Articolo Originale - Original Article

Early enteral nutrition in the critically ill patient: A retrospective study

S. PALMESE, M.G. DI DOMENICO, L. BUSIELLO, M. CASCELLA, E. DE ROBERTIS, M. PEZZA

Dipartimento di Scienze Chirurgiche, Anestesiologiche-Rianimatorie e dell'Emergenza, Università "Federico II" Napoli - Italy

ABSTRACT: ***Background and Aims.*** *To describe the problems associated with early administration of Enteral Nutrition in addition to the causes of suspension and latency.*
Design. *Retrospective study*
Results. *We recruited 304 patients admitted in ICU, 60 patients were excluded because of death or transfer whereas 244 were able to receive enteral nutrition. One hundred and two (102) patients received Enteral Nutrition within 48 hours, 52 patients received Enteral Nutrition after 48 hours while 90 patients did not received enteral nutrition. Our study shows that 41.8% of patients started enteral nutrition within 48 hours from admission to the Intensive Care Unit and 99% of them received an enteral caloric goal within 48 hours from the start of enteral nutrition. In 21.3% of the patients enteral nutrition was started after 48 hours from admission.*
Conclusions. *We emphasize the importance of starting enteral nutrition in patients with healthy bowel as soon as possible and the value of not giving up at the difficulty. (RINPE 2003; 21: 143-6)*

KEY WORDS: Early enteral nutrition, Indications, Contraindications, Side effects

PAROLE CHIAVE: Nutrizione enterale precoce, Indicazioni, Controindicazioni, Effetti collaterali

INTRODUCTION

Nutritional support is an essential component of the critically ill patient management. In the absence of contraindications, the provision of nutritional support by the gastrointestinal route is recognised to be the best and safest method. Recent evidences suggest that early Enteral Nutrition (EN) reduces the length of stay in the Intensive Care Unit (ICU) and results in better outcome (1-3). In fact, Enteral Nutrition maintains the integrity of the intestinal mucosa by preventing atrophy and, ultimately, promotes all the intestinal functions.

The gastrointestinal tract not only adsorbs nutrients, but also plays an important immunological role thanks to its rich lymphoid tissue (GALT: gut associated lymphoid tissue) (4, 5).

Taking all these aspects into account, in our Institution we administer, whenever possible, early Enteral Nutrition to all patients.

The aim of this retrospective study was to critically describe the problems associated with early EN administration, the causes of EN suspension as well as the latency period from admission to the Intensive Care Unit and the beginning of EN. We also analysed the causes of late EN and evaluated the correspondence between the volume of nutrients needed and those actually delivered.

MATERIALS AND METHODS

We analysed all the patients admitted during the year 1999. A nasogastric feeding tube was placed in all patients and an standard enteral formula bolus of 50 mL was given to all of them the moment we observed no contraindications.

After an hour we assessed the gastric residual volume. In the absence of impaired gastric empty, an infusion was started at the rate of 30-40 mL/hour, it was subsequently increased to a rate of 60-70 mL/h or more and halfway through the administration we monitored the stagnation.

Our EN caloric goal was approximately 1000\1500 Kcal\day, administered by a 1000/mL volume, or at least 50% of the total caloric goal divided into two 7-hour

Ricevuto il 23/6/2003
Accettato il 22/9/2003

administrations separated by a 5-hour break. Parenteral Nutrition, set up at 25-30 Kcal/kg/die, was associated with EN to provide the full caloric goal.

The patients were divided into three groups: the first received EN in the first 48 hours after admission; the second after 48 hours and the third group was unable to receive EN, or EN was suspended.

We examined the causes of late EN in the second group and the reasons for the impossibility of providing EN in the third group. For the third group we also analysed the possible causes of either not starting or suspending EN.

We assessed the number of patients who received the EN caloric goal in the first 48 hours from the beginning of their nutrition and we also analysed the correspondence between the established volume of nutrition and the volume actually delivered as well as the duration of EN.

