ORIGINAL ARTICLE

SINGLE-CENTRE ENDOSCOPIC GASTROSTOMY PLACEMENT RESULTS: EXPERIENCE AND MANAGEMENT OF COMPLICATIONS AND SIDE EFFECTS OF NUTRITIONAL PRODUCTS; REVIEW OF 426 CASE *PRESENTATIONS*

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Abstract

Introduction: We aim to present the results, experience, and management of the complications and side effects of nutritional products in geriatric patients (age≥65 years) who underwent percutaneous endoscopic gastrostomy.

Materials and Method: Between January 01, 2018, and 31 December 2021 we examined 426 patients from the endoscopy and intensive care units. We assessed their primary diseases, insertion indications, procedural complications (endoscopy unit, patient bedside, surgery-household), consultations in the clinic, and procedural morbidity and mortality.

Results: Tubes were successfully placed in 426 patients but could not be inserted in 2 patients. The most common indication was cerebrovascular disease (45.3%) and the most common complication was catheter mobilization 16 (3.7%), primarily due to caregivers after discharge. In one patient, the tube passed through the transverse colon before reaching the stomach. This was noticed during colonoscopy and subsequently removed, after which the wound was closed primarily without any major complications. Wound infection resulting from leakage from the side of the tube, occurred in 12 patients (2.8%). Complications were more frequent in male patients aged > 70 years. The most common side effects of nutritional products in these patients were intolerance and diarrhoea.

Conclusion: Percutaneous endoscopic gastrostomy is safe and minimally invasive endoscopic procedure associated with low rate of morbidity. Clinicians can maximize outcomes and identify complications early by being aware of complications and utilizing preventive strategies. Furthermore, they need to be aware of the proper management of nutritional products' side effects.

Keywords: Aged; Endoscopy; Critical Care; Gastrostomy.

INTRODUCTION

The primary indication for enteral and parenteral feeding is to provide nutritional support to meet the metabolic requirements of the patients with inadequate oral intake. Enteral feeding is usually the preferred method over parenteral feeding in patients with a functional gastrointestinal (GI) system due to the associated risks of the intravenous route, higher costs, and the inability of parenteral nutrition to provide enteral stimulation, which could compromise the gut defence barrier. Moreover, it has been shown that enteric feeding can decrease the risk of bacterial translocation and corresponding bacteraemia (1). Tube feeding through the GI tract is primarily considered in patients with insufficient oral intake and a functional GI system, and tube insertion into the alimentary tract can be safely maintained (2). Percutaneous endoscopic gastrostomy (PEG) was first reported by Gauderer et al (3). in 1980 using endoscopy to insert a feeding tube into the stomach. Since its introduction by Gauderer et al. several different techniques have been developed for PEG tube insertion. Generally, all these methods share the common concept of inserting the gastrostomy tube through the abdominal wall at the point where the stomach and abdominal wall are in closest contact. In addition to the PEG endoscopy unit, this procedure can be easily performed at the bedside in ambulatory cases, with sufficient intravenous and local sedation, making it cheaper and less risky alternative to surgical gastrostomy, and with a shorter recovery time (4). PEG complications such as gastric wall necrosis, colon perforation, bleeding, and peritonitis are very rare, and catheter occlusion, port leakage, and port infection are the most common minor complications (5). This study aimed to assess the outcomes of hospital-based endoscopic gastrostomy placement and propose a novel method for comparing long-term major and minor complications, as well as managing nutritional side effects of PEG, in comparison to those reported in the literature.

