ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Enteral feeding using nasogastric tube versus percutaneous endoscopic gastrostomy in critically ill patients

Waseem M. Seleem[1], Khadeja M. El Hossieny[2] and Heba M. Fathi[2]

1 Gastroenterology unit, Internal Medicine Department, Zagazig University Hospital, Egypt.

2 Intensive Care Unit, Anaesthesia Department, Zagazig University Hospital, Egypt.

Manuscript Info

Manuscript History:

Received: 15 June 2014
Final Accepted: 26 July 2014
Published Online: August 2014

Key words:
Enteral feeding, PEG feeding, NGT feeding, MAC, critically ill patients.

Corresponding Author

Waseem M. Seleem, Khadeja M. El hossieny

Abstract

Background: Enteral feeding is one component of nutritional support. It is the preferred method for nutritional support for patients that cannot receive adequate oral nutrition and have a functioning gastrointestinal tract (GIT). This method of nutritional support has undergone progression over recent times. The method of placement of enteral feeding tubes has evolved due to development of new feeding tubes and endoscopic technology.

Aim of the work: - The aim of this work is to compare the value of nasogastric tube (NGT) versus percutaneous endoscopic gastrostomy (PEG) for feeding critically ill patients.

Patients and methods: Out of 110 critically ill patients presented to ICU, 30 patients (5 females and 25 males) with their age ranged from 52 to 75 years had completed the study, they were divided into 15 patients with NGT feeding and 15 patients with PEG feeding and the other patients met the exclusion criteria. The effectiveness of NGT feeding was compared to PEG feeding according to the following parameters: measuring mid-arm circumference (MAC), serum albumin level, hemoglobin (HB), blood urea nitrogen (BUN) and serum creatinine level at baseline (week 0), 4 weeks and 8 weeks post-intervention.

Results: Our study revealed that; there was no significant difference between NGT and PEG groups as regard the baseline features but there was significant increase in serum albumin level at the 4^{th} week and in MAC and serum albumin level at the 8^{th} week in PEG group more than NGT group. Follow up of the studied parameters within each group at weak 0, the 4^{th} week and the 8^{th} week showed that patients in NGT group expressed decease in MAC, serum albumin level and BUN with significant decrease in serum creatinine level while there was increase in HB. Comparing these parameters within PEG group at the same intervals showed increase in MAC and HB with significant increase in serum albumin level while there was decrease in BUN with significant decrease in serum creatinine level.

Conclusion: Our study concluded that PEG is more effective than NGT as enteral feeding method for improving the nutritional status (in terms of MAC and serum albumin level), HB, BUN and serum creatinine level of the critically ill patients.

Introduction

In patients who are critically ill, there is no doubt that nutritional status and clinical outcome are linked (1). ICU patients typically experience catabolic stress and systemic inflammatory response; in turn, these responses alter both the morphology and function of the gastrointestinal tract (GIT) **(2).** Up to 60% of ICU patients suffer GIT dysfunction due to impaired GIT motility, digestion, or absorption **(3)**. Such GIT dysfunction, often coupled with inadequate caloric intake which lead many critically ill patients to develop an energy deficit and lose lean body mass **(4)**.

ICU patients with poor nutritional status commonly experience immune dysfunction, weakened respiratory muscles and lowered ventilation capacity, and reduced GIT tolerance **(5)**. As a result, patients are at risk for a wide range of complications including ventilator dependence; GI dysfunction with gastroesophageal reflux, esophagitis, or pulmonary aspiration; and infections that can lead to sepsis, multi-organ failure, and even death. For such patients, supportive nutrition has long been used as adjunctive care **(1)**.

Malnutrition is common in patients with acute and chronic illness. Nutritional management of these malnourished patients is an essential part of healthcare. Enteral feeding is one component of nutritional support. It is the preferred method of nutritional support in patients that are not receiving adequate oral nutrition and have a functioning GIT. Enteral feeding can be divided into methods that provide short-term and long-term access to the GIT. The method of placement of enteral feeding tubes has evolved due to development of new feeding tubes and endoscopic technology **(6)**.

