
Short Communication

Jejunal versus gastric feeding in patients with severe head trauma

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ABSTRACT: Introduction: Head trauma patients are highly catabolic and therefore require early and adequate nutritional support in order to sustain this metabolic reaction and prevent severe depletion of the body reserves. Although we have now an important body of evidence regarding the benefits of early enteral nutrition in these patients, there are still controversies regarding the method of nutrition delivery: intragastric or intrajejunal? Because of gastroparesis described in head trauma patients, some authors recommend the intrajejunal route as routine, but this requires the presence of an endoscopist and is time and resource consuming. The purpose of our study was to determine if there are any advantages in the jejunal versus gastric route for early enteral nutrition provision in severe head trauma patients.

Material and methods: In this prospective, randomized trial we included 23 adult patients with isolated head trauma having a Glasgow Coma Score ≤ 8 . All patients were under analgesic sedation, intubated and mechanically ventilated. They had invasive hemodynamic and intracranial pressure monitoring. Patients were divided into 2 groups: group G (n=11) receiving nutrition through a nasogastric tube, and group J (n=12) in whom a nasojejunal tube was inserted endoscopically. All patients had a target calorie intake of 25 Kcal/kg/day, starting at low rates and progressively increasing in the next days until the target was reached. Primary objectives were tolerance of nutritional support, incidence of infections (incidence of ventilation/intubation-associated pneumonia), days of mechanical ventilation, length of ICU and hospital stay, and mortality. Data are expressed as mean \pm SD.

Results: There were no differences in demographic parameters or type of intracranial injury between the two groups. All patients tolerated the nutritional support well, whether gastric or jejunal. The calorie target was reached in the majority of patients by days 3 to 5 and no patient required interruption of enteral nutrition. No differences were registered regarding primary outcome parameters in the study.

Conclusions: Early intragastric nutrition proves to be tolerated and feasible in severe head trauma patients, showing no differences in morbidity and mortality versus early intrajejunal nutrition. This has a theoretical and economic advantage because no endoscopy is required and nutrition delivery can start earlier. (Nutritional Therapy & Metabolism 2008; 26: 199-203)

KEY WORDS: Severe head trauma, Enteral nutrition, Gastric, Jejunal

INTRODUCTION

Among different trauma localizations, patients with head trauma are more catabolic than others due to multiple hormonal and metabolic changes (1, 2). This further determines rapid protein and energy depletion, leading to increased morbidity and mortality (3). There are indications that nutritional support can decrease morbidity, mortality and length of hospital stay in head-injured patients (4).

Early enteral nutrition is the first choice of nutrition-

al support in critically ill patients (5). In head-injured patients, gastroparesis used to be one of the factors precluding early enteral nutrition (6), so the jejunal route was suggested by some authors as the first option in this category of patients. This concept was recently challenged by a few randomized controlled trials.

The present study objective was to compare, in terms of tolerance and complications, the gastric route with the jejunal route for early enteral nutrition in adult patients with severe head trauma.

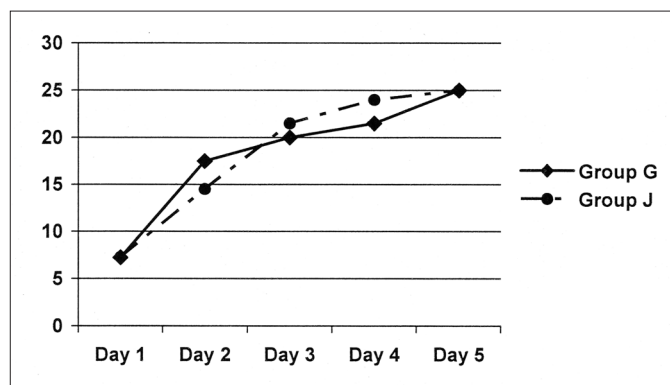


Fig. 1 - Energy intake (Kcal/kg/day).

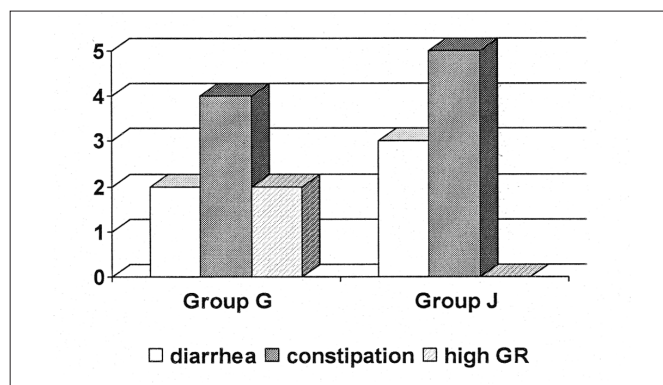


Fig. 2 - Digestive tolerance.

