



An evaluation of the indications, complications and results of patients with percutaneous endoscopic gastrostomy

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Abstract

Aim of this study is to evaluate the indications, complications and results of patients undergoing percutaneous endoscopic gastrostomy. In our study, we evaluated the outpatients or hospitalized patients applying to Turgut Özal Medical Center between April 2008-November 2010. 247 patients who would be unable to perform oral feeding for at least 4 weeks and underwent for PEG procedure were evaluated retrospectively. PEG procedure was performed 296 times on 247 cases. The most common indication for PEG has been neurological diseases (39.2%), other indications follow up in order with respiratory failure (10.5%), multiple trauma (10.1%), hypoxic encephalopathy (8.6%) and the other diseases (6.5%). Complications associated with PEG were wound infection (5.6%), tube blockage (3.2%), tube fracture (2.4%), tube leakage (2.4%), breakage (2.4%), and buried bumper syndrome (3.2%). Overall minor complication rate was %13,7, and overall major complication rate (buried bumpersyndrome) was 3.2%. The most common complication was wound infection. During follow-up, 102 patients died of primary disease. 30 days (early) and 1 year mortality rates were 14.3% and 39.5%. Overall mortality rate was 41,3% and mean survival was 17.34 ± 0.7 months. PEG tube was removed in 10 cases because of a adequate oral intake. The mean duration of a PEG tube stay was 16 ± 1.2 months. PEG is a procedure requiring no general anesthesia with low morbidity and mortality rates. It is also an effective, safe method which can be performed at the bedside. It should be one of methods preferred for patients who need long-term enteral nutrition.

Keywords: Percutaneous, endoscopic, gastrostomy

Introduction

Percutaneous endoscopic gastrostomy (PEG) is a method applied to provide enteral nutrition to patients unable to take a sufficient level of nutrition orally. The gastrointestinal system is preferred for patients with a normal and generally long-term requirement for enteral nutrition [1]. The application of PEG is a procedure made under local anaesthesia with the aid of endoscopy. Apart from in the endoscopy unit, it can also be applied at the bedside with a low level of sedation [2]. Compared to surgery, it has been reported to have few complications, have a shorter hospitalisation period and be more cost-effective [3-5]. A wide range of indications are defined for the use of PEG tube. It is primarily used in cases of neurological impairments associated with cerebrovascular stroke and stenosing tumours of the head and neck region and the upper gastrointestinal system [6,7]. Other indications for use are chronic gastrointestinal stenosis and decompression in the ileus [8]. The aim of this study was to evaluate the complications and results of patients following PEG tube placement for various indications and to make a contribution to the relevant literature.

Material and Method

A retrospective evaluation was made of patients with PEG tube placement in the Gastroenterology Clinic of Inonu University Turgut Ozal Medical Centre between April 2008 and November 2010. Patients who would be unable to perform oral feeding for at least 4 weeks underwent for PEG procedure. The patients were evaluated according to a form created for the study. The demographic data, primary diagnosis, co-morbidities, time of PEG application, duration of PEG use, indications for change, complications which developed after PEG application and duration of survival were the values taken for evaluation.

Patients were excluded if aged below 18 years, if the PEG follow-up records could not be accessed, if there was insufficient information in the records and the patient could not be reached by telephone. From an initial total of 257 patients, 10 did not meet all the inclusion criteria, so were excluded, leaving a total of 247 patients with 296 PEG applications for evaluation.

Percutaneous Endoscopic Gastrostomy Procedure

The procedure was applied in the endoscopy unit or on the ward where the patient was being treated for their general condition. For hospitalised patients who were not receiving antibiotics, 2gr cefazolin sodium was administered IV as prophylaxis at 30 mins prior to the procedure. Antibiotic

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prophylaxis was not administered to outpatients. Before starting the procedure, midazolam (0.05-0.1 mg/kg) sedation was administered intravenously if the patient was not intubated, then oxygen saturation was monitored and pulse with pulse oxymetry.

The procedure was applied by 2 gastroenterologists and an experienced assistant nurse. One of the gastroenterologists applied the endoscopy procedure and the other determined the location to place the PEG, sterilised the area and completed the procedure. The PEG was applied with the standard pull technique following 8 hours fasting using the Flexiflo Inverta-PEG 20 Fr kit (Abbott, Ireland). After the procedure, the distance of the external bumper from the skin was checked and after 4 hours nutrition was started with the appropriate nutritional products. No endoscopy check was made after the procedure. All patients were followed up 30 days after the PEG procedure and were evaluated in respect of complications. Patients were then followed up at 6-month intervals or when problems occurred. Approval for the study was granted by the Turgut Ozal Medical Centre Ethics Committee. Informed consent was obtained from all the patients or their relatives.

