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SHORT RESEARCH REPORT

Evaluation of parenteral nutrition use in patients undergoing major upper gastro-intestinal surgery

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Abstract *Background* After major upper gastro-intestinal surgery, enteral feeding is often hampered. There is still no consensus on which route of nutrition is preferable in patients undergoing this type of surgery. Current ESPEN guidelines recommend parenteral nutrition in undernourished patients, if caloric requirements cannot be met orally/enterally within 7 days and enteral nutrition is contraindicated. *Objective* The current practice of systematic parenteral nutrition at the thoracic surgery ward of the University Hospitals Leuven was evaluated based on the ESPEN guidelines. *Method* This prospective observational study included patients undergoing upper gastro-intestinal surgery and receiving postoperative parenteral nutrition. Parenteral nutrition use was considered appropriate when patients were undernourished and unable to obtain adequate caloric requirements by oral or enteral feeding within 7 days. *Results* Twenty-five out of 35 patients were nutritionally at risk. In 9 of 25 patients, the indication for parenteral nutrition was considered justified. As the intestinal tract below the anastomosis site remains accessible in the total studied population, enteral nutrition might be an option. Unfortunately, an appropriate jejunostomy tube was not available at our institution. *Conclusion* In accordance to the ESPEN guidelines, enteral nutrition can replace parenteral nutrition in most thoracic surgery patients, but only if an appropriate enteral access is available.

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Keywords Enteral nutrition · Gastro-intestinal surgery · Nutrition · Nutritional risk score · Parenteral nutrition

Impact of findings on practice statements

- A nutritional plan is mandatory for patients undergoing thoracic surgery, as most of the patients are nutritionally at risk.
- Most patients undergoing thoracic surgery can receive enteral nutrition instead of parenteral nutrition, based on the ESPEN guidelines. However, this is only feasible if an appropriate jejunostomy tube is available.
- The administration of enteral instead of parenteral nutrition to patients undergoing thoratic surgery reduces the direct and indirect nutrition costs.

Introduction

After major upper gastro-intestinal (GI) surgery, immediate postoperative oral or enteral feeding is hampered by common postoperative complications: swelling of the anastomotic site, disability of safe swallowing due to neck dissection, high risk for (micro) aspiration due to a vagatomized stomach causing gastroparesis and pyloric stenosis, and complications associated with surgically placed jejunostomy tubes for enteral nutrition (EN) such as leakage, infection, tube dislocation or obstruction [1, 2].

Although the gut remains accessible after major upper GI surgery from below the anastomotic site, most patients are systematically started on parenteral nutrition (PN) at the thoracic surgery ward of the University Hospitals Leuven. To the best of our knowledge, there is a paucity of methodologically well conducted studies to conclude on

the best modality for delivering nutritional support to this patient group [3–5].

According to the European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines, postoperative PN is beneficial in undernourished patients (defined as an Nutritional Risk Score (NRS) ≥3), if adequate caloric requirements cannot be met by oral or enteral feeding within 7 days and if EN is not feasible or not tolerated [6, 7].

Aim of the study

The current practice of systematic PN at the thoracic surgery ward was evaluated based on the ESPEN guidelines. The primary objective was to report the proportion of patients nutritionally at risk and the proportion of patients with appropriate PN therapy.

Ethical approval

The study was approved by the Hospital's Clinical Trial Center and Ethical Board.

Method

A prospective observational study was carried out by a clinical pharmacist at the 28-bed thoracic surgery ward of the University Hospitals Leuven. Adult patients admitted for an elective thoracic upper GI procedure (oesophagectomy, laryngopharyngo-oesophagectomy or Belsey Mark IV-procedure (i.e. an anti-reflux procedure)) and treated with PN in the postoperative setting, were eligible.

Baseline demographic data and the NRS were determined for every included patient at time of PN initiation [7]. Duration (number of days) of PN therapy was registered throughout the postoperative course and postoperative weight loss was registered after 6–12 months. PN infusion therapy consisted of Olimel® N7E 1, 1.5 or 2 L; an emulsion with a total energy of 1100 kcal/L and containing poly-amino-acids (43.75 g/L), glucose (140 g/L), lipids (40 g/L) and electrolytes. Cernevit®, a multivitamin powder for injection, and Addamel®, a concentrate for injection containing trace elements, were added daily to the PN.

