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Clinical Considerations in Specialized Nutrition in Critically III Patients

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ABSTRACT

Specialized nutrition support (SNS) is required when oral intake is either limited or not possible for a prolonged period of time. Common indications for SNS include patients in critical care, those with dysphagia, unconscious patients who cannot be fed, severely malnourished patients, and those with intestinal malabsorption. The two forms of SNS are enteral nutrition and parenteral nutrition. Enteral feeding is always preferred whenever possible, but parenteral feeding may be instituted if the patient has a nonfunctional GI tract (e.g., gastroschisis, short bowel syndromes), and/or if enteral feeding is contraindicated. Patients who are on SNS may develop several complications related to feeding tubes or intravenous catheters, as well as additional metabolic complications such as electrolyte imbalances, hyperglycemia, refeeding syndrome, gallstone disease, and nonalcoholic fatty liver disease.

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INTRODUCTION

The decision to administer specialized nutrition support needs to take into consideration three major factors: the patient's preexisting nutritional status, the impact of the disease process on nutritional intake, and the likeli-hood that specialized nutrition support will improve patient outcome or quality of life. Nutritional status can be evaluated with the Subjective Global Assessment, which uses history and physical data (e.g., weight loss and dietary intake before admission, disease severity, comorbid conditions, func-tion of the gastrointestinal tract) to clas-sify patients as well nourished, moderately malnourished, or severely malnourished. This screening tool has been validated in children and adults. Other indicators such as albumin, prealbumin, retinol binding protein, and transferrin lev-els reflect nutritional status but are influ-enced by acute and chronic inflammatory processes. An unintentional weight loss of greater than 10 percent over six months may be a sign of protein-calorie malnutri-tion, and weight loss greater than 20 percent increases the risk of severe protein-calorie malnutrition.[1,2]

Indications

Dysphagia (e.g., post-stroke state, multiple sclerosis, esophageal carcinoma),patients with a low GCS who cannot be fed, difficulty with oral intake in the early postoperative state, severe anorexia (e.g., terminally ill cancer patients, anorexia nervosa), severe malnutrition, critically-ill patients, Intestinal malabsorption. [2,3]

TYPES

First-line: enteral feeding

Advantages

Easier to perform, metabolic complications occur less often,intestinal motility is stimulated, preventing mucosal atrophy and lower risk of blood stream infection. [3]

Enteral feeding

Definition

Administration of nutrients directly into the stomach, duodenum, or jejunum with the help of feeding tubes. [3]

Indications

Acute respiratory failure requiring intensive care,mechanically ventilated patients, comatose patients (e.g., due to severe head injury), impaired swallowing (e.g., neuromuscular disorders like multiple sclerosis, cerebral palsy, stroke), anorexia or wasting syndrome (e.g., from chemotherapy, HIV), impaired gastrointestinal absorption or upper gastrointestinal obstructions (e.g., short bowel syndrome, inborn errors of metabolism, esophageal strictures, esophageal tumor), increased metabolic demands (e.g., sepsis, cystic fibrosis, burns, bronchopulmonary dysplasia). [4]

Contraindications

Mechanical ileus, bowel obstruction, acute abdomen (e.g., severe pancreatitis, peritonitis), upper GI bleeding, intractable vomiting or diarrhea, mucositis, radiation enteritis, severe substrate malabsorption, congenital GI anomalies, high-output fistulas, nonfunctional GI tract (e.g., gastroschisis, short bowel syndromes). [4]

Routes

Short-term: nasogastric tube , nasoduodenal, nasojejunal, orogastric, oroduodenal, or orojejunal. [4]

Long-term (> 2–3 weeks):

Gastrostomy tube: gastric feeding tube inserted endoscopically through a small incision through the abdomen into the stomach (e.g., percutaneous endoscopic gastrostomy, percutaneous radiologic gastrostomy, surgically placed gastrostomy). [4]

Jejunostomy tube: feeding tube inserted through a small incision through the abdomen into the jejunum to bypass the distal small bowel and/or colon (e.g., percutaneous endoscopic jejunostomy, percutaneous radiologic jejunostomy). [4]

Composition of enteral feeding solutions. [4]

Protein supply: amino acids/peptides / high-molecular-weight proteins. [4]

Carbohydrate supply: mono-, oligo- or polysaccharides. [4]

Fat supply: medium or long-chain fatty acids. [4]

Osmolality of enteral feeds: approximately 300 mOsmol/L. [4]

Electrolytes, trace elements, and vitamins are added according to the recommended daily intake. [4]

Complications

Enteral nutrition-associated respiratory failure,a complication of enteral feeding resulting in respiratory failure due to aspiration and increased carbon dioxide production. [4]

Pathophysiology

Aspiration → nosocomial pneumonia (small-volume aspirations) or respiratory failure (large-volume aspirations). [4]

Increased carbon dioxide production associated with nutrition → hypercapnia → respiratory distress and acute respiratory failure (especially in patients with COPD). [4]