MATERIAL AND METHODS

The study was prospective and randomized, approved by the Hospital Ethical Committee and conducted according to the Helsinki Declaration of 1975. Previous to enrolment, written informed consent was obtained from all patients' legal representatives (next of kin) and signed in addition by the patients themselves as soon as possible, throughout their hospitalization.

Inclusion criteria were age 18 years or over, isolated head trauma, Glasgow Coma Score (GCS) \leq 8, randomization within 24 hours or less from trauma. Exclusion criteria were refusal or absence of legal representative, more than 24 hours from trauma, low survival probability within the next 24 hours, suspicion of brain death, severe chronic diseases associated with poor survival probability at 28 days, impossibility of gastric or jejunal access.

All patients were mechanically ventilated and had invasive hemodynamic monitoring. Intracranial pressure was monitored in all patients for a variable period of time. Accordingly, continuous sedation with propofol (1-3 mg/kg/h) and fentanyl (0.01-0.04 μ g/kg/h) was used, with 2 to 4-hour morning interruptions for neurological function assessment.

Based on computer randomization, patients were allocated either to group G (Gastric) and had a polyurethane nasogastric tube (100 cm long, 12F diameter) blindly inserted, or to group J (Jejunal) and had a tube of similar material and size (but 120 cm long) endoscopically placed after the ligament of Treitz.

Within 24 hours of ICU admission, enteral nutrition with a standard (1 Kcal/mL) polymeric formula was started in all patients, continuously, at a rate of 20 mL/h. In both groups, the administration rate was progressively increased by 10-20 mL/h at 12-24-hour intervals up

to the target calorie goal, 25 Kcal/kg/day. If this goal was not reached by the fifth day, parenteral nutrition was added, but up to no more than 25 Kcal/kg/day. All patients had 30° head elevation throughout enteral nutrition administration.

Tolerance to enteral nutrition was monitored by measuring gastric residuals every 4 hours within the first 48 hours and at variable intervals thereafter, but at least once per day. If gastric residuals were more than 400 mL at 2 consecutive measurements, prokinetics were administered (metoclopramide 30 mg as 2-hour iv perfusion, lactulose 20 mg every 8 hours and/or iv neostigmine up to 1.5 mg/day).

Study endpoints included digestive tolerance (abdominal distension, high gastric residuals, diarrhea, constipation), infectious complications (especially pneumonia, but not only), number of days on mechanical ventilation, length of ICU and hospital stay, and mortality.

Statistical analysis was done with SPSS 12.0; results are expressed as mean \pm standard deviation; a $p < 0.05$ was considered statistically significant.

RESULTS

In the period from September to November 2004, 23 patients were enrolled, 11 in group G and 12 in group J. Their characteristics are illustrated in Table I. There were no differences in age, sex, GCS on admission, and type of brain injury between groups.

In all patients, enteral nutrition was started within 24 hours of ICU admission. This was well tolerated in all patients and the target intake was reached between the third and fifth day in all patients. Although a trend towards earlier achievement of the calorie target was noticed in group J, this was not significant (Fig. 1). No pa-

tient required a switch to TPN or additional parenteral nutrition during the study.

Digestive tolerance was considered good in both groups, although 2 patients in group G and 3 patients in group J developed an episode of diarrhea, which resolved spontaneously (Fig. 2). Moreover, 4 and 5 patients in group G and J, respectively, did not spontaneously pass stools within the first 4 days, requiring lactulose and metoclopramide administration. Two patients in group G, but no patient in group J had gastric residuals over 400 mL/day; metoclopramide was administered to the former.

No differences were registered in clinical outcomes:

TABLE I - PATIENT CHARACTERISTICS

Parameter	Group G (gastric) n=12	Group J (jejunal) n=11
Sex (M/F)	8/4	7/4
Age (years)	38.54 ± 13.86	36.40 ± 14.13
GCS on admission	6.33 ± 1.87	6.12 ± 1.12
Type of injury (total)	16	17
- contusion/intracerebral hematoma	4	5
- subdural hematoma	7	6
- epidural hematoma	3	3
- diffuse axonal injury	2	3

p > 0.10; GCS, Glasgow Coma Score

TABLE II - ENERGY INTAKE (Kcal/kg/day)

