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RESEARCH ARTICLE

DYNAMICS OF INFLAMMATORY AND ORGANIC CHANGES IN PATIENTS WITH SEPSIS UNDER PARENTERAL NUTRITION WITH SPECIALIZED AMINO ACIDS

Muralimova Ranogul
Senior teacher - Department of Anaesthesiology and Reanimatology, Tashkent Medical Academy, Tashkent, Uzbekistan

Islomjonova Asmo
Student - Tashkent Medical Academy, Tashkent, Uzbekistan

Abstract: The objective of the study is to assess the dynamics of inflammatory and organ indicators in patients with sepsis using specialized parenteral nutrition including amino acids. The analysis was conducted based on levels of inflammatory markers (C-reactive protein, fibrinogen, ESR), organ dysfunction (APACHE II and SOFA scores), and treatment effectiveness. Results indicate that the inclusion of specialized amino acids contributes to an earlier reduction in inflammation markers and severity of the condition.

Key words: Sepsis, parenteral nutrition, amino acids, C-reactive protein, organ failure, APACHE II, SOFA.

INTRODUCTION

Sepsis remains one of the most significant challenges in modern medicine, characterized by high mortality rates exceeding 30% in severe cases. The primary goals of treatment are to address organ failure, reduce systemic inflammation, and maintain metabolic balance in patients.

One modern approach involves the use of specialized parenteral nutrition containing amino acids. Specifically, glutamine and arginine, as key pharmaconutrients, support immune system function, regulate the inflammatory response, and enhance protein synthesis. This study examines the impact of specialized nutrition on inflammatory and organ indicators in sepsis patients.

METHODS

The study was conducted in an intensive care unit from 2022 to 2024. A total of 92 patients were included, divided into two groups: Group A, consisting of 46 patients receiving standard parenteral nutrition with the addition of specialized amino acids (glutamine and arginine), and Group B, consisting of 46 patients receiving standard parenteral nutrition. Inclusion criteria: ages 18 to 65, severe sepsis or septic shock. Patients with terminal-stage organ failure and contraindications to nutritional support were excluded.

The dynamics of inflammatory markers (C-reactive protein, fibrinogen, ESR), organ dysfunction (APACHE II, SOFA scores), and metabolic parameters were assessed. Statistical analysis was performed using SPSS v.25, with a significance level of $p<0.05$.

RESULTS

1. Dynamics of Inflammatory Markers:

The level of C-reactive protein (CRP), indicating the intensity of the inflammatory response, was significantly reduced in

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Group A. On day 1, CRP levels in Group A were 122.2 ± 14.6 mg/L, compared to 127.5 ± 25.8 mg/L in Group B. By day 7, CRP in Group A decreased to 89.95 ± 19.2 mg/L, while in Group B, this reduction was observed only by day 10, at 78.72 ± 21.2 mg/L.

