Enteral Nutrition Target of Critical Patients in The Intensive Care Unit

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Abstract

Objective: Nutritional support (NS) is an important part of the treatment of patients in the intensive care unit (ICU). The preferred method for NS is enteral nutrition (EN). The aim of the present study was to investigate the time of initiation of NS for patients admitted in the ICU, whether the nutritional target dose was achieved and if not, the factors that led to this.

Methods: The study was planned retrospectively and included patients aged between 18 and 90 years, followed up between 01/01/2017 and 12/31/2018 in the emergency ICU. Patients' demographic characteristics, the time of nutritional supplementation initiation, the time of achieving the target, and EN termination reasons during the nutritional status were evaluated.

Results: A total of 152 patients were analyzed. Of the 152 patients, 49 were investigated for enteral feeding. Enteral NS was provided via nasogastric tube (93%) and percutaneous endoscopic gastrostomy (PEG) (7%). The mean time to start EN was 10.3 (±8.6) h. The mean time to reach the target was 14.1 (±5.9) h in 96% of the patients. In 2 patients, the target dose could not be reached due to vomiting and excess gastric residual volume. Thirty (61%) patients had problems during NS and EN interrupted.

Conclusion: Any critically ill patient who has been in intensive care for >48 h should be considered at risk for malnutrition. In patients undergoing intensive care, it is recommended to start enteral feeding within 48 h (early enteral feeding) if there is no oral intake.

Keywords: Early enteral nutrition, nutritional target, malnutrition

Yoğun Bakım Ünitesindeki Kritik Hastalarda Enteral Beslenme Hedefi

Öz

Amaç: Beslenme desteği, yoğun bakım ünitesindeki (YBÜ) hastaların tedavisinin önemli bir parçası olup enteral beslenme ilk tercih edilen yoldur. Bu çalışmada, yoğun bakım ünitemize başvuran hastalar için beslenme desteği başlama zamanı, beslenme hedefine ulaşma düzeyi, bunun sürdürülebilirliği ve hedefe ulaşmada karşılaşılan nedenlerin araştırılması planlandı.

Yöntemler: Çalışmaya Acil Yoğun Bakım Ünitesinde 01.01.2017 ve 31.12.2018 tarihleri arasında takip edilen 18-90 yaş arası yetişkin hastalar dahil edildi ve çalışma retrospektif olarak planlandı. Hastaların demografik özellikleri, beslenme desteği başlama zamanı, hedefe ulaşma zamanı, enteral beslenme sırasında karşılaşılan beslenmeyi durdurma nedenleri değerlendirildi.

Bulgular: 152 hasta analiz edildi ve enteral beslenen 49 hasta araştırıldı. Hastalarda enteral beslenme desteği nazogastrik tüp (%93) ve perkütan endoskopik gastrostomi (PEG) (%7) ile sağlandı. Enteral beslenmeye başlama süresi ortalama 10.3(±8,6) saat olarak bulundu. Hedefe ulaşmak için ortalama süre, hastaların %96'sında 14,1(±5,9) saat olarak gözlendi. 2 hastada, kusma ve aşırı gastrik rezidü volüm nedeniyle hedef doza ulaşılamadı. Otuz (%61) hastada beslenme sırasında problem yaşandı ve enteral beslenme kesintiye uğradı.

Sonuç: 48 saatten fazla yoğun bakımda yatan kritik hastalar yetersiz beslenme için risk altında sayılmalıdır. Yoğun bakıma yatan hastalarda, ağızdan alım yoksa 48 saat içinde enteral beslenmeye başlanılması önerilir (erken enteral beslenme).

Anahtar Sözcükler: Erken enteral beslenme, beslenme hedefi, malnütrisyon

Nutritional support (NS) is an important part of the treatment of patients in the intensive care unit (ICU). Malnutrition can develop as a consequence of deficiency in dietary intake, increased requirements associated with a disease state, from complications of an underlying illness, such as poor absorption and excessive nutrient losses, or from a combination of these aforementioned factors [1]. Intensive care patients are prone to malnutrition, increasing the length of hospital stay and morbidity and mortality [2, 3]. Any critical patient who remains in the ICU for >48 h should be considered at risk for malnutrition [4]. After a better understanding of the pathophysiology of protein energy malnutrition (PEM), nutritional status of ICU patients has become more important [5]. Insufficient nutrition

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is strongly associated with increased morbidity and mortality in critically ill patients. Adequate and balanced NS should be provided to the patient to prevent malnutrition and related complications and to contribute to the patient's recovery [6].

