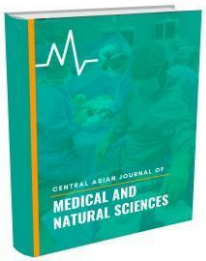

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Article

Application of Specialized Amino Acid Solutions in Intensive Care Therapy of Sepsis

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Abstract: Sepsis remains one of the leading causes of mortality in intensive care units. Metabolic disorders, protein catabolism, and deficiency of certain amino acids worsen the course of the disease. In recent years, the role of specialized amino acid solutions aimed at correcting metabolic disturbances and modulating the immune response has been actively studied. The most important amino acids are glutamine, arginine, cysteine, ornithine, and taurine, which have pronounced antioxidant, immunomodulatory, and endothelioprotective properties. This review summarizes current data on the use of amino acid solutions in intensive care therapy of sepsis, their impact on outcomes, and perspectives for further use.

Keywords: Sepsis, Intensive Care, Amino Acids, Glutamine, Arginine, Parenteral Nutrition

1. Introduction

Sepsis is a systemic inflammatory response of the body to infection, accompanied by severe organ dysfunction and high mortality, reaching 25–50%.

Despite advances in antibacterial therapy and organ support methods, mortality remains high [1], [2], [3]. One of the key directions in the therapy of sepsis is nutritional support, which provides the body's energy and plastic needs. Amino acids not only serve as building blocks but also exert significant metabolic and immunomodulatory effects. In this regard, the use of specialized amino acid solutions is considered a promising method for improving treatment outcomes [4], [5].

Aim of the Study

To study current data on the use of specialized amino acid solutions in intensive care therapy of sepsis, their clinical effectiveness, and perspectives for further use [6], [7].

2. Materials and Methods

This work analyzed modern literature sources and clinical studies dedicated to the use of amino acid solutions in patients with sepsis. Data on the most significant amino acids — glutamine, arginine, cysteine, ornithine, and taurine — were considered. Their impact on the course of sepsis, infectious complications, duration of ICU stay, and mortality was evaluated.

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3. Results

The analysis of data showed that in sepsis there is a pronounced deficiency of several amino acids, worsening the course of the disease.

Mechanism of Action of Specialized Amino Acids in Sepsis

a. Glutamine – main substrate for enterocytes and immune cells; supplementation reduces infectious complications and hospital stay.
b. Arginine – regulates microcirculation, stimulates proliferation of T-lymphocytes, and improves immune response.
c. Cysteine – precursor of glutathione, reduces oxidative stress.
d. Ornithine and Taurine – participate in ammonia detoxification, stabilize cell membranes, and reduce inflammation [8], [9].“The analysis of data showed that in sepsis there is a pronounced deficiency of several amino acids, worsening the course of the disease. The most clinically significant among them are glutamine, arginine, cysteine, ornithine, and taurine, each exerting distinct pathogenetic effects, see Table 1.”

Table 1. Main amino acids and their role in sepsis.

Amino Acid	Main Effects in Sepsis	Clinical Significance
Glutamine	Substrate for enterocytes and immune cells, supports intestinal barrier function	Reduction of infectious complications, shorter ICU stay
Arginine	NO synthesis, improves microcirculation, stimulates T-lymphocytes	Improved immune response, faster organ recovery
Cysteine	Glutathione precursor, antioxidant	Reduction of oxidative stress, protection of cell membranes
Ornithine	Ammonia detoxification, energy metabolism	Reduction of metabolic load, support of liver function
Taurine	Membrane-stabilizing and anti-inflammatory effects	Reduction of inflammation, endothelial protection

4. Discussion

The data obtained confirm that specialized amino acid solutions exert a pronounced pathogenetic effect in sepsis [10], [11], [12]. Their use not only replenishes plastic needs but also provides immunomodulatory, antioxidant, and endothelioprotective effects. It is especially important to note that sepsis is accompanied by severe hypercatabolism, making amino acids critically necessary for maintaining metabolic homeostasis [13], [14], 15]. The practical use of these solutions is advisable in severe sepsis, septic shock, multiple organ failure, and marked negative nitrogen balance.

5. Conclusion

The application of specialized amino acid solutions in the intensive care therapy of sepsis represents a pathogenetically justified and clinically relevant approach. Analysis of the literature and clinical studies demonstrates that glutamine, arginine, cysteine, ornithine, and taurine are not only structural components of protein metabolism but also exert significant regulatory functions. Their supplementation improves immune competence, reduces oxidative stress, stabilizes the endothelium, and enhances nitrogen balance, which are critical factors in the hypercatabolic state of sepsis.

In practical terms, the use of amino acid solutions contributes to the reduction of infectious complications, improvement of organ function, shortening of intensive care unit stay, and, in many cases, increased survival. These findings confirm that nutritional

support should not be regarded as a secondary adjunct but as an integral component of sepsis therapy with direct impact on outcomes.

However, despite encouraging results, several questions remain open regarding the optimal composition, dosage, and timing of amino acid supplementation in different patient populations. Large-scale multicenter clinical trials are needed to establish standardized protocols and to evaluate long-term effects on recovery and quality of life.

Overall, the evidence indicates that targeted administration of amino acid solutions offers not only metabolic replenishment but also immunomodulatory and protective effects, making it a promising strategy in the multimodal management of sepsis.

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