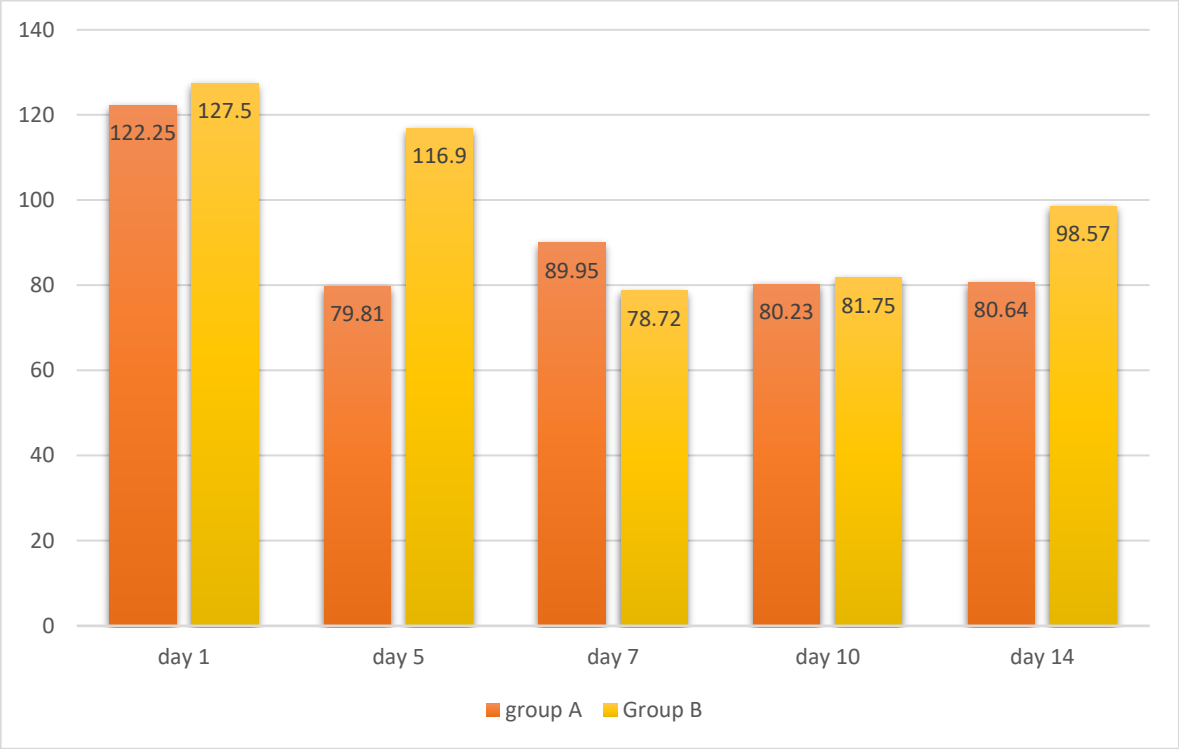

Figure 1. Dynamics of C-reactive protein levels in patients from groups A and B

In both groups, there was a general trend toward reduced inflammatory markers such as leukocytosis, neutrophilic left shift, leukocyte intoxication index, and erythrocyte sedimentation rate (ESR). However, in patients receiving specialized amino acids, reductions in neutrophilic leukocytes occurred significantly faster, indicating a more pronounced positive trend in inflammation resolution.

Fibrinogen, a marker of coagulation and inflammation, decreased more actively in Group A. On day 10, fibrinogen levels were 4.08 ± 0.56 g/L in Group A compared to 5.21 ± 0.49 g/L in Group B (p=0.04).

Indicator (Normal)	Group A					Group B				
	Days of Observation									
	1	5	7	10	14	1	5	7	10	14
C-reactive protein (up to 5 mg/L)	122,25 ±14,64	79,81 ±16,95	89,95 ±19,2	80,23 ±19,9	80,64 ±23,1	127,5 ±25,8	116,9 ±51,2	78,72 ±21,2	81,75 ±60,7	98,57 ±50,3
Fibrinogen (2-4 g/L)	5,34 ±0,34	5,33 ±0,28	5,03 ±0,42	4,08 ±0,56*	4,71 ±0,05	5,2 ±0,38	5,25 ±0,42	5,09 ±0,43	5,21 ±0,49	4,49 ±0,58

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ESR (M: 2-10 mm/h; F: 2-15 mm/h)	4 7,55 ±3,36	4 7,30 ±2,87	4 6,42 ±2,90	4 5,21 ±2,76	4 4,5 ±3,36	46, 26 ±3,6	46, 35 ±4,17	4 5,06 ±4,34	4,81 ±4, 01	45 ,06 ±2,56
Leukocytes (4-9\u00d710\u2079/L)	1 1,45 ±1,18	1 0,44 ±0,88	1 0,33 ±1,04	9 ,66 ± 0,98	9 ,98 ±0,59	11, 25 ±0,93	10, 4 ±0,55	1 0,45 ±0,51	,96 ±0, 99	9, 21 ± 0,87
Neutrophils (1-6%)	1 5,71 ±1,42	1 3,08 ±0,92	1 3,09 ±0,71	1 1,97 ±0,01*	1 2,04 ±1,03	15, 38 ±1,23	13, 17 ±1,37	1 2,03 ±1,26	2,62 ±1, 19	10 ,74 ±1,22**
LII (up to 1.5)	4 ,56 ±1,82	2 ,68 ±0,67	2 ,0 ±0,35	1 ,9 ±0,32	1 ,86 ±0,45	3,1 3 ±0,82	2,7 5 ±0,27	1 ,88 ±0,39	,27 ±0, 51	2, 03 ±
Serum Iron (11.6-30.4 \u00b5mol/L)	3 ,74 ±0,46	3 ,54 ±1,08	3 ,97 ±1,13	7 ,82 ±2,42	8 ,15 ±0,65*	3,8 8 ±0,91	2,4 5 ±0,35	2 ,85 ±0,95	,1 ±0, 84	7, 3 ±0,92

