Early nutritional therapy in trauma: after A, B, C, D, E, the importance of the F (FEED)

Terapia nutricional precoce no trauma: após o A, B, C, D, E, a importância do F (FEED)

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A B S T R A C T

A significant number of deaths in trauma occurs days to weeks after the initial injury, being caused by infection and organ failure related to hypercatabolism and consequent acute protein malnutrition. Nutritional therapy should be planned and included with other routines of resuscitation for patients with multiple trauma and severe burns. The rapid acquisition of a route for nutritional support is important to start early nutritional therapy within 48 hours of care. The enteral route is the preferred option in traumatized postoperative patients but the parenteral route should be prescribed when enteral feeding is contraindicated or inadequate. After the initial measures dictated by ATLS, synthesized in the A (airway), B (breathing), C (circulation), D (disability) and E (exposure), we include the letter F (feed) to emphasize the importance of early nutritional care in trauma.

Key words: Multiple trauma. Burns. Surgical procedures. Nutrition therapy. Enteral nutrition.

INTRODUCTION

There is consistent correlation between nutritional status and the results of surgical treatment. Nutritional deficits are associated with longer hospital stay and higher rates of postoperative complications and mortality. The perioperative nutritional therapy plays a key role in improved clinical outcomes [1].

Early nutritional therapy is the one initiated within 48 hours of hospital admission or of an operation. I can be performed via the enteral route (enteral nutritional therapy - ENT), parenteral one (parenteral nutrition - PNT) or both. The choice of the best route, the perfect time to start, especially in critically ill and potentially unstable patients, remains a matter of discussion [2].

Trauma leads to death according to a trimodal distribution. The initial peak (50%) occurs shortly after the accident and due to serious injury, often incompatible with life. In this situation, usually death can only be avoided with preventive measures. The second peak (30%) occurs around the first and second time after trauma. It is due usually to the serious injuries that compromise breathing and induce massive bleeding. Repeated evidence of literature existing on this group show a appreciable component of "avoidable deaths", ie, therapeutic failures due to delayed or inappropriate treatment. The third peak (20%) is late, occurring days to weeks after the trauma, caused by infection and organ failure, either due to the trauma itself or to the potential flaws in the initial care provided to the victim. Among the causes that increase mortality in the third peak, we can safely point negligence regarding the early acquisition of a route of nutritional support and hence the delay in introduction of nutrition therapy, resulting in worsening of clinical status of a patient already severely debilitated [3].

Rational for early nutrition therapy in trauma

The increased catabolism and resulting acute protein malnutrition is a frequent condition in trauma [4]. The following Systemic Inflammatory Response Syndrome (SIRS) is directly related to the magnitude of the trauma and raises, just after few days, the Compensatory Anti-Inflammatory Response Syndrome CARS. This bimodal mechanism can lead to great loss of lean body mass, impaired healing, immunoparalysis and, ultimately, multiple organ dysfunction [2,5]. Over the last decade, it has been shown that these patients benefit from the use of early nutrition therapy, especially if it contains immunomodulators [3,6]. The goal of nutrition therapy is to decrease the early

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loss of lean mass, provide calories and improve the patient's immunity and healing.

We thus advocate that treatment protocols for patients in these conditions include, in the initial steps to be taken, in addition to the formal recommendations, summarized in A (airway), B (breathing), C (circulation), D (disability) and E (exposure), the letter "F" (feed), thus emphasizing the importance of nutritional therapy in the early post-injury recovery [3]. This will allow changes in the routines hitherto adopted in many centers. In this regard, the Brazilian Guidelines for Nutritional Therapy (DITEN), issued by the Brazilian Medical Association and the Federal Council of Medicine and produced by Brazilian Society of Parenteral and Enteral Nutrition (SBNPE) is a major breakthrough for the systematization of nutritional conducts in trauma [3,6].

Early enteral or parenteral nutrition?

In elective operations, early ENT brings notable advantages over the PNT for being more physiological. These effects are related mainly to the modulation of the immune response and maintenance of intestinal integrity (intestinal barrier), preventing bacterial translocation and overgrowth of pathogenic germs [2,3,5,7].

Similarly, ENT appears to be the preferred option in postoperative trauma patients [2]. A recent review of the literature shows that it causes a significant reduction in infectious complications and length of hospital stay when compared to early PNT [3]. Accordingly, there appears to be no benefit from the use of isolated PNT in trauma victims [8]. Its use should be reserved for patients unable to tolerate enteral therapy or as a complement to it. In a recent meta-analysis [9] involving six randomized trials and 234 patients, early ENT started up to 24 hours post-trauma or admission to a surgical ICU was associated with significant reduction in mortality (OR 0.34, 95% CI 0.14-0.85) and pneumonia (OR 0.31, 95% CI 0.12-0.78). In patients suffering from head trauma, early ENT can reduce general and infectious complications [10]. It is also clearly established that ENT is the preferred route for nutritional support compared to PNT in these patients [11]. However, the ENT started later may have deleterious results [8]. In a meta-analysis [12], Simpson and Doig (2005) demonstrated that the survival of critically ill patients (including trauma victims) was higher in patients undergoing early PNT versus late ENT (OR 0.29, 95% CI 0.12-0.70).