MATERIALS AND METHOD

In this study we examined the indications, complications, and long-term results of PEG tube placement at the patient bed in 428 patients in the endoscopy and intensive care units of the state hospital between January 01, 2018, and 31 December 2021. Two patients were found to have gastric ulcers and carcinoma during endoscopy and were therefore excluded from the study. All procedures followed the ethical rules and the principles of the Declaration of Helsinki. The study was initiated with the approval of the Medical Faculty Clinical Research Ethics Committee (Ethical no:2022-SBB-06919). Patient's demographic and clinical characteristics and PEG results were evaluated. Since the study was designed retrospectively, the need for written informed consent from the patients was waived. The decision to perform PEG was made by the neurologist and the anaesthesiologist for patients whose swallowing reflex in the feeding unit was not sufficient and for patients whose enteral nutrition was not sufficient due to prolonged intubation or comorbid disease in the intensive care unit. Patient's age, sex, primary diseases, reason for insertion, procedure-related complications, and associated morbidity and mortality were recorded. All patients in our study were aged ≥65 years. Routine laboratory examinations were conducted on all patients with PEG indications before the procedure. Prophylactic antibiotics were administered to all patients. All patients met the criteria for bleeding disorders [international normalized ratio (INR): <1.5, Platelet (Plt): >50,000], and gastroscopy was performed to rule out contraindications that could hinder the procedure, such as pathologies, diffuse acid in the abdomen, and gastrointestinal obstruction. All patients received peripheral oxygen during the procedure. Saturation, electrocardiography (ECG), and systolic and diastolic blood pressures were continuously monitored. Sedation was administered to all cases under the supervision of a physician. Prophylactic treatment and antibiotics were given

to each patient 2-4 hours before the procedure. The procedure was performed using the "pull" technique, paying attention to sterilization and the "Flowell Percutaneous Endoscopic Gastrostomy Tube" with a size of 16 fr was used. Enteral feeding was not initiated until 24 hours after the PEG procedure.

Statistical Analysis

Statistical analysis was performed using the SPSS version 25.0 software (SPSS Inc., Chicago, IL, USA). Data are presented as the mean±standard deviation and frequency values for categorical variables. Data concerning surgical treatment results are presented as percentages.

RESULTS

The number of patients who underwent PEG was 426; 238 (55.9%) were female, and 188 (44.1%) were male. Among them, 274 (64.3%) were patients who could not be fed due to a neurological pathology and were hospitalized in the intensive care unit (Table 1). Of these patients, 193 (45.3%) had cerebrovascular disease and 81 (19.8%) had chronic nervous system diseases, such as amyotrophic lateral sclerosis, multiple sclerosis, and dementia. In seven (1.64%) patients, PEG was applied due to trauma, malignancies such as head, neck, and oropharyngeal cancer in 16 (3.7%) patients, and prolonged intubation in 129 patients (30.2%) (Table 2). The mean follow-up period was 120.8(1-1090) days. A total of 194 patients (45.5%) were discharged from the hospital due to primary or comorbid diseases (118 patients, 60.8%). The most common early complication was catheter mobilization, which was observed in 16 (3.7%) patients, and was mainly accidentally done by their caregivers after discharge. Meanwhile, wound infection occurred in 12 patients (2.8%) (Table3). Most patients improved with medical treatment; however, catheter removal was required in five patients (1.2%) due to infection.

Table 1. Distribution by clinic

Clinic	Number of patients	%
İntensive care	274	64.3
Neurology service	80	18.7
Palliative service	72	16.9

Table 2. Distribution of cases according to their etiology

Primary disease	Number of patients	%
Cerebrovasculer disease	193	45.3
Chronic nervous diseases	81	19
Extended intubation	129	30.2
Malignancy	16	3.7
Trauma	7	1.64

Table 3. Complications of the PEG procedure

Complication	Number of patients	%
Catheter mobilization	**12**	**2.8**
Wound İnfection	5	1.1
Colon perforation	1	0.2

In one patient, the PEG had passed through the transverse colon's two layers before reaching the stomach, resulting in the transverse colon getting trapped between the stomach and the abdominal wall. Fortunately, there were no fatalities related to PEG insertion. The rate of complication development was higher in male patients aged 70-75 years.

DISCUSSION

PEG for enteral nutrition has become widespread and offers distinct advantages in terms of cost and lower complication rates compared to parenteral nutrition (6).

Ekin et al. (7) found that 93% of PEG indications are primarily related to neurological discomfort. Takunaga et al (8). reported that 75% of patients had cerebrovascular disease. In our study, most PEG patients had neurological disease (64.3%), while others had undergone extended intubation, malignancy, and trauma.