ESPEN guidelines state that "postoperative PN is beneficial in undernourished patients (interpreted as NRS ≥3) in whom EN is not feasible or not tolerated" (grade A2 recommendation) and also "in patients with postoperative complications impairing GI function who are unable to receive and absorb adequate amounts of oral/enteral feeding for at least 7 days (interpreted as a duration of PN treatment of ≥7 days)" (grade A2 recommendation) [6]. Most of the patients of the studied population had no postoperative complications (e.g. ileus) justifying PN use, but didn't have an appropriate jejunostomy tube for EN in terms of avoiding the above mentioned complications. Therefore, the criteria of NRS ≥ 3 and PN ≥ 7 days are the criteria used in our study that had to be fulfilled to justify the use of PN in this studied population (Fig. 1). Based on NRS and duration of PN, patients were divided into 4 groups: NRS < 3 and PN < 7 days, NRS < 3 and PN ≥ 7 days, NRS ≥ 3 and PN < 7 days, and NRS ≥ 3 and PN ≥ 7 days.

Mean and median values are displayed for normal and non-normal distributed continuous variables respectively.

Results

During the five-month study period between 2/2013 and 6/2013, 35 of the 400 hospitalized patients were included, all fulfilling the above mentioned inclusion criteria. Baseline patient characteristics are shown in Table 1. The majority of included patients underwent oesophagectomy (n = 27; 77 %), followed by Belsey Mark IV in 14 % of patients (n = 5) and laryngopharyngo-oesophagectomy (n = 3; 9 %). The median NRS was 4 (IQR = 2–5). All patients were treated with a total of 283 PN bags (median of 6 per patient, IQR = 5–8) from the first postoperative day per standard protocol. Almost every patient received a dietary consultation during hospitalization, most of the time in the last part of hospitalization (median time 69.23 % of the length of stay).

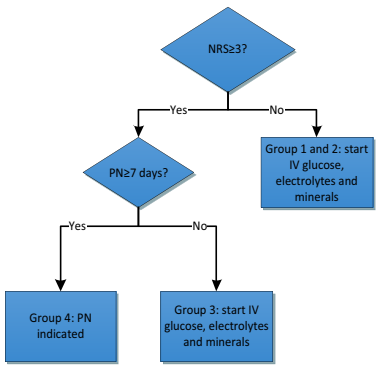

Fig. 1 Evaluation of the indication of PN- flowchart (*IV* = intravenous; *NRS* = nutritional risk score; *PN* = parenteral nutrition) Group 1 = NRS < 3 and PN < 7 days. Group 2 = NRS < 3 and PN ≥ 7 days. Group 3 = NRS ≥ 3 and PN < 7 days. Group 4 = NRS ≥ 3 and PN ≥ 7 days

Table 1 Baseline characteristics

Baseline characteristics	
Type of surgery	
Oesophagectomy (n)	27
Laryngopharyngectomy and oesophagectomy (n)	3
Belsey Mark IV-procedure (n)	5
Male/female ratio	26/9
Length (cm)[a]	169 ± 8
Weight (kg)[a]	71 ± 17
BMI (kg/m^2)[a]	25 ± 5
Age (year)[a]	63 ± 10
NRS[b]	4 (2–5)
Ideal amount kilocalories (kcal)[a]	1623 ± 274
Ideal amount nitrogen (g)[a]	15.7 ± 2.6
Hospital mortality rate	0 %
Number of fasting days (days)[b]	1 (1–2)
Postoperative start PN (days)[b]	2 (1–2)
Postoperative LOS (days)[b]	13 (10–19)
Number of days PN/LOS (%)[a]	51.74 ± 20.07
Total fluid volume per day (mL)[b]	1637.5 (1500–1820)
Daily residual stomach volume (mL)[b]	100 (10–200)
Number of dietary consultations per patient during hospitalization[b]	
Oesophagectomy	1 (1–2)
Belsey Mark IV-procedure	0 (0–1)
Laryngopharyngectomy and oesophagectomy	4 (2.5–4)
Percentage of LOS when first dietary consultation takes place[b]	69.23 (52.88–83.33)

a = Mean and standard deviation, *b* = median and IQR, *IQR* = interquartile range, *LOS* = length of stay, *NRS* = nutritional risk score, *PN* = parenteral nutrition

Twenty-five out of 35 patients were nutritionally at risk (NRS $\geq$ 3). In 9 out of 25 patients, the indication for PN was considered justified, fulfilling both predefined criteria (NRS $\geq$ 3 and PN duration $\geq$ 7 days). Additionally, 16 patients had a NRS $\geq$ 3 but the duration of PN in this cohort was less than 7 days. In those patients, oral feeding was restarted within 7 days at a gradual increase and not to the full caloric intake as intended by the ESPEN criteria within the intended time frame [6–8]. The remaining 10 patients did not fulfill the NRS-criterion (Fig. 2).