In the statistical analysis, qualitative data were expressed as number and percentage and quantitative data with standard deviation. Survival was evaluated with Kaplan-Meier analysis.

Results

PEG was applied to a total of 247 patients, comprising 134 (54.2%) males and 113 (45.7%) females, between April 2008 and November 2010. The mean age of the patients was 61 ± 17 years (range, 18-90 years). When the patients were examined in respect of indications, the most common reason for PEG was cerebrovascular diseases in 97 patients (39.2%). The indications of the patients are given in detail in Table 1. Co-morbidities were determined in a total of 34 (14.7%) patients. The most common diseases were heart failure and chronic obstructive pulmonary disease (COPD). Other additional diseases are shown in Table 2. The patients were evaluated on the 30th day and at 6 month intervals in respect of complications. In cases of early complications and problems related to the use of PEG, patients were called for follow-up early. Complications were seen in a total of 42 (16.8%) patients, of which 8 (3.2%) were major and 34 (13.6%) were minor. The most common minor complication was wound site infection in 14 (5.6%) patients. The distribution of complications is shown in

Table 3. The PEG tube was removed from 10 patients as they started to take sufficient oral nutrition. The mean duration of the PEG was 16 ± 1.2 months (range, 13.5 – 18.4 months; CI 95%) (Figure 1). A total of 102 patients died during the follow-up period. The mean survival following PEG placement was 17.34 ± 0.7 months (range,

15.84 -18.84; CI 95%). As 35 patients died during the 1st month, the early mortality rate was calculated as 14.1%. The mortality rate of the 1st year was calculated as 39.5%, the 2nd year as 42.7%. At the 30th month, as there was a survival rate of 58.7%, the total mortality rate was determined as 41.3%. The survival analysis of the patients is shown in Figure 2.

Figure 1. Survival analysis according to duration time of PEG stay

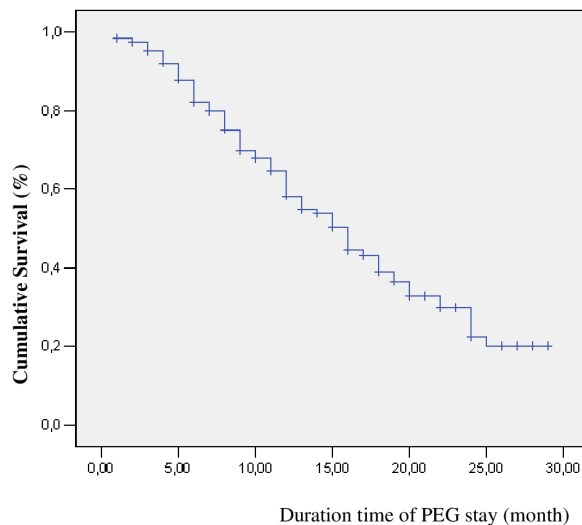


Figure 2. Survival analysis after PEG insertion

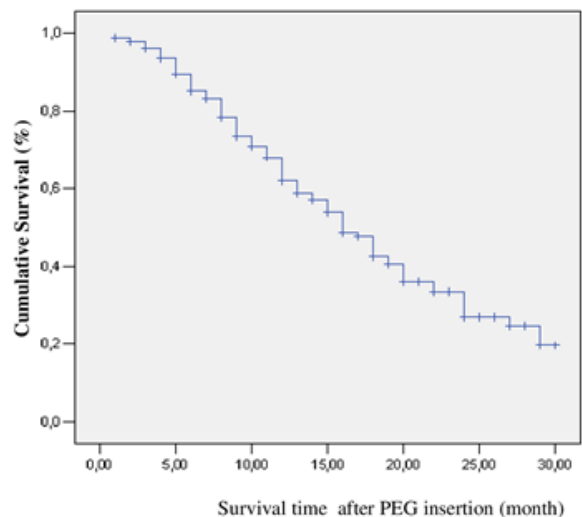


Table 1. Distribution of etiologies in patients underwent PEG procedure.

