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PERCUTANEOUS ENDOSCOPIC GASTROSTOMY EXPERIENCES AFTER ONE THOUSAND FIFTY FOUR PROCEDURES

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ABSTRACT

Aim: Percutaneous endoscopic gastrostomy (PEG) and percutaneous endoscopic jejunostomy (PEJ) are the methods preferred for nutrition in patients who cannot be fed orally but whose gastrointestinal function is normal. PEG can occasionally be used for decompression purposes. PEG is currently often applied due to the ease of application compared with conventional gastrostomy, fewer complications are seen during and after the procedure and it is more economical. The aim of this study was to evaluate the indications, complications, and follow-up processes of patients applied with PEG and to examine the obtained results in the light of the relevant literature.

Method: A retrospective review was made of 1054 procedures applied to 908 patients, who underwent PEG with the Pull method between January 2005 and December 2016. The data were retrieved from patient records of demographic characteristics, indications and short- and long-term complications and the disease processes were examined.

Conclusion: According to the results obtained, PEG is the most commonly used method of enteral nutrition because it does not require frequent changes, is easy to apply and has low mortality and morbidity rates.

Introduction:

Percutaneous endoscopic gastrostomy (PEG) is a method that is used to provide enteral feeding in patients whose gastrointestinal system integration and functions are normal but who do not have adequate oral food intake due to swallowing disorders.The process also provides shorter recovery times and thus reduces maintenance costs. PEG is a method preferred in patients that need long-term enteral nutritional support and was first applied by Gauderer and Ponsky in 1980 (1,2). There are two main indications for PEG tube placement. One is the need to provide enteral nutrition and the other is gastrointestinal decompression (discharge of the gases and fluids that accumulate in the distal part of the gastrointestinal system due to occlusion) (3). The PEG treatment can be performed using a variety of techniques in patients who are determined to have indications. PEG is the most preferred method (4) and is considered safe irrespective of the application technique. Nevertheless, some complications have been reported.

The aim of this study, was to evaluate our experience with PEG administration, especially in the management of complications, and to assess the use of PEG in patients with improved swallowing reflex.

MATERIAL AND METHOD

A retrospective evaluation was made of the data of patients who underwent PEG and PEJ between January 2005 and December 2016. This study was approved by ethics board of Istanbul Research and Training Hospital(2017-1088)

Patients who were admitted to the endoscopy unit for PEG but could not undergo the PEG procedure due to contraindications, and were referred for conventional gastrostomy or jejunostomy were excluded from the study. The abdominal examinations and gas-fecal discharges of patients who underwent PEG for nutrition were evaluated before the intervention. The gastro-intestinal system (GIS) functions of patients with normal findings were assessed as normal, and interventions were performed by evaluating whether these patients received anti-coagulant, bleeding-clotting times, and, if any, previous operative traumas. Before the procedure, informed consent was obtained from the patient or their family, as appropriate.

PEG was administered to 905 patients for nutrition and to 1 patient for decompression and PEJ was administered to 2 patients for nutrition. The procedure was performed under intensive care conditions to 498 patients connected to a respiratory support device, in the operating room to 1 patient not connected to a respiratory support device, and in the endoscopy unit to 409 patient.

Premedication was administered of midazolam (IV.) and pethidine (IV.) or propofol (IV.) only and the patients were monitored. The PEG tube placement was made with the pull method. After preparing the necessary materials for PEG application, the abdominal region where the intervention was to be made was cleaned and sterilized in accordance with the conditions of asepsis and antisepsis. The duodenum II segment was reached by entering from the mouth with a gastroscope and passing the esophagus, stomach, and pylorus. After the passage was seen to be open, the gastroscope was held at the anterior wall of the stomach and the site of PEG application was determined in the abdominal wall. Following local anesthesia, a 1 cm skin-subcutaneous incision was made to the identified site. At the site of the incision, first a cannula was placed and then a guide wire was advanced to the stomach lumen through the cannula. The guide wire was held and pulled out of the mouth with the aid of the snare. The gastrostomy tube was applied under endoscopic control by attaching the PEG kit (Flocare-PEG set 18 CH, Nutricia Healthcare S.A. CH-1618 Chatel St-Denis, Switzerland ve EndoVive standard PEG kit, Boston Scientific) to the guide wire.

