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CASE STUDY

Specific Considerations for Enteral Nutrition in Extended Period Prone Positioned Non-ARDS ICU Patient

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ABSTRACT

Background: Early enteral nutrition (EN) is recommended in critical care to reduce the complications. However, hesitancy exists when administering EN in a prone position. We report a case of non-ARDS patients with extended periods of prone position receiving EN.

Case: A 18 years old, quadriplegic, male, underwent cervical internal fixation and gluteal flap. Postoperatively, he was to be prone positioned for 10 days. Analgesics was tramadol and NSAID. NGT placement and patency was confirmed. The bed was tilted 30º upright and EN intermittently administered every 4 h, followed by GRV check in 2 h. Intake was gradually increased in each feeding. Patient was discharged after 48 h. Further management was also in the prone position.

Discussions: Feeding tolerance reduction and tube displacement is associated with EN in prone patients. Pre-feeding tube patency and position check is imperative. Feeding tolerance, GRV, and vomiting should be monitored. No recommendation for ultrasound monitoring. Upright tilting was to aid nutrition passage by gravity. Prokinetics and pump feeding were not performed in this patient. Tolerance was excellent, no complications in nutritional management were found.

Conclusions: EN during a prone position is challenging, yet the findings support that EN is feasible and can be well tolerated.

Keywords: ICU, Enteral Nutrition, Non-ARDS, Post Operative, Prone Position

Background

Nutrition is a fundamental part of the critical care management. Well managed nutrition modulates the immune system, improves wound healing and maintains muscle mass leading to reduced ventilated days, overall intensive care duration of stay and mortality.1 Guidelines of European Society for Clinical Nutrition and Metabolism (ESPEN) suggests that in critically ill, a systemic survey of nutritional risk within 24 h of admission is recommended, accompanied by early EN to reduce the risk of infectious complications and organ failure in critically ill patients. Enteral nutrition (EN) is recommended to be initiated within 48 hours in all critically ill patients admitted to the intensive care unit (ICU).2 However, early enteral nutrition feasibility in patients with extended periods of prone positioning is still much questioned by clinicians.

In critical care, enteral feeding during a prone position is challenging. Most of the prone positioning in ICU was due to indication of ARDS, however, prone positioning may also be indicated by the post operative care. Prone positioning if not done correctly tends to increase the intra-abdominal pressure and decrease the gastro oesophageal barrier pressure which may subsequently lead to increased gastroesophageal regurgitation and micro aspiration. Even more, reports involving patients who are ventilated in a prone position tend to have a sicker patient, which might in itself be contributory to reduced gastrointestinal mobility and higher GRV.

Sedation for ventilation with opioid infusion further compounds and contributes to this decreased intestinal motility.3 Therefore, it is essential to apply some specific consideration on delivering nutrition to patients in a prone position for a longer duration of time.

Despite evidence showing feasibility of this method during patient care in ICU, there is a hesitancy in administering enteral diet during prone positioning. The fear of complications and perceived risk still haunts most of the clinician in delivering enteral nutrition in such patients. In this paper we report a case of a non ARDS patient with prolonged prone positioning and its challenge in nutritional management.

Case

A 17 year male was admitted to the hospital with neglected cervical spinal cord injury and gluteal decubitus. The patient was planned for internal fixation for his spine and also a gluteal flap. The 48 kg and 167 cm patient was quadriplegic and slightly malnourished. Patient was able to take oral intake preoperatively and had no history of dysphagia, diabetes, food allergy or food intolerance. Preoperative blood pressure was 95/64, heart rate 105 beat/min. He was breathing 24 breath per minute spontaneously with SpO2 100% room air. Induction was delivered in supine position with a combination of propofol, fentanyl, and rocuronium. Endotracheal intubation was performed in "in line" style, and nasogastric tube was placed after the intubation in the same manner. Subclavian central venous line was also placed to serve as the main intravenous access. The patient was then positioned for the surgery into a prone position. During positioning, meticulous attention was given for the tube and line, so they were not to be dislodged in the process. The operation was performed in a prone position after the access and pressure points were checked. The operation lasts for 4 hours and was uneventful. Postoperatively, the cervical spine fixation was well-placed, (Figure 1) and the patient was then transferred to the Surgical ICU.

In the ICU, the patient was put on mechanical ventilation and sedated with midazolam. Analgesia is given with intravenous infusion of fentanyl. Cervical collar neck was applied postoperatively and prone positioning was to be maintained for 10 days. Norepinephrine was administered to maintain MAP > 70 mmHg. As soon as the patient's haemodynamic was stable, the bed was tilted 30 degrees upright and the patient was immediately weaned from the ventilator (Figure 2). Fentanyl was discontinued after the patient arrived in the ICU, and replaced by NSAIDs and tramadol. The continuous tramadol dose was 12 mg per hour (0.25 mg/kg/hour).