Day	Group G	Group J
1	7.25 ± 4.12	7.28 ± 2.50
2	17.52 ± 8.24	14.53 ± 7.23
3	20.05 ± 6.57	21.48 ± 7.07
4	21.54 ± 5.78	24.05 ± 6.82
5	25.23 ± 4.56	25.06 ± 4.92

TABLE III - OUTCOME DATA

Parameter	Group G n=12	Group J n=11
Ventilation/intubation-associated pneumonia	4/12 (30%)	4/11 (36.36%)
Duration of mechanical ventilation (days)	8.23 ± 4.66	9.50 ± 5.11
Length of ICU stay (days)	15.12 ± 9.38	13.55 ± 10.84
Length of hospital stay (days)	15.77 ± 10.00	15.95 ± 11.25
Mortality	3/12 (25%)	3/11 (27.72%)

p > 0.05

prevalence of nosocomial pneumonia, duration of mechanical ventilation, length of ICU and hospital stay. The mortality rate was also similar between groups (Tab. II).

DISCUSSION

Publications on this specific topic are rather scarce in the literature. Although recent recommendations (7) stipulate early enteral nutrition as the first choice of nutritional support provision in critically ill patients, including severely brain-injured patients (8, 9), there are no clear recommendations if this should be given intragastrically or intrajejunally. An exception are patients submitted to major abdominal surgery, in whom routine early jejunal feeding is recommended (7).

For other categories of critically ill, routine intragastric nutrition should be commenced in the first 24 hours from admission, provided there are no specific contraindications. One relative contraindication might be severe head trauma, where a certain degree of gastroparesis and even ileus has been described (6, 10).

Gastroesophageal reflux has also been reported in head trauma patients, precluding early gastric feeding because of the risk of aspiration. The reflux may be due to decreased pressure of the lower esophageal sphincter (11). Moreover, gastric emptying takes twice as long as normal in brain-injured patients (12) and up to 50% of patients have intolerance to intragastric nutrition due to gastroparesis in the first week after trauma (3, 6, 12). However, increased gastric residuals were only noted in 2 of our intragastrically fed patients; the increase was transient and resolved after 2 days of metoclopramide administration.

Besides overcoming gastroparesis, the most widely claimed advantage of transpyloric passage of the feeding tube is reduction of the aspiration risk. Unfortunately, this advantage could not be confirmed by clinical trials (13, 14). In our study, all patients were intubated and ventilated, so frank aspiration was not a threat. Still, silent aspiration between the tracheal tube cuff and tracheal wall was incriminated as a risk factor for nosocomial pneumonia. No difference in the prevalence of nosocomial pneumonia was registered between groups, although the number of patients included in our study does not permit a firm conclusion. However, our findings are in concordance with the results of other trials in which no decrease in the incidence of nosocomial pneumonia was demonstrated with transpyloric passage of the feeding tube (15).

In contrast with the classic belief that intrajejunal nutrition has significant benefits over intragastric nutri-

tion in head-injured patients, several recent publications claim that early gastric nutrition is safe and well tolerated in such patients (16, 17), which is in concord with our findings. Moreover, our study shows that clinical outcome was similar whether patients were fed intragastrically or intrajejunally. The most important limitation, as mentioned before, is the small number of patients included.

Another important finding in the present trial is the fact that none of the patients in group G required supplementary parenteral nutrition nor advancement of the feeding tube into the jejunum because of gastric intolerance.

Regarding the addition of early parenteral nutrition to enteral support, which some authors advocate in such highly catabolic patients, caution is warranted because hyperglycemia is very dangerous for the outcome of head-injured patients (18). In our study no differences were found between groups in the number of episodes and severity of hyperglycemia (results not shown).

The most obvious advantage of intragastric nutrition is the ease and speed of feeding tube insertion, enabling the early start of nutritional support administration. In contrast, insertion of the tube into the jejunum generally requires the presence of an endoscopist, as the success of blind insertion is highly dependent on expertise. In our study (and in general, in our ICU), the jejunal tube was inserted in all cases by the endoscopist, who is always available in our (emergency) hospital. This is not the case in all hospitals and it may delay jejunal access and early start of enteral nutrition. As head-injured patients are more catabolic than other trauma patients (19), early start of nutrient supply is extremely important to prevent host depletion and protein-energy malnutrition (20).

A recent Cochrane review including 11 trials and a

total of 534 patients looked at the impact on outcome of early versus delayed nutrition and the route of feeding. The authors concluded that early enteral feeding may be associated with fewer infections and a trend towards better outcomes in terms of survival and disability. Still, the trials were too small to draw clear conclusions about clinical outcomes and further trials in head trauma patients are needed (21).

