An Analysis of Percutaneous Endoscopic Gastrostomy Complications

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ABSTRACT

Objective: To determine the indications of early and late complications in 224 patients who underwent Percutaneous Endoscopic Gastrostomy (PEG) procedure.

Study Design: Observational study.

Place and Duration of Study: Department of General Surgery, Karatay University and Medipol University, Turkey, from January 2014 to December 2020.

Methodology: Patients' age, gender, primary diseases, PEG indications, morbidity, mortality, and complications were recorded by performing the PEG procedure. Hospitalisation, follow-up periods of the patients, and the re-insertion of PEG were evaluated.

Results: The most common indication for PEG tube insertion was nutritional disorder associated with cerebrovascular diseases in 81 (37%) patients. No mortality was perceived due to the PEG tube insertion. However, mortality was observed in 84 (38.4%) patients in the first six months, in 6 (2.7%) patients between the sixth and twelfth month, and in 8 (3.7%) patients after the twelfth month. All these mortalities were attributed to the primary disease. In the early and late periods, complications were observed in the total of 45 (20.4%) patients. Among them, 17 (7.7%) patients experienced early period complications, whereas 28 (12.7%) patients experienced late period complications.

Conclusion: Enteral nutrition should be preferred in order to avoid complications of parenteral nutrition in the patients who need long-term nutrition. In enteral nutrition, PEG should be preferred to surgical gastrostomy because it has less morbidity and mortality, can be done at the bedside and outpatiently when necessary, does not require general anesthesia, and is cheaper and practical.

Key Words: *Gastrostomy, Percutaneous Endoscopic gastrostomy, Enteral nutrition, PEG complications.*

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INTRODUCTION

Gastrostomy is a nutrition technique that is used for treating patients who cannot be fed orally for any reason and whose gastrointestinal system functions are normal. It is intended for long-term enteral feeding (more than four weeks) in the patients who experience problems with swallowing. In this context, the patient should have an acceptable life expectancy.[1] This surgical procedure was performed by Verneuil for the first time in 1876, France. Although many technical modifications have been made, the application of the Percutaneous Endoscopic Gastrostomy (PEG) technique was defined by Gauderer in 1980.[2]

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Absolute contraindications to PEG tube placement include serious coagulation disorders, hemodynamic instability, sepsis, severe ascites, peritonitis, abdominal wall infection at the placement site, peritoneal carcinomatosis, lack of a safe tract for percutaneous insertion, gastric outlet obstruction, history of total gastrectomy, prolonged ventilation assistance, and lack of informed consent. Relative contraindications include a history of partial gastrectomy and a large intrathoracic hiatal hernia.[3] The randomised controlled studies showed that this technique has been associated with superior outcomes with respect to complication and mortality rates in relation to radiological or surgical gastrostomy.[4] In a recent Korean study, the minor and major complication rates were reported as 16.4% and 12.3%, respectively.[5]

At present, the PEG is more practical and cheaper procedure that can be performed under local anaesthesia and sedation when compared to surgical gastrostomy. The main indications of the PEG include neurogenic dysphagia and head–neck cancers. The minor complications of the PEG include wound infection, leakage from the tube edge, and tube displacement.

On the other hand, the major complications include buried bumper syndrome, bleeding, perforation, ileus, gastrocolic fistula, and aspiration pneumonia.[6] The PEG indications can be modified and the complication rates can be decreased in the future by leveraging advanced technologies and increased endoscopic experience. The aim of this study was to determine the indications and early and late complications, and management of these complications in the patients who underwent the PEG procedure.

METHODOLOGY

This retrospective study included 224 patients who had undergone the PEG procedure at Department of General Surgery, Karatay University and Medipol University, Turkey, between January 2014 and December 2020 after obtaining approval from the local ethics committee. Five patients who failed percutaneous gastrostomy attempts were excluded from the study. In addition, patients under 18 years of age and those whose archive records could not be accessed were also excluded from the study.

Patients' age, gender, primary diseases, PEG indications, morbidity, mortality, and complications due to the PEG procedure were recorded. PEG complications were classified as major and minor complications. Major complications were accepted as bleeding, internal organ damage, gastrocolocutaneous fistula, and necrotising fasciitis. Leakage from the stoma site, infection, tube dislocation, and tube obstruction were regarded as minor complications. Hospitalisation and follow-up periods of the patients were recorded in terms of days. Information about the survival of the patients or the reinsertion of PEG was communicated by phone and such information was acquired from the patients or their relatives.

