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RECOMMENDATIONS FOR SPECIALIZED NUTRITIONAL-METABOLIC TREATMENT OF THE CRITICAL PATIENT

Recommendations for specialized nutritional-metabolic management of the critical patient: Special situations, polytraumatisms and critical burn patients. Metabolism and Nutrition Working Group of the Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC)☆

Recomendaciones para el tratamiento nutrometabólico especializado del paciente crítico: paciente politraumatizado y paciente quemado crítico. Grupo de Trabajo de Metabolismo y Nutrición de la Sociedad Española de Medicina Intensiva, Crítica y Unidades Coronarias (SEMICYUC)

A. Blesa-Malpica[a,*], A. Martín-Luengo[b], A. Robles-González[c]

[a] *Servicio de Medicina Intensiva, Hospital Universitario Clínico San Carlos, Madrid, Spain*
[b] *Servicio de Medicina Intensiva, Hospital Universitario de Burgos, Burgos, Spain*
[c] *Servicio de Medicina Intensiva, Hospital Universitario Vall d'Hebron, Barcelona, Spain*

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Introduction

In polytraumatized patients, the extent of the injuries determines malnutrition risk, with the need for nutritional support measures. In major (critical) burn victims, nutritional management is required because of the intense catabolic response and tissue repair needs. Patients with burns affecting 40% of their body surface may present a 40%−80% increase in basal energy expenditure during the acute phase of the disorder.

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* Corresponding author.
E-mail address: ablesamal@gmail.com (A. Blesa-Malpica).

Table 1 Toronto formula used in adult major burn patients.

−4.343 + (10.5*burned surface%) + (0.23*caloric intake) + (0.84*HB) + (114*T) − (4.5*days elapsed)

HB: Harris-Benedict equation; T: temperature.

The consumption of muscle mass is a result of protein catabolism exceeding protein synthesis. In effect, muscle mass acts as a substrate for the production of acute phase proteins, neoglycogenesis and healing of the wounds.

Stress hyperglycemia in the burn victim is a prolonged situation,[1,2] and failure to control it adequately results in poor wound healing, graft loss and the exacerbation of muscle catabolism.

The use of indirect calorimetry is particularly relevant in patients of this kind. In non-septic patients and individuals in which the energy supply is not excessive (overfeeding), the provision of proteins runs parallel to survival.[3] The recommendation in such cases is to administer a low fat and high protein diet.[2]

Do the caloric and protein requirements of these patients differ from those of the rest of critical patients?

The stress response generated by injuries of this kind requires a protein supply that is greater than in other critical patients.[4] The adult burn and/or polytraumatized patient is estimated to need 1.5−2 g/kg/day of protein.[5–7]

The caloric requirements do not seem to increase very much. Carbohydrate supply should not exceed 4−5 g/kg/day (though amounts of up to 7 g/kg/day have been described).[1] The lipid supply in turn should represent less than 10% of the non-protein caloric needs, and in no case should it exceed 30% of the total calories. This measure appears to improve protein utilization.[1,4]

The gold standard is indirect calorimetry with a supply limited to 100% of the calculated value. In the absence of indirect calorimetry, the Harris-Benedict equation with a factor of 1.3–1.5 affords an approximate idea of the caloric requirements. In burn cases, the Toronto equation[8] (Table 1) seems to be the best option, though other formulas have also been used, such as the Carlson equation[9] or 25 kcal + (30−40 kcal × % burned body surface area).[10]

In the management of these patients, the three key elements of metabolic support are control of the hypermetabolic situation, of muscle consumption and of stress hyperglycemia.[2] An adequate protein supply will not always be possible with the usual formulas, and in such situations protein supplements will prove necessary.

What is the most advisable administration route in these patients?

Feeding via the enteral route is advised, even using the post-pyloric route, in the very early stages (first 6 h) of injury,[1,11] and preferably as close as possible to the jejunum. Use of the parenteral route should be considered if necessary to ensure the required nutrient supply. When correctly used, this technique is safe.[12] The high metabolic demands of burn victims may require combined utilization of the enteral and parenteral routes.[13]

Do diets enriched with glutamine and other pharmaconutrients play a role?

