

Usefulness of Semi-solid Medical Foods Administered After Percutaneous Endoscopic Gastrostomy

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ABSTRACT

Background: Even if preoperative enteral nutrition is administered without any issues, some patients suffer from gastrointestinal symptoms (e.g., vomiting and diarrhea) after initiating gastrostomy feeding. Because of the amino acid composition and limited amount of lipids, elemental diets may reduce the risk of gastrointestinal symptoms. However, elemental diets are expensive. Semi-solid medical foods are inexpensive and more closely mimic normal physiology than elemental diets. The aim of the present study was to investigate the usefulness of semi-solid medical foods when administered after percutaneous endoscopic gastrostomy (PEG).

Method: This retrospective study analyzed 91 patients who had PEG performed by the author who was the attending physician. All patients received preoperative enteral nutrition with liquid nutrients, and there were no instances of gastrointestinal symptoms before PEG tube placement. The types of nutrients administered after PEG were divided into three categories: semi-solid medical foods ($n = 20$), polymeric formulas ($n = 26$), and elemental diets ($n = 45$). The incidence of gastrointestinal symptoms was compared among the three groups.

Results: No gastrointestinal symptoms occurred in the semi-solid medical foods group; the incidence of gastrointestinal symptoms in the semi-solid medical foods group was significantly lower than that of the polymeric formulas group [0% vs. 26.9% (7/26), $p < 0.05$] and was similar to that of the elemental diets group [0% vs. 2.2% (1/45), $p = 1$].

Conclusion: If preoperative enteral nutrition is administered without any issues, semi-solid medical foods are useful as nutrients administered after PEG tube placement.

Keywords: diarrhea, percutaneous endoscopic gastrostomy, semi-solid medical food, vomiting

ABSTRAK

Latar belakang: Meskipun tidak ada masalah saat pemberian nutrisi enteral preoperatif, beberapa pasien mengalami gejala gastrointestinal (seperti muntah dan diare) setelah memulai asupan nutrisi melalui gastrostomi. Karena komposisi asam amino dan kandungan lemak yang terbatas, diit elemental dapat menurunkan risiko terjadinya berbagai gejala gastrointestinal tersebut. Namun, diit elemental membutuhkan biaya yang cukup besar. Pangan medis semisolid adalah nutrisi yang tidak mahal dan lebih fisiologis dibandingkan dengan diit elemental. Tujuan penelitian ini adalah untuk mengetahui manfaat pangan medis semisolid saat diberikan melalui gastrostomi endoskopik perkutan (PEG).

Metode: penelitian retrospektif ini menganalisis 91 pasien yang telah dipasang PEG oleh penulis sebagai dokter penanggung jawab pasien. Seluruh pasien mendapat nutrisi enteral preoperatif dalam bentuk cair dan tidak ada gejala gastrointestinal sebelum pemasangan selang PEG. Jenis nutrisi yang diberikan setelah pemasangan

PEG dibagi menjadi tiga: pangan medis semisolid ($n = 20$), formula polimerik ($n = 26$), dan diit elemental ($n = 45$). Insidens gejala gastrointestinal dibandingkan antara ketiga kelompok tersebut.

Hasil: tidak ada gejala gastrointestinal yang dialami kelompok pangan medis semisolid; insidens ini lebih rendah dibandingkan dengan kelompok formula polimerik [0% vs. 26.9% (7/26), $p < 0.05$] dan sama dengan kelompok diit elemental [0% vs. 2.2% (1/45), $p = 1$].

Simpulan: bila tidak ada masalah pemberian nutrisi enteral preoperatif, pangan medis semisolid merupakan nutrisi yang bermanfaat pada pemberian melalui selang PEG.

Kata kunci: diare, gastrostomi endoskopik perkutan, muntah, pangan medis semisolid

INTRODUCTION

The American Society for Parenteral and Enteral Nutrition and the Japanese Society for Parenteral and Enteral Nutrition have recommended the use of gastrostomy tubes for patients whose nutritional intake is likely to be qualitatively or quantitatively inadequate for a period exceeding four weeks.^{1,2} However, even if preoperative enteral nutrition is administered without any issues, some patients suffer from gastrointestinal symptoms (e.g., vomiting and diarrhea) after initiating gastrostomy feeding.³ Gastrointestinal symptoms reduce patients' quality of life and increase nursing workload. In addition, aspiration pneumonia and dehydration due to diarrhea are life-threatening complications of enteral nutrition.

