Optimising healing through enteral and parenteral nutrition in critical illness

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Wound care in the intensive care unit (ICU) is a multifaceted challenge. These patients often experience complex wounds, such as pressure ulcers, surgical wounds, or trauma-related injuries, which require meticulous care. Although local wound management is essential, an equally important, yet sometimes underemphasised, component of effective wound care in these settings is proper nutritional support. Critical illness often induces a hypermetabolic state, catabolic stress, and immune dysfunction, all of which can impair wound healing. This article examines the significant role that nutrition, specifically via enteral nutrition (EN) and total parenteral nutrition (TPN) routes, plays in promoting wound healing and improving patient outcomes in the ICU.

The importance of nutrition in wound healing

Adequate nutrition is integral to wound healing, a process that relies on the availability of critical nutrients such as proteins, vitamins, and minerals. These nutrients are essential for tissue repair, collagen synthesis, and immune function. In the ICU, critically ill patients are often at risk of malnutrition due to a variety of factors, including prolonged fasting, catabolism, and gastrointestinal dysfunction (Peate and Hill, 2022). Nutritional deficiencies can lead to delayed wound healing, increased risk of infection, and longer recovery times.

Protein is the cornerstone of wound healing, playing a critical role in the formation of collagen, which provides structural support to the wound. Studies have shown that protein-energy malnutrition is associated with increased wound healing time and higher rates of wound-related complications (Wang et al, 2022). In addition to proteins, other nutrients such as vitamin C, vitamin A, zinc, and arginine are vital for immune function and collagen production, which are both essential for efficient wound healing (Grada and Phillips, 2022).

Enteral nutrition in critical illness

EN, provided through nasogastric (NG) or nasojejunal (NJ) tubes, is the preferred method for delivering nutrition to critically ill patients in the ICU. When the gastrointestinal tract is functional, enteral feeding is advantageous over parenteral routes because enteral stimulation preserves gut integrity, prevents bacterial translocation, and supports the immune system (Quiroz-Olguín et al, 2021). Early enteral feeding, typically initiated within 24 to 48 hours of ICU admission, improves wound healing outcomes compared with delayed feeding (Peate and Hill, 2022). This is achieved by providing the body with essential nutrients needed for tissue repair and regeneration.

EN formulas are often tailored to meet the specific needs of ICU patients, with certain products enriched with immune-modulating components such as arginine, omega-3 fatty acids, and glutamine. These nutrients have been shown to enhance immune function, reduce inflammation, and promote tissue regeneration, all of which are crucial for wound healing. A recent study demonstrated that patients receiving early EN with immune-enhancing formulas had faster wound closure and reduced rates of wound infections compared with those who received standard nutrition (Grada and Phillips, 2022).

Challenges in enteral nutrition delivery

Despite the benefits of EN, its delivery in the ICU is not without challenges. Some patients may experience gastrointestinal intolerance, manifesting as vomiting, diarrhoea, or gastric residual volumes, which can delay the initiation or continuation of EN. Careful monitoring and adjustments to the feeding regimen may be necessary to ensure the patient receives adequate nutrition. This can include using prokinetic agents to enhance gastrointestinal motility or switching to post-pyloric feeding, such as NJ feeding, rather than NG feeding, if gastric feeding intolerance occurs. These strategies help maintain effective nutrient delivery, especially when standard feeding methods are insufficient.

Another significant concern is underfeeding leading to insufficient wound healing (Peate and Hill, 2022). Underfeeding can result from frequent interruptions to feeding due to medical procedures, patient intolerance, or mechanical issues with feeding tubes. It is crucial for the ICU care team to monitor nutritional delivery closely and make necessary adjustments to meet the patient's metabolic demands during their critical illness.

Total parenteral nutrition in critical illness

For patients who are unable to tolerate enteral nutrition due to gastrointestinal issues such as bowel obstruction, severe ileus, or ischaemia, TPN is a necessary alternative. TPN provides all essential nutrients intravenously, bypassing the gastrointestinal system entirely. Although TPN can meet the metabolic demands of critically ill patients, it carries higher risks compared with EN, including central line-associated bloodstream infections (CLABSI) (Fonseca et al, 2018) and metabolic complications such as hyperglycaemia and liver dysfunction.

The decision to initiate TPN should be made cautiously, balancing the benefits of providing essential nutrients with the risks associated with intravenous feeding. In ICU patients with large or non-healing wounds the timely initiation of TPN can support wound healing by delivering proteins, carbohydrates, and micronutrients necessary for tissue repair. However, it is suggested that delaying TPN until EN is proven inadequate

can reduce the risk of complications such as infections and metabolic disturbances (Peate and Hill, 2022).

Recent guidelines recommend that parenteral nutrition be reserved for patients where oral nutrition and EN are contraindicated (Singer et al, 2023). Furthermore, the administration of TPN should be closely monitored, with regular assessment of metabolic markers such as blood glucose, liver function tests and electrolytes to avoid complications such as refeeding syndrome or electrolyte imbalances.

When using TPN to support wound healing, it is essential to ensure that the nutrient composition meets the patient's specific needs. Both underfeeding and overfeeding critically ill patients can lead to poor outcomes. For instance, overfeeding can increase the risk of hyperglycaemia and insulin resistance, both of which impair wound healing and increase the likelihood of infection. Therefore, nutritional targets should be carefully calculated based on the patient's resting energy expenditure and metabolic needs, which can be assessed using indirect calorimetry (Woodrow, 2018).

Conclusion

In the ICU, the role of nutrition in wound care cannot be overstated. Both EN and TPN play critical roles in providing the essential nutrients required for wound healing, immune function and overall recovery. Although EN is preferred due to its benefits in preserving gut function and reducing infection risk, TPN remains a vital option for patients who cannot tolerate enteral feeding.

The delivery of nutrition in the ICU, whether through EN or TPN, requires careful consideration of timing, quantity, composition, and monitoring. By carefully monitoring nutritional intake and adjusting feeding strategies to meet the individual needs of each patient, ICU teams can optimise outcomes and improve wound healing in critically ill patients. **BJN**

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