Many studies have been conducted and continue to performed about when NS should be given to ICU patients, which way should be used, how much should be given, whether it should be given continuously or intermittently, and what the content should be. Based on these studies, international guidelines are used which provide recommendations on many issues about NS [4]. According to the European Society for Clinical Nutrition and Metabolism guideline, it is recommended to use oral route in patients who are followed up in the ICU and to start enteral feeding within 48 h (early enteral feeding) if there is no oral intake. It has been shown that early onset enteral nutrition (EN) reduced mucosal atrophy, maintained bowel barrier function, and reduced intestinal bacterial translocation [7].

Although the importance of NS has been emphasized in many studies, it is also common to stop or reduce nutrition for some reasons in ICU patients. The damage of the beneficial microbiome, which is very important for normal bowel physiology, deteriorates bowel epithelial regeneration and damages the protective barrier [8]. As a result, it can cause serious fatal consequences that can result in sepsis.

Nutritional status has gained importance with better understanding of the pathophysiology of PEM in ICU patients and optimal modalities in the administration of nutritional therapy [5]. Adequate nutrition of ICU patients improves outcome, whereas malnutrition is strongly associated with increased morbidity and mortality rates among critically ill patients [6].

The preferred method for NS is EN. EN is a physiologic, safe, and effective NS method for patients with normal bowel function, and complications are less common than parenteral nutrition [9, 10].

It has been shown in many studies that adequate NS in critical intensive care patients has positive effects on patient outcomes. However, after the initiation of feeding, it is sometimes not sufficient to achieve the target dose. Therefore, the aim of the present study was to investigate the level of achievement of nutritional target, its continuity, and the problems encountered in reaching the target in our clinic.

Material and methods

This was a retrospective observational study planned between 01/01/2017 and 12/31/2018. The study was approved by the Istanbul University-Cerahpaşa Cerrahpaşa School of Medicine Ethics Committee. Written informed consent was obtained from the study subjects (no. 83045809-604.01.02, 02/05/2019).

Demographic data (age, body weight (kg), height (cm), and body mass index), comorbidities, causes of ICU admission, and Acute Physiology and Chronic Health Evaluation (APACHE) II and Sequential Organ Failure Assessment (SOFA) scores were recorded. Inclusion criteria consisted of adult patients aged 18–90 years who were followed up in the ICU for >72 h. Exclusion criteria comprised patients who were taken to intensive care for postoperative follow-up after any surgery, patients with ICU hospitalization <72 h, patients aged <18 years, and patients feeding parenterally and orally.

The daily energy target of the patients was calculated as 25 kcal/kg/day. When the NS was initiated in the follow-up of the patients, how the patients were fed (enteral/parenteral), enteral feeding route (oral, nasogastric, nasojejunal, and PEG), product formulation (standard, hypercaloric, fibrous, and diabetic product), when the target dose can be reached, the reasons (such as lack of treatment, non-application of the nurse, end of feeding product, vomiting, and diarrhea) if the target dose could not be reached, and the reasons of interrupted EN during the ICU stay were recorded.

Gastrointestinal complications (vomiting, diarrhea (aqueous/soft stool >200–250 g/day or >250 mL/day, and fecal frequency ≥3–5 times/day), constipation (absence of excretion for >3 days), distension, and abdominal pain), and what was done against these problems (the dose was reduced, the product was changed, the fiber product was added, and EN was discontinued) were also recorded. Mechanical complications related to the tube (obstruction, displacement, and removal) and procedures for the solution (opened with the guide, irrigation with pressurized water or soda, opened, and withdrawn) were determined. The reason for termination of EN during the treatment period (patient rejected, patient could not tolerate, oral intake was adequate, complications, hemodynamic instability, operation, discharge, and died) was noted.

All data are expressed as mean±standard deviation and 95% confidence interval. We used descriptive statistics definition.

Results

A total of 152 patients who were followed up in the ICU were analyzed. Postoperative patients (42), patients hospitalized for <72 h (17), patients fed orally (39), and patients fed parenterally (9) were excluded from the study.

Overall, 49 (30 male and 19 female) patients were investigated for enteral feeding. The mean age of the patients was 68 (±17.7) years (Table 1). The mean APACHE II and SOFA scores were 24.6 (±8.2) and 7.2 (±3.5), respectively.