Enteral feeding for this patient is immediately started as soon as the hemodynamic was stable. The position of the nasogastric tube tip was confirmed by X-ray (Figure 4), while tube patency patency was checked by aspirating the tube, free flow of gastric fluid was present indicating the tube was patent. Enteral feeding was commenced by administering glucose solution 20 cc every 4 hours via Nasogastric tube, gastric residue was measured every 2 hour post administration. Nasogastric intake was gradually increased in each feeding if less than 50% residue was found and the Gastric Residual Volume (GRV) was less than 500 cc. After two well tolerated administration of glucose solution, enteral formula was introduced starting from 50 cc, and progressively tapered up during the first 24 hour ICU care. In the first 24 hour ICU care, patients diet was able to reach 200 cc enteral formula every 4 hours. Enteral nutrition was continued intermittently every 4 hours bolus feeding, followed by GRV examination in 2 hours.

Patient was extubated after 36 hours of ventilator without complications, oxygen supplementation was continued with nasal cannula. Enteral formula was increased to 250 cc enteral formula every 4 hours via NGT post extubation. Patient was discharged to the regular ward after 48 hours of ICU care. Tolerance of diet was excellent, no complaints of nausea or vomiting was documented until ICU discharge. Further management in general ward was also in the prone position.

Discussion

According to the European Society for clinical nutrition and metabolism (ESPEN), any critically ill patient admitted to critical care for more than 48 hours is at risk of malnutrition. Nutrition should commence in the first 24-48 hours of admission to intensive care if there are no contraindications to do so. Enteral nutrition should only be delayed in patients with uncontrolled haemodynamic instability, hypoxaemia, hypercapnia and acidosis if required.2 clinical practice guidance suggests that EN should not be delayed solely because of prone positioning.5 This patient was admitted to ICU for hemodynamic and respiratory monitoring, he was prone positioned for the gluteal wound care for 10 days. Patient MAP was slightly declined during the first 6 hour ICU care but can be managed with norepinephrine infusion. Therefore there is no contraindication to start enteral nutrition in this patient.

A nasogastric tube was used as the route for EN. The tube was placed after intubation in this patient. As per the ESPEN and ESICM guidelines, postpyloric nutrition should only be considered in patients with high GRV who are not improved with prokinetic agents.[2,5]

In these special conditions, post-pyloric nutrition is recommended to reduce the risk of VAP. Post-pyloric tube placement requires endoscopic guidance, fluoroscopy or nasojejunal tube wire guidance. It should be noted that changes in patient position can also

cause the tip of the post-pyloric tube displacement.[6]

Tube displacement is associated with EN in prone patients. Tube placement and patency was imperative to be checked before commencing the enteral feeding. NG tube position was rechecked after repositioning as changing the position is known to cause the tube to move. Chest x-ray done for the general imaging was utilized to confirm position of NG tube. Tube patency was confirmed by gastric tube aspiration. NG tube aspirated prior and after proning as there have been witnessed episodes of emesis and aspiration particularly when transitioning from the supine to prone position and back. If the patient is a subject of deproning, feeding should be stopped one hour prior to changing the position. The gastric contents should again be aspirated. Once deproned, gastric contents should be aspirated and the position of the nasogastric tube should be rechecked before restarting nutrition.

Bed should be in reverse Trendelenburg position of 30 degrees. Upright tilting was to aid nutrition passage by gravity and minimize passive regurgitation. reverse Trendelenburg is the standard practice can be found in the most critical care unit that apply enteral feeding in a prone position.7 A before and after study was conducted in France looking at the practicalities of NG feeding in prone position and included interventions such as bed tilting 25 degrees head up, prophylactic intravenous erythromycin with the first prone positioning and increased acceleration to target rate enteral nutrition that concluded that these interventions enabled them to deliver NG feeding without increases in GRV, vomiting, or VAP.

In critically ill patients, energy expenditure should ideally be assessed by indirect calorimetry, however several calculation formulas can also be used to estimate calorie requirements in the absence of the calorimetry. Estimated energy requirements are calculated using the Harris-Benedict formula. The Basal Metabolic Rate (BMR) of this patient is 1431 kcal/24 hours while the calorie intake required in this patient is 1717 kcal/24 hours. It is recommended that hypocaloric nutrition be given in the early stages of acute critical illness not exceeding 70% of energy expenditure. This should be increased to 80-100% over 72 hours. Protein is given 1.5 g/kg/24h after 24 hours of ICU care. Enteral nutrition should be the primary option for delivering nutrition in critically ill when there is no contraindications.

Feeding tolerance and vomiting was monitored closely in this patient. In prone positioned patients, GRV is recommended to be measured every 4-6 hours. Measuring GRVs has been the traditional way of monitoring the tolerance of enteral feeding, although studies in the past have questioned the reliability and effectiveness of this as a clinical measure. ESPEN defines high GRV as more than 500 ml for nutrition in critically ill patients. Although it is generally believed that the prone position is associated with decreased nutrition tolerance, a prospective observational study in Spain concluded that nutrition in the prone position is feasible, safe and not associated with an increased risk of gastrointestinal complications.4 The findings were replicated in the prospective observational study conducted in India.

