JOURNAL OF
CONTEMPORARY MEDICINE

DOI:10.16899/jcm.1331937
J Contemp Med 2023;13(5):782-785

Original Article / Orijinal Araştırma

Clinical Outcomes of Percutaneous Endoscopic Gastrostomy in the Respiratory Intensive Care Unit

Solunum Yoğun Bakım Ünitesinde Perkütan Endoskopik Gastrostominin Klinik Sonuçları

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Abstract

Aim: Percutaneous endoscopic gastrostomy (PEG) is a feeding method used in patients who are expected to require enteral nutrition for more than 2-3 weeks. We aimed to evaluate PEG indications, complications, and post-procedural patient prognosis in patients followed up in our intensive care unit and fed via PEG.

Material and Method: We retrospectively reviewed 51 patients receiving PEG between January 1, 2017, and December 31, 2022, in the Respiratory Intensive Care Unit.

Results: Among the patients receiving PEG, 30 (58%) were male. The average age was 63.9, ranging from 23 to 90. The mean scores for the Glasgow Coma Scale (GCS), Acute Physiology and Chronic Health Evaluation II (APACHE II), and Sepsis Related Organ Failure Assessment (SOFA) were 8.47, 22, and 7.45, respectively. The mean duration until PEG placement was 24.8 days, and the average intensive care unit (ICU) hospitalization was 48.8 days.PEG was performed in 21 patients (41.2%) due to cerebrovascular disease, in 19 patients (37.3%) due to Alzheimer, dementia, or Parkinson's disease, and 18 patients (35.3%) due to prolonged mechanical ventilation. The complication rate associated with PEG was 13.7%. Among the patients who underwent PEG, 35 (68.6%) were discharged, while 16 (31.4%) died.

Conclusion: Considering its easy use at bedside, low complication, and mortality rates, PEG insertion is appropriate for continuing enteral therapies, especially in intensive care patients with insufficient oral intake.

Keywords: Percutaneous endoscopic gastrostomy, intensive care unit, indications and complications, prognosis, nutrition

Öz

Amaç: Perkütan endoskopik gastrostomi (PEG), 2-3 haftadan daha uzun süreli enteral beslenmeye ihtiyaç duyması beklenen hastalarda kullanılan beslenme yöntemidir. Yoğun bakım ünitemizde takip ettiğimiz ve beslenmelerini PEG açarak sağladığımız hastalarda PEG endikasyonlarını, komplikasyonlarını ve işlem sonrası hasta prognozlarını değerlendirmeyi amaçladık.

Gereç ve Yöntem: Hastanemiz Solunum Yoğun Bakım Ünitesinde 1 Ocak 2017 – 31 Aralık 2022 tarihleri arasında PEG uyguladığımız 51 hastayı retrospektif olarak incelendi.

Bulgular: PEG uygulanan hastaların 30'u (%58) erkekti. Hastaların yaş ortalaması 63,9 (min 23-max 90)du. Hastaların Glasgow koma skalası (GKS) ortalaması 8,47, Akut Fizyoloji ve Kronik Sağlık Değerlendirme II (APACHE II) skoru ortalaması 22, Sepsis İlişkili Organ Yetmezliği Değerlendirmesi (SOFA) skoru ortalaması 7,45, PEG açılma günü ortalaması 24,8, yoğun bakım yatış gün ortalaması 48,8 di. Hastaların 21'ine (%41,2) Serobrovasküler hastalık(SVH), 19'una (%37,3) Alzhemier/ Demans/ Parkinson, 18'ine (35,3) uzamış mekanik ventilasyon nedeniyle PEG açıldı. PEG komplikasyon oranı %13,7 idi. PEG açılan hastaların 35'i (%68,6) taburcu, 16'sı (%31,4) exitus oldu.

Sonuç: Hasta başında kolayca uygulanabilmesi, komplikasyon ve mortalite oranlarının son derece az olması nedeniyle özellikle oral alımı yeterli olmayan yoğun bakım hastalarında enteral tedavilerin sürdürülebilmesi için PEG takılması uygundur.

