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The Impact of Early Enteral Nutritional Support on the Rehabilitation of Stroke Patients

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Abstract:

This study aims to investigate the impact of early enteral nutritional support on the recovery of stroke patients. Stroke patients frequently experience dysphagia due to bulbar palsy or impaired consciousness, leading to severe nutritional deficiency and exacerbating clinical deterioration. Early enteral nutritional support constitutes a therapeutic approach wherein nutrients are delivered via nasogastric tubes, nasojejunal tubes, or percutaneous endoscopic gastrostomy within 24-48 hours of hospital admission, provided gastrointestinal function permits. This study seeks to elucidate the profound impact of early enteral nutritional support as an active clinical intervention on the rehabilitation process of stroke patients. This approach delivers balanced nutrients directly to the gastrointestinal tract, aiming to rapidly correct negative nitrogen balance and provide the material foundation for tissue repair and immune function. Practice demonstrates that early intervention with enteral nutrition significantly improves nutritional indicators such as serum albumin and prealbumin levels, alleviating malnutrition.by maintaining the integrity of the intestinal mucosal barrier and modulating the body's inflammatory response, thereby enhancing immune function and reducing the incidence of infectious complications. Ultimately, it creates an optimal metabolic environment to maximize neurological recovery, effectively shortening the rehabilitation period and improving clinical prognosis. Consequently, integrating early enteral nutritional support into the standard early treatment protocol for the stroke holds crucial clinical significance for enhancing overall patient outcomes.

Keywords: Early Enteral Nutritional; Rehabilitation; Stroke.

1. Introduction

Acute ischemic stroke (AIS), commonly termed „stroke," constitutes a circulatory disorder arising from sudden rupture or occlusion of cerebral blood vessels. AIS frequently results from congenital conditions or lifestyle factors such as irregular dietary habits and sleep patterns, leading to focal or global brain tissue damage [1]. AIS now ranks as the third leading cause of death globally and a primary cause of disability. Current research indicates that the global burden of stroke is predominantly concentrated in low- to middle-income countries. As the world's largest developing nation, China accounts for nearly one-fifth of the global population and bears the highest disease burden worldwide. In recent years, the epidemiological trend of stroke in China has become increasingly severe, with the standard prevalence rate among individuals aged 40 years and above rising from 2.28% in 2013 to 2.64% in 2021 [2]. AIS is currently categorized into two types: ischemic stroke and haemorrhagic stroke. Ischemic stroke constitutes the most prevalent stroke event, accounting for 66.8–80% of cases, with a higher incidence among males than females. Obese individuals and those with diabetes mellitus are classified as high-risk groups [3].Many stroke patients present with underlying medical conditions, making them susceptible to gastrointestinal dysfunction and intolerance to enteral nutrition. This often leads to dysphagia, which impairs normal contraction of the mandibular and hyoid muscles. Consequently, patients experience difficulties with eating and maintaining adequate nutritional status [4].

Post-stroke dysphagia constitutes a neurogenic swallowing disorder and ranks among the most prevalent complications in stroke patients, affecting 20–50% with varying degrees of impairment [5]. A clinical study of 326 stroke patients identified primary manifestations as: choking on liquids (72.0%), slow eating (68.1%), residual food in the mouth (59.5%). Patients with aspiration had a significantly higher incidence of aspiration pneumonia (41.2%) compared to those without dysphagia (3.8%), confirming the link between aspiration and pulmonary infection [6]. The primary mechanism of dysphagia likely involves stroke-induced damage to brain regions controlling swallowing function, disrupting coordination of the swallowing muscles. This impairs the ability to ingest regular food, subsequently affecting patients' overall nutritional status and potentially leading to serious consequences such as aspiration or malnutrition.

While stroke patients are increasingly receiving attention within the field of enteral nutrition, the association between early enteral nutritional support and rehabilitation outcomes in stroke patients (particularly those with dysphagia) remains unsystematically reviewed and analysed. Therefore, this paper collates and analyses relevant research on early enteral nutrition and stroke patient recovery, summarizes the clinical efficacy of early enteral nutritional support for stroke patients (particularly those with dysphagia) in rehabilitation, with the aim of providing theoretical reference for subsequent related studies.