Nasogastric feeding was stopped eight hours before the procedure. Furthermore, antibiotic prophylaxis was not administered. PEG procedure was performed on all the patients using the pull technique described by Gauderer using 20F PEG kits.[2] The procedures were performed with a videoendoscope manufactured by the Fujinon brand. After the PEG was placed, a gastroduodenoscope was used to verify that the intragastric part of the tube was placed in the mucosa and check whether there was any bleeding. Twelve hours after the insertion of PEG, 20- cc of water was injected through the tube. Subsequently, patients, in whom no leakage was found from the PEG edge, were fed with 20 cc enteral nutrition solution.

Statistical analyses were performed with SPSS 18.0 software (SPSS Inc., Chicago, IL, USA). The distribution of data was determined by performing the Kolmogorov–Smirnov test. Continuous variables were expressed as mean ± SD, and categorical variables were provided in terms of frequency and percentage. A p-value less than 0.05 was considered to be statistically significant.

RESULTS

PEG was inserted in 219 out of 224 patients (97.7%). Five patients were excluded because the PEG could not be inserted. Among 219 patients, 142 (64.2%) were males and 77 (35.2%) were females. The average age of the patients was 74.45 ± 16.51 years. The demographic data of the patients are given in Table I.

The most common indication for the PEG tube insertion was nutritional disorder associated with cerebrovascular diseases in 81 patients (37%). This was followed by dementia (n = 53; 24.2%) and general condition disorder (n = 24; 11%). Other indications are given in Table I.

Table I: Distribution of patients according to demographic data and their ethiology.

Age (years) (mean ± SD)	74.45 ± 16.51
Gender (n/%)	
Male	142 (64.8%)
Female	77 (35.2%)
Length of stay (days) (mean ± SD)	
Before PEG procedure	40.58 ± 64.47
After PEG procedure	59.37 ± 94.47
Mortality rates	
≤ 6 months	84 (38.4%)
6 - 12 months	6 (2.7%)
≥ 12 months	8 (3.7%)
Number of patients requiring re-PEG	8 (3.7%)
Etiology, n (%)	
Cerebrovaskuler accident	81 (37.0%)
Alzheimer's and dementia	53 (24.2%)
General condition disorder	24 (11%)
After neurosurgery	19 (8.7%)
Nasopharynx and esophageal cancer	17 (7.8%)
Post-myocardial infarction/hypoxic brain	17 (1.8%)
Motor neuron disease	4 (1.8%)
Metastatic disease	4 (1.8%)

SD; Standard deviation.

Table II: Distribution of complications related to PEG procedure.

Complication	Early (n/%)	Late (n/%)
Tube dislocation	7 (3.2%)	15 (6.8%)
Infection	4 (1.8%)	2 (0.9%)
Bleeding	4 (1.8%)	0
Leak	2 (0.9%)	4 (%1.8)
Occlusion	0	7 (%3.2)

No mortality was perceived due to the PEG tube insertion. However, mortality was observed in 84 (38.4%) patients in the first six months, in 6 (2.7%) patients between the sixth and twelfth month, and in 8 (3.7%) patients after the twelfth month due to the primary diseases.

In the early and later periods, complications were observed in a total of 45 (20.4%) patients. Among them, 17 (7.7%) patients experienced early period complications, whereas 28 (12.7%) patients experienced later period complications. In the early period, after the PEG tube insertion, major complications developed in 6 (2.7 %) patients and minor complications developed in 11 (5%) patients. Tube dislocation and wound infection were considered as minor complications. On the other hand, bleeding and leakage were regarded as major complications. The complications developed in the early and later periods, the number of patients, and the percentage values are summarised in Table II. In the later period, the tube was re-inserted due to the tube

displacement in 15 (6.8%) patients. In four (1.8%) patients, the tube was replaced with a thicker (22/24F) gastrostomy tube due to the leakage from the tube edge and the leakage was controlled. In seven (3.2 %) patients, the tube was replaced due to the tube occlusion. In the later period after the PEG process, no major complications were observed due to the PEG.