Anahtar Kelimeler: Perkütan endoskopik gastrostomi, yoğun bakım ünitesi, endikasyon ve komplikasyon, prognoz, nutrisyon

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Received *(Geliş Tarihi)*: 24.07.2023 **Accepted *(Kabul Tarihi)*:** 23.08.2023

INTRODUCTION

Nutrition is a basic need for patients who are followed up and treated in the intensive care unit.[1] In cases where the patient cannot be fed orally, parenteral or enteral nutrition is administered. Enteral nutrition is used for patients with a functioning gastrointestinal system but cannot be fed orally. Enteral nutrition aims to protect the patient's mucosal integrity, mucosal barrier function, intestinal immune response, and normal flora structure.[2] The most appropriate technique for long-term enteral nutrition is gastrostomy or, less frequently, jejunostomy. There are three ways to create a gastrostomy: surgical gastrostomy, radiologic gastrostomy, or percutaneous endoscopic gastrostomy.[3] Percutaneous endoscopic gastrostomy (PEG) is a feeding method used in patients expected to need enteral nutrition for more than 2-3 weeks and was first applied to children by Gauderrer and Ponsky in 1980.[4,5] PEG is preferred in the endoscopy or intensive care unit because it is easy to perform, safe, low-cost, and less invasive.[6] In this study, we aimed to evaluate PEG indications, complications, and post-procedural prognosis of patients who were followed up in our intensive care unit and whose nutrition was provided by PEG.

MATERIAL AND METHOD

The study was carried out with the permission of Health Sciences University Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital Ethics Committee (Date: 10.11.2022, Decision No: 2022-293). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

We retrospectively analyzed 51 patients who underwent PEG between January 1, 2017, and December 31, 2022, in the Respiratory Intensive Care Unit of our hospital. Routine laboratory tests were requested from all patients with PEG indication before the procedure. Feeding of patients receiving enteral nutrition via the nasogastric route was stopped at least 8 hours before the procedure. Prophylactic antibiotics were not administered because all patients were on antibiotics for their primary diseases. All patients were evaluated for contraindications such as bleeding disorders [international normalized ratio (INR): <1.5, Platelet (Plt): >50.000], a pathology that might interfere with gastroscopy, diffuse abdominal ascites, and gastrointestinal obstruction. Peripheral oxygen saturation, electrocardiography (ECG), and systolic and diastolic blood pressure values were monitored continuously during the procedure. Sedation and analgesia were administered by an intensive care physician. The percutaneous access site was sterilized. Translumination was achieved by gastroscopy, and the puncture site was determined by finger fluctuation. The procedure was performed with the pull technique. In this study, Fujinon® Fujifilm EG-590 WR fiber endoscope was used, and a 20-Fr percutaneous endoscopic gastrostomy set EzFeed (ZKSK®-Germany) was placed in all procedures. After PEG placement, the intragastric part of the tube was determined to be fully inserted into the mucosa with a gastroduedonoscope, and bleeding control was performed. Leakage control was performed with 50 cc water 12 hours after PEG placement. Patients were gradually fed with enteral nutrition solution at a rate of 20 ml/hour 24 hours after PEG application.

The data of the patients were recorded from the patient files and the electronic archive system of the hospital. Age, gender, Charlson comorbidity index (CCI), Glasgow Coma Scale (GCS), Acute Physiology and Chronic Health Evaluation II (APACHE II) score, Sequential Organ Failure Assessment (SOFA) score, number of days of hospitalization in the intensive care unit, PEG indication, PEG opening day, PEG complications, and patient prognosis were recorded.

Statistical Analysis

Descriptive statistics were used for demographic and clinical data, Chi-square analysis was used to show the relationship between categorical data, and Student T-test analysis was used for continuous variables. A p-value < 0.05 was considered significant in the study. SPSS program (Version 22, SPSS Inc., Chicago, IL, USA) was used for calculations.