We also recorded for each patient during the ICU stay any digestive complications caused by EN, such nausea, vomiting, abdominal distension and diarrhoea. The patients were also monitored for the entire hospital stay in terms of length of stay in ICU and total days of EN.

RESULTS

Patient demographics, primary admission diagnosis and ventilatory support are shown in Table I.

The patients admitted to our ICU during the year 1999 were 304, 32 were transferred and 28 were dead in the first 48 hours while 244 patients were analysed (Tab. II). The length of ICU stay was 19.3 ± 12.8 days, the mean ± SD on EN was 14.4 ± 11.3 days. Five patients died after the start of EN.

Enteral feeding was provided within 48 hours from admission to 102 patients (41.8%) (Group 1); in 52 patients (21.3%) EN was started after 48 hours from admission to ICU (Group 2); the reasons for late nutrition are reported in Table III.

One hundred and one (101) patients from Group 1 (99%) that received EN within 48 hours from admission to ICU, received the established enteral caloric goal with the volume delivered, only one patient was given 250 mL instead of 1000 mL. In 90 patients (Group 3) (36.8%) it was impossible to provide EN, or EN was suspended because of the presence of several major contraindications (Tab. IV).

In Groups 1 and 2 the volume delivered was as established in 123 patients and the EN caloric goal was reached. In 31 patients the established volume was not completely delivered. (Tab. V).

In Table VI we report the digestive complications resulting from the feeding.

DISCUSSION

The benefit of correct nutritional support in critically ill patients is known.

The therapeutic nutritional goal is to reach and maintain an adequate nutritional state, avoiding malnutrition and/or hypercatabolism.

TABLE I - PATIENT PROFILE

Male/Female	186/118
Mean age	
20 – 50	58 (19%)
50 – 70	131 (43%)
> 70	115 (37.8%)
Primary admission diagnosis	
COPD	90 (29.6 %)
Cerebral diseases	45 (14.8 %)
Myocardiopathies and Valvulophaties	48 (15.7 %)
Surgery complications	42 (3.8 %)
Tumours	21 (6.9 %)
Bronchopneumonia and ab ingestis	20 (6.5 %)
Metabolic coma	14 (4.6 %)
Sepsis	12 (3.9 %)
Polytrauma	6 (1.9 %)
Hepatopathies	6 (1.9 %)
Ventilatory support	
Mechanical ventilation	183 (60.1%)
Spontaneous ventilation	121 (39.8 %)

TABLE II - MAIN RESULTS

Patients analysed	244
Dead and transferred (M/F)	60 (32/28)
ICU days*	19.3 ± 12.8
EN days*	14.4 ± 11.3
Group 1 (Enteral nutrition within 48 h)	102/244 (41.8%)
Group 2 (Enteral nutrition after 48 h)	52/244 (21.3%)
Group 3 (No enteral nutrition)	90/244 (36.8%)

* Mean (SD)

TABLE III - REASONS OF LATER NUTRITION

	Patients
Unstable haemodynamic conditions	18 (7.3%)
Torpid peristalsis	8 (3.2%)
Diarrhoea	7 (2.8%)
Gastroparesis	6 (2.4%)
Curarization	4 (1.6%)
Weaning	3 (1.2%)
Gastrointestinal haemorrhage	1 (0.4%)
Unknown	5 (2%)

The final outcome is greater resistance to infection and reduction of the length of ICU stay. An early start of EN is the best way to achieve this result (6-8).

We administered the enteral feeding formulas by nasogastric intermittently feeding tube (more frequently) or by nasoduodenal feeding tube with continuous infusion. We prefer the cyclic feeding to allow gastric acidification, we have however used the second procedure in 5 patients with impaired gastric emptying even though the tubes are much more expensive and their insertion requires special skills (6-8).

Our study shows that 41.8% of the patients started EN within 48 hours from admission and 99% of them received the EN caloric goal 48 hours after beginning EN. An important result is the correct correspondence between established and administered volume (9). Whenever bowel function was normal, EN was used.

