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Research advances in the application of early enteral nutrition in elderly patients with severe acute pancreatitis†

Review

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Abstract: This article reviews research advances in the application of early enteral nutrition (EEN) in elderly patients with severe acute pancreatitis (SAP). Elderly SAP patients are associated with higher mortality rates due to age-related immune dysfunction, whereas EEN has been demonstrated to improve clinical prognosis, reduce infection and complication rates, and shorten hospital stays. However, ongoing debates exist regarding the optimal timing, route selection, and complication management of EEN. Through a systematic review of the literature, this study synthesizes current evidence on EEN in elderly SAP populations, critically examines unresolved clinical controversies, and proposes future research priorities to inform evidence-based practice.

Keywords: *early enteral nutrition • elderly • intervention timing • nutrition route • review • severe acute pancreatitis*

1. Introduction

Severe acute pancreatitis (SAP), a systemic hypermetabolic disorder caused by dysregulated pancreatic enzyme secretion, triggers accelerated protein catabolism and systemic inflammatory responses. Given the rapid aging of China's population, the incidence of SAP among elderly patients has risen substantially. This condition is characterized by acute onset, rapid progression, and high mortality rates. Elderly individuals with SAP face distinct clinical challenges due to age-related immune dysfunction and frequent comorbidities, establishing this population as a critical target for specialized nutritional support. Epidemiological studies indicate that approximately 30% of SAP patients present with malnutrition at initial diagnosis,[1] a prevalence particularly pronounced in the elderly. Timely nutritional intervention is therefore essential. Robust clinical evidence confirms that enteral nutrition (EN),

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compared with parenteral nutrition, significantly reduces mortality risk, lowers infection and complication rates, shortens hospitalization duration, and demonstrates superior cost-effectiveness.[2–4] Consequently, EN has emerged as a cornerstone therapy for improving outcomes in elderly SAP patients. Nevertheless, persistent controversies surround the optimal timing of initiation, selection of administration routes, and standardized complication management protocols for early EN in this population. This article comprehensively reviews existing evidence on early EN applications in elderly SAP patients, with the objective of informing evidence-based clinical decision-making.

1.1. Definition of EN

EN constitutes a physiologically targeted nutrient delivery system that delivers essential metabolic substrates through the gastrointestinal tract. As a clinically validated therapeutic modality, EN is prioritized for its superior safety profile and clinical feasibility in critical care settings. Delivery modalities encompass both oral intake and tube feeding approaches, including but not limited to nasogastric (NG), nasoduodenal, nasojejunal (NJ), and combined gastrostomy-jejunostomy access devices. Early enteral nutrition (EEN), operationally defined as EN initiation within the critical 48-h window post-hospitalization,[5] represents a time-sensitive intervention to modulate disease pathophysiology.

2. EEN in elderly SAP patients

Traditionally, SAP patients are often treated with fasting to suppress pancreatic exocrine activity. However, prolonged fasting may exacerbate malnutrition and immune function decline,[6] potentially leading to infectious complications such as pancreatic infections and peripancreatic necrosis, which can be life-threatening in severe cases.

The guidelines from the European Society of Clinical Nutrition and Metabolism (ESPEN) emphasize initiating EN early[7] and highlight its clinical benefits. In contrast, the 2022 guidelines from the American Society for Parenteral and Enteral Nutrition (ASPEN) acknowledge that early EN may be more suitable depending on patient circumstances,[8] reflecting a more flexible approach.

The use of EEN for elderly SAP patients is gaining more attention. Studies indicate that EEN can alleviate symptoms, maintain intestinal mucosal integrity, and reduce bacterial translocation, thereby improving survival rates.[9] Hui et al.[10] pointed out that compared with parenteral nutrition, EEN not only supplies nutrition but also improves intestinal barrier function, immune responses, and gut microbiota balance. Yao et al.[11] and Liu et al.[2] reported that EEN lowers the incidence of multiple organ failure and complications, shortens hospital stays, and reduces infections, all of which are vital for optimizing clinical outcomes in elderly SAP patients. However, the optimal timing and administration route of EEN for this group remain controversial.

3. Timing of EEN intervention

In elderly SAP patients, there is no consensus on the optimal timing for initiating EN. Studies vary in their recommended starting points, but most support early initiation to prevent malnutrition and immune dysfunction from prolonged fasting. Research indicates that ultra-early EN is more effective, enabling faster recovery and reducing complications. Mikhailov et al.[12] found that ultra-early EN shortens hospital stays and cuts related costs. Feng et al.[13] discovered that EEN boosts gut antioxidant activity, regulates inflammation, and lowers Multiple Organ Dysfunction Syndrome (MODS) risk in SAP patients. These findings highlight the advantages of ultra-early EN. The 2022 Chinese expert consensus[14] also stresses early EN implementation for elderly SAP patients.

