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NUTRITIONAL SUPPORT STRATEGIES IN TRAUMATIC BRAIN INJURY AND THEIR IMPACT ON THE RECOVERY PROCESS

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Abstract: In patients with traumatic brain injury (TBI), nutritional support plays a crucial role in reducing catabolic processes and accelerating recovery. This study evaluated the effectiveness of enteral and parenteral nutrition methods in patients with traumatic brain injury.

Introduction

Traumatic brain injury (TBI) remains one of the most severe and complex problems in modern critical care and emergency medicine. It is a leading cause of mortality and long-term disability, particularly among patients of working age, and places a significant burden on healthcare systems worldwide. The clinical course of TBI is often complicated by profound metabolic disturbances, including hypermetabolism and increased protein catabolism, which substantially elevate the body's nutritional requirements. As a result, patients with traumatic brain injury are highly susceptible to the rapid development of nutritional deficiencies during the acute and subacute phases of treatment.

Insufficient nutritional intake in patients with TBI negatively affects immune function, increases susceptibility to infectious complications, and delays tissue repair and neurological recovery. These metabolic changes can lead to prolonged intensive care unit stays, higher rates of complications, and poorer functional outcomes. Therefore, ensuring adequate nutritional support is a critical component of comprehensive intensive care management for patients with traumatic brain injury.

The selection of an appropriate nutritional support strategy plays a key role in maintaining metabolic stability, preserving lean body mass, and supporting cerebral recovery processes. Enteral and parenteral nutrition are the two main methods used in clinical practice, each with specific indications, advantages, and limitations. Enteral nutrition supports gastrointestinal integrity and physiological digestion, while parenteral nutrition is often required in cases where enteral feeding is contraindicated or not tolerated.

Given the importance of early and adequate nutritional intervention, evaluating the effectiveness of different nutritional support methods in patients with traumatic brain injury is essential. A rational and individualized approach to nutritional therapy can contribute to reducing complications, improving neurological outcomes, and accelerating the overall recovery process in this patient population.

Materials and Methods

The study was conducted in the neuro–intensive care unit of the Namangan Regional Branch of the Republican Scientific Center of Emergency Medical Care. A total of 40 patients diagnosed with traumatic brain injury were enrolled in the study. All patients required intensive care treatment and nutritional support during the acute phase of injury. The participants were divided into two comparable groups according to the method of nutritional support provided. The first group consisted of 20 patients who received enteral nutrition, while the second group included 20 patients who were administered parenteral nutrition.

Nutritional support in both groups was initiated according to standard intensive care protocols, taking into account the clinical condition of the patients and the feasibility of gastrointestinal tract use. Enteral nutrition was provided through the gastrointestinal route in patients with preserved intestinal function, whereas parenteral nutrition was used in cases where enteral feeding was contraindicated or

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not tolerated. The duration and volume of nutritional support were adjusted individually based on the patient's metabolic needs and clinical response.

The effectiveness of nutritional support was evaluated using a combination of laboratory and clinical indicators. Blood biochemical parameters, including serum albumin, glucose levels, and C-reactive protein, were measured to assess nutritional status, metabolic response, and inflammatory activity. Gastrointestinal function was monitored through the assessment of intestinal motility. The incidence of infectious complications was recorded throughout the observation period. Neurological status and recovery dynamics were evaluated using the Glasgow Coma Scale, which was assessed at baseline and during follow-up. The collected data allowed for a comparative analysis of the clinical and metabolic outcomes associated with enteral and parenteral nutrition in patients with traumatic brain injury.

Results

The analysis of clinical and laboratory data demonstrated notable differences between patients receiving enteral nutrition and those receiving parenteral nutrition. Patients in the enteral nutrition group showed more favorable indicators of nutritional status and recovery dynamics throughout the observation period. In particular, enteral nutrition was associated with more effective nutrient absorption, as evidenced by significantly higher serum albumin levels, which reached 38.2 ± 2.5 g/L. This finding indicates better preservation of protein balance and reduced severity of catabolic processes in patients who received nutritional support via the gastrointestinal tract.

In contrast, patients in the parenteral nutrition group exhibited less favorable outcomes in terms of infectious complications. The incidence of infections was higher in this group, occurring in 40% of patients, compared with 25% in the enteral nutrition group. This difference suggests that parenteral nutrition may be associated with an increased risk of infection during intensive care treatment, potentially due to factors related to invasive vascular access and impaired immune response.

Assessment of neurological recovery using the Glasgow Coma Scale revealed more rapid and pronounced improvement in patients receiving enteral nutrition. The mean GCS score in the enteral nutrition group reached 12.5 ± 1.8 points, whereas patients in the parenteral nutrition group achieved a lower average score of 10.2 ± 2.1 points. These results indicate faster restoration of consciousness and neurological function in patients supported with enteral feeding.

Overall, the collected data demonstrate that enteral nutrition is associated with improved metabolic parameters, lower frequency of infectious complications, and more favorable neurological recovery when compared to parenteral nutrition in patients with traumatic brain injury. These findings emphasize the clinical benefits of enteral nutritional support in the intensive care management of this patient population.

Conclusion

The findings of this study confirm the critical importance of adequate nutritional support in the management of patients with traumatic brain injury. The comparative analysis of enteral and parenteral nutrition demonstrated that the method of nutritional delivery significantly influences metabolic stability, incidence of infectious complications, and neurological recovery during intensive care treatment. Patients who received enteral nutrition exhibited more favorable biochemical indicators, particularly higher serum albumin levels, reflecting improved protein balance and reduced severity of catabolic processes. These metabolic advantages were accompanied by a lower frequency of infectious complications, highlighting the protective role of gastrointestinal tract utilization and the preservation of physiological immune mechanisms.

In contrast, parenteral nutrition, although necessary in certain clinical situations, was associated with a higher rate of infectious complications, which may negatively affect recovery dynamics in patients with traumatic brain injury. The assessment of neurological outcomes using the Glasgow Coma Scale further demonstrated that enteral nutrition contributes to faster and more pronounced neurological recovery, indicating its positive influence on cerebral function and overall clinical progress.

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The results underscore that enteral nutrition should be considered the preferred strategy for nutritional support in patients with traumatic brain injury whenever gastrointestinal function is preserved. At the same time, the study emphasizes that parenteral nutrition remains an important alternative in severe cases where enteral feeding is not feasible. The necessity of an individualized approach to nutritional therapy is therefore evident, taking into account the patient's clinical condition, metabolic needs, and tolerance to feeding methods.

Overall, the study supports the integration of enteral nutrition as a key component of comprehensive intensive care management in traumatic brain injury, contributing to improved clinical outcomes and accelerated recovery processes .

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