Prevention

Correct patient positioning (semirecumbent position, Fowler position, semi-Fowler position).Ensure adequate tube type and placement, use formulations with an adequate carbohydrate:fat ratio to avoid excessive total caloric intake, promote gastric emptying using motility agents (e.g., metoclopramide). [4]

Other complications

Diarrhea, metabolic complications of specialized nutrition support, feeding tube-related, blockage of the feeding tube, nasogastric tube, accidental placement of the tube inside the trachea , injury to or perforation of the stomach wall, gastrostomy or jejunostomy, peristomal infection, high-output fistulas, gastroesophageal reflux. [4]

Parenteral nutrition

Intravenous administration of nutrients that bypasses the gastrointestinal tract, total parenteral nutrition: provision of all nutritional requirements intravenously without using the gastrointestinal tract. [5]

Indications for total parenteral nutrition

Total parenteral nutrition should only be considered in patients without a functioning GI tract or when complete bowel rest is indicated, GI anomalies, severe bowel obstruction (e.g., achalasia, esophageal strictures), short bowel syndrome, internal or external enteric fistulae, severe malabsorption due to chronic inflammatory bowel diseases (e.g., Crohn disease, ulcerative colitis), malignancies associated with severe malnutrition, congenital GI anomalies (e.g., gastroschisis, tracheoesophageal fistula, severe intestinal atresia), necrotizing enterocolitis. [5]

Contraindications

Enteral nutrition is feasible, serum hyperosmolality, severe hyperglycemia, severe electrolyte abnormalities, volume overload. [5]

Routes

Parenteral nutrition is required for < 2 weeks: peripheral venous line, or peripherally inserted central catheter. [5]

Parenteral nutrition is required for > 2 weeks: tunneled central venous catheter or a port.[5]

Regimens

-Continuous parenteral nutrition

Most commonly used, especially in hospital settings, slower infusion rate, higher risk of fatty liver. [5]

-Cyclical parenteral nutrition

TPN is given mostly at night, faster infusion rates. [5]

Disadvantage: higher risk of fluid overload, electrolyte imbalances, and unstable glucose levels. [5]

Composition of parenteral feeding solutions

Protein supply: amino acids. [5]

Carbohydrate supply: mostly glucose. [5]

Fat supply: medium-chain fatty acids in a fat emulsion. [5]

Osmolality of parenteral feeds: 1000–2000 mOsmol/L. [5]

Electrolytes, trace elements, and vitamins are added according to the recommended daily intake. [5]

Complications

Intestinal failure-associated liver disease

Definition

Liver dysfunction caused by the medical and surgical treatments for intestinal failure. [6]

Parenteral nutrition-associated cholestasis (PNAC): intrahepatic cholestasis due to prolonged parenteral nutrition (> 2 weeks). [6]

Epidemiology: common in neonates, especially preterm infants. [6]

Risk factors

Parenteral nutrition: inappropriate use of lipid emulsions, lack of antioxidants, aluminum toxicity, prolonged infusion periods (> 2 weeks), prematurity, small for gestational age, low birth weigh, intestinal malformations (e.g., of the small bowel), necrotizing enterocolitis, early or recurrent sepsis, intestinal surgery (e.g., prolonged maintenance of stomas). [6]

Diagnostics

Medical history: prolonged parental nutrition, intestinal failure, unexplained cholestasis. [6]

Elevated serum direct bilirubin. [6]

≥1 mg/dL: early sign of liver injury. [6]

≥ 2.0 mg/dL: indicates cholestatic liver disease. [6]

Elevated AST, ALT, GGTP. [6]

TREATMENT

Medical treatment: Ursodeoxycholic acid**,** maximizing enteral feedings: early initiation and progressive increase of feedings, parenteral nutrition management: cyclical infusions, tapering soybean lipid emulsion, light protection for parenteral nutrition bag, antibiotic, surgical treatment, bowel lengthening procedures (if applicable). [7,8]

CONCLUSION

Specialized nutrition support should be offered to patients who are malnourished or at risk of becoming malnourished when it would benefit patient outcomes or quality of life. Improving the nutritional value of ingested food and tailoring intake to the patient's preferences, abilities, and schedule should be the first measures in addressing nutritional needs. When these interventions alone are insufficient to meet nutritional requirements, oral nutritional supplements should be considered. Nutritional status should be evaluated in patients before specialized nutrition sup- port is considered. Enteral nutrition is used when patients have a functional gastrointestinal tract but are unable to safely swallow. Although a variety of enteral formulas are available, evidence for choosing a specific formula is often lacking. Parenteral nutrition should be used only when enteral nutrition is not feasible. There are no known benefits of parenteral nutrition over the enteral route, and the risk of serious complications is much greater with parenteral nutrition. Even when the parenteral route is necessary, some enteral nutrition is beneficial when possible. Specialized nutrition support can provide an effective bridge until patients are able to return to normal food and, in rare cases, may be continued as long-term home enteral or parenteral nutrition. Specialized nutrition support is not obligatory and can be harmful in cases of futile care and at the end of life.

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