However, debate persists regarding the mortality impact of ultra-early EN. Li et al.[15] demonstrated that EN initiation within 24 h post-admission achieves superior mortality reduction compared with 24–72 h initiation windows. Conversely, Song et al.,[16] through meta-analysis of 10 randomized trials, established that EN commencement within 48 h significantly lowers mortality risk. These findings, however, lack universal consensus. Investigations by Sun et al.,[17] Bakker et al.,[18] and Márta et al.[19] revealed no statistically significant mortality difference between ultra-early (≤24 h) and standard early EN (24–72 h) protocols in SAP cohorts. Collectively, while ultra-early EN demonstrates theoretical pathophysiological advantages, its mortality-reducing efficacy remains unvalidated in pragmatic clinical scenarios, necessitating further multicenter prospective studies.

4. Choice of EN route for early intervention

In addition to the timing of intervention, the choice of nutritional route also affects the prognosis of elderly SAP patients.

Domestic and international studies predominantly investigate tube-feeding modalities, including NG and NJ approaches. Ma et al.[20] demonstrate that NJ tube feeding significantly enhances clinical remission rates, reduces all-cause mortality and complication incidence, and accelerates both inflammatory marker normalization and hospital discharge timelines. Deane et al.[21] corroborate these findings, reporting decreased risks of ICU-acquired pneumonia in SAP cohorts alongside improved nutrient delivery efficiency. Conversely, Singh et al.[22] and Nally et al.[23] establish comparable safety and efficacy profiles for NG tube feeding, highlighting its technical simplicity and potential superiority in mitigating infection-related complications, thereby positing NG tubes as a viable alternative to NJ placement in select clinical scenarios.

Systematic reviews and meta-analyses by Carlin-Ronquillo et al.[24] and Wang et al.[25] demonstrate no significant differences between the 2 feeding methods in reducing mortality, infection rates, and hospital stays. However, Wang et al.[25] also found that nasogastric tube (NGT) nutrition is linked to higher feeding intolerance and multi-organ failure rates compared with nasojejunal tube (NJT) nutrition. Górski et al.[26] and Dutta et al.[27] further highlight that NGT nutrition may more often lead to feeding intolerance issues like diarrhea and pain. Therefore, in clinical decision-making, it is essential to balance procedural convenience with gastrointestinal tolerability. The choice of the appropriate EN route for elderly SAP patients should be based on their individual condition and available medical resources.

Overall, these studies indicate that both NG and NJT nutrition are safe and effective for SAP patients. Yet, they have different application scenarios and risk profiles (Table 1). Clinical decisions should be based on a comprehensive assessment of patient tolerance, medical conditions, and individual needs. More high-quality research is needed to clarify the long-term safety and benefits of different nutrition routes.

5. Related complications of EEN

5.1. Gastrointestinal intolerance

Studies indicate that 38% of SAP patients experience feeding intolerance during EN, a relatively high rate.[28] Elderly SAP patients receiving early EN are particularly prone to symptoms like diarrhea, bloating, nausea, and vomiting. This is mainly due to their reduced gastrointestinal function and digestive absorption capacity, compounded by the systemic inflammatory response and cachexia caused by SAP.[28] Additionally, factors such as high osmolarity, excessive fiber, improper temperature, and rapid infusion rates[29–31] can also lead to gastrointestinal intolerance.

To manage these symptoms, healthcare providers should promptly identify the underlying causes and adjust the nutrition regimen accordingly. Initially, EN should be started at a slow infusion rate, gradually increasing as the patient's tolerance builds.[32] The nutritional solution can be diluted and its temperature adjusted to body temperature (38–40°C).[33] Moreover, solutions with low osmolarity, low fat, low fiber, and easy digestibility are recommended. The composition and ratio of the nutritional solution should be tailored to the patient's condition and tolerance. Close monitoring of the patient's responses, along with regular checks of blood sugar and electrolyte levels, is essential to ensure the effectiveness and safety of nutritional support.