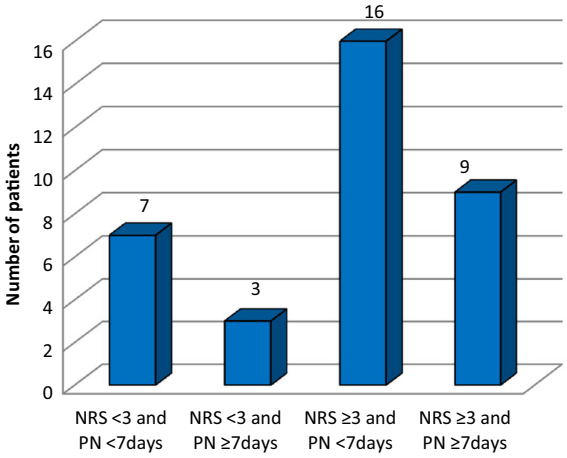

Fig. 2 Indication for parenteral nutrition (*NRS* = nutritional risk score, *PN* = duration of parenteral nutrition)

Discussion

This observational study revealed that the majority (25/35 patients) of the studied population was nutritionally at risk (NRS $\geq$ 3) and that a nutritional plan is mandatory. There are several strategies to improve nutritional management. In order to identify those patients at risk for undernutrion, a risk assessment for severe undernutrition according to the 4 criteria stated by the ESPEN working group should be performed systematically upon admission [6]: weight loss $>$ 10–15 % within 6 months; BMI $<$ 18 kg/m^2; subjective global assessment, Grade C; serum albumin $<$ 30 g/L (with no evidence of hepatic or renal dysfunction). Consequently, a nutritional plan can be installed for patients at risk, preferably with EN because this has the advantage to feed the patient on a more feasible way in comparison with PN, even after discharge.

A comparison between the current ESPEN guidelines on PN use after surgery and the actual practice at the thoracic surgery ward of the University Hospitals Leuven, revealed that in 9 out of 35 patients the indication for PN was justified because of the high risk for undernutrition (NRS $\geq$ 3) and the inability to receive and absorb adequate amounts of oral/enteral feeding for at least 7 days (PN $\geq$ 7 days; Fig. 2). Although the study confirmed that a high proportion of patients was nutritionally at risk (NRS $\geq$ 3 was detected in 25 out of 35 patients), oral feeding was restarted within 7 days after surgery in 16 of those 25 patients (NRS $\geq$ 3 and PN $<$ 7 days), however only at a gradual increase and not to the full caloric intake as intended by the ESPEN criteria within the intended time frame [6–8]. The remaining 10 patients did not fulfill the NRS-criterion, but 3 of them received PN because of postoperative complications such as pyloric stenosis (ESPEN [6], grade A2 recommendation). In conclusion, if an appropriate enteral feeding tube was present, 28 out of 35 patients could be fed by EN, including the 9 patients with NRS $\geq$ 3 and PN $\geq$ 7 days.

Unfortunately, to date such a jejunostomy tube was not available at our institution. The current available tubes are considered to be too small, to cause too much side effects or to get blocked too often. Therefore, as mentioned in the Method, contraindications for EN as prerequisite to justify

the initiation of PN were not taken into account, despite the fact that this is recommended in the ESPEN guidelines [6]. If these would have been considered, PN was not first choice in the entire study population. However, to date, it is still not conclusive whether PN or EN should be the first choice of nutrition in this selected group of patients [3–5].

Nevertheless, this study has some limitations. First, the duration of PN treatment was used as surrogate marker for estimating the duration of the inability of adequate oral/enteral caloric intake. The ESPEN guidelines state that one of the criteria that have to be fulfilled to justify PN, is the inability to receive and absorb adequate amounts of oral or enteral feeding for at least 7 days [6]. Estimating the duration of inability to receive adequate amounts of oral or enteral feeding is very difficult, especially in the immediate postoperative phase. Therefore, calculating retrospectively the duration of PN seemed a more objective criterion. Second, we are aware of the small amount of patients, especially the number of patients undergoing Belsey Mark IV-procedure or laryngopharyngectomy with oesophagectomy, being the main limitation of this study.

Critical appraisal of recommendations concerning initiation of PN in surgical patients is an ideal task for the clinical pharmacist, as this leads to an objective assessment of how many patients really need PN versus EN. However, the clinical setting confronts the team also with limitations or unexplored areas of the intended populations of these specific guidelines.

Conclusion

The majority of the population in our study was nutritionally at risk, so a nutritional plan is mandatory. According to the current ESPEN guidelines, PN was justified in 9 of 35 patients. However, PN could only be replaced by EN if an appropriate jejunostomy tube would be found. Specific problems rise in thoracic surgical patients where a continuous risk analysis should be made to avoid pulmonary complications and aspiration, whichever route for nutritional support is chosen. Methodologically well conducted studies that compare the efficacy, safety and tolerability of EN via jejunostomy tube versus PN in this specific patient population are needed. Whether EN, compared with PN, has an effect on the overall survival, will be the subject of further research in the near future.

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Conflicts of interest None of the authors have financial or personal relationships with other people or organizations that could inappropriately influence (bias) their work.

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