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RECOMMENDATIONS FOR SPECIALIZED NUTRITIONAL-METABOLIC TREATMENT OF THE CRITICAL PATIENT

Recommendations for specialized nutritional-metabolic treatment of the critical patient: Heart disease. 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: patologia cardìaca. Grupo de Trabajo de Metabolismo y Nutrición de la Sociedad Española de Medicina Intensiva, Crítica y Unidades Coronarias (SEMICYUC)

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Introduction

Cardiological patients can present two types of malnutrition: cardiac cachexia, defined as the loss of 6% of usual body weight during the last 6 months in patients with a longer than 6-month history of congestive heart failure; and malnutrition of the critical patient, associated to heart surgery or serious acute cardiological disease.

Patients with chronic heart failure have a prevalence of malnutrition of up to 50%. Scores of <17 on the Mini Nutritional Assessment (MNA) scale, or the presence of cardiac cachexia, which affects 12–5% of these patients, constitute independent predictors of mortality.

Questions

1 **Do the energy and protein requirements of these patients differ from those of the rest of critical patients?**

Although there are no major differences in the caloric-protein requirements with respect to the rest of critical

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patients, some aspects need to be taken into account. Indirect calorimetry is the reference method for determining energy expenditure in the critically ill, but this technique cannot be used in patients subjected to extracorporeal membrane oxygenation (ECMO) as support under conditions of heart failure. Options such as the Mifflin-St. Jeor or Penn State 2003 formulas remain useful for energy calculation in intubated patients.[1] A more simple and useful approach is the habitual administration of 20—30 kcal/kg ideal weight/day, taking into account that in patients with cardiac cachexia and a body mass index (BMI) < 18 kg/m^2, the calculation must be made based on current body weight, in order to avoid possible refeeding syndrome.

With regard to the protein requirements, the recommendation is to provide 1.2–1.5 g/kg/day.[2]

The current tendency in critical patients - including cardiological patients - is to supply a hypocaloric (<20 kcal/kg/day) and moderately hyperproteic diet (1.21.5 g/kg/day) during the first week, followed by coverage of the usual requirements (25 kcal/kg/day and 1.5—2 g de proteins/kg/day).

In the cardiological critical patient, volume restriction (1.5–2 liters/day) and a low-sodium diet are recommended.[3] The use of normo- or hypercaloric and hyperproteic diets with a high caloric density allows administration of the caloric-protein objectives in each moment to be supplied in smaller volumes.

2 What is the most widely recommended administration route in these patients?

Oral feeding is the ideal option, with the provision of nutritional supplements if intake proves scarce. When oral feeding is not possible, enteral nutrition (EN) is the alternative of choice, provided the patient digestive tract is functional. Early EN should be attempted.

Altered intestinal function may make it necessary to start nutritional management with parenteral nutrition (PN). Patients with cardiogenic shock subjected to mechanical ventilation (MV) and any type of extracorporeal support often suffer intercurrent complications, and are therefore individuals at high nutritional risk. Enteral nutrition should be introduced in the first 24—48 hours after hemodynamic stabilization of the patients, complementing with PN in the event of intolerance to EN.[4,5] If the patient does not tolerate full EN dosing, maintaining a certain enteral support (trophic doses) is of benefit in such cases.

3 Is early nutritional management with enteral nutrition indicated in patients with low cardiac output and in patients subjected to extracorporeal oxygenation and ventricular assist measures?

When cardiac function is greatly impaired and intraaortic balloon counterpulsation, ECMO or external ventricular assist measures are used, EN should not be started while the patient continues to present hemodynamic instability, due to the risk of intestinal ischemia.[4]

Once hemodynamic stability has been achieved, EN can be introduced within 24—48 hours after the start of mechanical assist, with gradual increases in the diet between 48—72 hours after starting administration. As in the rest of critical patients, nutritional management should be complemented with PN if 60% of the nutritional objective or target is not reached within four days after introducing EN. The literature indicates that patients subjected to extracorporeal oxygenation and ventricular assist measures are able to reach 60–70% of the scheduled caloric-protein objectives.[6,7]

4 What is the best formula for the nutritional management of cardiological critical patients? Do diets enriched withω-3 fatty acids and other pharmaconutrients play a role?

The most advisable formula would be a hyperproteic and hypercaloric diet with or without fiber. Hyperproteic formulas with a concentrated energy supply are recommended.

