tube malpositioning	0	0	-
Epistaxis or Sinusitis	1 (6.6)	1 (10)	1
Accidental tube removal	0	1 (10)	0.4
Tube clogging	1 (6.6)	0	1
Aspiration pneumonia	0	0	-
Exacerbation of pain	5 (33.3)	2 (20)	0.68
Vomiting	2 (13.3)	1 (10)	1
Diarrhoea	5 (33.3)	3 (30)	1
Amylase increase > 10%	0	0	-
Lipase increase > 10%	1 (6.6)	0	1
CRP increase > 10%	2 (13.3)	2 (20)	1
Need to switch to TPN	4 (26.6)	0	0.27
Energetic target reached	14 (93.3)	8 (80)	1
Days to caloric target, mean (95% CI)	5.6 (3.8-7.4)	4.3 (3.1-5.6)	0.3

TPN: Total parenteral nutrition.

in the NG tube group was significantly higher than the NI group (mean 6.2 *vs* 4.7, *P* = 0.04). At a logistic regression analysis, we could not identify factors associated with the NG tube position, although CT severity index was the variable closest to significance (OR = 1.6 per unit, 95% CI: 0.95-2.9). Moreover, in all 4 patients (100%) with a CT severity index > 6, the tube did not migrate beyond the pylorus, compared to 11 of the 21 patients (52.3%) with an index ≤ 6; however this difference was not statistically significant, probably due to the small number of patients.

Safety and tolerability of nutrition

There were no differences regarding complications of the feeding tube positioning, such as malpositioning, epistaxis or aspiration pneumonia between patients with a NG or a NI tube. Moreover, after EN start, there was no significant difference between the NG and the NI tube groups in terms of exacerbation of pain, biochemical changes (amylase, lipase and C-reactive protein), side effects or need to switch to TPN. A similar high percentage of patients reached the energetic target (2000 Kcal) in both groups without significant time difference (Table 3).

Clinical outcome

As detailed in Table 4, there was no significant difference in the clinical outcome between the two groups, although more complications occurred in the NG group.

DISCUSSION

In the present study spontaneous migration of the EN tube beyond the stomach occurred in 40% of predicted SAP patients, and a higher CT severity index was associated with the tube being retained in the stomach. However, EN was successfully delivered in some 90% of cases, even in those patients in which tube migration beyond the ligament of Treitz was unsuccessful. Similar results in terms of safety and tolerability were observed in patients with

Table 4 Clinical outcomes of patients according to tube position *n* (%)

	Nasogastric (<i>n</i> = 15)	Nasointestinal (<i>n</i> = 10)	<i>P</i>
Mortality	0	0	-
Need of surgery	0	0	-
Complications			
Infected pancreatic necrosis	3 (20)	1 (10)	1
Renal failure	1 (6.6)	0	1
Respiratory failure	2 (13.3)	0	0.1
Bleeding	1 (6.6)	0	1
Any of the above complications	4 (26.6)	1 (10)	0.6
Total hospital stay, mean (95% CI)	30.6 (18.1-43)	21.2 (17.7-24.6)	0.1

an “NG” or an “NI” tube. Furthermore, both approaches were equally effective in providing the nutritional support needed, caloric goals were reached in similar time intervals and length of hospital stay was not different.

A first interesting result regards the rate of spontaneous tube migration after bedside positioning, without endoscopic or radiologic assistance. The feeding tube migrated to a NI position in 40% of cases, and patients with the NG tube had a significantly higher CT scan severity index. Bedside tube positioning caused only few mild complications without differences between the two groups, but no cases of aspiration pneumonia occurred. This finding is relevant, as although delivery of feeding into the small bowel should be associated with a lower risk of aspiration, there are few data supporting this view^[18].

The rate of spontaneous distal tube migration with unguided probing is considered to be around 50% in patients admitted to intensive care units (ICU) for different diseases^[19]. Few studies have reported these data specifically for patients with predicted SAP, with success rates of spontaneous migration ranging from 60% to 80%^[20,21]. Our results are in agreement with a recent French study reporting an overall successful migration in 61% of patients with either mild or severe AP, with this rate being reduced to 48% in SAP patients having a CT severity index score ≥ 4 ^[21]. Similarly, in our experience, in all patients with extensive pancreatic necrosis (CT severity index > 6), the tube did not migrate beyond the pylorus, and the CT index seemed a risk factor associated with failed spontaneous migration. These data may be explained by an impaired transpyloric migration due to gastroparesis, or to mechanical obstacles caused by local oedematous reactions and/or fluid collections present in the most advanced SAP cases.

As far as tolerability and safety are concerned, we have not observed any significant difference between patients receiving EN either by NG or NI tube. The nutritional goal was reached in 93% of NG patients and 80% of NI. Our findings seem to be in agreement with those published by Eatock *et al.*^[15], who had randomized 49 SAP patients into two groups, administering EN through NG tube in 27 cases and through NI tube in the remaining 22. Patients had been monitored daily by severity index and

pain score to evaluate changes in AP severity due to enteral feeding, and during hospital stay groups behaved similarly, no matter the kind of EN used. Another two randomized clinical trials^[16,17] dealing with NG enteral feeding have supported the safety and efficacy of this nutritional route, and subsequent meta-analyses confirmed the lack of difference between the two approaches, although the paucity of available data was underlined as a factor limiting the evaluation^[22,23].