There are controversial results in the literature on the use of prophylactic antibiotics before the procedure. In a published meta-analysis, a single dose of antibiotics was shown to reduce peristomal wound infection (8), but this was not observed in other study. In a study by Ekin et al (7). the effectiveness of prophylactic antibiotic use was not demonstrated. Meanwhile, Tokunaga et al (8). reported that prophylactic antibiotic use reduces procedural complications and the possibility of regional infection. Routine antibiotic prophylaxis (1000 mg cefazolin) was applied in our practice. Dormann et al (9). have shown that a single dose of ceftriaxone administered 30 minutes before percutaneouse endoscopic gastrostomy significantly reduces local and systemic infective complications. However, we preferred prophylactic antibiotic (1000 mg cefazolin) to reduce local and systemic infective complications. In this study the wound infection rate was as low as 1,1% when compared to 5-30% in the literature (10).

The literature lacks standardization regarding when and how to initiate feeding after a PEG procedure. Traditionally, limited feedings started 24 hours after the procedure, following gastrostomy data. Some studies have suggested starting feeding with in 1 hour, 24 hours, or the first 12 hours (11). In our routine practice, we commence the first feeding in the morning following the procedure.

Bankhead et al (12). found that the complication rate of the percutaneous endoscopic method was the lowest, followed by the open surgical method. Meanwhile, the laparoscopic method had the highest complication rate. PEG was the most frequently reported favourable option. Morbidity and mortality rates for the PEG procedure in surgical gastrostomy are higher than those for the endoscopic PEG procedure. Moreover, the endoscopic PEG procedure does not require general anaesthesia, can be performed at the bedside, and is cost-effective, making it a preferred choice (13).

The main complications are gastrocolic fistula and peritonitis. These complications are typically identified months after PEG placement, when the original PEG tube is removed or manipulated, or when the replacement tube is placed into the colon (14,15).

Preventing this complication involves using good transillumination and finger pressure to guide the puncture site placement. In our study, we observed a colonic injury while inserting a PEG tube. Four months later, a colonoscopy was performed, revealing that the tube had passed through the transverse colon's two layers without blocking the colonic passage. The tube was pulled out (Figure 1,2) and closed primarily without the need for an emergency procedure.

Zopf et al (16). identified four risk factors associated with complications and infections following PEG procedures: hospital stay, PEG tube size, the endoscopist' experience, and underlying malignant diseases. There were no reported cases of regional infection. Complications were observed in 1 case (7.6%), and PEG-related mortality was reported to be below 1%. In previous studies, the first 30-day mortality rates ranged from 8% to 26.8% in different series, with three-month mortality rates ranging from 15.7% to 42% due to external causes. In our study, no procedure-related mortality was observed. The previously reported