DISCUSSION

Several different techniques were defined to continue enteral feeding in the patients who cannot be fed orally for any reason, whose gastrointestinal system functions are normal, and those who require tube feeding for a period longer than four weeks. At present, PEG is commonly preferred due to its low morbidity and mortality rates. Other procedures include laparoscopic gastrostomy, percutaneous ultrasound guided gastrostomy, and percutaneous radiographic guided gastrostomy. PEG indications include neurologic dysphagia, in particular, cerebrovascular diseases, head–neck cancers, general condition disorder, long-term gastric decompression, and stomach volvulus.[7]

The indication rates varied in different case series in the literature. A study conducted by Hossein *et al*. reported that the PEG was administered to the patients due to neurologic dysphagia (66 %), aspiration pneumonia (14%), and oesophageal tumours (3%).[8] On the other hand, Nenad et al. reported that the PEG tube was inserted into 44% of the patients due to malignancy diagnoses such as neck and head cancers (61%).[9] In the present study, the most common indication for PEG tube insertion was cerebrovascular diseases [n=81 (37%)]. This was followed by dementia (n=53; 24.2%) and general condition disorder (n = 24; 11%). The number of patients with PEG tube insertion due to head–neck cancer was 17 (7.8%).

PEG tube insertion was completed in over 95% of the patients for whom the PEG tube insertion has been planned. In the case series of 64 patients conducted by Senol *et al*., the PEG tube insertion could not be completed in three patients; insufficient transillumination (two patients), and incapability of reaching the stomach because of oesophageal cancer (one patient).[10] Nenad *et al*. reported that the PEG tube insertion rate was 98% in their series of 366 patients, and the PEG tube could not be inserted in seven patients due to the patients' previous history and intra-abdominal adhesions.[9] Taking into consideration the patients in whom the PEG tube could not be inserted, according to the literature, it is seen that the most common reasons include oesophageal cancer, laryngeal cancer that obstructs the lumen, intra-abdominal adhesion that prevents the visualisation of transillumination, and a previous operation or gastratrophia. Aman *et al*. conducted a study on a series of 232 patients, shared their eight-year experiences, and reported that the PEG tube insertion failed only in two patients with a success rate of 99.1%.[11] They also mentioned the importance of clear visualisation of transillumination in reducing major complications such as bleeding (occurred in two patients) and colon perforation (occurred in one patient) while performing the PEG insertion.

In the present study, the PEG insertion rate was found to be 97.7%, and the procedure could not be completed in five patients. In line with the literature, the endoscope could not be advanced into the stomach in two out of the five patients due to nasopharyngeal cancer and in one patient due to oesophageal cancer. In the remaining two patients, the PEG could not be performed, as the transillumination could not be seen due to previous abdominal operations and intra-abdominal adhesions, and the decision to continue performing the procedure would have resulted in serious morbidity and mortality. The authors think that not insisting on continuing the procedure when transillumination cannot be clearly seen while creating PEG will decrease the possibility of major complications.

Although the PEG insertion is a minimally invasive operation, major complications such as bleeding, perforation, gastrocolic fistula, aspiration pneumonia, and peritonitis may develop.[12] In the literature, the major complication rate was reported as ranging between 0 and 2.8%.[12,13] In the present study, six (2.7%) patients experienced a major complication in the early period. In three (1.35%) out of four (1.8%) patients who experienced bleeding, the bleeding was brought under control through follow-up and supportive care. In one (0.45%) patient, the bleeding could be brought under control by performing blood transfusion and conducting endoscopic sclerotherapy twice. In two (0.9%) patients, acute abdomen pain developed due to leakage into the abdomen in the early period, and the tube was removed and laparotomy was performed. The PEG procedure was smoothly re-performed in these patients after one month. No other major complications were perceived. A meta-analysis reported that the rates of morbidity and mortality due to the procedure were 9.4% and 0.53%, respectively.[14] Although the major complication rate in the current study was consistent with the rate in the literature (2.7%), the total morbidity rate in this study (20.4%; 45 patients) seems to be higher than observed in the literature. When examining the series published on this subject in Turkey, we see that the morbidity rates are a little high.[10]

Taking into consideration the examination of the data in this study in detail, it was seen that 17 (7.7%) patients had early period complications, whereas 28 (12.7%) patients had late period complications. When these complications, which occurred in the later period, were evaluated, it was observed that 80% of them were caused due to the re-insertion of the tube as a result of its displacement or occlusion in the patients who were receiving care at home. According to the researchers, PEG-related morbidity rates in Turkey can be reduced by enhancing the quality of patient care through more efficient patient and patient relative training, enhanced home care services, and increased number of nurses specialised in nutrition.