	n	%
Cerebrovascular Disease	97	39.2
Chronic Neurological Diseases	26	10.5
Multitrauma	25	10.1
Hypoxic encephalopathy	21	8.6
Malignancy	8	3.3
After neurosurgery operation	12	4.8
Nasopharynx /Larynx tm	9	3.6
Respiratory failure	26	10.5
Heart failure	7	2.9
Others	17	6.5

PEG: Percutaneous endoscopic gastrostomy

Table 2. Complications of PEG procedure

Minor complications	n	%
Wound infection	14	5.6
Tube blockage	8	3.2
Leakage	6	2.4
Breakage	6	2.4
Major complications		
Buried bumper syndrome	8	3.2

PEG: Percutaneous endoscopic gastrostomy

Table 3. Co-morbid Diseases

	n	%
Cerebrovascular disease	3	1.3
Parkinson disease	4	1.7
Heart failure	6	2.5
Pneumonia	4	1.7
COPD	5	2.1
Malignancy	4	1.7
Heart failure+ COPD	3	1.3
Chronic renal failure	1	0.4
Hypertension	4	1.7

COPD: Chronic obstructive pulmonary disease

Discussion

Adequate nutrition assumes an extremely important role in the treatment and follow-up of several diseases. Enteral nutrition is known to have positive effects on the intestinal system. For the nutrition of patients who cannot obtain sufficient nutrition orally, PEG is the easiest route to be used. Since it was first described in 1980, its use has spread at increasing rates [1]. In patients requiring long-term enteral nutrition, PEG is preferable to nasogastric catheter as it does not create nasal irritation or psychological stress, shortens the hospital stay and there is less aspiration of stomach contents [9,10]. In a study by Norton et al, of patients with cerebrovascular disease in the early stage of PEG nutrition, it was shown that compared to patients with nasogastric nutrition, there was no lack of daily calorie requirement, hospital stay was shortened and mortality rates were reduced [11]. While the first applications were only for neurological diseases and head and neck trauma, the indication range has widened in recent years to include respiratory failure, head and neck cancers, malnutrition, recurrent aspiration pneumonia, fluid electrolyte disorders and other oropharyngeal diseases with swallowing difficulties. In a retrospective study comparing the indications for the use of PEG tubes in the years between 1992 and 2002, a decrease was determined in the rates of patients with cerebrovascular diseases (33-29%), chronic motor neurone disease (27-11%) and multiple sclerosis (8-4%) and an increase in diseases related to the head and neck (16-24%) and other indications (respiratory failure, aspiration pneumonia etc, 16-31%) [12]. In the current study, the indications for the application of PEG to 247 patients were consistent with literature with the highest rate of 39% for cerebrovascular disease. Other indications were chronic neurological disease (9%), multi-trauma

(10%), respiratory failure (10%), hypoxic encephalopathy (8%), following neurosurgery (5%), Ear Nose and Thorat (ENT) diseases (3%), malignancies (3%) and other indications (17%). Compared to surgical gastrostomy, PEG is a safer method with lower mortality and complication rates. Moreover, the application does not require general anaesthesia, can be applied at the bedside, provides a more rapid start to nutrition, has a shorter hospital stay and lower costs compared to surgical gastrostomy [13-15]. Despite success rates of over 95% of PEG applications, complications have been reported related to the PEG procedure [16,17]. PEG complications are defined as major and minor, separated into 3 groups of complications during upper GIS endoscopy before the procedure, those directly related to the PEG procedure and those which develop during use of the PEG tube after the procedure [18]. In a large meta-analysis by Wollmann et al, of 4194 PEG applications, morbidity related to the PEG procedure was reported as 9.4% and mortality as 0.53% [19]. In another study of 103 cases, minor complications such as tube loosening, tube removal, leakage, blockage or skin infection were reported at the rate of 10.7% and major complications such as, peritonitis and fistula at 0.97% [20]. Although several studies in literature have reported PEG-related complications at rates varying from 12% to 43%, only 1-3% of these are major complications [8,16,21,22]. In the current study, no complications were seen directly related to the PEG procedure and the rates of minor (13.7%) and major (3.2%) complications which developed are consistent with those in literature.