2. Current General Management of Stroke

2.1 Conventional Treatment

For patients with ischemic stroke, antiplatelet agents (aspirin) constitute the primary therapeutic approach, often supplemented with lipid-lowering drugs (statins). Statins have good anti-inflammatory properties; however, long-term studies have revealed their side effects cannot be overlooked. Prolonged statin use may cause irreversible damage to hepatocytes. Additionally, prolonged statin use may cause symptoms such as muscle soreness and fatigue, with severe cases potentially developing rhabdomyolysis [7].

For stroke patients with dysphagia, the primary current treatment is transcranial magnetic stimulation (TMS). This therapy employs low-frequency pulsed magnetic fields to generate microcurrents, primarily targeting cranial nerve functions. It enhances neural excitability in the central nervous system, thereby improving intracranial neural function [7]. However, transcranial magnetic stimulation alone presents certain limitations in rehabilitation therapy. Combining it with early enteral nutritional support can yield synergistic effects.

2.2 Early Enteral Nutritional Support

Early nutritional support typically refers to the provision of nutritional diets via feeding tubes (such as nasogastric or nasojejunal tubes) during the initial phase of disease management (i.e., within 24 to 72 hours of hospital admission or stroke onset). This addressed swallowing difficulties arising from stroke that prevent oral intake, thereby meeting the patient's nutritional requirements. Early intervention aims to prevent severe malnutrition and compromised intestinal barrier function arising from dysphagia or neuroinflammation. Its core principle is delivering balanced nutritional formulas tailored to metabolic requirements, encompassing energy, protein, vitamins, minerals, and dietary fibre. Concurrently, it must account for swallowing impairments, reduced digestive capacity, and heightened stress states. Foundational energy and macronutrients—typically comprising protein, carbohy-

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drates, and fats—constitute the patient's core requirements. Improving prognosis and preventing complications often involves supplying key micronutrients such as dietary fibre, vitamins, and minerals, alongside specialized functional additives. For instance, some formulations incorporate glutamine as an intestinal mucosal protector to mitigate stress-induced intestinal mucosal damage, proving particularly suitable for critically ill stroke patients or those with concurrent infections.

3. Impact of Early Enteral Nutritional Support on Recovery in Stroke Patients (Including Those with Dysphagia)

3.1 Effects on Nutritional Status

Malnutrition is a common complication in stroke patients and a significant prognostic risk factor. This arises because stroke patients readily enter a hypercatabolic state, characterized by markedly increased energy expenditure and accelerated protein breakdown, frequently leading to negative nitrogen balance and hypoalbuminaemia. Early nutritional support via nasogastric or nasojejunal tubes delivers comprehensive, balanced nutrients, effectively interrupting this vicious cycle.

A controlled study involving 66 patients with ischemic stroke and dysphagia compared routine nursing interventions in the control group with enteral nutritional support in the intervention group. Individualized nutritional requirements were assessed and tailored to each patient's condition. Findings revealed a serum albumin (ALB) decrease of 2.20 g/L in the intervention group and prealbumin (PA) decreased by 5.13 g/L, representing significantly smaller declines than in the control group. This demonstrates that enhanced nutrient intake can effectively prevent adverse nutritional outcomes arising from dysphagia following stroke [8].

3.2 Effects on Immune Function

Stroke patients frequently encounter immune dysfunction stemming from malnutrition, elevating infection risks and creating a vicious cycle of „malnutrition-immunosuppression-infection". As the body's largest immune organ, the gut necessitates enteral nutritional support to maintain intestinal mucosal integrity and immune function.

One study employed stratified block randomization to divide 96 stroke patients into two groups: the control group received early parenteral nutrition support, while the study group received early enteral nutrition support via nasogastric tube feeding of enteral nutritional suspension. Results revealed a decrease in total lymphocyte count from 10.25 to 10.02 and immunoglobulin levels from 1.75 to 1.69 ± 0.36, both significantly lower than the control group [9]. Another study involving 86 stroke patients with dysphagia divided participants into two groups based on timing of enteral nutrition support: the observation group received enteral nutrition formula 24 hours post-admission, while the control group received it on the third day. After two weeks, both groups exhibited reduced immunoglobulin and neutrophil levels compared to pre-treatment, with the observation group showing a greater decrease (7.12% lower), further indicating that early intervention better prevents malnutrition caused by dysphagia [9].