Glutamine (Gln), through conversion to glutamate, is the main energy source for myocytes. Low Gln levels have been observed in the postoperative period of heart surgery.[8] Different experimental studies have found the administration of Gln after myocardial ischemia to result in faster myocardial recovery, with the improvement of cardiac output and the ATP/ADP ratio.[9]

Arginine (Arg), as a precursor of nitric oxide (NO), intervenes in the regulation of cardiovascular function. Arginine restores NO synthesis, reduces the production of free radicals, and lessens leukocyte adherence to the endothelium.[10] Intravenous Arg doses of 3—5 g reduce blood pressure and platelet aggregation.[11]

With regard to ω-3 fatty acids, most of the available studies have been carried out in non-critical patients. These fatty acids exert beneficial effects upon atherogenesis, inflammation, endothelial integrity and cardiac damage, with a decrease in the incidence of malignant arrhythmias.[12] The recommended dosage in the stable cardiological patient is 1 g/day of ω-3 fatty acids (eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]) in the form of fish oil.[12,13]

In relation to oligoelements and antioxidants, it has been shown that selenium deficiency can result in myocardiopathy with focal left ventricular fibrosis,[14] and patients in the postoperative period of heart surgery experience a decrease in blood selenium levels that can increase the risk of organ failure.[15] In ischemic patients with reperfusion mechanisms, the supply of antioxidants (vitamins A, C, E and selenium) limits myocardial damage and can contribute to improve cardiac function.[16]

5 Should cardiac transplant patients receive specific nutrition in terms of quantity and quality or as regards the administration route used?

Candidates for heart transplantation often present cardiac cachexia. The recording of a percentage of ideal body weight < 80%, albumin < 3.5 mg/dl and an MNA score of < 17 points affords prognostic information referred to postoperative morbidity-mortality, the evolution of the graft over time, and hospital stay.[17]

Optimization of the patient nutritional condition before heart transplantation seeks to improve postoperative recovery and organ function - though confirming data from the literature are lacking - as well as post-transplantation mortality. The nutritional considerations prior to transplantation have been extrapolated from major abdominal surgery.

The course is usually favorable after heart transplantation, and the patient shows good tolerance of early oral feeding, within the first 24 h after surgery. However, when the clinical course proves torpid, EN is the option of choice, as in the rest of critical patients. In the immediate period after transplantation, the nutritional recommendations referred to patients receiving other solid organ grafts apply.

No studies to date have evaluated the need for specific nutritional support in the postoperative period of heart transplantation or in readmission due to graft failure or severe sepsis. In these cases the treatment should be similar to that prescribed in the rest of critically ill patients.

With regard to the use of pharmaconutrients, experimental studies evidence that the provision of Arg and ω-3 fatty acids improves graft survival,[18,19] though the human studies are few and involve only small patient samples. The available scientific evidence is therefore too limited to allow recommendations to be made.[20]

Recommendations

- The administration of 20—30 kcal/kg current body weight/day and of 1.2–1.5 g/kg/day of proteins is recommended in the cardiological critical patient, in a way similar to any other critical patient, though with volume restriction (1.5—2 l/day), high caloric density and low sodium content. (Level of evidence: expert opinion. Grade of recommendation: low).
- In patients subjected to ECMO or ventricular assist measures, early and safe EN is advised after hemodynamic stabilization, with close monitoring of signs of intolerance. (Level of evidence: low. Grade of recommendation: moderate).
- The administration of Gln and Arg is recommended in patients with myocardial ischemia. (Level of evidence: expert opinion. Grade of recommendation: low).
- The routine provision of ω-3 fatty acids in the cardiological critical patient is not advised. (Level of evidence: low. Grade of recommendation: low).
- Supplementing with vitamin E and selenium may be considered in the cardiological critical patient, due to their possible contribution to improved cardiac function. (Level of evidence: low. Grade of recommendation: low).
- It is not advisable to administer pharmaconutrients (Arg, fatty acids ω-3) to post-cardiac transplant patients receiving nutritional support. (Level of evidence: low. Grade of recommendation: low).

Conflicts of interest

Dr. Jiménez-Jiménez declares that he has no conflicts of interest. Dr. Jordá-Miñana has received payment from the pharmaceutical industry dedicated to nutritional products for participation in educational programs and for participation in scientific events. None of these collaborations imply any conflict affecting the recommendations of the present study, however. Dr. González-Iglesias has received payment from Nestlé for conferences on educational activities, and from Nutricia for participation in scientific congresses.

Note to supplement

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