Table 1. General characteristics of the patients using enteral nutrition

Gender (M/F)	30/19
Average age (years)	68±17.7
Mean APACHE II	24.6 (±8.2)
Mean SOFA	7.2 (±3.5)

M/F, male/female; APACHE II: Acute Physiology and Chronic Health Evaluation; SOFA: Sequential Organ Failure Assessment

Table 2. Admission causes

	n (%)
Respiratory failure	28 (57)
Sepsis	9 (19)
Trauma	4 (8)
Acute renal failure	3 (6)
Cerebrovascular accident	2 (4)
Post-CPR	2 (4)
Severe electrolyte disorders	1 (2)

CPR: cardiopulmonary resuscitation; n: number

Admission causes of these patients were respiratory failure (57%), sepsis (19%), trauma (8%), acute renal failure (6%), cerebrovascular accident (4%), post-cardiopulmonary resuscitation (4%), and severe electrolyte disorders (2%) (Table 2).

Enteral NS, dependent on the day of ICU stay, was provided via nasogastric tube (93%) and percutaneous endoscopic gastrostomy (PEG) (7%). Of the 49 patients, 33 (67%) were started to be fed with standard product, 13 (26%) with fiber product, and 3 (7%) with diabetic product. All of the patients were started to be fed within 48 h (early EN). The mean time to start EN was 10.3 (+8.6) h. The mean time to reach the target was 14.1 (+5.9) h in 96% of the patients.

In two patients, the target dose could not be reached due to vomiting and excess gastric residual volume. The mean time to reach the target was 14.1 (+5.9) h in 96% of the patients.

Thirty (61%) patients had problems during NS and EN interrupted (Table 3). The most important part of the reasons was about gastrointestinal problems such as diarrhea, excess gastric residual volume, and vomiting (41%). Open PEG (13%), removal of nasogastric tube (13%), extubation (11%), opened tracheostomy (11%), and operation (9%) were the other problems during EN.

Table 3. Complications in patients with enteral nutrition

	%
Gastrointestinal problems	
Diarrhea	2
Vomiting+excess GVR	39
Operations and invasive interventions	
PEG	13
Opening tracheostomy	11
Undergoing surgery	9
Other reasons	
Removal of nasogastric tube	13
Extubation	11
Hemodynamic instability	2

GVR: gastric residual volume; PEG: percutaneous endoscopic gastrostomy

In the present study, we observed that on average, the patients had received 79.6% of the energy requirements compared with the calculated goals.

Discussion

Nutritional support is routinely provided to all patients who remain in the ICU for more than a few days. It may be provided by the enteral or intravenous route, but the enteral route is preferred and is recommended by nutrition guidelines as first-line therapy [11, 12].

Guidelines recommended that if oral intake is not possible, early EN (within 48 h) in critically ill adult patients should be performed/initiated rather than delaying EN (grade of recommendation: B-strong consensus 100% agreement) [4]. In the present study, we investigated 49 patients, and in all of them, NS was initiated within 48 h. The mean time to start EN was 10.3 (±8.6) h.

Although EN is a recommended method, various causes may prevent the target dose from being reached (motility and absorption disorders, high gastric residual volumes, distension, vomiting, and diarrhea). In our study, after the initiation of EN, only two patients could not reach the target dose due to vomiting and high residual volume. The mean time to reach the target was 14.1 (±5.9) h in 96% of the patients.

During nutritional status, nutrition intolerance due to motility and absorption disorders, especially in intensive care, was observed, such as high gastric residual volumes, distension, vomiting, and diarrhea. In the present study, gastrointestinal problems were the

biggest part of the interruption of EN in 41% of the patients. In addition, operations and undergoing surgery, removal of the nasogastric tube, extubation, and hemodynamic instability were the other reasons.

However, these problems can prevent reaching the calculated goals and cause insufficient energy target.

Insufficient energy target and protein were also reported by Heyland et al. [11] who observed that ICU patients receive 61.2% of the energy targets, and Weijs observed that it is 75% [13]. In one study, they observed that on average, 68.07% of the energy requirements and 57.92% of the protein requirements had been prescribed [14]. Similar results were found by McClave et al. [15] who reported that only 65% of the patients receive adequate prescription compared with the calculated goals, and that only 51% is actually infused. Only 76% of the prescribed energy and nutrition were administered during the ICU stay in the study by Adam et al. [16]. Average nutritional adequacy in critical care units was reported as only 59% in the study by Cahill et al. [17]. In our study, ICU patients reached 79.6% of the energy target.

In conclusion, NS is very important in the ICU to prevent malnutrition-related complications and mortality. Early EN is recommended within 48 h if no oral intake according to the guidelines. The application of EN in critically ill patients does not fulfill the actual energy and protein needs. After starting EN, many reasons, especially gastrointestinal causes, may cause feeding interruption. This can lead to malnutrition with insufficient energy and protein intake. Therefore, nutritional status should be evaluated daily, malnutrition should be prevented, and complications should be reduced.

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