Elemental diets consist of essential amino acids, glucose, trace elements, and vitamins. Depending on the amino acid composition, elemental diets are easily absorbed and highly digestible. Therefore, elemental diets are less likely to induce diarrhea than standard liquid nutrients.⁴ Furthermore, elemental diets are related to more rapid gastric emptying and fewer episodes of aspiration than standard liquid nutrients, most likely due to their limited amount of lipids.⁴ However, elemental diets are expensive.⁵ Semi-solid medical foods are inexpensive and more closely mimic normal physiology than elemental diets. The aim of the present study was to investigate the usefulness of semi-solid medical food when administered after percutaneous endoscopic gastrostomy (PEG).

METHOD

This retrospective study included 177 patients who underwent PEG performed by the author (who was the attending physician) from August 1, 2011 to March 31, 2019. The following patients were excluded: 56 patients who received preoperative non-enteral nutrition; 16 patients who received postoperative enteral nutrition with L-8[□] (Asahi Kasei Pharma, Tokyo, Japan), which

is currently unavailable commercially in Japan; 13 patients who received specialized nutrition support; and one patient without gastrostomy feeding after PEG. In total, 91 patients were analyzed.

All patients received preoperative enteral nutrition with liquid nutrients, and there were no instances of gastrointestinal symptoms before PEG tube placement. Enteral nutrition through a PEG tube was started on the third day after its placement. Semi-solid medical foods were administered by bolus infusion (5–10 min). A gravity-controlled method was used to administer liquid nutrients (900–1,200 kcal/day) at a speed of 250–400 mL/h.

Patient data extracted from medical records included the following: age, gender, indications for PEG, preoperative enteral nutrition with elemental diets, nutrients administered after PEG, previous history of pylorus-preserving gastrectomy, hemodialysis, serum albumin levels, serum alanine aminotransferase levels, serum creatinine levels, serum hemoglobin levels, serum brain-type natriuretic peptide levels, and gastrointestinal symptoms (vomiting or diarrhea) within five days after the initiation of enteral feeding through a PEG tube. Diarrhea was defined as liquid or loose stool occurring at least three times a day, and stool sample-based tests confirmed non-infectious causes. The types of nutrients administered after PEG were divided into three categories: semi-solid medical foods, polymeric formulas, and elemental diets. The incidence of gastrointestinal symptoms was compared among the three groups.

The present study was approved by the Institutional Ethics Committee, and informed consent was obtained from the patients or their families. All statistical analyses were conducted using EZR (Easy R) version 1.37, and p values of < 0.05 were considered significant.⁶ The author used the two-sided Mann–Whitney U test or the Fisher's exact test to assess differences between two groups.

RESULTS

Patients' backgrounds are summarized in Table 1, and the liquid nutrients administered after PEG tube placement are shown in Table 2.

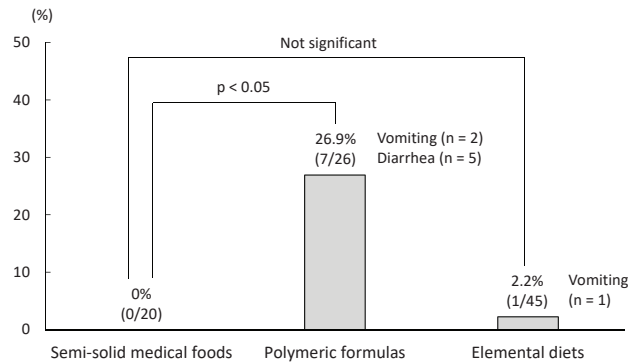


Figure 1. Comparisons of gastrointestinal symptoms

There were no significant differences in the patients' backgrounds among the three groups. The comparisons of gastrointestinal symptoms are shown in Figure 1. No gastrointestinal symptoms occurred in the group who received semi-solid medical foods; the incidence of gastrointestinal symptoms in the semi-solid medical foods group was significantly lower than that of the

polymeric formulas group [0% vs. 26.9% (7/26), $p = 0.0137$] and was similar to that of the elemental diets group [0% vs. 2.2% (1/45), $p = 1$] (Figure 1).