Hemorrhage in the stomach lumen was determined by endoscopic checking whether the tube can rotate easily around itself. The patients were fed by enteral feeding after 8 hours and were regularly visited by the nutrition team once a week.

The data of the patients treated with PEG were retrospectively analyzed and the demographic distribution, indications, complications and PEG removal procedures of the patients were evaluated.

RESULTS

Between January 2005 and December 2016, PEG was administered to 905 patients for nutrition and to 1 patient for decompression and PEJ was administered to 2 patients for nutrition. The patients comprised 482 (53.1%) males and 426 (46.9%) females with a mean age of 68.57 years (range, 14-104 years) .There were 2 patients aged 14 years and the PEG indications of both patients were cranial trauma. The 104-year old patient was operated on for occlusive cerebrovascular disease (CVD). PEG procedure only was applied to 818 patients and 90 patients were treated with more than one procedure. The first PEG change of these patients who underwent more than one procedure was performed in the 3rd month at the earliest and in the 8th year at the latest. The change was made at least once and 5 times at most. The duration of feeding with PEG ranged from 7 days to 3243 days with a mean period of 220.18 days (Table 1).

Table 1: Demographic distribution of PEG and PEJ proced ures

Intensive care unit Enoscopy unit Operating room	Number of patients Number of procedures 498 538 409 515 1 1
Distribution of single and multiple procedures	Patients who underwent a single procedure: 818 Patients who underwent multiple procedures: 90 Total number of procedures :1054
Age of patients:	Age range,14-104 years; mean age 68.57 years.
Gender distribution	Male: 482 (53.1%) Female: 426(46.9%)
Duration of feeding with PEG	Range, 7-3243 days; mean duration 220.18 days
Performed procedures and patient numbers	PEG for nutritional purposes : 905 PEJ for nutritional purposes :2 PEG for decompression purposes :1

Cerebrovascular disease was the leading indication for PEG at a rate of 50.1%.Other indications are described in Table 2. (Table 2)

Table 2: Indications

PEG indication	Number	Rate
Occlusive cerebrovascular disease	455	50.1%
Alzheimer's disease	110	12.1%
Situations causing hypoxia in the brain	62	6.82%
Cranial trauma	59	6.5%
Brain tumor	50	5.5%
Head and neck region tumors	34	3.75%
Pneumonia, left heart failure	31	3.41%
Intracranial hemorrhage (hypertension-related)	30	3.30%
Parkinson's disease	19	2.09%
Motor neuron disease	15	1.65%
Encephalitis	8	0.88%
Esophagus tumor	8	0.88%
Hydrocephalia	6	0.66%
Spastic tetraplegia	4	0.44%
Esophageal perforation	3	0.33%
Lymphoma	2	0.22%
Stomach Tumor	2	0.22%
Myasthenia gravis	2	0.22%
CO poisoning	1	0.11%
Drug intoxication	1	0.11%
Preeclampsia	1	0.11%
Leukemia	1	0.11%
Cardiomyopathy	1	0.11%
Colon tumor	1	0.11%
Lung tumor esophagus pressure	1	0.11%
Pancreas tumor	1	0.11%

One patient had undergone an operation for a colon tumor 1 year previously and had ileus due to carcinomatosis peritonei during hospitalization at that time.This patient was treated with PEG for decompression.

No translumination could be ensured in the abdominal wall only in 5 of 908 patients during the procedure and these 5 patients required imaging. Following the imaging, one patient had to undergo PEG with the aid of laparoscopy.

