



Nutritional therapy and immunotherapy with the use of arginine in the perioperative period: an effective and safe option?

Terapia nutricional e imunoterapia com o uso de arginina no perioperatório: uma opção eficaz e segura?

DOI: 10.56238/isevjhv2n2-018

Receiving the originals: 06/04/2023

Acceptance for publication: 27/04/2023

Henrique Bosso

São José do Rio Preto Medical School - (FAMERP)

Ana Laura Rezende Hubaide

LATTES: 7957060961746261

Union of the Great Lakes Colleges - (UNILAGO)

Thaís Bezerra Kol

LATTES: 6281637228801529

Union of the Great Lakes Colleges - (UNILAGO)

Icaro Saraiva Fernandes

LATTES: 7066388881881174

Union of the Great Lakes Colleges - (UNILAGO)

Estela Donda Campos

LATTES: 4376608053038681

Union of the Great Lakes Colleges - (UNILAGO)

Matheus Lot e Silva

LATTES: 5070290036911416

Union of the Great Lakes Colleges - (UNILAGO)

Natalia Kokubo De Marchi

LATTES: 6273885063511993

São José do Rio Preto Medical School - (FAMERP)

Vitor Hugo Bayer Nogueira dos Santos

LATTES: 6227482794742019

São José do Rio Preto Medical School - (FAMERP)

Abel Guilherme Rosa

LATTES: 0565030870616294

São José do Rio Preto Medical School - (FAMERP)

Marcos Vinícius Veanholi

LATTES: 9651746782687145

Union of the Great Lakes Colleges - (UNILAGO)



ABSTRACT

The World Health Organization, in 2008, revealed that 234 million operations were performed worldwide, which is equivalent to one surgery for every 25 people alive in the world¹. Among them, about 5% had complications, and 50% of them were considered¹. What is the perioperative period is defined as the period that involves the surgical act from the previous preparation to recovery and discharge. It starts when the surgeon indicates the operation until the patient returns to his or her normal activities². The perioperative period involves the preoperative, transoperative, and postoperative phases, each with its own specificities³. The importance of the period and its understanding is due to the fact that it aims to improve the lives of patients, acting therapeutically, but it presents risks and potential complications if each step is not well performed.

Key-words: Arginine, Perioperative, Immunotherapy, Amino acids.

1 INTRODUCTION

The World Health Organization, in 2008, revealed that 234 million operations were performed worldwide, which is equivalent to one surgery for every 25 people alive in the world¹. Among them, about 5% had complications, and 50% of them were considered¹. What is the perioperative period is defined as the period that involves the surgical act from the previous preparation to recovery and discharge. It starts when the surgeon indicates the operation until the patient returns to his or her normal activities². The perioperative period involves the preoperative, transoperative, and postoperative phases, each with its own specificities³. The importance of the period and its understanding is due to the fact that it aims to improve the lives of patients, acting therapeutically, but it presents risks and potential complications if each step is not well performed.^{2,3}

For greater safety in the perioperative period, the application of the Accelerated Total Postoperative Recovery (ACERTO) program is extremely important, which allows a significant decrease in hospitalization days, complications and postoperative morbidity in successive clinical studies, without increasing readmission rates^{5,6}. The main pillars of the ACERTO project are: perioperative assessment of nutritional status; shortening of preoperative fasting; early postoperative refeeding; reduction of intravenous fluids; prevention of postoperative nausea and vomiting; avoidance of postoperative opioid use; rational use of drains and probes; encouragement of extra-early ambulation; rational use of antibiotics^{5,6}.

In this context, within the perioperative evaluation of nutritional status, the use of immunonutrition has been emphasized in recent years⁵. It is based on the complement of the protein formula of oral supplements or enteral nutrition, and the nutritional formula containing arginine, omega-3 fatty acids, and nucleotides is the most widely used today.^{2,5}



2 OBJECTIVES

To analyze and describe the main aspects of arginine use during the perioperative period in the last 10 years.

3 METHODS

This is a narrative review, in which the main aspects of arginine during the perioperative period in the last 10 years were analyzed. The study was started with theoretical training using the following databases: PubMed, sciELO and Medline, using as descriptors: "arginine" AND "amino acids" AND "immunotherapy" AND "perioperative" in the last 10 years. Since this is a narrative review, this study is risk-free.

4 RESULTS AND DISCUSSION

Arginine is a semiessential or conditionally essential amino acid, associated mainly in peptide and protein formation, urea cycle function, creatine synthesis, proline synthesis, polyamine synthesis⁷. In addition arginine seems to play other important physiological functions, such as stimulating the secretion of nitric oxide, insulin, glucagon, catecholamines, prolactin and growth hormone, which could help to understand the beneficial effect of arginine supplementation in the diet of patients in perioperative situations^{7,8}. On the other hand, in recent years there has been an increasing attention to arginine in the performance and maintenance of the immune response.^{7,8,9}

In the perioperative context, arginine plays a key role in the endocrine system by acting on pancreatic beta cells, stimulating insulin secretion and increasing tissue sensitivity to insulin; in the immune system, stimulating the thymus to produce T lymphocytes, improving immune response; in healing through growth hormone, whose secretion is stimulated by arginine, accelerates the process of wound healing and reduces the loss of muscle mass by immobilization after surgery and in liver regeneration¹⁰.