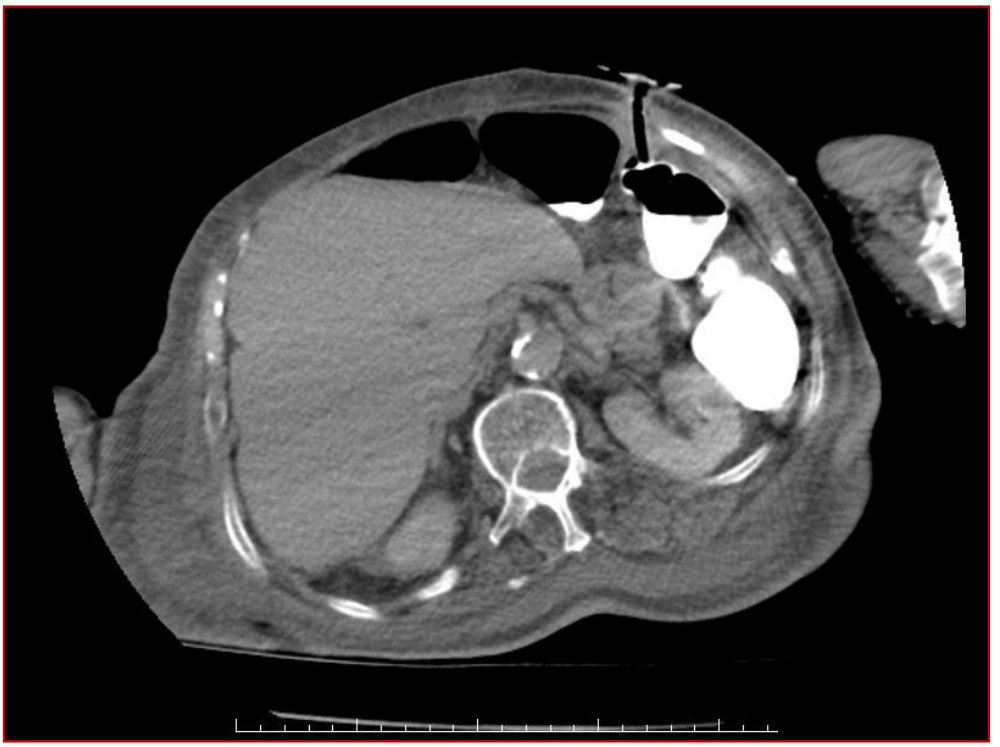

Figure 1. CT scanning of the Peg Tube

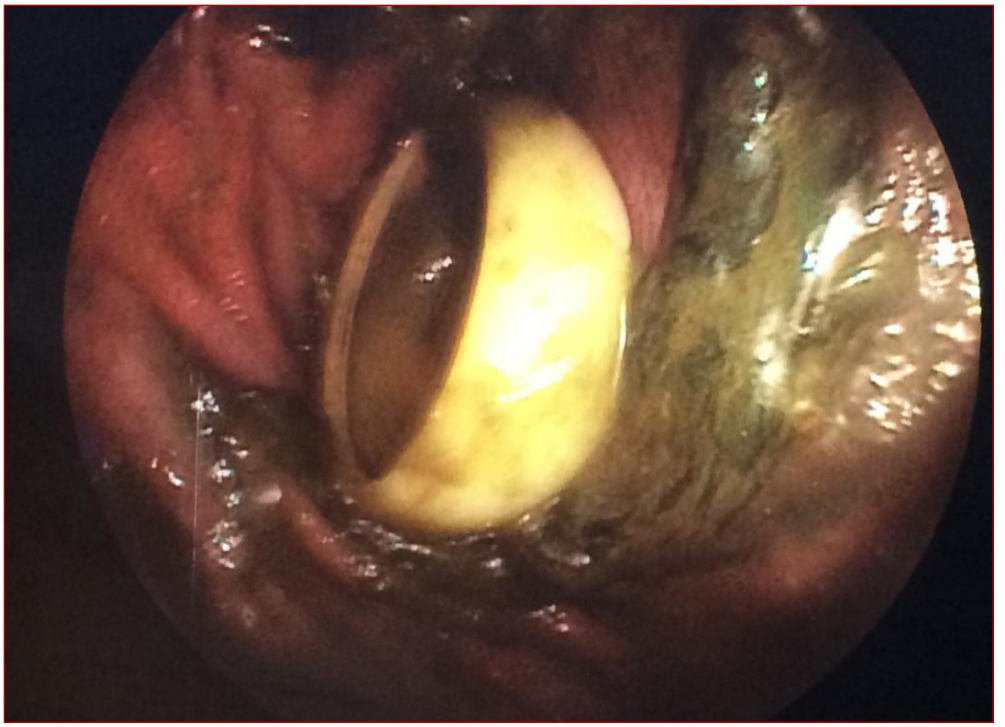

Figure 2. Peg tube in the transverse colon

risk factor for PEG tube insertion, increased age (16), was consistent with the findings in our study. Wound infection developed in 12 patients (2.8%). In cases of PEG catheter infection (whether early or late), wound cultures were obtained from the site and irrigated until culture results were available. Ciprofloxacin and topical fucidic acid were used, and systemic antibiotics were prescribed based on culture results. Enteral nutrition was discontinued if the infection worsened, and a switch to parenteral nutrition was made. If the issue persisted (as there was a foreign object), the PEG catheter was removed and we waited for the infected area to heal completely (2-3 weeks) before reinserting a new PEG. During this period, we halted NG and enteral/parenteral nutrition. For patients who presented to the emergency room, typically on the first or second day after the PEG catheter was removed by patients or their relatives at home to prevent closure of the catheter site due to epithelialization, we inserted a size 18 silicone Foley catheter. The balloon was inflated with 10 cc of sterile fluid, and the catheter was pulled back into the skin and secured. If it was not retracted and secured, it could move distally due to intestinal motility, potentially leading to closure, vomiting, and aspiration. During the COVID-19 epidemic, we encountered patients for whom we couldn't perform new PEG procedures for up to six months, and surprisingly, there were no problems. The non-closure of the lumen allowed us to reattach the PEG's with a lower risk of complications in patients who were enrolled in the PEG program using the same lumen. In cases where we suspected the PEG catheter was obstructed due to dressing beneath the stopper during mobilization (mainly stopper and tissue compression between the stomach and skin), we removed the catheter from the skin and gently pulled it upward, positioning it within the high-quartered superior area. If the catheter was 2 cm or less from the skin's surface and the bulb was palpable under the skin, we considered the catheter to be in place. We have seen this during repeat patient endoscopies. Consequently, if there was no infection, we initiated the PEG exchange program, performing endoscopy and PEG replacement during the same session. If there was an infection, we installed an NG tube, continued enteral feeding, detected the catheter, completed infection treatment, and then inserted a new PEG catheter. The rate of complication development was higher in male patients over the age of 70 years.