RESULTS

Thirty (58%) of the patients who underwent PEG were male. The mean age of the patients was 63.9 years (min 23-max 90). The mean values of GCS, APACHE II score, SOFA score, mean PEG insertion day, and mean number of intensive care unit hospitalization are presented in **Table 1**.

Table 1: Demographic data of the patients

Mean age (years) mean (min-max)	63.9 (23-90)
Female/Male n (%)	21/30 42/58
GCS mean value	8.47 (6-15)
APACHE II score mean value mean	22.00 (4-33)
The mean value of the SOFA score	7.45 (2-11)
PEG deployment day average	24.80 (4-67)
The average number of days of intensive care hospitalization	48.80 (8-190)

GCS: Glasgow Coma Scale, APACHE II: Acute Physiology and Chronic Health Evaluation II, SOFA: Sequential Organ Failure Assessment, PEG: Percutaneous Endoscopic Gastrostomy, n: Number of patients, %: Percentage, min: Minimum, max: Maximum

PEG was performed in 21 patients (41.2%) for cerebrovascular disease (CVD), 19 patients (37.3%) for Alzheimer's/ Dementia/ Parkinson's disease, and 18 patients (35.3%) for prolonged mechanical ventilation. The indications for PEG opening and PEG complications are given in **Table 2**. All PEG complications were minor, and no mortality was observed during the procedure in any patient. Compression tamponade was applied to one patient with minor bleeding, and the bleeding stopped without additional intervention. In two patients, infectious discharge developed around the PEG, and no additional treatment was performed because they received antibiotics. Enteral feeding was stopped in one patient who developed feeding intolerance, and the PEG cannula was placed in free drainage. Enteral motility was increased by intravenous metoclopramide, and enteral feeding was started. The PEG cannula was opened with pressurized water in a patient with tube obstruction.

Table 2: Patients' PEG deployment indications and complications

PEG deployment indications	n	%
Tracheo-esophageal fistula (TOSF)	1	2,0
Multiple Sclerosis (MS)	1	2,0
Cerebral Palsy (CP)	2	3,9
Inadequate oral intake	5	9,8
Cerebrovascular disease (CVD)	21	41,2
Prolonged ventilation	18	35,3
Alzheimer/Dementia/Parkinson's	19	37,3
PEG Complications	**n**	**%**
Early complication (<30 days)		
Minor bleeding	1	1,9
Leakage/non-infectious	1	1,9
Leaking/infectious	2	3,9
Nutritional intolerance	1	1,9
Late complication (>30 days)		
Obliteration	2	3,9
Total complications	7	13,7

n: Number of patients, %: Percentage

Among the patients who underwent PEG, 35 (68.6%) were discharged, 16 (31.4%) were exited, and the conditions and parameters affecting the prognosis are given in **Table 3**.

Table 3: Parameters affecting the prognosis of the patients

Factors affecting prognosis					
Variables	**Discharged**		**Exitus**		**p value**
	%	**n**	**%**	**n**	
Tracheostomy status					
No	65.7	23	87.5	14	0.176
Yes	34.4	12	12.5	2	
Gender					
Female	40	14	43.8	7	0.801
Male	60	21	56.3	9	
Charlson comorbidity index (CCI)					
0-2	57.1	20	25	4	0.033*
>3	42.9	15	75	12	
Age (Mean±SD)	65.07±21.27		63.49±15.66		0.067
SOFA score (Mean±SD)	6.36±2.24		7.86±1.75		0.001*
APACHE II score (Mean±SD)	19.29±8.40		23.05±6.19		<0.0001*
PEG deployment day (Median)	10		22		0.130
Number of days in the intensive care unit (Median)	24		46		0.183

*: Statistically significant difference, SOFA: Sequential Organ Failure Assessment, APACHE II: Acute Physiology and Chronic Health Evaluation II, PEG: Perkütan Endoskopik Gastrostomy, SD: Standard deviation, n: Number of patients, %: Percentage

DISCUSSION

The enteral route is preferred in patients with inadequate oral intake if gastrointestinal system functions are normal. The most important reasons for this are; low cost, protection of intestinal mucosal barrier function and intestinal immune response, maintenance of normal flora structure, and reduction of bacterial translocation/bacteremia risks.[7,8]