Regarding clinical outcomes, we have not found any significant difference in terms of complications, mortality and length of hospital stay between the two groups, although most complications occurred in patients receiving NG feeding (Table 4). This small, not significant gap is probably due to a higher prevalence of extensive necrosis in the NG group, accordingly to the significant higher CT scores of these patients at entry. However, since our group of predicted SAP patients did not experience prolonged organ failure which is a key event in discriminating patients with more severe forms^[24], and we observed absence of mortality in both groups, the findings obtained in our study may not apply to patients with SAP and prolonged multiple organ failure.

This is the first study of its kind observing the outcome of EN in SAP patients in a “real world” clinical setting, with the study protocol driven by the need to have more solid grounds in making clinical decisions about everyday medical care circumstances. Both the proximal and the distal enteral approaches result to be feasible, safe and effective in most patients.

The working hypothesis we wanted to test, and that seems to be confirmed by our results, was that when spontaneous tube migration fails EN can be safely administered through NG tube. This issue has a relevant impact on everyday clinical practice as the main limit to EN usage in AP is the technical difficulty in obtaining small bowel access, as reported by 72% of ICUs joining a national survey in Canada^[25].

Of course, the present non-randomized study design cannot highlight the potential benefits of NG nutrition, such as the possibility of immediate start of EN after tube positioning, but only the potential harms caused by stimulation of pancreatic function. However our observation may support the need for further clinical research aimed at clarifying this issue. Furthermore, as the rate of spontaneous distal migration of the nutrition tube, and factors related with it, was one of the results the study was aimed at identifying, the design could not imply a randomization between NG and NI, nor a power calculation. As a consequence, it is possible that differences between groups have not been appreciated due to underpowered samples. In this view, the ongoing multicentre trial on gastric *vs* mid-jejunal feeding funded by the National Institutes of Health will probably provide further important information (<http://clinicaltrials.gov> Identifier: NCT00580749).

In conclusion, spontaneous distal tube migration in patients with predicted SAP is successful in 40% of patients, and CT severity index is higher in patients with failed distal migration of the nutrition tube. EN administered by NG or NI tubes seems to provide equal safety,

tolerability and efficacy, even if more results are necessary to validate the routinely use of NG tubes in SAP patients.

COMMENTS

Background

Severe acute pancreatitis (SAP) requires an adequate nutritional support. Enteral nutrition (EN) should be preferred to total parenteral nutrition in patients with SAP, as it is associated with reduced mortality and complications. However, in clinical practice EN is employed far less frequently than it should. The main obstacle to EN diffusion is that it is considered complicated, as to ensure full pancreatic rest, nutrition tubes should be placed in the jejunum, requiring often troublesome procedures. In the past few years, it has been proposed that EN through nasogastric (NG) tubes may be a simple, safe and equally valid alternative to nasojejunal tubes.

Research frontiers

The authors speculated that a pragmatic possibility in real-world clinical practice would be to employ NG feeding whenever tube migration to the jejunum of bedside inserted feeding tubes does not occur spontaneously. They therefore aimed at assessing the rate of spontaneous distal migration of EN tubes in patients with predicted SAP, to identify possible factors associated with it, and to compare the safety and tolerability of EN with an elemental formula in patients who started nutrition with a "proximal", NG or a "distal", naso-intestinal (NI) tube, depending on the success of spontaneous tube migration.

Innovations and breakthroughs

The authors found that spontaneous tube migration to a NI site occurred in 10/25 (40%) prospectively enrolled SAP patients, while in 15 (60%) nutrition was started with a NG tube. Groups were similar for demographics and pancreatitis aetiology but computed tomography (CT) severity index was higher in NG tube patients than in NI (mean 6.2 vs 4.7, $P = 0.04$). The CT index seemed a risk factor for failed obtention of spontaneous distal migration. EN through NG or NI tube were similar in terms of tolerability, safety, clinical goals, complications and hospital stay.

Applications

This is the first study of its kind observing the outcome of EN in SAP patients in a "real world" clinical setting, with the study protocol driven by the need to have more solid grounds in making clinical decisions about everyday medical care circumstances. Both the proximal and the distal enteral approaches resulted to be feasible, safe and effective in most patients. This issue has a relevant impact on everyday clinical practice as the main limit to EN usage in AP is the technical difficulty in obtaining small bowel access.

Peer review

NG tube insertion, a simpler approach, will probably replace total parenteral nutrition and nasojejunal feeding in the near future. Therefore, despite the small number of patients, this paper is suitable for publication after revision.

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S- Editor Wang YR L- Editor O'Neill M E- Editor Zheng XM