Management of side effects of nutritional products: In the past, the use of the enteral nutrition set (gravity) for meals, which relied on the patient's reflexes, often resulted in catheter blockages due to incorrect nutrition. However, we have observed no blockages when using the enteral feeding set with washing (pump feeding) during follow-up. With this set, enteral feeding is performed by washing with water. In patients starting nutrition, especially patients with diabetes mellitus(neuropathy), issues related to intolerance, stemming from reduced motility, are alleviated with the use of metoclopramide. However, for patients who develop intolerance and cannot be diagnosed with a condition obstructing luminal passage via endoscopy, continuous nutrition with pumps is considered. During this period, the enteral nutrition dose is reduced, and the remaining nutrition is administered intravenously. Enteral feeding is gradually increased to the full dosage as tolerance improves.

Regarding diarrhoea after enteral feeding, we conducted stool microscopy and stool culture when there were more than three episodes and a change in stool colour. We had previously obtained these samples from all patients, and many of the results were negative. We have observed that in most cases, diarrhoea is caused by the rapid enteral feeding in infants (17). That is why we initially administer feeding through a pump. If metoclopramide becomes necessary in a sequential approach, we pause enteral feeding, switch to a fibre-based enteral nutrition product, administer hyoscine-n-butyl bromide and prebiotic

products, reduce enteral nutrition, and complete the remaining nutrition parenterally in more resistant cases. Eventually, we discontinue enteral nutrition and provide parenteral nutrition. In our observations, we have seen the use of carbapenem, piperacillin/tazobactam, and teicoplanin in cases that are resistant to these treatments (18). Proper patient education is essential, particularly when there is a change in the patient's condition or care.

Removal of the PEG tube is recommended when it is no longer needed or when complications such as persistent leakage or buried bumper syndrome require its removal. Experts have suggested using a "cut and push" technique to remove PEGs in adults (19,20). However, reports of serious and sometimes fatal complications, such as small bowel perforation and obstruction, favour the use of endoscopic removal of PEG tubes. Generally, the PEG tract closes in the first few days after PEG removal; however, occasionally, a gastrocutaneous fistula persists, and several factors, such as prolonged duration of tube placement, local infection, and underlying poor tissue healing, contribute to delayed maturation of the PEG tract.

CONCLUSION

Percutaneous gastrostomy is a safe and minimally invasive endoscopic procedure associated with a low morbidity rate. It is also easy to follow up and replace when a blockage occurs. Although it is generally considered safe, PEG tube placement can be associated with many potential complications. Awareness of these complications and the use of preventive strategies can allow endoscopists to maximize outcomes and identify complications early. Additionally, they must be knowledgeable about effectively managing the side effects of nutritional products.

Ethics Committee Approval: The study was carried out with the permission of the University Ethics Committee (Ethical no: 2022-SBB-06919).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

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