Minimum administration of nutrients via the nasogastric route is important, not for nutritional purposes but for its favourable trophic effect on the intestinal mucosa.

Recent studies have demonstrated that in the absence of enteral feeding, the GALT rapidly disappears and can be restored equally by the administration of nutrients thought the gastrointestinal tract (4).

We underline the importance of maintaining the integrity of the intestinal mucosa to avoid bacterial translocation. Recent data (10, 11) suggest that the damage to this barrier leads to a major incidence of infections, morbidity and mortality. In critically ill patients with sepsis or trauma, an early beginning of EN reduces the incidence of the infective processes and the length of stay in the ICU. Some studies (10, 11) have shown that Total Parenteral Nutrition is associated with alterations of the enteric mucosa (intracellular oedema, villus atrophy, and increased intestinal permeability) that cause sepsis and other side effects such as catheter-associated infections, thrombosis, hepatic and renal dysfunction and metabolic diseases (hyperglycaemia, hypophosphataemia); these alterations were completely resolved in all subjects after enteral refeeding.

EN was administered to 21.3% of patients after 48h. The most common cause of the delayed starting of EN is haemodynamic instability, which is very frequent in critically ill patients. We should point out that in these patients the start of EN could be delayed after improvement of splanchnic blood flow using dobutamine or better enoximone (12).

The more important side effects of EN that we observed are gastric residual, vomiting, abdominal distension, diarrhoea and constipation (Tab. VI). We examined 15 cases (6.1%) with high residual volume and in all cases, after the analysis of gastroparesis, we used prokinetic agents (metoclopramide or erythromycin) and, moreover, whenever possible, we gave an under pyloric infusion, slowing down the infusion rate and placing the patient in the antitrendelemburg position at about 30°, to avoid aspiration of the enteral formulas. Aspiration of the enteral formula is associated with low morbidity and mortality; researchers have observed that aspiration pneumonia requires antibiotics in only 1-4% of the cases (4). In fact, the risk factors for aspiration are age, de-

TABLE IV - PATIENTS WITHOUT ENTERAL NUTRITION

	Patients
Major abdominal surgery	34 (36.8%)
Unstable Haemodynamic conditions	15 (6.1%)
Curarization	15 (6.1%)
Fistula (>500 mL\h)	9 (3.6%)
Unstable hepatopathies	5 (2%)
Abdominal distension	4 (1.6%)
Occlusion or subocclusion	3 (1.2%)
Pancreatitis	3 (1.2%)
Intestinal ischemia	1 (0.4%)
Enteropathies	1 (0.4%)

TABLE V - NUTRIENT INTAKE CHARACTERISTICS DURING STUDY PERIOD

Group 1	
Patients with EN caloric goal	101/102 (99%)
Volume delivered/die*	1000 ± 100 mL
Patients without EN caloric goal	1/102 (0.9%)
Volume delivered/die*	250 mL
Group 1 + 2	
Patients with EN caloric goal	123/154 (79.8%)
Volume delivered/die*	1000 ± 100 mL
Patients without EN caloric goal	31/154 (20.1%)
Volume delivered/die*	500 ± 300 mL

* Mean (SD)

TABLE VI - GASTROINTESTINAL COMPLICATIONS

	Patients
Gastric residual vomiting	15 (6.1%)
Vomiting	12 (4.9%)
Diarrhoea	10 (4%)
Constipation	2 (0.8%)
Abdominal distension	11(4.%)

creased level of consciousness, bolus versus continuous feeds, and patient position. Impaired gastric emptying is an important problem (7); it is the most common reason for suspending EN in critically ill patients (6, 13). Here are some of the factors that interfere with gastric emptying: haemodynamic instability, drugs (opiates, dopamine), electrolyte abnormalities, hyperglycemias and sepsis (14, 15).

Residual volume is a very imprecise measure of gastric emptying, especially in the absence of nausea, vomiting, and abdominal distension (6).