Nasoenteric (gastric, duodenal, or jejunal) catheters can be inserted in the early period to use the enteral route. Long-term use of these methods has complications such as pharyngeal ulceration, esophagitis, esophageal ulceration, and gastric erosion. If the enteral route is used for more than four weeks, gastrostomy is recommended.[9-11]

In the study of Tok et al., PEG deployment was found to be 28.8 days on average. In our patients hospitalized in our respiratory intensive care unit, PEG opening took a mean of 24.8 days, and in some patients, the hesitancy of relatives to give consent prolonged the process, similar to the literature.[12,13]

The Charlson comorbidity index (CCI) consists of 19 disease group variables. It is widely used in studies because of its simple structure and ability to facilitate patient evaluations. In the study conducted by Düzenli et al., their patients' mean CCI value was 4.8.[14] In our study, the mean CCI value was 2.9, and mortality was high in patients with a CCI value of 3 and above (p=0.033).

In our study, the mean APACHE II score was 22, and the mean GCS score was 8.4. In the study by Çelik et al., the mean APACHE II score was 18.5, and the mean GCS score was 8.6. In another study, the mean APACHE II score was 11.4.[12-15] In our study, APACHE II, SOFA, and CCI scores were significantly higher in patients with exitus (p=<0.0001, p=0.001, p=0.033). These values were consistent with the literature.

The neurologic patient group constitutes the majority of patients in whom PEG was placed. In the study by Kartal et al.[16] this rate was CVD at 74.6% and Alzheimer's/Dementia/Parkinson's at 10.8%. In the study by Tokunaga et al.[9] 75% of the patients had CVD. In our study, these rates were CVD at 37.2%, prolonged ventilation at 35.3%, and Alzheimer's/Dementia/Parkinson's at 37.3%. We attributed the higher proportion of patients requiring long-term ventilation compared to the literature to the fact that our intensive care unit is a respiratory intensive care unit.

In our study, two patients with Cerebral Palsy (CP) and one with Multiple Sclerosis (MS) underwent early PEG. Swallowing disorders or dysphagia are common in adults with cerebral palsy. These disorders can occur at various stages of development but are typically caused by damage to the nervous system, head, or neck.[17,18] In our patients diagnosed with CP, PEG was opened on the fourth and fifth days of intensive care unit hospitalization to prevent aspiration pneumonia and to ensure feeding. Since dysphagia may develop in patients with multiple sclerosis, these patients need nutritional support. Most of the time, the oral route for nutrition may be inadequate. PEG insertion is indicated in these patients.[19,20] PEG was laced on the sixth day of intensive care unit hospitalization in our patient diagnosed with MS.

Although PEG is a minimally invasive procedure, different complication rates have been reported.[21,22] Major complications reported with a rate of 0-2% in the literature include bleeding, perforation, gastrocolic fistula, and aspiration pneumonia.[23,24] No major complication was observed in our study. The most common minor complication is wound site infection, which has been reported with a rate of 3-30%.[25] Less common minor complications include leakage

from the tube edge and tube occlusion.[26] In our study, leakage from the tube edge occurred in one patient, and obstruction occurred in two patients. Our minor complication rate was 13.7%.

This study had some limitations. The first and most important limitation was that the study was retrospective, and the number of patients was small. Secondly, the study was single-center, and the data do not reflect the characteristics of the general population because it was a respiratory intensive care unit.

CONCLUSION

Since it can be easily applied at the bedside and the complication and mortality rates are extremely low, PEG insertion is appropriate to maintain enteral nutrition and treatments, especially in intensive care patients with insufficient oral intake..

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Health Sciences University Yedikule Chest Diseases and Thoracic Surgery Training and Research Hospital Ethics Committee (Date: 10.11.2022, Decision No: 2022-293).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

Note: *Presented as an oral presentation at National Lung Health Congress with International participation, March 15-18, 2023 at Sueno Deluxe Hotel, Belek Antalya.

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