Post-procedural complications were seen in 123 patients (13.5%). The most common complication was leakage around PEG in 66 (7.26%) patients. In 38 of these, it was seen that the distance between the inner ring and the outer fixation was too large, and this distance was narrowed through the endoscopy. The PEG was changed in 24 patients and regression was obtained in the complaints of the patients. Due to persistent leakage in four patients, PEG was removed in 2 patients and replaced with a Foley catheter, and the problem was resolved. In the other 2 patients, gastric motility-enhancing drugs were started for the persistent leakage due to gastroparesis, the nutrition team was contacted and measures were taken about the amount of food and the rate of food intake.

Post-procedural complications were followed by Buried Bumper Syndrome (BBS) in 35 (3.85%) patients. These patients were seen to have BBS on the 7th day at the earliest and in the 16th month at the latest after the procedure. In 31 of the patients with BBS, as the wide part of the tube partially embedded in the stomach wall could be advanced to the stomach lumen in the endoscopy unit, these patients were followed up with conservative treatment.The remaining 4 patients required surgical intervention.

Acute abdomen was seen in 2 of the patients with BBS within the first month after the procedure and these patients underwent surgery under general anesthesia. In 2 patients who had BBS 1 year after the procedure, abdominal drainage and debridement were performed with local anesthesia due to skin infection and abscess development around the PEG. Treatment was switched to parenteral nutrition until the patients recovered and then the PEG procedure was repeated.

The third complication was soft tissue infection around the PEG. This complication developed in 13 (1.43%) patients in total, 11 of whom were treated with conservative antibiotherapy. The tube had to be removed and replaced by gastrocutaneous fistula in 2 patients. Treatment was switched to parenteral nutrition until the fistulas were closed, after which the PEG was applied again.

The fourth complication was procedural bleeding seen in 8 (0.88%) patients. No transfusion was required in 7 patients, while 1 patient was bleeding to a level that required transfusion. In 3 patients, the internal and external rings were narrowed under endoscopy control and the bleeding was stopped by applying a buffer to the stomach. Injections of adrenaline diluted at the rate of 1/10 were performed endoscopically in 3 patients and in 1, a suture was applied to narrow the skin incision, and an injection of adrenalin diluted at the rate of 1/10 was administered and the bleedings were stopped. One patient with a 5 cm hematoma on the abdomen wall underwent endoscopy and was followed conservatively after it was observed that there was no bleeding in the stomach lumen.

Due to the narrow gastro-esophageal junction in 1 patient, the wide part of the PEG tube with the guide wire was attached to the distal esophagus, and the tube appeared to be completely out of the abdomen wall as a result of excessive pull. A stomach perforation developed in this patient, who was then taken immediately for surgery under general anesthesia and PEG was applied from the place of perforation through the mini-laparotomy. An intraabdominal organ injury occurred in 1 patient. A segmental jejunum resection was performed in 1 patient with

jejunum perforation.

There were 3 (0.33%) patient deaths associated with the procedure. In 2 patients, cardiac arrest developed during the procedure due to comorbid diseases and these patients died at 1 and 4 days respectively after the procedure. In 1 patient, acute abdomen developed due to Buried Bumper Syndrome 22 days after the procedure, and despite surgery, this patient also died after 7 days.

Complications

Major complications	Minor complications
Buried Bumper syndrome (BBS): 35(%3.8) Follow-up with conservative treatment :31 Drainage with local anesthesia :2 Surgical treatment with general anesthesia :2	Leakage around PEG :66(%7.26) Endoscopic revision :38 PEG change :24 Replacement with Foley Catheter :2 Medical treatment :2
Hemorrhage :8(%0.88) Narrowing down of the rings :3 Endoscopic sclerotherapy :3 Skin suture and sclerotherapy :1	Local wound infection :13(%1.43) Antibiotherapy :11 PEG removal :2
Free gastric perforation : 1(%0.11)	
Intraabdominal organ injury :1(%0.11)	

During the PEG procedure, 6 (0.66%) patients had a median incision on the upper abdomen. Five patients underwent PEG and the other underwent PEJ and no complications were encountered in their follow-up.