The prevalence of under nutrition among hospitalized individuals ranges from 18.2% to 40%. Due to the increase in the basal metabolic rate and the presence of numerous situations that make the administration of enteral diets difficult, there is an expectation that under nutrition prevalence among critically ill patients will be even higher **(7).** The presence of malnutrition among critically ill patients is alarming due to its association with a higher susceptibility to infections, lean body mass reduction, predisposal to respiratory insufficiency/failure, impairment of wound healing, development of pressure ulcers, increase of cost and length of hospitalization and higher mortality rates **(8).**

Nutritional therapy plays an important role in the treatment of critically ill patients, because it allows the tailored administration of energy and nutrients prevents/reduces the installation of under nutrition, or corrects nutritional alterations already installed in under nourished patients. In addition, it has been recently demonstrated that nutritional therapy plays a primary therapy role, intervening directly in the pathophysiological alterations of diseases and hence, in the clinical outcome **(4).**

Patients and methods:-

This study had been conducted in Gastroenterology unit, Internal Medicine department and ICU, Anaesthesia department Zagazig University Hospital, Egypt.

The study was approved by the ethical committee of the hospital and a written informed consent was obtained from each patient or his relatives.

Out of 110 critically ill patients presented to ICU, 30 patients (5 females and 25 males) with their age ranged from 52 to 75 years had completed the study; they were divided into 15 patients with NGT feeding and 15 patients with PEG feeding while the other patients met the exclusion criteria.

All patients included in this study were subjected to; thorough history taking, complete physical examination, with measuring of MAC (midway between the acromioclavicular joint and lateral epicondyle of humerus), routine laboratory investigations especially; serum albumin level, HB, BUN and serum creatinine at baseline (week 0), 4 weeks and 8 weeks post-intervention, random blood sugar, INR, PTT abdominal ultrasound and ECG.

Patients in both groups received a standard enteral feed (fresubin). The rate of delivery of the feed was 50 ml per hour in the first 24 hours then increased to an average of 100 ml per hour for patients in both groups. The volume of the given formula was calculated according to the caloric requirement for each patient through simplistic formula (25-30 kcal/kg/d) (**1**).

Inclusion criteria for enteral feeding: Unconscious patients with swallowing disorders and critically ill patients taking less than 50% of estimated nutritional requirements with a functioning GIT **(1).**

Exclusion criteria for enteral feeding: Patients are taking more than 50% of estimated nutritional requirements, patients with extreme hemodynamic instability or escalating requirements for vasopressors, critically ill patients who have a compromised GIT function i.e. complete intestinal obstruction, paralytic ileus, intractable vomiting, GIT hemorrhage, short bowel and/or severe diarrhea and refusal to participate in the study **(1)**

Exclusion criteria for PEG: Presence of contraindication for enteral feeding, prior gastric surgery, pregnancy, tense ascites, gastroparesis, irreversible gastric or pancreatic cancer, severe gastroesophageal reflux or gastric outlet obstruction, refusal to participate in the study and absence of an informed consent by patients' relatives for PEG application **(9).**

NGT placement:

The patency of the nares is assessed. An otoscope may be used to examine the passage way and identify septal deviation or other anatomical restrictions. Pretreatment of the nasal passage ways with oxymetazoline. The nasal mucosa and the posterior oropharynx can be anesthetized with 4 % lidocaine spray. The proper depth of the tube insertion is estimated by measuring the distance from the xiphoid process to the angle of the mandible and then to the nostril. Position the patient in sitting upright "sniffing" position, lubricate the distal end of the NGT and insert it into the nasal cavity, passing it posteriorly along the floor of the nasal canal then into the posterior oropharynx. Once the tube is past the larynx, guide it rapidly to the predetermined depth .

Proper gastric placement was confirmed by auscultating borborygmus over the epigastrium as air is injected into the tube with the catheter-tip syringe **(10).**

Endoscopic PEG placement:-

PEG tubes with a large lumen (at least 15 French) were used to avoid clogging. The "two operator" method was used; the first operator controls the gastroscope. The gastroscope light is then transilluminated through the anterior abdominal wall. The second operator applies finger pressure on the anterior abdominal wall. This diaphanoscopy should result in indentation of the gastric mucosa. The puncture site is marked, the anterior abdominal wall is then aseptically cleaned, after adequate local anesthesia (e.g. bupivacaine to improve local pain relief post insertion) and an appropriate initial incision, the puncture cannula is inserted under endoscopic control into the stomach which has been previously fully dilated with air. A thread is passed through the cannula sheath into the stomach, grasped using the biopsy forceps by the endoscopist and drawn out through the mouth together with the gastroscope. The thread loop is fastened tightly to the external end of the PEG tube, while applying continuous traction on the thread the PEG tube is drawn down through the esophagus, the stomach and out through the puncture site until the internal fixation plate has drawn the anterior wall of the stomach against the abdominal wall. To avoid causing damage to the mucosa while pulling the thread, it must be ensured that the cannula sheath remains in the puncture canal during the positioning phase until the conical tip of the tube is locked in its intragastric end. Provided that positioning of the PEG tube has been conducted without complications **(6)**.