Stroke is frequently complicated with malnutrition stemming from dysphagia. Mere nutritional supplementation cannot alleviate conditions arising from compromised immune function. Early enteral nutritional support provides personalized nutritional care, delivering adequate protein, vitamins, and other nutrients. This promotes wound healing, facilitates tissue repair and regeneration, accelerates recovery, enhances immunity during illness, and reduces treatment-related complications and infections.

3.3 Impact on Neurological Function

The core essence of stroke rehabilitation lies in the recovery of neurological function. Patients with severe stroke may develop complications during their illness, such as hemiplegia or aphasia, resulting in neurological impairment. Enteral nutritional support delivered via nasogastric tube meets the body's nutritional requirements, thereby enhancing immunity and resistance.

A study involving 103 severe stroke patients compared conventional care (53 patients) with early enteral nutritional support (50 patients). After three weeks of treatment, efficacy was assessed using the National Institutes of Health Stroke Scale (NIHSS). Results showed the control group's NIHSS score decreased by only 18.03 points, whereas the observation group demonstrated a significant reduction of 21.02 points. Post-intervention, the study group exhibited higher levels of immunoglobulin and serum prealbumin compared to the control group. Thus, the observation group receiving early enteral nutritional support demonstrated significantly superior neurological recovery compared to standard treatment. Combining enteral nutritional support during treatment for severe stroke patients improves nutritional status, promotes neurological rehabilitation, and aids in preventing complications [10].

3.4 Impact on Negative Nitrogen Balance

Post-stroke patients frequently experience reduced food intake due to dysphagia, coupled with increased protein

breakdown, leading to a negative nitrogen balance where „protein consumption exceeds intake“. This triggers muscle mass decline. Early enteral nutrition precisely supplements proteins (e.g., whey protein, casein), promoting nitrogen intake exceeding excretion. This reverses negative nitrogen balance, reduces muscle breakdown, and prevents rehabilitation delays caused by excessive muscle loss. A clinical controlled trial involving 72 stroke patients with dysphagia assigned 36 to a control group receiving conventional semi-liquid diets alongside standard care, while 36 patients in the observation group received enteral nutrition via nasogastric tube. This consisted of (comprising standard Lixun homogenized meals, concentrated whey protein powder, Lixun probiotics, and salts). After four weeks of treatment, the observation group demonstrated a greater reduction in negative nitrogen balance (17.16%) compared to the control group. This indicates that early enteral nutritional support is beneficial for improving the negative nitrogen balance of stroke patients and has a positive effect on their rehabilitation [6].

4. Limitations of Early Enteral Nutritional Support

4.1 Dual Challenges of Dysphagia and Aspiration Risk

Although early enteral nutritional support provides nutrition to stroke patients via nasogastric or nasojejunal tubes, circumventing some swallowing difficulties, the issue of upper oesophageal sphincter dysmotility persists. Even with post-pyloric feeding (e.g., via nasojejunal tubes), the risk of occult aspiration remains. Research indicates aspiration rates post-stroke reach 30–50%, showing significant correlation with pneumonia incidence. Furthermore, feeding tubes themselves may compromise lower oesophageal sphincter function, increasing gastro-oesophageal reflux risk [11].

4.2 Gastrointestinal Dysfunction and Risk of Microbial Translocation

Post-stroke sympathetic hyperactivation induces intestinal ischemia-reperfusion injury, leading to downregulation of tight junction proteins and increased intestinal permeability. Early high-volume feeding may exacerbate gastrointestinal dysfunction, particularly with hypertonic formula administration. Recent clinical studies suggest post-stroke gut microbiota dysbiosis promotes inflammatory cytokine release, while current early enteral nutritional support shows limited evidence of microbiota regulation [12].