The most common minor complication of the PEG tube insertion is a wound site infection, which was reported to be at a rate of six-percent in a recent meta-analysis.[15] Another most common complication is leakage from the tube edge. In the literature, the answer to the question of whether prophylactic antibiotic admin-

istration provides efficient protection against peristomal infection is controversial. Some studies reported that antibiotic prophylaxis can reduce wound site infection.[16] On the other hand, Nenad *et al*. reported that the rate of wound site infections was only 0.8%, even though they did not use prophylactic antibiotics before the PEG procedure in their study.[9] Chung *et al*. emphasised that technical issues such as over-tightening of the gastronomy tube, incision size, and traction during feeding have a significant impact on the development of wound site infection.[17] The European Parenteral and Enteral Nutrition Association stated that routine antibiotic prophylaxis is not mandatory before the PEG procedure by experienced hands under antiseptic conditions.[18] In this study, process-related wound site infections occurred in four (1.8%) patients. Two (0.9%) patients were hospitalised due to necrosis associated with wound site infection. Subsequently, these patients were treated with intravenous anti-biotherapy, debridement, and discharged with a gastrostomy tube. The wound site infection rate (1.8%) was low, even though routine antibiotic prophylaxis was not performed before the PEG with the exception of patients whose anti-biotherapy continued due to the existing primary disease which also supports this suggestion.

CONCLUSION

Consequently, enteral nutrition should be preferred in order to avoid complications of parenteral nutrition in patients who need long-term nutrition. In enteral nutrition, PEG should be preferred to surgical gastrostomy because it has less morbidity and mortality, can be done at the bedside and outpatient when necessary, does not require general anesthesia, and is cheaper and practical. We think that it would be an appropriate approach to perform the PEG procedure, which can be performed safely and effectively, in surgical endoscopy units as much as possible due to the possibility of minor or major complications which may occur during and after the procedure and may require surgical follow-up and treatment.

PATIENTS' CONSENT:

Since it was designed as a retrospective study, the data were collected from the hospital archive following the approval of the Ethics Committee. Informed consent was obtained from all the patients before the procedure.

ETHICAL APPROVAL:

This study was conducted in compliance with the ethical principles according to the Declaration of Helsinki, and it was approved by the Ethical Committee of KTO Karatay University (No. June 2020/019).

COMPETING INTEREST:

The authors declared no competing interest.

AUTHORS' CONTRIBUTION:

YT: Conceived the study design, data collection, data analysis, and statistical activity.

GY: Conceived the study design, literature review, and manuscript writing.

BG: Data analysis, literature review, and result compilation.

All authors approved the final version of the manuscript to be published.