A prospective study conducted in the Netherlands found that GRV in the prone and supine positions did not differ significantly.8 Until now, there has been no bedside radiological imaging with USG or X-ray for assessment of nutritional tolerance. Continuous pump feeding was not performed in this patient due to limited facilities. Continuous pump feeding is more

recommended by ASPEN and ESPEN compared to bolus feeding. In continuous feeding, the intake volume should not be increased more than 60-85 ml/hour to avoid enteral nutrition intolerance.9 However, in this patient, bolus administration did not cause intolerance, diarrhea, or other complications. In nutritional intolerance, it is recommended to give erythromycin as the first-line prokinetic option if there are no contraindications. According to the ESPEN meta-analysis, intravenous erythromycin is the first-line prokinetic therapy in high GRV. Alternatively, metoclopramide or a combination of both can be used. A second-line prokinetic agent can then be added as needed if no response is seen within 24-48 hours. The risk of QT prolongation, arrhythmias, and possible seizures are evaluated based on the risks and benefits of prokinetic administration.10 Caution should be exercised for possible QT prolongation and arrhythmias especially during long-term prokinetic use. Both agents are known to have tachyphylactic effects with long-term use. This patient did not show any signs of dietary intolerance, therefore no prokinetics were given. Parenteral nutrition may also be considered after 72 hours if enteral nutrition intolerance persists despite mitigation efforts. The rapid improvement in respiratory neuromuscular function in this patient, and the absence of severe metabolic changes suggest that enteral nutrition in this patient has a positive effect on the patient's clinical outcome.

Conclusion

Administering enteral nutrition in the prone position is challenging, yet the findings support that enteral nutrition is feasible and well tolerated. Enteral nutrition is prioritized in patients who tend to spend significant periods of time in the prone position and are critically ill. Parenteral nutrition should be considered as a last resort. Tube placement and patency checks prior to feeding are mandatory. GRV, vomiting, and tolerance should be closely monitored. Prokinetics and post pyloric feeding may be considered if there are signs of nutritional intolerance.

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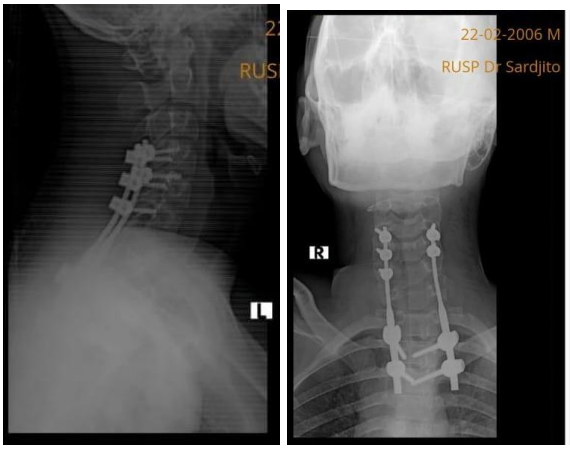
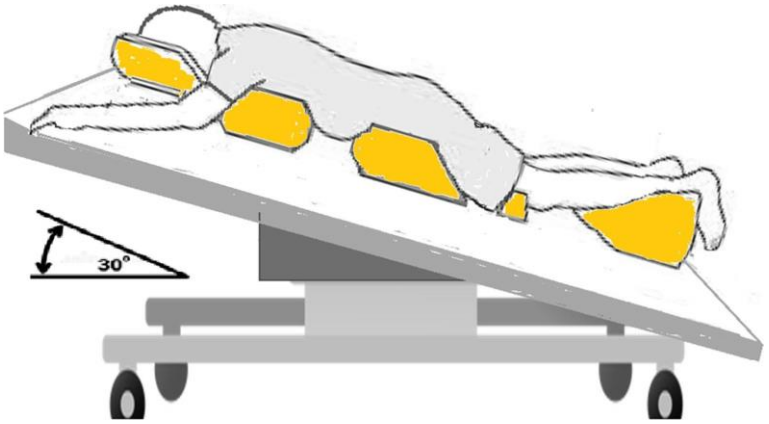
Tables and Figures

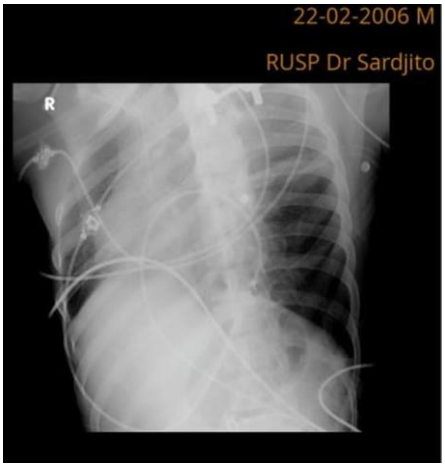


Gambar 1. Post-operative radiography of internal cervical spine fixation

Gambar 2. Postoperative clinical conditions and patient's position.



Gambar 3. Schematic figure of patients position during ICU care. Pressure points are padded with soft linens and pillows (yellow).



Gambar 4. Post-operative radiography showing the tip of NGT overlapping with the gastric shadow.