Two patients who were applied PEJ had stomach tumor. One of these patients had a remnant stomach tumor developing on the stomach floor, while the other had an advanced stage stomach tumor.

The PEG tube was removed under endoscopy control in 22 (2.42%) of these patients as a result of improvements in the swallowing function. A neurology consultation was performed for these patients before the PEG tube was removed and the procedure was performed after confirming that the swallowing function was completely recovered. The swallowing function of these patients recovered after 15 days at the earliest and after 24 months at the latest. The majority of these patients had cranial trauma and were aged between 18 and 80 years of age.

Patients with PEG removed

Age of the patients	Range, 18-80 years; mean age 48.8 years
Sex	Female: 9 Male: 13
Patients	Cranial Trauma :9 CVH :5 Brain tumor :4 Hypoxic Brain Injury :3 Esophageal Tumor:1
PEG duration	Range, 15 days - 2 years: mean duration 120.8 days

DISCUSSION

It is essential for patient health to ensure adequate enteral feeding in patients with impaired swallowing function who cannot obtain adequate oral nutritional intake for a long time. Enteral feeding is ensured invasively by surgical gastrostomy or by jejunostomy, while it is also ensured minimal invasively by nasogastric catheter (NGC), percutaneous radiological gastrostomy (PRG) or PEG or PEJ.

Surgical gastrostomy was first described by Egeberg in 1837, but Verneuil performed the first operation in 1876 using this technique, which was later standardized by Stamm in 1894. This method is performed under general anesthesia by placing a Foley catheter in the stomach with a median incision on the upper abdomen (5).

It can be applied endoscopically by gastrostomy, push, pull and introducer (6)methods. In all three methods, sedo-analgesia, abdominal translumation, guiding wire, guide needle and gastrostomy tube are used. There are differences in terms of the direction in which the tube is attached. In one study, apart from abdominal wall incision size, there was no difference in efficiency and complications between pull and push methods (7).

In 1981, Preshaw performed the first percutaneous radiographic gastrostomy (PRG). This technique is similar to the PEG applied with the push method and fluoroscopy is used in the process. There are studies which have reported that the method is a minimally invasive and effective procedure with low morbidity and mortality (8).

Besides the advantages, all of these methods have some disadvantages. Patients with swallowing difficulties were mostly fed with NGS until 1980, and if NGS could not be applied, gastrostomy and jejunostomy were performed with surgical intervention. Since that time, there has been increasing use of the percutaneous endoscopic gastrostomy (PEG) application, as a less invasive method, which has been shown to be faster, safer and cheaper than the surgical method (9,10).

In addition to being safe, the PEG process also has some special considerations. Patients who have had previous abdominal surgery can be fitted with a PEG tube after ensuring a "safe area" where the intestines and other abdominal organs are not in the process area [11]. Among the patients included in this study, 6 patients (0.66%) who had previously undergone upper GIS operation were implemented with PEG and PEJ safely. In addition, obese patients and those with cirrhosis with ascites in the abdomen are special cases for PEG.

Some major or minor complications may develop following the PEG process (12). These major complications can be life-threatening and should be intervened promptly when diagnosed.Major complications are usually seen during the procedure.

These include cardiopulmonary problems due to sedation and aspiration as well as the complications related to endoscopic examination and application of the procedure. The rate of cardiopulmonary arrest ranges from 0.3% to 1% (13). In the current series, 2 (0.22%) patients had cardiopulmonary arrest during the procedures. No aspiration was seen because the procedures were performed after 8 hours of fasting and some of the patients were intubated.

Perforation and bleeding due to PEG procedure have been rarely reported in the literature. The reported cases include gastric artery injury, splenic and mesenteric venous injury leading to retroperitoneal hematoma, hematoma of the rectus muscle, and hemorrhage in the area of PEG application (14,15). Injuries to the liver, spleen, colon and small bowel are other complications that may occur during the procedure (16,17). No complications related to endoscopic examination occurred in the current series but gastric perforation and jejunal injury occurred during the implementation of the procedure. The complications were corrected with surgery in 2 patients. Although there was no major vessel injury in the series, 7 (0.77%) patients had a hemorrhage in the field of the PEG application and 1 (0.11%) patient had hematoma in the rectus muscle.