In the current study, a total of 42 complications developed following PEG, 33.3% of minor complications which were wound site infections, as the most commonly seen complication. The frequency of wound site infection in literature has been reported to vary between 3-65% depending on the defining criteria, whether or not antibiotic prophylaxis has been given and the duration of follow-up [23,24]. Antibiotics were taken by all the hospitalised patients in the current study, as those who were hospitalised and not receiving antibiotics were administered with 2gr cefazolin sodium parenterally as prophylaxis. No prophylactic antibiotics were given to outpatients. No comparison was made in the current study between the group who received antibiotics and those who did not in terms of wound site infection. Although the need for antibiotic prophylaxis has been reported in the latest guidelines, there are conflicting results in literature [25,26]. No major complications were observed in the current study, such as peritonitis, haemorrhage, aspiration, necrotising fasciitis and gastrocolocutaneous fistula. A rarely seen late complication of PEG is buried bumper syndrome, which in literature this has been defined as the bumper emerging from the submucosa and outside the stomach by erosion of the stomach wall [27]. In general, the prevalence of buried bumper syndrome varies between 0.3%- 2.4% (28,29). As 8 patients (3.2%) in the current study were determined with buried bumper syndrome, this

rate was found to be a little higher than that in literature. Other minor complications (tube blockage, leakage and breakage) in the current study were seen to be consistent with rates in literature [30,31]. Although there is a high value of evidence related to the decrease in mortality rates in some particular patient groups with PEG nutrition, such as those with stroke-related dysphagia and amyotrophic lateral sclerosis, there is very little evidence on this subject within general patient groups [32,33]. Previous studies have reported mortality rates in the first 30 days as between 9-18% and 4-31% (34-36). Successful results of long-term mortality from PEG tube nutrition have not been well-examined. In a study of 97 cases by Taylor et al, the 1 month mortality rate was determined as 22% and the main reasons for deaths within the first 30 days were reported to be associated with comorbidities such as pneumonia, heart disease and cerebrovascular diseases [37]. In literature, early and long-term mortality rates have not been determined as high in patients with specific indications or diagnoses, but in contrast, high hospital mortality and 6-month mortality rates in patients with severe complications following PEG procedure have been reported (47.4% and 82.4% respectively). In the same study, following high mortality rates associated with complications developing in the first 30 days, the survival curve was observed to progress in parallel with those with no complications [37]. In a retrospective multi-centre study of geriatric patients, the mortality rate in the first 30 days was determined as 5%, at the end of 1 year as 25% and the total mortality rate was reported as 53% with death associated with PEG procedure in 8 patients [38].

In the current study the mortality rate in the first month was determined as 14.1% and the total mortality rate as 41.3%. Mortality was not related to the PEG procedure in any patient. Every study has different conditions and although the early mortality rates of the current study were consistent with those in literature, the total mortality rate was seen to be at the lower general limit. The early stage mortality rates not related to the PEG tube, have shown differences depending on the age of the patient and the primary disease. Factors affecting mortality have shown differences between studies. While some studies have reported high mortality rates in cancer patients, others have stated higher rates in patients with dementia [21,39,40]. In the current study, nutrition was started within 3-4 hours of the PEG procedure. Routine endoscopic checking was not applied in the current study. However, in 2 cases, sufficient nutrition was not obtained via the catheter and because of leakage from the side of the catheter, a decision could not be made so an endoscopic check was applied. As a result of the endoscopy, it was observed that buried bumper syndrome had started in these 2 patients in the early stage. Cases of buried bumper syndrome in the early stage have been reported in literature [41]. Endoscopy checking has not been deemed necessary as a routine procedure but has been recommended when there is suspicion of the location of the bumper in the stomach [42,43].

In the light of all these results, despite the high success rates of PEG applications, complications and mortality rates show a great many variables because of an increase in the indications for use and the primary diseases of the patients. In conclusion, PEG can be considered to be one of the safe, effective methods with low morbidity and mortality rates with no requirement for general anaesthesia.