N.B The needle aspiration test was done using a syringe containing 5ml saline solution during gastric aspiration to avoid the risk of overlying small or large bowel perforation (**11).**

Preparations and aftercare prior to and after endoscopic placement of an enteral tube system (6):-

Preparation	Aftercare
• Exclusion of contraindications. • Current coagulation status (INR<1.5, PTT<50 seconds and/or platelets >50,000/mm3). • Patient fasting overnight (8 h). • Antibiotic prophylaxis (2 g cefotaxime i.v. 1 h before the procedure). • Shaving the epigastric region above the umbilicus if necessary. • Analgesia/sedation (e.g. midazolam i.v.). • Placement of tube system under sterile surgical conditions.	• Allow external fixation plate to adapt over night with low traction. • Ensure tube has sufficient free movement 45mm after first change of dressing next morning. • Sterile Y-compress under the external fixation plate. • Sterile renewal of dressings on a daily basis. • Nutrients can be delivered via the tube 1 h after uncomplicated PEG placement. • Training of patients and/or relatives.

Statistical analysis:

Data were tabulated and subjected to computer assisted statistical analysis using the statistical package for social science (SPSS) version 18.0. Data is expressed by descriptive statistics (mean ± standard deviation) and inferential statistics (t-test for comparing the means of the two groups, ANOVA test for comparing the multiple means within each group at different point of time (weak 0, weak 4 and weak 8). A p-value less than 0.05 were considered statistically significant, and less than 0.001 considered highly significant.

Results:

Baseline features (week 0) showed no significant difference between NGT and PEG groups as shown in (table 1).

Table (1): Comparison between the studied groups as regard MAC, Albumin, HB, BUN and creatinine at baseline.

Weak 0 (Baseline)	NGT group N= 15	PEG group N= 15	T	P
MAC (cm)	32.8±2.6	33.7±3.08	-0.83	0.41
Serum albumin (gm/dl)	3.9±0.6	3.7±0.4	0.67	0.5
HB (gm/dl)	10.8±1.1	10.9±1.0	-0.22	0.82
BUN (mg/dl)	38.7±6.3	38.9±8.5	-0.09	0.9
Serum creatinine (mg/dl)	1.5±0.4	1.3±0.4	0.82	0.41

With regard to the studied parameters after four weeks, as shown in (table 2), serum albumin level was significantly higher in the PEG group compared to the NGT group while the other parameters showed no significant difference between the two groups.

Table (2): Comparison between the studied groups as regard MAC, serum albumin, HB, BUN and serum creatinine at the 4^{th} week.

Weak 4	NGT group N= 15	PEG group N= 15	T	P
MAC (cm)	32.8±2.5	34.4±3.04	-1.4	0.15
Serum albumin (gm/dl)	3.6±0.5	4.04±0.3	-2.2	0.03*
HB (gm/dl)	10.7±1.1	10.6±0.9	0.2	0.8
BUN (mg/dl)	36.1±5.4	37.1±7.2	-0.4	0.69
Serum creatinine (mg/dl)	1.2±0.3	1.05±0.2	1.3	0.18

At the final monitoring, both serum albumin level and MAC were significantly higher in the PEG group compared to the NGT group at 8th week (table 3).

Table (3): Comparison between the studied groups as regard MAC, serum albumin, HB, BUN and serum creatinine at the 8th week.

Weak 8	NGT group N= 15	PEG group N= 15	T	P
MAC (cm)	32.2±2.7	35.2±3.3	-2.5	0.01*
Serum albumin(gm/dl)	3.3±0.4	4.2±0.3	-5.5	0.00**
HB (gm/dl)	11.08±1	11.3±0.9	-0.6	0.5
BUN (mg/dl)	34.6±4.5	35.3±5.9	-0.3	0.7
Serum creatinine (mg/dl)	1±0.2	0.9±0.1	0.9	0.3

Follow up of the studied parameters within each group at weak 0, the 4th week and the 8th week showed that patients in NGT group expressed decease in MAC, serum albumin level and BUN with significant decrease in serum creatinine level while there was increase in HB as shown in (table 4).

