



AN OVERVIEW ON COMPLICATIONS OF PARENTERAL THERAPY IN CRITICALLY ILL PATIENTS

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ABSTRACT

Critically ill patients require more than medical attention to their ongoing distress, as the disease puts strain on the metabolic processes in the body. This precludes to malnourishment associated with critical illness, which in the past was a major cause of mortality in this group. To provide a general understanding of complications of parenteral nutrition in critically ill patients in the current medical literature. Electronic database PubMed was used in this review and data was collected from relevant journal articles, randomized controlled trials, and observational studies containing the term used in the mesh: "nutritional therapy"[Mesh] AND "intensive care unit"[Mesh] within the title or abstract. Nutritional therapy in critically ill patients demands regular assessment of the patient's condition, underlying metabolic processes, and regular assessment. Clinical judgment is important in combination with following guidelines and follow-up through laboratory tests. Prevention is key to successful parenteral nutrition with minimal complications. If complications do occur, it is important to recognize the warning signs and act fastidiously.

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Introduction

Critically ill patients require more than medical attention to their ongoing distress, as the disease puts strain on the metabolic processes in the body. This precludes to malnourishment associated with critical illness, which in the past was a major cause of mortality in this group. The reason is the incremented stress caused by unmet metabolic demands, leading to a higher risk of complications in already vulnerable patients [1]. In this review we aim to provide a general understanding of parenteral nutrition in critically ill patients in current medical literature, and the importance of nutrition therapy in intensive care settings.

Materials and Methods

PubMed database was used in this review to collected data from relevant journal articles, randomized controlled trials, and observational studies containing the term used in the mesh: "nutritional therapy"[Mesh] AND "intensive care unit"[Mesh]

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within the title or abstract. English and translated English articles, documents, controlled and randomized clinical trials that are published and met with the needed criteria were included only.

Review

We focus on medical nutritional therapy in critically ill patients as they present with severe illness, co-morbid diagnoses, and depleted bodily efforts to fight the disease. Furthermore, as patients improved in intensive care units, they are transferred or stepped down to other wards or units. This means that general and acute medical wards should also be aware of the importance of parenteral nutrition in these patients. The indications and suitability of the route of feeding can be generally divided into central and peripheral nutritional therapy (**Table 1**).

Systematic assessment of patients would give appropriate clues to the nutritional status, this evaluation is important first during the admission of a patient and second during the intensive treatment process. The earlier the recognition of metabolic disturbance and bodily malnutrition, the better the outcome of the medical therapy. This is due to an association between essential nutritional deficit and severity of morbidity and mortality occurrence.

Table 1. Types of Parenteral Nutrition

	Central	Peripheral
Route	Central Vein Port, Jugular catheter	Peripheral catheter
Expected duration for nutritional need	14 days or more	Less than 14 days
Indication for nutritional therapy	Nutritional depletion and high metabolic demands, return to normal function is not expected in the short term	Return to normal oral intake and bowel function is expected within a few days
Uses	Calories as needed	Limited for maintenance

The major role of nutritional therapy is to assist the body's metabolic response to injury, cellular damage, and immunological response. However, it is important to note that studies have also shown no clinical benefit of over-nutrition, with some reporting adverse effects of morbidity in patients [2-4].

Complications

The most important complication of nutritional therapy would be a failure to achieve nutritional support due to inadequate monitoring and irregular assessment of the patient. To understand this further, we need to address the main goals of nutritional therapy which are the support of body mass, structure, and function of organs, correcting and preventing nutritional deficiencies, and preventing harm.

There are common complications in parenteral nutrition, mainly overfeeding or underfeeding. Patients at risk include smaller lean body sizes, sedated, or geriatric population. Administration of excess calories could lead to complications and increased risk of mortality. This overfeeding could result in hyperglycemia, hepatic dysfunction, refeeding syndrome, metabolic acidosis, hypertonic dehydration, and azotemia.

Glycemic Disturbance

Complications of total parenteral nutrition could be divided into metabolic, catheter-related, and sepsis complications. Rapid infusion of glucose could lead to hyperglycemic status, this is critical in patients with comorbid diabetic disease, on steroidal therapy, or inactive infection. This is because the addition of glucose to an already stressed metabolic response leads to an increased release of glucocorticoids.

The physician could advise for the blood glucose to be monitored frequently when therapy is initiated. This is important later as well when the parenteral glucose is stopped, as the risk of hypoglycemia increases significantly with the abrupt stopping of glucose infusion. In the event of potential hypoglycemia, an infusion of dextrose of ten percent concentration could prevent exacerbation of symptoms.

Hepatocellular Dysfunction

Hepatic dysfunction is a potential complication of parenteral nutrition with excess caloric intake [5]. The common complication occurring with caloric excess is cholecystitis, the pathophysiological mechanism behind this includes the dormant state of the gastrointestinal tract during the parenteral feeding [6]. For this reason the physician should consider monitoring the liver function on weekly basis, or at least every two weeks. The other important change in management could include shifting the total parenteral bag from infusing over 24 hours to 12 hours, as this would give the hepatocellular process time to rest and recalibrate. In addition to cholecystitis, other hepatocellular dysfunctions include cholestasis, cholelithiasis, steatosis, and steatohepatitis [7].

Refeeding Syndrome

Refeeding syndrome occurs as a compensation mechanism in malnourished patients who are receiving the parenteral replacement. This is because the fat and protein stores in the body are being used when the carbohydrates are depleted. When the patient begins receiving parenteral therapy, the carbohydrate mechanism starts with a surge in insulin, causing uptake of electrolytes. This is most prominent with phosphates, as hypophosphatemia manifests as rhabdomyolysis, respiratory failure, arrhythmias, seizures, and coma [8]. Therefore, bone chemistry levels should be checked alongside liver function tests, considering adding electrolyte supplementation accordingly [9].

Metabolic Bone Disease

In patients on long-term parenteral therapy, there is a risk of metabolic bone disruption. This is mainly due to overfeeding of salts including aluminum and calcium but also contributed to by excess protein and glucose [10]. The physician should be attentive to serum and urine levels of calcium and phosphate [11]. Clinical features of calcium excess in the blood include bone pain, osteopenia, and bony fractures, all of these features are associated with prolonged parenteral feeding. This is often an indication of discontinuation of parenteral therapy altogether.

Catheter-Related Complications

Catheter blockage could result from poor flushing technique, non-compliance, fibrin sheath formation, drug precipitation, lipid residual, and venous thrombosis [12]. The prevention and treatment of the blockage are similar as they focus on alerting the caregiver or nursing team to proper technique and care, usage of tissue plasminogen activator for thrombus formation, and replacement of the blocked catheter. There are more devastating complications of in-line catheters, which is sepsis. This is because both the deranged metabolic state of the disease combined with a foreign instrument in the body predisposes the patient to infection [13]. Furthermore, the components of the parenteral feeding may expose the patient to certain organisms. Lipids support the growth of pathogens, hyperosmolar feeding causes inflammation and thrombosis within veins, and high dextrose fluids are feeding sources for many bacteria [14].

Conclusion

Nutritional therapy in critically ill patients demands regular assessment of the patient's condition, underlying metabolic processes, and regular assessment. Clinical judgment is important in combination with following guidelines and follow-up through laboratory tests. Prevention is key to successful parenteral nutrition with minimal complications. If complications do occur, it is important to recognize the warning signs and act fastidiously.

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