Other major complications mentioned in literature are acute necrotizing fasciitis, buried bumper syndrome and tumor spread around the stomach. Cases of acute necrotizing fasciitis are rare but may be fatal (18,19). It is believed that tumor cells around the stomach spread from the head and neck region to the incision site

via the tube (20, 21). Furthermore, some studies have reported that these tumors spread through the hematogenous and lymph systems (22). This complication was not seen in the current large case series.

Buried Bumper syndrome a rare complication that results from the progression of the gastrostomy tube into the stomach wall. It causes catheter insufficiency and is diagnosed with endoscopic examination and the inability to see the inner ring of the gastrostomy tube. Treatment requires the removal and re-insertion of the PEG catheter(23).

This complication occurs in approximately in 0.3-2.4% of the patients (24). In the current study, 35 (3.8%) patients had buried bumper syndrome. When compared with literature, this high ratio can be attributed to the long period of follow-up and the fact that the health center where the study was conducted is a training hospital.

There are minor complications associated with PEG such as soft tissue infection, leakage around the PEG, granuloma formation (25) and dislocation of the PEG tube.

During the application of PEG by the pull method, the gastrostomy tube is removed from the stomach and abdominal wall by passing through the oral cavity and so the factors causing the infection are transported from the mouth to the incision site. Therefore, peristomal infection is the most noticeable complication and has been reported at rates between 5%-25% in different studies (26). Application-induced peristomal infection has been shown to be easily prevented by antibiotic prophylaxis (27,28). All the patients in the present study were hospitalized in various departments of the hospital and most were receiving different antibiotic treatments for various reasons. Care was taken to remove secretions in the mouth before the procedure and only 13 (1.43%) patients had an infection in the intervention area. Considering that patients with BBS also have peristomal infections, this rate was 5.3% with 48 patients. However, the retrospective nature of the study casts doubt on the reliability of this data, which can be considered a limitation of the study.

Peristomal leakages can be seen in the first few days following the placement of the PEG tube as well as in patients with a maturing PEG path (12). Leakage may be due to infection, ulceration, Buried Bumper Syndrome, or displacement of the tube, but patients should also be evaluated for slow gastric emptying, overfeeding, and enlarged gastric fistula (29). The intervention usually begins with taking detailed precautions and continues with the treatment of specific causes, including the underlying disease. There was leakage around the tube in 114 (12.4%) patients. The underlying causes were BBS in 35 (3.8%) patients, local infection in 13 (1.43%) patients and displaced tubing in 66 (7.26%) patients, with enlargement of the fistula, and gastroparesis.'

With improvements in the swallowing function, it is recommended to remove the tube when it is no longer needed with the cutting and pushing method (12,30). In the present study, the swallowing functions of 22 (2.42%) patients improved.In 2 of these patients, the swallowing function improved within 1 month and these were young patients with cranial trauma. All of these patients were evaluated by a neurologist and according to the obtained result, the PEG tube was removed by the cutting and pushing method in conjunction with endoscopy. After removal of the tube, the existing gastro-cutaneous fistula was left to secondary heal and all the patients recovered in this way.

The present study can be considered a good source of data related to PEG treatment because of the high number of patients and procedures examined, the long follow-up period, and the fact that patients with recovered swallowing function were treated with the PEG method. However, the weakness of the study is that it was retrospective.

In conclusion, the PEG method is widely used in patients who need long-term enteral nutrition support and cannot provide sufficient oral nutritional intake. The PEG method is at the forefront of this treatment for reasons such as not requiring general anesthesia, easy bedside application in endoscopy and intensive care units, and low rates of complications and morbidity.Nutrition with the help of a PEG tube is easy for relatives of the patient to administer, is highly comfortable for the patient, is well-tolerated and low cost.

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