References

- Gauderer MWL, Ponsky JL, Izant RJ. Gastrostomy without laparotomy: a percutaneous endoscopic technique. *J Paediatr Surg.* 1980;15(6):872-5.
- Ho CS, Yee ACN, McPherson R. Complications of surgical and percutaneous nonendoscopic gastrostomy: review of 233 patients. *Gastroenterology.* 1988;95(5):1206-10.
- Grant JP. Comparison of percutaneous endoscopic gastrostomy with Stamm gastrostomy. *Ann Surg.* 1988;207(5):598-603.
- Russell TR, Brotman M, Norris F. Percutaneous gastrostomy. A new simplified and costeffective technique. *Am J Surg.* 1984;148(1):130-1.
- Jones M, Santanello SA, Falcone RE. Percutaneous endoscopic vs surgical gastrostomy. *JPEN J Parenter Enteral Nutr.* 1990;14(5):533-4.
- Karminski M, Jeejeebhoy KN. Modern clinical nutrition. *Am IV Ther and Clin Nutr.* 1979;32(1)23-38.
- Akner G, Cederholm T. Treatment of PEM in chronic nonmalignant disorders. *Am J Clin Nutr.* 2001;74(1):6-24.
- Kondrup J, Johansen N, Plum LM, Bak L, Larsen IH, Martinsen A, Andersen JR, Baerthsen H, Bunch E, Lauesen N. Incidence of nutritional risk and causes of inadequate nutritional care in hospitals. *Clin Nutr.* 2002;21(6):461-8.
- Escallon J, Total Nutrition Therapy. Chicago Illinois, 1997.
- Matarese LE, Gotthschlich MM, eds. Contemporary Nutrition Support Practice. 2nd ed. St Louis: WB Saunders; 2003;181-7.
- Hamidon BB, Abdullah SA, Zawawi MF, Sukumar N, Aminuddin A, Raymond AA. A prospective comparison of percutaneous endoscopic gastrostomy and nasogastric tube feeding in patients with acute dysphagic stroke. *Med J Malaysia.* 2006 Mar;61(1):59-66.
- Park RH, Allison MC, Lang J, Spence E, Morris AJ, Danesh BJ, Russell RI, Mills PR. Randomised comparison of percutaneous endoscopic gastrostomy and nasogastric tube feeding in patients with persisting neurological dysphagia. *BMJ.* 1992;304(6839):1406-9.
- Baeten C, Hoefnagels J. Feeding via nasogastric tube or percutaneous endoscopic gastrostomy. A comparison. *Scand J Gastroenterol Suppl.* 1992;194:95-8.
- French Society of Digestive Endoscopy. Guidelines of the French Society of Digestive Endoscopy (SFED): Endoscopic Gastrostomy. *Endoscopy.* 1999;31(2):207-8.
- Löser Chr, Fölsch UR. Guidelines of the German Association of Gastroenterology (DGVS) Percutaneous endoscopic gastrostomy (PEG). *Z Gastroenterol.* 1996;34:637-41.
- Löser C. Clinical aspects of long-term enteral nutrition via percutaneous endoscopic gastrostomy (PEG). *J Nutr Health Aging.* 2000;4(1):47-50.
- Aschl G, Kirchgatterer A, Allinger S, Hinterreiter M, Hubner D, Kranewitter W, Stadler B, Wimmer L, Knoflach P. Indications and