Arginine has shown the greatest benefit when supplementation is started preoperatively. In well-nourished patients, preoperative supplementation alone may be adequate¹³. On the other hand, malnourished patients should receive supplementation throughout the perioperative state¹³. In elective surgeries, it is usually started seven to fourteen days before surgery, in the patient candidate to medium/large surgeries and in patients with severe nutritional risk such as weight loss >10% in 6 months; BMI<18.5 kg/m²; subjective global assessment and/or serum albumin < 3 mg/dL¹⁴. Also, patients undergoing cancer surgeries, even in the absence of malnutrition, arginine should also be maintained postoperatively for a period of about 5 days¹⁴.



In addition to arginine, other components also have an important role in nutritional immunotherapy, and most studies used nutritional formula containing arginine, omega-3 fatty acids and nucleotides⁶. This interaction of immunonutrients has been shown to favorably modulate the inflammatory response, enhance the immune response, and promote healing^{6, 11}. Although there are studies that have not demonstrated differences in postoperative outcomes, in most of them the use of diet with immunonutrients was related to the reduction of complications, especially infectious and length of hospital stay^{6, 11, 12}.

5 CONCLUSION

Arginine is a semi-essential amino acid, with importance in several body systems, among them the immune and endocrine systems, which are directly related to the perioperative period in all its three phases. Major and high-risk surgeries are associated with high morbidity and mortality, in part due to a postoperative state of arginine deficiency that leads to immunosuppression and increased infectious morbidity. Besides arginine, other components can also be added to immunotherapy, among which the most cited are glutamine, nucleic acids, and omega-3. Furthermore, most of the articles found relate the use of arginine in immunotherapy for oncologic patients and patients submitted to oncologic surgeries; however, other studies have been showing its importance and effectiveness in the non-oncologic perioperative period.



REFERENCES

Ferraz EM. Safe surgery: a requirement of the 21st century. *Revista do Colégio Brasileiro de Cirurgiões*. 2009;36:281-2.

Larissa Mesquita, What is Perioperative, What are its Stages and Treatments. 2023. <https://www.eumedicoresidente.com.br/post/perioperatorio>

Callegaro GD, Baggio MA, Nascimento KC, Erdmann AL. Perioperative care from the surgical client's perspective.

Thaís Silva Vervloet, The application of project ACERTO and the safe surgery protocol in the surgical routine | Colunistas. 2023. <https://www.sanarmed.com/a-aplicacao-do-projeto-acerto-e-do-protocolo-de-cirurgia-segura-na-rotina-cirurgica-colunistas>

DE-AGUILAR-NASCIMENTO JE, SALOMÃO AB, CAPOROSSI C, DOCK-NASCIMENTO DB, EDER PORTARI-FILHO PE, CAMPOS AC, IMBELLONI LE, SILVA-JR JO, WAITZBERG DL, CORREIA MI. Projeto ACERTO-15 years changing perioperative care in Brazil. *Revista do Colégio Brasileiro de Cirurgiões*. 2021 Jan 20;48.

de-Aguilar-Nascimento JE, Salomão AB, Waitzberg DL, Dock-Nascimento DB, Correa MI, Campos AC, Corsi PR, Portari PE, Caporossi C. ACERTO guideline of perioperative nutritional interventions in elective general surgery. *Revista do Colégio Brasileiro de Cirurgiões*. 2017 Nov;44:633-48.

Martínez-Augustin O, DE MEDINA FS. Arginine, nitric oxide and endothelial function. *Ars Pharmaceutica (Internet)*. 2004 Sep 20;45(4):303-17.

Biochemistry V. Molecular Biology. Degenerative diseases (master) Afternoon.

Abbas AK, Lichtman AH, Pillai S. Basic immunology e-book: functions and disorders of the immune system. Elsevier Health Sciences; 2019 Jan 25

Juliana Pires. Arginine. 2022. <https://www.infoescola.com/bioquimica/arginina/>

Hamza N, Darwish A, O'Reilly DA, Denton J, Sheen AJ, Chang D, et al. Perioperative enteral immunonutrition modulates systemic and mucosal immunity and the inflammatory response in patients with periampullary cancer scheduled for pancreaticoduodenectomy: a randomized clinical trial. *Pancreas*. 2015;44(1):41-52.

Zhang Y, Gu Y, Guo T, Li Y, Cai H. Perioperative immunonutrition for gastrointestinal cancer: a systematic review of randomized controlled trials. *Surg Oncol*. 2012;21(2):e87-95.

Mizock, B.A. and Sriram, K., 2011. Perioperative immunonutrition. *Expert Review of Clinical Immunology*, 7(1), pp.1-3.

Correia MI, Tavares GM. *Terapia Nutricional no Perioperatório*.