(Table 1.1 reflects the dynamics of key inflammatory markers in Groups A and B over 14 days of observation.)

2. Organ Dysfunction:

During treatment, Group A exhibited a clear trend toward reductions in both overall severity and the extent of multiple organ dysfunctions. This indicates a faster and more pronounced improvement in clinical conditions for patients receiving specialized amino acids. In Group B, while there were no statistically significant differences, the dynamics of improvement were less evident.

By day 7 and 14, there was a slight but consistent decrease in total scores on the APACHE II and SOFA scales in Group B, reflecting some improvement, albeit without significant differences from baseline scores.

- APACHE II: The average score in Group A decreased from 31.4 ± 0.69 to 18.4 ± 0.54 by day 14. In Group B, the reduction was less pronounced, from 31.55 ± 0.67 to 20.12 ± 0.62.

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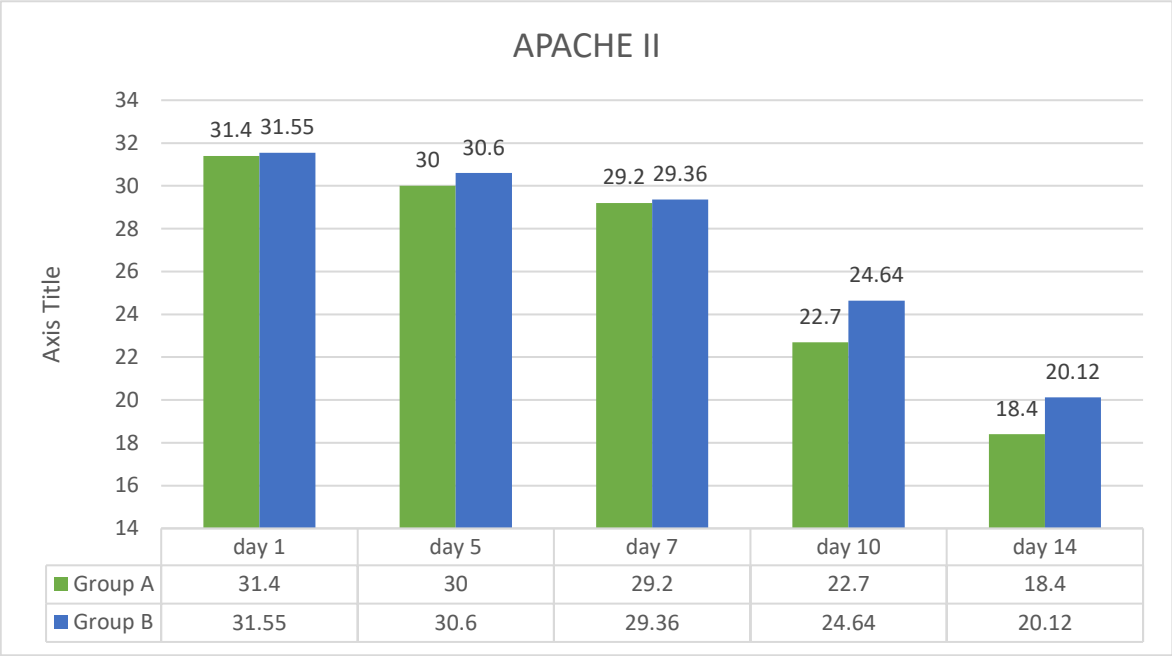
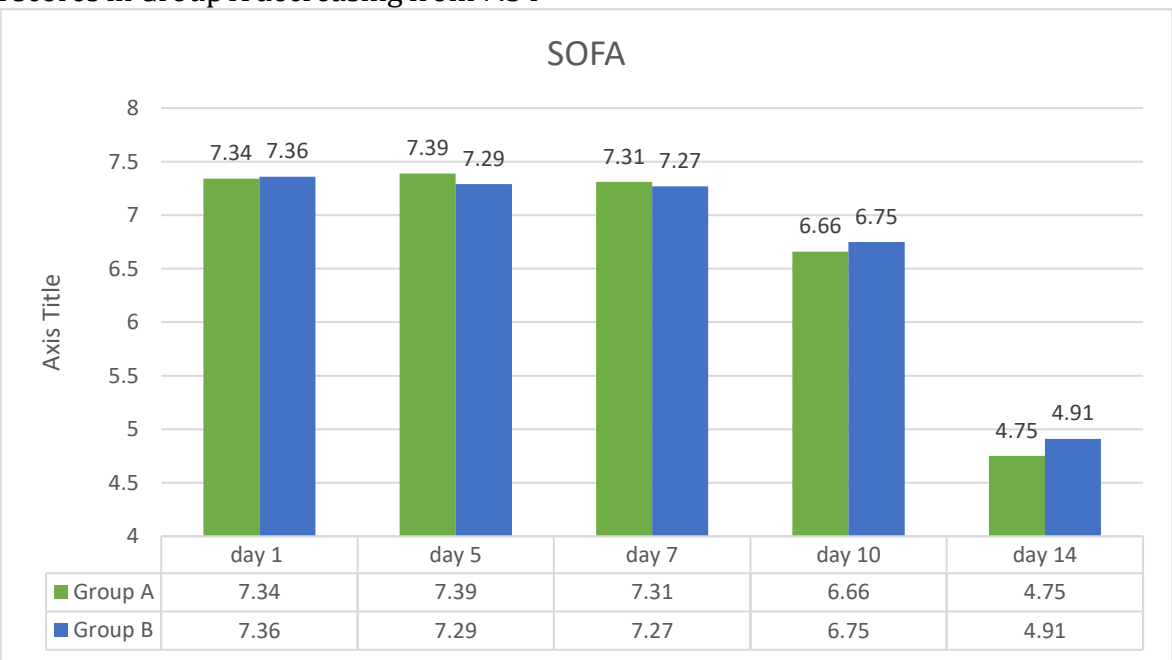


- SOFA: A similar trend was observed, with scores in Group A decreasing from 7.34 ± 2.2 to 4.75 ± 1.6, compared to 7.36 ± 2.5 to 4.91 ± 1.8 in Group B.



2.1 Dynamics of Organ Dysfunction in Groups A and B:

2.1.1 Respiratory Failure:

Upon enrollment, 22% of patients in Group A and 20.4% in Group B required mechanical ventilation. In Group B, two additional patients required respiratory support due to worsening respiratory failure. The average duration of mechanical ventilation was one day shorter in Group A (10.88 ± 9.17 days) compared to Group B (11.83 ± 8.66 days).

2.1.2 Acute Cardiovascular Failure:

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Nutritional support was contraindicated for patients requiring high doses of cardiotonic drugs to stabilize hemodynamics. These patients were excluded from the study.

Clinical Outcomes:

The average length of ICU stay was 12.3 ± 3.8 days in Group A and 14.7 ± 4.2 days in Group B (p=0.05). Mortality in Group A was 14%, 5% lower than in Group B.

DISCUSSION

The results confirm that the inclusion of specialized amino acids in parenteral nutrition facilitates an earlier reduction in inflammatory markers and improvement in organ dysfunction indicators. This aligns with existing literature highlighting glutamine and arginine as critical nutrients for modulating the inflammatory response in sepsis.

CONCLUSION

Adding specialized amino acids to parenteral nutrition for sepsis patients contributes to earlier reductions in inflammation, improved organ indicators, and shorter hospital stays.

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