- complications of percutaneous endoscopic gastrostomy. *Wien klin Wochenschr.* 2003;115(3-4):115-20.
18. Löser Chr, Wolters S, Fölsch UR. Enteral long-term nutrition via percutaneous endoscopic gastrostomy (PEG) in 210 patients: a four-year prospective study. *Dig Dis Sci.* 1998; 43(11):2549-57.
 19. Fietkau R, Iro H, Sailer D, Sauer R. Percutaneous endoscopically guided gastrostomy in patients with head and neck cancer. *Rec Res Cancer Res.* 1991;121:269-82.
 20. Lee JH, Machtay M, Unger LD, Weinstein GS, Weber RS, Chalian AA, Rosenthal DI. Prophylactic gastrostomy tubes in patients undergoing intensive irradiation for cancer of the head and neck. *Arch Otolaryngol Head Neck Surg.* 1998;124(8):871-5.
 21. Ponsky JL, Gauderer MW. Percutaneous endoscopic gastrostomy: indications, limitations, techniques, and results. *World J Surg.* 1989;13(2):165-70.
 22. Graham SM, Flowers JL, Scott TR, Lin F, Rigamonti D. Safety of percutaneous endoscopic gastrostomy in patients with a ventriculo-peritoneal shunt. *Neurosurgery.* 1993;32(6):932-934.
 23. Clinical Nutrition ESPEN guidelines on artificial enteral Nutrition, Percutaneous endoscopic gastrostomy (PEG). 2005;24(5):848-61.
 24. Lennard-Jones JE. Ethical and legal aspects of clinical hydration and nutritional support. *BJU Int.* 2000;85(4):398-403.
 25. Sharma VK, Howden SW. Meta-analysis of randomized, controlled trials of antibiotic prophylaxis for PEG. *Am. J. Gastroenterol.* 2000;95(11):3133-6.
 26. Gossner L, Keymling J, Hahn EG, Ell C. Antibiotic prophylaxis in percutaneous endoscopic gastrostomy (PEG): a prospective randomized clinical trial. *Endoscopy.* 1999;31(2):119-24.
 27. Akkersdijk WL, van Bergeijk JD, van Egmond T, Mulder CJ, van Berge Henegouwen GP, van der Werken C, van Erpecum KJ. Percutaneous endoscopic gastrostomy (PEG): comparison of push and pull methods and evaluation of antibiotic prophylaxis. *Endoscopy.* 1995;27(4):313-6.
 28. Sartori S, Trevisani L, Nielsen I, Tassinari D, Abbasciano V. Percutaneous endoscopic gastrostomy placement using the pull-through or push-through techniques: is the second pass of the gastrostomy necessary? *Endoscopy.* 1996;28(8):686-8.
 29. Byrne KR, Fang JC. Endoscopic placement of enteral feeding catheters. *Curr Opin Gastroenterol.* 2006;22(5):546-50.
 30. Tucker AT, Gourin CG, Ghegan MD, Porubsky ES, Martindale RG, Terris DJ. 'Push' versus 'pull' percutaneous endoscopic gastrostomy tube placement in patients with advanced head and neck cancer. *Laryngoscope.* 2003;113(11):1898-902.
 31. Fernández I, Rodríguez S, González A, Castellano G, Montejo JC, Casis B, Garfia C, Martín A, Sánchez F, Solís JA. A comparative study of 2 technics of percutaneous endoscopic gastrostomy. *Rev Esp Enferm Dig.* 1995;87(5):357-61.
 32. Grant JP. Percutaneous endoscopic gastrostomy. *Ann Surg.* 1993;217(2):168-74.
 33. Sartori S, Trevisani L, Nielsen I, Tassinari D, Abbasciano V. Percutaneous endoscopic gastrostomy placement using the pull-through or push-through techniques: is the second pass of the gastrostomy necessary? *Endoscopy.* 1996;28(8):686-8.
 34. Coentry BJ, Karatassas A, Gower L, Wilson P. Intestinal passage of the PEG end-piece: is it safe? *J Gastroenterol Hepatol.* 1994;9(3):311-3.
 35. Korula J, Harma C. A simple and inexpensive method of removal or replacement of gastrostomy tubes. *JAMA* 1991;265:1426-8.
 36. Waxman I, Al-Kawas F, Bass B, Glouderman M. PEG ileus. A new cause of small bowel obstruction. *Dig Dis Sci* 1991;36:251-4.
 37. Yaseen M, Steele MI, Grunow JE. Nonendoscopic removal of percutaneous endoscopic gastrostomy tubes: morbidity and mortality in children. *Gastrointest Endosc* 1996;44: 235-8.
 38. Schrag SP, Sharma R, Jaik NP, Seamon MJ, Lukaszczyk JJ, Martin ND, Hoey BA, Stawicki SP. Complications Related to Percutaneous Endoscopic Gastrostomy (PEG) Tubes. *A Comprehensive Clinical Review. J Gastrointest Liver Dis.* 2007 Dec;16(4):407-18.
 39. Chowdhury MA, Batey R. Complications and outcome of percutaneous endoscopic gastrostomy in different patient groups. *J Gastroenterol Hepatol.* 1996 Sep;11(9):835-9.
 40. Azzopardi N, Ellul P. Pneumonia and mortality after percutaneous endoscopic gastrostomy insertion. *Turk J Gastroenterol.* 2013;24(2):109-16.
 41. Plumser AB, Gottfried EB, Clair MR. Pneumoperitoneum after percutaneous endoscopic gastrostomy. *Am J Gastroenterol.* 1984;79(6):440-1.
 42. Strassen WN, Mc Cullogh AJ, Marschall JB. Percutaneous gastrostomy: another cause of 'benign' pneumoperitoneum. *Gastrointest Endosc.* 1984;30(5):296-8.
 43. Erkan G, Coban M, Kaan Ataç G, Çalişkan A, Değertekin B. The advantage of retrieval PEG tubes in patients with buried bumper syndrome - a case report. *Turk J Gastroenterol.* 2012;23(6):773-5.