Early nutrition therapy in patients undergoing damages control laparotomy

Several studies have consistently shown that early ENT in the postoperative period of abdominal surgeries is safe and well tolerated [2,3]. Nevertheless, it should only be started once the patient is hemodynamic stable. The onset before that can bring serious complications such as intestinal necrosis[13]. Early ENT is not related to an increase in gastrointestinal complications, including anastomotic leak or fistula, a fear very common among surgeons that end up hampering its use [2,3,8,14]. In contrast, the early initiation of enteral or oral feeding can reduce complications related to the surgical wound and healing, septic complications, weight loss and improve postoperative nitrogen balance [2,3,6].

A laparotomy for damage control has become a routine procedure after trauma with bleeding difficult to control leading to shock [15]. In a multicenter prospective study, Dissanaike *et al*. evaluated the safety and effectiveness of ENT in these patients. Of the 100 patients included, 32 underwent early ENT and 68 late ENT. No differences were found in relation to multiple organ failure, days of mechanical ventilation, length of ICU stay, length of hospital stay or mortality between the two groups. However, the incidence of pneumonia was significantly lower in patients undergoing early ENT (43.8 vs.72.1%, p=0.008). Early ENT, besides feasible and safe, was an independent risk factor for reducing the incidence of pneumonia (OR 0:32, 95% CI 0.13-0.79) in patients undergoing surgery for damage control [16].

Immunonutrition in trauma

Although there is no consensus, additional benefits of ENT have been demonstrated in trauma with the use of immunomodulatory formulas (glutamine, arginine, nucleotides, omega-3 fatty acids). In 2006, the European Society for Metabolism and Nutrition (ESPEN) proposed on its guidelines the use of immunonutrition in trauma with level A recommendation [17]. Several meta-analyses on the effects of immunonutrition were conducted in critically ill patients [18,19,20]. In 2001, Heyland *et al.* [20] revised 22 studies involving 2000 patients and showed that immunonutrition supplementing enteral nutrition led to a significant reduction of infections (HR 0.66, 95% CI 0.54-0.80). Nonetheless, there was no gain in mortality (HR 1.10, 95% CI 0.93-1.31).

There is great heterogeneity in the type of formula used, variety of the population studied and quality of the studies published so far. In a recent review, Todd *et al*. [8] suggested that the use of immunomodulatory formulas should be reserved for trauma patients at high risk, including the ones sustaining major multiple trauma. However, attention should be given to the exact combination of immunonutrients necessary to obtain some benefit (or avoid a potential harm), which is not clearly defined in the literature to date, as will be discussed later.

Early nutritional therapy in severly burned

Severe burns determine grave malnutrition due to intense and prolonged hypermetabolic state (lasting up to one year after the initial injury) [4,21]. In recent years, early ENT has become extremely important in the initial management of these patients. Early ENT is related to the prevention of ileus, stress ulcers and other effects of hypermetabolism[22]. International protocols such as the one of the American Burn Association (ABA)[23] and others [3,17,24]

recommend that critically ill burn victims should have ENT started as early as possible, provided that the digestive tract is able to receive it. For the Canadian Clinical Practice Guidelines, the beginning of ENT should occur in the first 48 hours after admission of these patients in the ICU [25]. The early intra-gastric feeding is recommended by the Eastern Association for the Surgery of Trauma, since it has been shown that its delay for more than 18h results in high levels of gastroparesis, leading to the need for PNT [26]. This society advocates the early passage of a feeding tube still in the trauma room. In a multicenter study published in 2011, Mosier *et al.* [27] observed that the ENT initiated within the first 24 hours after admission was related to shorter ICU stay (40.7 vs. 52.5 days, p = 0.03) and the incidence of wound infection (54.5 vs. 80%, p = 0.01). Nevertheless, some studies, including a systematic review on the subject [28], have demonstrated no impact of ENT on variables such as length of hospital stay, global indices of infection (including pneumonia) and mortality [29]. Although safe and feasible, the greatest difficulty for adoption of ENT in the first 24h is observed in patients with higher APACHE II score and greater burned body surface. Thus, these patients should be treated with greater attention in order for early ENT to be timely implemented.