With our approach we observed few cases of diarrhoea (< 5%). This result can be explained by taking into account the fact that we prefer feeding formulas enriched with fibre and at low osmolarity. In the presence of diarrhoea we also observed that a reduced speed of administration solved the problem in all cases.

In conclusion, we fed by EN 63% of our patients, they could be more if we included patients transferred from the ICU within 48 hours and a good number of these are in fact surgical patients.

Some physicians consider EN dangerous for its side effects but they do not understand the important advantages supported by the bowel and the whole body. In our study 4 out of 5 unknown causes of failure in starting EN (Tab. III) are the result of this indifference. We also emphasise the importance of starting EN in patients with healthy bowel as soon as possible and of not giving up at the first sign of difficulty.

We believe that our analysis can help us all to improve the percentage of patients that receive early EN in the near future.

Address for correspondence:
Dr. M. Pezza
Via Tasso, 290
80127 Napoli, Italy

REFERENCES

1. Moore FA, Feliciano DV, Andrassy RJ, et al. Early enteral feeding, compared with Parenteral, reduces septic post-operative complications: the results of a meta-analysis. Ann Surg 1992; 216: 172-83.
2. Bower RH, Talamini MA, Sax HC, et al. Postoperative enteral vs Parenteral nutrition. Arch Surg 1986; 21: 1040-5.
3. Kudsk KA, Croce MA, Fabian TC, et al. Enteral versus Parenteral feeding: Effects on septic morbidity after blunt and penetrating abdominal trauma. Ann Surg 1992; 215: 503-11.
4. Napolitano LM, Bochicchio G. Enteral feeding of the critically ill. Current opinion in critical care 2000; 6: 136-42.
5. Takahashi I, Kijono H. Gut as the largest immunologic tissue. JPEN 1999; 23 (5): S7-11.
6. Cohen J, Aharon A, Singer P. The paracetamol absorption test: a useful addition to enteral nutrition algorithm? Clinical Nutrition 2000; 19 (4): 233-6.
7. Antara Mallampalli, SA. McClave, Harvy L. Snider: Defining tolerance to enteral feeding in the intensive care unit. Clinical Nutrition 2000; 19 (4): 213-5.
8. Mangiante G, Marini P, Freatucello GB, et al. Il tubo di Bengmark nella pratica clinica: un nuovo mezzo per l'alimentazione enterale. RINPE 1998; 16: 183-6.
9. De Jonghe B, Appere-DeVechi C, Fournier M, et al. A prospective survey of nutritional support practices in intensive care unit patients: what is prescribed? What is delivered? Crit Care Med 2001; 29: 8-12.
10. Buchman AL, Moukarsel AA, Bhute S, et al. Parenteral nutrition is associated with intestinal morphologic and functional changes in humans. JPEN 1995; 19 (6): 453-60.
11. Chris Anderson D, Heimburger DC, Morgan SL, et al. Metabolic complications of total Parenteral nutrition: Effects of nutrition support services. JPEN 1996; 20 (3): 206-10.
12. Kern H, Schroder T, Kaulfuss M, et al. Enoximone in contrast to dobutamine improves hepatoslanchnic function in fluid optimised septic shock patients. Crit Care Med 2001; 29: 1519-25.
13. Mangiante G, Canepari P, Colucci G, et al. Il ruolo della nutrizione enterale precoce (EEP) nella pancreatite severa. RINPE 1999; 17: 78-84.
14. Bower RH, Cerra FB, Bershadsky B, et al. Early enteral administration of a formula (Impact) supplemented with arginine, nucleotides, and fish oil in intensive care unit patients: Results of a multicenter, prospective, randomized, clinical trial. Crit Care Med 1995; 23: 436-49.
15. Kenler AS, Swails WS, Driscoll DF, et al. Early enteral feeding in post surgical cancer patients: Fish oil structured lipid-based polymeric formula versus a standard polymeric formula. Surgery 1996; 223: 316-33.