DISCUSSION

Semi-solid medical foods are superior to standard liquid nutrients in terms of preventing gastroesophageal reflux and reducing the risk of aspiration pneumonia in gastrostomy-fed patients.^{7,8} Additionally, two randomized controlled studies have reported that semi-solid medical foods prevent diarrhea.^{9,10} This difference may be due to the thickeners and pectin contained in semi-solid medical foods, which are associated with delayed gastric emptying or prolonged small intestinal transit time.^{9,10} Therefore, the utility of semi-solid medical foods is deemed reasonable. The fact that semi-solid medical foods had an equivalent efficacy to elemental diets is important; thus, physicians should administer semi-solid medical foods due to their inexpensive cost.

Surprisingly, approximately one-fourth of the patients receiving enteral nutrition with polymeric formulas, which are frequently used in clinical

Table 1. Patients' backgrounds

	Semi-solid medical foods (n = 20)	Polymeric formulas (n = 26)	p^*	Elemental diets (n = 45)	$p^†$
Age (year), median	82.5	81	0.920	81	0.316
Male, n (%)	10 (50.0)	11 (42.3)	0.766	15 (33.3)	0.271
Indications for PEG, n (%)			0.103		0.471
CVD	8 (40.0)	11 (42.3)		19 (42.2)	
Dementia	5 (25.0)	9 (34.6)		15 (33.3)	
Sarcopenia	2 (10.0)	2 (7.7)		7 (15.6)	
Parkinson's disease	4 (20.0)	0		3 (6.7)	
Dementia with Lewy bodies	0	1 (3.8)		0	
Malignancy	0	3 (11.5)		0	
Schizophrenia	1 (5.0)	0		1 (2.2)	
Preoperative EN with elemental diets, n (%)	0	1 (3.8)	1	3 (6.7)	0.547
Pylorus-preserving gastrectomy, n (%)	1 (5.0)	0	0.435	1 (2.2)	0.524
Hemodialysis, n (%)	0	2 (7.7)	0.498	2 (4.4)	1
Serum Alb level, median (g/dL)	3.55	3.4	0.213	3.4	0.137
Serum ALT level, median (IU/L)	16.5	15	0.807	18	0.771
Serum Cr level, median (mg/dL)	0.52	0.61	0.557	0.58	0.649
Serum Hb level, median (g/dL)	12.2	11.55	0.773	11.8	0.518
Serum BNP level, median (pg/mL)	27.95	46.3	0.201	43.9	0.570

*: Polymeric formulas vs. semi-solid medical foods, †: Elemental diets vs. semi-solid medical foods, Alb: albumin, ALT: alanine aminotransferase, BNP: brain-type natriuretic peptide, Cr: creatinine, CVD: cerebrovascular diseases (cerebral infarction, cerebral hemorrhage, subarachnoid hemorrhage, or subdural hemorrhage), EN: enteral nutrition, Hb: hemoglobin.

Table 2. Liquid nutrients administered after PEG tube placement

	kcal/mL (g)	n
Semi-solid medical foods (n = 20)		
RACOL-NF Semi-Solid for Enteral Use [®] ; Otsuka Pharmaceutical, Tokyo, Japan	1.0	20
Polymeric formulas (n = 26)		
ENSURE H [®] ; Abbott Japan, Tokyo, Japan	1.5	9
RACOL-NF Liquid for Enteral Use [®] ; Otsuka Pharmaceutical, Tokyo, Japan	1.0	9
E-7 [®] ; Clinico, Tokyo, Japan	1.0	8
Elemental diets (n = 45)		
ELENTAL [®] ; EA Pharma, Tokyo, Japan	1.0	45

PEG: percutaneous endoscopic gastrostomy

practice, suffered from gastrointestinal symptoms (Figure 1). PEG itself or postoperative non-enteral nutrition for only three days may have caused impaired gastrointestinal function. Due to the high incidence of gastrointestinal symptoms, physicians should avoid administering polymeric formulas.

The present study has several limitations. First, the author used a single-center and retrospective study design. Second, different dosages of nutrients may have influenced the incidence of vomiting or diarrhea.

CONCLUSION

If preoperative enteral nutrition is administered without any issues, semi-solid medical foods are useful as nutrients administered after PEG tube placement.

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