5. Conclusion

Extensive clinical research collectively demonstrates that early enteral nutritional support is not merely a fundamental life-sustaining measure during the rehabilitation of stroke patients (particularly those with dysphagia), but rather a critical therapeutic approach spanning acute-phase management and the prevention and treatment of complications. This review clarifies that early enteral nutritional support provides adequate protein, vitamins, and other nutrients, thereby promoting wound healing, facilitating tissue repair and regeneration, accelerating recovery, and enhancing immunity during illness to reduce treatment-related complications and infections.It also improves nutritional status, promotes neurological recovery, and aids in preventing complications. Collectively, these effects demonstrate how early enteral nutritional support creates favourable conditions for the overall rehabilitation of stroke patients. However, clinicians must recognize that numerous areas of early enteral nutritional support require further investigation. For instance, the optimal timing for initiating early enteral nutritional support, the most appropriate protein dosage, and how to develop better individualized specific nutrient regimens require further validation through large-scale, multicentre, high-sample-size randomized controlled trials. Clinically, we anticipate that more high-quality research will continuously refine this management strategy, ultimately enabling every stroke patient to benefit and advancing the overall standard of stroke diagnosis and treatment.

References

[1] Feigin V L, Stark B A, Johnson C O, et al. Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019[J]. The Lancet Neurology, 2021, 20(10): 795-820.

[2] Gao Lingxiao, Cao Yuanyuan, Tian Ruotong, et al. Trends in the Burden of Stroke in China from 1990 to 2021 and an Age-Period-Cohort Model Analysis [J]. Chinese Journal of Evidence-Based Medicine, 2025, 25(07): 761-767.

[3] Powers W J, Rabinstein A A, Ackerson T, et al. Guidelines for the early management of patients with acute ischemic stroke: 2019 update to the 2018 guidelines for the early management of acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association[J]. Stroke, 2019, 50(12): e344-e418.

[4] Lü You, Zhou Xuan. Systematic review of factors influencing social participation among stroke patients [J]. Nursing and Rehabilitation, 2025, 24(08): 20-28.

[5] Zhang Yuzhen, Yu Xiaoming, Xu Haichen, et al. Application of Probiotic Enteral Nutritional Support Combined with

ISSN 2959-409X

Transcranial Magnetic Stimulation in the Rehabilitation of Dysphagia Following Stroke [J]. Chinese Journal of Practical Neurology, 2024, 27(03): 351-355.

[6] MeiYun L,ChiaHao H,ChauPeng L, et al.Respiratory muscle training in stroke patients with respiratory muscle weakness, dysphagia, and dysarthria -a prospective randomized trial.[J]. Medicine,2020,99(10):e19337.

[7] Sun Maling, Zhu Dan, Zeng Xinhua, et al. Investigation into the Effects of Early Enteral Nutrition on Nitrogen Balance, Immune Function and Prognosis in Stroke Patients with Dysphagia [J]. Health Care Research and Practice, 2018, 15(06): 31-35.

[8] Chen Yunyun, Li Aiping, Du Wenjuan. Effects of Early Enteral Nutritional Support on Nutritional Indicators, Neurological Function and Immune Function in Patients with Dysphagia Following Stroke [J]. Contemporary Medical Forum, 2025, 23(09): 165-168.

[9] Yang Yanfang, Li Qian, Tang Lihua. The Effect of Early Enteral Nutritional Support on Neurological Function in Patients with Ischemic Stroke and Dysphagia [J]. Journal of Qilu Nursing, 2022, 28(05): 74-77.

[10] Xi Junnan, Wu Shaohua, Xue Huiyuan, et al. Effects of Enteral Nutrition Therapy on Inflammatory Stress Levels in Patients with Severe Stroke and Factors Influencing Gut Microbiota Dysbiosis [J]. Advances in Modern Biomedical Sciences, 2024, 24(12): 2310-2313+2278.

[11] Xu Yuemei. The Efficacy of Early Enteral Nutritional Support in ICU Stroke Patients [J]. Chinese Community Physician, 2021, 37(32): 77-78+81.

[12] Zhang Jiaoying, Cai Lianzhu, Wang Meigui. Risk factors and countermeasures for occult aspiration in stroke patients with dysphagia [J]. Tibetan Medicine, 2025, 46(01): 67-68.