Glutamine (Gln) supplementing in the critically ill is subject to controversy resulting from the Redox trial,[14] which proves inappropriate, the Signet study,[15] which is insufficient, and the Metaplus trial,[16] which only reports adverse effects, with an objective not established in the design and involving a subgroup of medical patients. Burn and/or polytraumatized patients constituted a minority presence in all of them.

Consideration of the use of such enrichment measures is recommended in trauma and burn victims. It is advisable to determine their plasma levels, use an adequate dose (0.2–0.5 g/kg/day),[17] with early introduction, and continue administration for a period of over 5 days.

Glutamine favors a decrease in infections, a shortening of hospital stay,[17] and lesser in-hospital mortality.[18,19] Its intervention in the production of heat shock proteins, the regulation of hyperglycemia, action upon the immune cells and participation as an antioxidant are the suggested mechanisms underlying its beneficial effects in the critical patient.[19,20] However, all this is subject to correct compliance with the known conditioning criteria, such as the absence of multiorgan failure (particularly in the presence of acute renal failure), dosing, treatment duration and use of the parenteral route. According to the available data, patients with diminished plasma Gln levels that are able to increase these levels once supplementing has started are the individuals that benefit most.[21]

Arginine is involved in hormone release, the reduction of insulin resistance and in the healing process, with action upon the blood vessels via the nitric oxide pathway, and has other known effects in surgical patients. As a result, it is very likely to offer benefits in critical burn and trauma patients - though specific studies in these fields are lacking.[22–24] With regard to the use of omega-3 fatty acids, there is no strong evidence warranting their administration in patients of this kind,[25,26] though their immune modulating effects could justify their use.

Supplementing with selenium and other micronutrients (zinc and copper) appears to be of benefit, though there is no clear consensus regarding the indicated amounts. In any case, the advised doses exceed the standard doses.[27–29] The studies found in the literature mostly involve small patient samples and report that such supplements shorten wound healing time and hospital stay, and reduce the number of nosocomial infections and patient mortality.[30,31]

Of the drugs used in major burn victims, oxandrolone[32] is advised over the long term at a dose of 0.1 mg/12 h via the oral route.[33] Beta-blockers have shown benefits in children[34–36] and could also be useful in adults.

Recommendations

- It is advisable to determine the requirements using indirect calorimetry during the early phases (Level of evidence: low. Grade of recommendation: low).

- It is believed that patients with burns affecting more than 20% of their body surface should receive early nutrition via the oral route, and if this is not possible, via the gastric or postpyloric route (Level of evidence: moderate. Grade of recommendation: high). If the required caloric supply cannot be met, complementary nutrition (parenteral) is advised (Level of evidence: low. Grade of recommendation: low).
- A supply of 1.5—2 g/kg/day of protein is recommended, with over 70% of the non-protein calories in the form of carbohydrates, and limiting lipids to complete the caloric total (Level of evidence: moderate. Grade of recommendation: low).
- It is advisable to use pharmaconutrients such as Gln (0.2–0.5 g/kg/day) (Level of evidence: moderate. Grade of recommendation: high) and arginine (Level of evidence: low. Grade of recommendation: low).
- In trauma and burn victims it is advisable to supplement the diet with selenium, zinc and other micronutrients, and doses higher than those used in medical critical patients are probably indicated (Level of evidence: moderate. Grade of recommendation: low).
- In critical burn victims it is advisable to administer oxandrolone at a dose of 0.1 mg/kg/12 h via the oral route (Level of evidence: moderate. Grade of recommendation: moderate), as well as beta-blockers (Level of evidence: low. Grade of recommendation: low).

Conflicts of interest

The authors declare that they have no conflicts of interest.

Note to supplement

This article forms part of the supplement ''Recommendations for specialized nutritional-metabolic management of the critical patient. Metabolism and Nutrition Working Group of the Spanish Society of Intensive and Critical Care Medicine and Coronary Units (SEMICYUC)'', with the sponsorship of Abbott Nutrition.

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