5.2. Aspiration risk

In elderly patients, physiological declines linked to aging raise the risk of EN reflux and aspiration,

Comparison criteria	NGT	NJT
Complexity of placement	Simple, no imaging guidance required	Technically demanding, often requires fluoroscopic or endoscopic guidance
Risk of aspiration	Higher (due to reflux potential)	Significantly reduced (direct delivery to jejunum)
Gastrointestinal tolerance	Higher incidence of nausea, vomiting, or bloating	Better tolerance
Target population	Suitable for stable patients with good gastrointestinal tolerance	Preferred for high-risk patients (e.g., mechanically ventilated, bedridden, or aspiration-prone)
Infection Risk	Lower	Slightly higher (invasive placement increases infection risk)
Cost-Effectiveness	More economical	Higher cost (requires specialized equipment and expertise)
Clinical Priority	Reasonable choice in resource-limited settings	Preferred for elderly SAP patients (requires comprehensive evaluation of patient condition)

Note: NGT, nasogastric tube; NJT, nasojejunal tube; SAP, severe acute pancreatitis.

Table 1. Comparison table of NGT and NJT.

boosting the incidence of aspiration pneumonia.[34] Studies suggest that NGT placement depth may affect aspiration risk.[35] Chen et al.[36] indicate that in critically ill patients needing EN, fluoroscopy-guided deeper NGT placement is safe and effective, reducing aspiration risk. Before placing a tube in elderly SAP patients, a thorough assessment of their condition is necessary to determine the proper insertion depth and minimize aspiration risk.

The 2022 Chinese expert consensus[14] suggests elevating the head of the bed to 30°–45° during enteral feeding to reduce aspiration risk. Clinical guidelines[33] also recommend maintaining this angle during NG feeding, avoiding unnecessary patient movement during feeding, and keeping the patient in a semi-recumbent position for 30 min to 1 h after feeding. The guidelines further suggest placing the NGT tip past the pylorus to effectively prevent aspiration.

5.3. Tube-related complications

Common complications during EN in elderly patients include NGT blockage, displacement, and dislodgment. Elderly patients may experience discomfort from the tube, increasing the risk of accidental displacement or removal.[37] Tube blockage can result from various factors such as lumen stenosis, external pressure, nasal secretions, increased nutrient solution viscosity, drug residues, improper care, delayed gastric emptying, or gastroesophageal reflux.[38] To prevent blockages, regular tube flushing before and after nutrient infusion, when changing formulas, and during infusion is essential. Proper tube fixation is crucial to avoid displacement, kinking, or folding. If blockage occurs, immediate clearance with a syringe of warm water is necessary to restore patency.[39] When selecting an NGT, consider the patient's age, health, and nasal condition to choose an appropriate diameter and reduce complications.

5.4. Metabolic complications

During EN, elderly SAP patients are prone to metabolic complications due to organ dysfunction and metabolic impacts of the disease. Common issues include blood sugar fluctuations causing hyperglycemia or hypoglycemia, electrolyte imbalances such as hyperkalemia or hyponatremia, calcium and phosphorus disorders leading to hypocalcemia, and liver/kidney dysfunction from pancreatitis, shown by increased serum creatinine or transaminases.[40] These not only affect nutrition support effectiveness but may also worsen the patient's condition.

To reduce these risks, personalized EN plans should be developed based on the patient's metabolic state and tolerance. This involves adjusting the composition, concentration, infusion rate, and total volume of the nutrient solution while closely monitoring biochemical indicators. These preventive measures are essential to lower the risk of metabolic complications and ensure the safety and effectiveness of EN.[41]

6. Conclusions

EEN is crucial for treating elderly SAP patients. It boosts immune defense, reduces inflammation, lowers complication risks, and accelerates recovery. However, the clinical evidence on the optimal timing, nutrition route, and complication management of EEN is still insufficient due to several research limitations. First, most clinical trials have small sample sizes and lack subgroup analyses targeting elderly SAP patients. Second, there is a lack of consensus among studies on the definition of "ultra-early" timing (e.g., within 24 h vs. within 48 h), which makes it difficult to compare study results. Third, existing guidelines are primarily based on data from non-elderly populations, and there is an urgent need for evidence-based recommendations specifically for elderly patients.

Although the clinical value of EEN is widely recognized, further verification of its implementation details is required. Based on the available evidence, it is recommended that clinicians individualize the timing and route of EEN initiation according to patients' tolerance, complications, and medical conditions, while closely monitoring feeding intolerance and metabolic complications. As more high-quality studies are conducted in the future, it is expected that more precise guidelines and treatment strategies will be developed to support healthcare professionals in providing personalized and precise medical services for elderly SAP patients.

Conflicts of interest

All contributing authors declare no conflicts of interest.

Ethical approval

Ethical issues are not involved in this paper.

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