Comparing these parameters within PEG group at the same intervals showed increase in MAC and HB with significant increase in serum albumin level while there was decrease in BUN with significant decrease in serum creatinine level (table 5).

Table (4): Follow up of the studied parameters among NGT group.

NGT group	Weak 0	Weak 4	Weak 8	F	P
MAC (cm)	32.8±2.6	32.8±2.5	32.2±2.7	0.3	0.73
Serum albumin (gm/dl)	3.9±0.6	3.6±0.5	3.3±0.4	3.1	0.055
HB (gm/dl)	10.8±1.1	10.7±1.1	11.08±1	0.36	0.69
BUN (mg/dl)	38.7±6.3	36.1±5.4	34.6±4.5	2.08	0.13
Serum creatinine (mg/dl)	1.5±0.4	1.2±0.3	1±0.2	7.4	0.002*

Table (5): Follow up of the studied parameters among PEG group.

PEG group	Weak 0	Weak 4	Weak 8	F	P
MAC (cm)	33.7±3.08	34.4±3.04	35.2±3.3	0.6	0.54
Serum albumin (gm/dl)	3.7±0.4	4.04±0.3	4.2±0.3	5.7	0.007*
HB (gm/dl)	10.9±1.0	10.6±0.9	11.3±0.9	1.3	0.2
BUN (mg/dl)	38.9±8.5	37.1±7.2	35.3±5.9	0.74	0.48
Serum creatinine (mg/dl)	1.3±0.4	1.05±0.2	0.9±0.1	6.3	0.005*

Discussion:-

The methods of placement of enteral feeding tubes have evolved due to development of new feeding tubes and endoscopic technology. Enteral feeding can be divided into methods that provide short-term and long-term access to the GIT **(6)**. PEG is the gold standard for long-term enteral feeding. It has replaced almost completely the classic surgical gastrostomy for long-term enteral nutrition of patients unable to take oral feedings. An adequate PEG candidate should have life expectancy longer than a few weeks **(12)**.

Our results recorded that patients in the PEG group showed improvement in the nutritional status including anthropometric measurement of MAC and serum albumin level while patients in the NGT group showed decrease in these parameters at follow up, this was in agreement with **Hamidon et al (13)** who noticed a significantly higher serum albumin level in the PEG group as compared to the NGT group at 4 weeks post-intervention, also they demonstrated some improvement in triceps skin fold thickness (TSFT) as an anthropometric parameter in the PEG group after 4 weeks but we assessed MAC instead of TSFT as the anthropometric parameter in our study , this was explained by **Norton et al (14)** who found that patients in the PEG group enjoyed the benefit of uninterrupted feeding and were associated with fewer treatment failures whereas 71% of the patients received feeding through NGT missed at least one day's feed with a mean loss of 22% of their total prescribed feed due to frequent

replacement of the NGT secondary to recurrent blockage and displacement of the NGT which did not occur with PEG feeding.

Considering hemoglobin level; there was improvement of hemoglobin level in both groups and it was more in the PEG group than the NGT group. This result was attributed to frequent clogging and displacement of NGT which did not occur with PEG feeding. **Kagansky and Rimon (15)** supported our finding and concluded that enteral feeding with enriched formula appears to improve serum albumin and hemoglobin levels for long-term care of patients. In contrast to our finding; **Norton et al (14)** reported an overall modest reduction in hemoglobin concentration in both groups , this may be related to their use of different feeding formula (Nutrison) with different components (lower level of iron, B12 and folic acid) and the shorter duration of follow up of the patients (6 weeks) than that of our study (8weeks).

As regards serum creatinine and BUN; our results showed improvement of both after enteral feeding (including both PEG and NGT groups), this was related to improvement of the hydration status and decreased catabolic activity of the patients with regular feeding; this was in agreement with **Arinzon et al (16)** who reported that enteral nutrition was associated with improvement in blood count (hemoglobin and lymphocyte count), renal function tests (BUN, creatinine), hydration status and in serum proteins (total protein, albumin, and transferrin).

