



Parenteral Nutrition Avoids Energy Deficits



Critical illness is characterised by nutritional and metabolic disorders, resulting in increased muscle catabolism, fat-free mass loss, and hyperglycaemia. The objective of nutritional support is to limit fat-free mass loss, which has negative consequences on clinical outcomes and recovery. Early enteral nutrition is recommended by current guidelines as the first choice feeding route in ICU patients. However, enteral nutrition alone is frequently associated with insufficient coverage of the body's energy requirements, and the subsequent energy deficiency is correlated to worsened clinical outcome.

Controlled trials have demonstrated that, in case of failure or contraindications to full enteral nutrition, parenteral nutrition administration on top of insufficient enteral nutrition within the first four days after admission could improve the clinical outcome, and may attenuate fat-free mass loss.

In this report, the authors explain that cautious use of parenteral nutrition in intensive care unit (ICU) patients is strongly linked to improved outcomes. Parenteral nutrition is cautious if all-in-one solutions are used, glycaemia is controlled, and over nutrition is avoided. The optimal use of parenteral nutrition in the ICU should be based on the assertion that limiting the energy deficit and preventing overfeeding would improve the clinical outcome, shorten the recovery period, and reduce overall costs.

The Burden of Energy Deficiency

Analyses conducted in US, Canadian, and Swiss hospitals found that a maximum of 52 to 70 percent of prescribed calories were actually delivered through enteral nutrition in ICU patients. Optimisation of enteral nutrition in the ICU remains a great challenge even when a well-trained and experienced nutrition team is available. The resulting energy deficit has been associated with increased mortality, increased infection rate, impaired wound healing, adult respiratory distress syndrome, renal failure, a need for surgery, and pressure sores. Energy deficiency also leads to fat-free mass loss, undernutrition, and its related complications. When enteral nutrition is insufficient to cover the energy target, parenteral nutrition could be a reliable means to match energy requirements with delivery, and avoid further energy deficits.

Supplemental Parenteral Nutrition and Improved Clinical Outcome

Two prospective, controlled, randomised trials have provided evidence of the clinical benefit of parenteral nutrition in ICU patients. The Swiss SPN trial was conducted in 305 mixed medical-surgical ICU patients (seven percent with cardiac arrest, five percent with myocardial infarction) with insufficient enteral nutrition or failure to optimise enteral nutrition. The delivery of 100 percent of the energy target from day 4 to day 8 by enteral nutrition and supplemental parenteral nutrition in ICU patients receiving less than 60 percent of their

energy needs during the first three days of their ICU stay reduced the number of patients with nosocomial infections, as well as the duration of mechanical ventilation.

In the Early Parenteral Nutrition Trial, Doig et al. showed that in 1,372 mixed medical-surgical ICU patients (20 percent with cardiovascular diseases) with relative contra-indications to enteral nutrition, there were no deleterious effect of early parenteral nutrition provided within the 24 hours following admission in comparison with standard care at the physician's discretion. Early parenteral nutrition showed clinical benefits on the duration of invasive ventilation, 60-day quality of life and body composition.

Other studies showed that supplemental parenteral nutrition could reduce the incidence of enteral nutrition-related side effects and their related costs.

Inappropriate Use of Parenteral Nutrition and Risk of Complications

Parenteral nutrition has been repeatedly associated with overfeeding, especially in the 1980s and 1990s, in a period when it was thought that the more calories were administered, the better the outcome would be. Overfeeding has no beneficial impact on the nutritional status, and is in fact deleterious. Hart et al. showed that feeding burn patients more than their energy expenditure leads to fat rather fat-free mass accretion.

In 2014, an inappropriate use of parenteral nutrition remains associated with an increased risk of infections and liver metabolic complications. These risks are increased by the early initiation and the duration of parenteral nutrition, the presence of sepsis, recent surgery and multifocal colonisation, and by energy provision >25 kcal/kg/day.

The Optimal Parenteral Nutrition in Clinical Practice

In the absence or unavailability of indirect calorimetry, the European Society for Clinical Nutrition and Metabolism (ESPEN) recommends avoiding delivering ≥ 25 kcal/kg actual body weight (BW)/day during the acute phase, and ≥ 30 kcal/kg actual BW/day during the post-acute phase. Severely malnourished patients on parenteral nutrition should initially receive 10 kcal/kg actual BW/day, then the target should progressively be increased to reach 25–30 kcal/kg actual BW/day over three to four days.

The systematic use of parenteral nutrition must be avoided. In selected patients, such as those with an appropriate indication, 'all-in-one' parenteral nutrition can be administered successfully and safely if it is used by a trained team, if energy delivery is adapted to the energy target, if a glycaemic control is obtained, and if parenteral nutrition is limited over time. Parenteral nutrition should be gradually weaned over time when enteral nutrition reaches the energy target, to avoid overfeeding and infectious complications of parenteral nutrition.

Conclusions

In the ICU, optimal nutrition support should prevent both energy deficit and overfeeding, thereby improving the clinical outcome. Parenteral nutrition should be limited to enteral nutrition contraindications or failure. Parenteral nutrition is a safe therapy for ICU patients as long as overfeeding and hyperglycaemia are avoided. Inadequate use of parenteral nutrition is associated with an increased infection rate and liver dysfunction.

The prescription of parenteral nutrition to supplement insufficient enteral nutrition (the "SPN concept") should be initiated 24–72 hours after ICU admission, since it results in improving clinical outcomes and cost-savings. The safe use of parenteral nutrition is of great interest, since it could preserve fat-free mass in patients presenting more and more to a certain extent with clinical situations of ageing, sarcopenic obesity, chronic diseases and pre-existing undernutrition.

Image Credit: Wikipedia

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