REFERENCES

1. Gomes CA, Andriolo RB, Bennett C, Lustosa SA, Matos D, Waisberg DR, *et al*. Percutaneous endoscopic gastrostomy versus nasogastric tube feeding for adults with swallowing disturbances. *Cochrane Database Syst Rev* 2015; 2015(5):CD008096. doi:10.1002/14651858.CD008096.pub4.
2. Gauderer MWL, Ponsky JL, Izant RJ. Gastrostomy without laparotomy: A percutaneous endoscopic technique. *J Pediatric Surg* 1980; 15(6):872-75. doi:10.1016/s0022-3468(80)80296-x.
3. Hussain A, Woolfrey S, Massey J, Geddes A, Cox J. Percutaneous endoscopic gastrostomy. *Postgrad Med J* 1996; **72**(852):581-5 doi: 10.1136/pgmj.72.852.581.
4. Pih GY, Na HK, Ahn JY, Jung KW, Kim DH, Lee JH, *et al*. Risk factors for complications and mortality of percutaneous endoscopic gastrostomy insertion. *BMC Gastroenterol* 2018; 18(1):101. doi: 10.1186/s12876-018-0825-8.
5. Park SK, Kim JY, Koh SJ, Lee YJ, Jang HJ, Park SJ. Complications of percutaneous endoscopic and radiologic gastrostomy tube insertion. *Surg Endosc* 2019; 33(3): 750-6. doi: 10.1007/s00464-018-6339-1.
6. Hucl T, Spicak J. Complications of percutaneous endoscopic gastrostomy. *Best Pract Res Clin Gastroenterol* 2016; 30(5):769-81. doi: 10.1016/j.bpg.2016.10.002.
7. Rahnemai-Azar AA, Rahnemaiazar AA, Naghshizadian R, Kurtz A, Farkas DT. Percutaneous endoscopic gastrostomy: Indications, technique, complications and management. *World J Gastroenterol* 2014; **20(24)**:7739-51. doi:10.3748/wjg.v20.i24.7739.
8. Hossein SM, Leili M, Hossein AM. Acceptability and outcomes of percutaneous endoscopic gastrostomy (PEG) tube placement and patient quality of life. *Turk J Gastroenterol* 2011; 22(2):128-33. doi: 10.4318/tjg.2011.0180.
9. Nenad V, Saray A, Jankovic S, Mesihovic R. Percutaneous endoscopic gastrostomy (PEG): Retrospective analysis of a 7-year clinical experience. *Acta Inform Med* 2012; 20(4): 235-37. doi: 10.5455/aim.2012.20.235-237.
10. Şenol Z, Karakaş DO, Yılmaz I. Perkutan Endoskopik Gastrostomi Tecrubemiz: 64 olgunun degerlendirilmesi. *Van Tıp Dergisi* 2013; 20:52-6 ISSN: 1300-2694 / 2587-0351.
11. Amann W, Mischinger HJ, Berger A, Rosanelli G, Schweiger W, Werkgartner G, *et al*. Percutaneous endoscopic gastrostomy (PEG) 8 years of clinical experience in 232 patients. *Austria Surg Endosc* 1997; 11(7):741-4. doi:10.1007/s004649900440.
12. Fávaro GM, Filho TF, Coca DS, Cunha MA, Sato Uemura R, Furuya Júnior CK, *et al*. Endoscopic gastrostomy: Critical analysis in a regional referral hospital. *Rev Gastroenterol Peru* 2017; **37(1)**:33-8. PMID: 28489834.
13. Disario J. Endoscopic approaches to enteral nutritional support. *Best Pract Res Clin Gastroenterol* 2006; 20(3):605-30. doi: 10.1016/j.bpg.2006.02.002.

14. Lin HS, Ibrahim HZ, Kheng JW, Fee WE, Terris DJ. Percutaneous endoscopic gastrostomy: Strategies for prevention and management of complications. *Laryngoscope* 2001; 111(10):1847-52. doi:10.1097/ 00005537-200110000-00033.

15. Strijbos D, Keszthelyi D, Bogie RMM, Gilissen LPL, Lacko M, Hoeijmakers JGJ, *et al*. A systematic review and meta-analysis on outcomes and complications of percutaneous endoscopic *versus* radiologic gastrostomy for enteral feeding. *J Clin Gastroenterol* 2018; **52(9)**:753-64. doi: 10.1097/MCG.0000000000001082.

16. Lipp A, Lusardi G. Systemic antimicrobial prophylaxis for percutaneous endoscopic gastrostomy. *Cochrane Database Syst Rev* 2013; 2013(11):CD005571 doi:10.1002/ 1465 1858.CD005571.pub3.

17. Chung RS, Schertzer M. Pathogenesis of complications of percutaneous endoscopic gastrostomy. A lesson in surgical principles. *Am Surg* 1990; 56(3):134-7. PMID: 2316933.

18. Loser C, Aschl G, Hebuterne X, Mathus-Vliegen EMH, Muscaritoli M, Niv Y, *et al.* Guidelines on artificial enteral nutrition- percutaneous endoscopic gastrostomy (PEG). *Clin Nutr* 2005; 24(5):848-61. doi:10.1016/j.clnu.2005.06.013.