Considering complications; the NGT group recorded more complications than the PEG group e.g. tube clogging in 5 cases, tube dislodgement in 4 cases, diarrhea in 4 cases and vomiting in 2 cases, this was in agreement with **Pancorbo et al (17)** who found the following complications in patients with NGT feeding: tube dislodgement (48.5%), electrolytic alterations (45.5%), hyperglycemia (34.5%), diarrhea (32.8%), constipation (29.7%), vomiting (20.4%), tube clogging (12.5%), and lung aspiration (3.1%). While the PEG group recorded few complications e.g. mild peristomal infection in 2 cases that was also a frequent complication reported **by Duarte et al (18)** and was controlled by IV antibiotics.

Conclusion: Our study concluded that PEG is better than NGT as an enteral feeding method for critically ill patients in improving their nutritional status (including MAC and serum albumin level), HB, BUN and serum creatinine as patients with PEG enjoyed the benefit of uninterrupted feeding with fewer treatment failures and complications.

References

1-Mc Clave SA, Martindale RG, Vanek VW, et al : Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). JPEN J Parenter Enteral Nutr 2009; 33:277-316.

2-Peuhkuri K, Vapaatalo H and KorpelaR: Even low-grade inflammation impacts on small intestinal function. World J Gastroenterol 2010; 16:1057-1062.

3-Reintam A, Parm P, Kitus R, et al: Gastrointestinal symptoms in intensive care patients. Acta Anaesthesiol Scand 2009; 53:318-324.

4-Cahill NE, Dhaliwal R, Day A,et al: Nutrition therapy in the critical care setting: What is "best achievable"practice? An international multicenter observational study.Crit Care Med 2010; 28 (2): 395-401.

5-Heyland DK, Dhaliwal R, Drover JW, et al: Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. JPEN J Parenter Enteral Nutr 2003; 27:355-373.

6-Rafferty GP and Tham TCK: Endoscopic placement of enteral feeding tubes. World J Gastrointest Endosc 2010; 2(5): 155-164.

7-Khalid I, Doshi P and DiGiovine B: Early enteral nutrition and outcomes of critically ill patients treated with vasopressors and mechanical ventilation. Am J Crit Care 2010; 19:261-268.

8-Singer P, Pichard C, Heidegger CP, et al : Considering energy deficit in the intensive care unit. Curr Opin Clin Nutr Metab Care 2010; 13:170-176.

9-Somi Mohammad Hossein, Maghbouli Leili and Antikchi Mohammad Hossein: Acceptability and outcomes of percutaneous endoscopic gastrostomy (PEG) tube placement and patient quality of life. Turk J Gastroenterol 2011; 22 (2): 128-133**.**

10-Thomsen, T.; Shafer, R. and Setnik, G: Nasogastric Intubation. N ENgl J Med 2006; 354: 17.

11-Schrag SP, Sharma R, Jaik NP, et al: Complications related to percutaneous endoscopic gastrostomy (PEG) tubes. A comprehensive clinical review.J Gastrointestin Liver Dis 2007; 16: 407-418.

12-Jorge Fonseca, Carla Adriana Santos and José Brito: Predicting survival of endoscopic gastrostomy candidates using the underlying disease, serum cholesterol, albumin and transferrin levels. Nutr Hosp 2013 ; 28(4):1280-1285.

13-B B Hamidon, S A Abdullah, M F Zawawi, et al: A Prospective Comparison of Percutaneous Endoscopic Gastrostomy and Nasogastric Tube Feeding in Patients with Acute Dysphagic Stroke. Mad J Malaysia 2006; 61(1):59-66.

14-B Norton, MHomer-Ward, MT Donnelly, et al: A randomized prospective comparison of percutaneous endoscopic gastrostomy and nasogastric tube feeding after acute dysphagic stroke**.** BMJ 1996; 312: 13-6

15-Kagansky M and Rimon E: Is there a difference in metabolic outcome between different enteral formulas?JPEN J Parenter Enteral Nutr 2007; 31(4):320-3.

16-Arinzon Z, Peisakh A and Berner YN: Evaluation of the benefits of enteral nutrition in long-term care elderly patients.Journal of the American Medical Directors Association 2008; 9 (9):657-62

17- Pancorbo-Hidalgo PL, García Fernandez FP and Ramírez-Pérez C: Complications associated with enteral nutrition by nasogastric tube in an internal medicine unit. J Clin Nurs 2001;10 (4):482-90.

18-Duarte H, Santos C, Capelas ML and Jorge Fonseca J: Peristomal infection after percutaneous endoscopic gastrostomy:A 7-year surveillance of 297 patients Arq Gastroenterol 2012; 49 (4): 255-258.