CONCLUSIONS

Our study, although including a small number of patients, demonstrates that early intragastric nutrition is safe and feasible in severely brain-injured patients (GCS \leq 8). Early jejunal nutrition has no advantages over early gastric nutrition, but the latter is easier to apply in clinical practice. Further studies including a larger number of patients are needed to look at specific endpoints such as influence on clinical outcome and cost-benefit ratio.

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REFERENCES

1. Grahm TW, Zadrozny DB, Harrington T. The benefits of early jejunal hyperalimentation in the head-injured patient. *Neurosurgery* 1989; 25: 729-35.
2. Chioléro R, Schutz Y, Lemarchand T, et al. Hormonal and metabolic changes following severe head injury or noncranial injury. *JPEN J Parenter Enteral Nutr* 1989; 13: 5-12.
3. Ott L, McClain C, Young B. Nutrition and severe brain injury. *Nutrition* 1989; 5: 75-9.
4. Young B, Ott L, Twyman D, et al. The effect of nutritional support on outcome from severe head injury. *J Neurosurg* 1987; 67: 668-76.
5. Marik PE, Zaloga GP. Early enteral nutrition in acutely ill patients: a systematic review. *Crit Care Med* 2001; 29: 2264-70.
6. Norton JA, Ott LG, McClain C, et al. Intolerance to enteral feeding in the brain-injured patient. *J Neurosurg* 1988; 68: 62-6.
7. Kreymann KG, Berger MM, Deutz NEP, et al. ESPEN guidelines on enteral nutrition: intensive care. *Clin Nutr* 2006; 25: 210-23.
8. Borzotta AP, Penning J, Papisadero B, et al. Enteral versus parenteral nutrition after severe closed head injury. *J Trauma* 1994; 37: 459-68.
9. Minard G, Kudsk KA, Melton S, Patton JH, Tolley EA. Early versus delayed feeding with an immune-enhancing

- diet in patients with severe head injuries. *JPEN J Parenter Enteral Nutr* 2000; 24: 145-9.
10. Ologoiu D, Tiganiuc L, Constantinesc A, Greco I. Nutritional support in acute head trauma patients. *Rom J Clin Nutr* 2007; 2: 85-96.
 11. Saxe JM, Ledgerwood AM, Lucas CE, Lucas WF. Lower esophageal sphincter dysfunction precludes safe gastric feeding after head injury. *J Trauma* 1994; 37: 581-4.
 12. Weekes E, Elia M. Observations on the patterns of 24-hour energy expenditure changes in body composition and gastric emptying in head-injured patients receiving nasogastric tube feeding. *JPEN J Parenter Enteral Nutr* 1996; 20: 31-7.
 13. Spain DA, DeWeese RC, Reynolds MA, Richardson JD. Transpyloric passage of feeding tubes in patients with head injuries does not decrease complications. *J Trauma* 1995; 39: 1100-2.
 14. Strong RM, Cordon SC, Solinger MR, et al. Equal aspiration rates from postpylorus and intragastric-placed small bore nasoenteric feeding tubes: a randomized prospective study. *JPEN J Parenter Enteral Nutr* 1992; 16: 59-63.
 15. Kortbeek JB, Haigh PI, Doig C. Duodenal versus gastric feeding in ventilated blunt trauma patients: a randomized controlled trial. *J Trauma* 1999; 46: 992-6.
 16. Montecalvo MA, Steger KA, Farber HW, et al. Nutritional outcome and pneumonia in critical care patients randomized to gastric versus jejunal tube feedings. The Critical Care Research Team. *Crit Care Med* 1992; 20: 1377-87.
 17. Klodell C, Carroll M, Carrillo EH, Spain DA. Routine intragastric feeding following traumatic brain injury is safe and well tolerated. *Am J Surg* 2000; 179: 168-71.
 18. Young B, Ott L, Dempsey R, Haack D, Tibbs P. Relationship between admission hyperglycemia and neurologic outcome of severely brain-injured patients. *Ann Surg* 1989; 210: 466-73.
 19. Haider W, Lackner F, Schlick W, et al. Metabolic changes in the course of severe acute brain damage. *Eur J Intensive Care Med* 1975; 1: 19-26.
 20. Rapp RP, Young B, Twyman D, et al. The favorable effect of early parenteral feeding on survival in head-injured patients. *J Neurosurg* 1983; 58: 906-12.
 21. Perel P, Yanagawa T, Bunn F, Roberts I, Wentz R, Pierro A. Nutritional support for head-injured patients. *Cochrane Database Syst Rev* 2006; 4: CD001530.

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