Patients with a burned body surface over 20% should receive nutritional therapy, as they will fail to meet their energy needs only orally [30]. The ENT, either intra-gastric or trans-pyloric, should be the option of choice for these patients. Given the well documented benefits of ENT over PNT on the burned patients [31,32], the latter shall be indicated only in reserved cases, where the digestive tract is not able to receive ENT [28]. We emphasize that, regardless of the route of administration, the importance of early nutrition therapy in these cases should be borne in mind.

Early nutrition therapy in severe trauma

The timing of the injury or of hospital admission (ICU or not), or preferably both, becomes the time of reference for beginning of nutritional therapy. Regardless, the main focus of nutrition therapy in severe trauma aims to aid in the treatment or prevention of infections, improvement of oxidative stress and modulation of the immune-inflammatory response [9,33,34,35].

In patients with severe trauma in the intensive care, early ENT has been widely documented and is associated with a reduction in infectious complications and better glycemic control [36]. The initial recommendation, however, is to wait for the hemodynamic stability of the patient [13]. Glycemic control is important and, therefore, at the beginning the amount of calories should not exceed 25 kcal/kg/day. In contrast, the protein amount must be high, from 1.5 to 2 g/kg/day [3].

Generally, the time required for ENT to achieve the caloric target ranges from three to seven days, even in ICUs with formal protocols for nutritional therapy [37]. Nonetheless, ENT may cause gastrointestinal intolerance, increasing the time to reach the target and thus causing protein-calorie deficit during the first week of ICU stay [38]. This can lead to infections, increased duration of mechanical ventilation and of ICU stay, and pressure ulcers [39,40]. The time to onset of a mixed nutritional therapy (ENT and PNT) is controversial [2]. ESPEN guidelines recommend simultaneous administration of PNT supplementing ENT after two days in patients who cannot receive ENT or are not getting an insufficient one [41]. This conduct can be explained by recent data coming from a meta-analysis, revealing low mortality with the use of early PNT in critically ill patients [12,42]. However, for the American Society for Parenteral and Enteral Nutrition (ASPEN) [43] PNT should not be started before the seven days without nutritional support or insufficient ENT. These differences in nutritional practices not only indicate a gap in the evidence on the subject, but also represent significant discrepancies in costs dispensed to patients under intensive care in each country [44]. A recent review article brought an in-depth debate on the current discussion about the timing of the association between ENT and PNT [45].

Controversies exist regarding the use of immunonutrients in critically ill patients. Many meta-analyzes have suggested potential risks when immunomodulatory formulas are used improperly [46]. Severe disease is accompanied by various combinations of systemic inflammation and generalized immunosuppression, which may be alleviated or exacerbated by therapy using immunonutrients. Particularly in septic patients, arginine supplementation may have deleterious effects [47]. Arginine suplementation causes plasma levels of nitric oxide to progressively increase as the severity of sepsis increases, especially in the presence of multiple organ dysfunction. ESPEN [41] recommends the use of arginine only for patients without major severity criteria, with known APACHE II score less than 15. ASPEN [43], on its turn, discourages the use of arginine in septic patients under any condition.

CONCLUSION

In trauma, nutritional therapy should be started early, as soon as there is hemodynamic stability, preferably within 48 hours of admission or the completion of an operation. It can be performed via the enteral route (ENT), parenteral one (PNT) or both. ENT appears to be the preferred option in postoperative trauma patients. PNT should be reserved for those who are unable to tolerate enteral therapy or as a complement to it. Although there is no consensus, additional benefits of ENT with the use of immunomodulatory formulas (containing glutamine, arginine, nucleotides, omega-3 fatty acids) have been demonstrated in trauma. In addition to the initial measures dictated by ATLS, synthesized in the A (airway), B (breathing), C (circulation), D (disability) and E (exposure), we propose to include the letter F (feed) to emphasize the importance of early nutritional care in the post-injury.

R E S U M O

*Um número significativo de mortes no trauma ocorre dias a semanas após a injúria inicial, sendo causado por infecções e insuficiência orgânica, relacionadas a hipercatabolismo e consequente desnutrição proteica aguda. A terapia nutricional deve ser planejada e incluída com as demais condutas de reanimação para pacientes politraumatizados e grandes queimados. A rápida aquisição de uma via para suporte nutricional é importante para inicio da terapia nutricional precoce em até 48 horas do atendimento. A via enteral é a opção preferencial no pós-operatório de pacientes traumatizado mas a via parenteral deve ser prescrita quando a enteral está contraindicada ou insuficiente. Após as medidas iniciais ditadas pelo ATLS, sintetizadas em A (*air*), B (*breath*), C (*circulation*), D (*disability*) e E (*exposure*), nós incluímos a letra F (*feed*) para enfatizar a importância do atendimento nutricional precoce no trauma.*

Descritores: *Trauma múltiplo. Queimaduras. Procedimentos cirúrgicos. Terapia nutricional. Nutrição enteral.*

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