RESEARCH

Early mortality and adverse health outcomes after percutaneous endoscopic gastrostomy placement in palliative care patients

Palyatif bakım hastalarında perkütan endoskopik gastrostomi yerleştirilmesinden sonra erken mortalite ve olumsuz tıbbi sonuçları

Mehmet Erdevir[1] , Dilara Dönmez Güler[2] , Esra Ateş Bulut[2]

[1]Yüregir State Hospital, Adana, Türkiye
[2]University of Health Sciences, Adana, Türkiye

Abstract

Purpose: Percutaneous endoscopic gastrostomy (PEG) is performed in patients unable to feed by mouth. In this study, we aimed to compare early mortality and adverse health outcomes between stroke patients and non-stroke patients who underwent PEG placement while receiving palliative care.

Materials and Methods: The study included patients who were admitted to the palliative care unit between March 2022 and September 2023 and had undergone PEG within the three months preceding their admission. Patient records were reviewed retrospectively. Patients' sex, age, Charlson Comorbidity Index, tracheostomy status, pressure injuries, readmission rates, and mortality rates within 30 days after discharge who underwent PEG placement were obtained.

Results: The study included 34 stroke patients and 54 non-stroke patients. The stroke patients had a higher mean Charlson Comorbidity Index of 6.08±1.48 compared to the non-stroke patients, whose mean Charlson Comorbidity Index was 3.01±2.42. The length of hospitalization was 60.47 ± 24.27 days in stroke patients and 86.26 ± 63.02 days in non-stroke patients. Tracheostomy was present in 26.5% of stroke patients, compared with 66.7% of non-stroke patients. Thus, non-stroke patients experienced statistically significant longer hospital stays and a higher frequency of tracheostomy. Among all patients, the rate of early healthcare admission was 45.5%, and the overall mortality was 23.9%. Readmission rates, mortality, and complications related to PEG placement were similar between the two groups. The frequency of PEG-related complications was 8.8% in the stroke group and 3.7% in the non-stroke group. The 30-day post-discharge mortality rate was 29.4% in the stroke group and 20.4% in the non-stroke group. Mortality was

Öz

Amaç: Perkütan endoskopik gastrostomi (PEG), oral beslenmesi mümkün olmayan hastalarda uygulanmaktadır. Bu çalışmada, palyatif bakım servisi takipli, perkütan endoskopik gastrostomi uygulanan inme hastaları ile inme geçirmemiş hastalar arasında erken mortalite ve olumsuz sağlık sonuçlarını karşılaştırmayı amaçladık.

Gereç ve Yöntem: Çalışmaya, Mart 2022–Eylül 2023 tarihleri arasında palyatif bakım servisinde yatırılan ve servis yatışından itibaren son üç ay içinde PEG uygulanan hastalar dahil edildi. Hasta kayıtları retrospektif olarak incelendi. PEG uygulanan hastaların cinsiyet, yaş, Charlson Komorbidite İndeksi, trakeostomi durumu, bası yaraları, yeniden yatış oranları ve taburculuk sonrası 30 gün içindeki mortalite oranları değerlendirildi.

Bulgular: Çalışmaya 34 inme hastası ve 54 inme geçirmemiş hasta dahil edildi. İnme hastalarının ortalama Charlson Komorbidite İndeksi 6,08±1,48 iken, inme geçirmemiş hastalarda bu değer 3,01±2,42 idi. İnme geçirmiş hastalarda hastanede kalış süresi 60,47±24,27 gün olarak görülürken, inme geçirmemiş hastalarda bu süre 86,26±63,02 gün idi. İnme geçirmiş hastaların %26,5'i trakeostomiliyken buna karşın inme geçirmemiş hastaların %66,7'sinde trakeostomi mevcuttu. İnme geçirmemiş hastalarda istatistiksel olarak hastanede kalış süresi daha uzun ve trakeostomi sıklığı daha yüksek bulundu. Bütün hastalarda erken sağlık hizmetine başvuru oranı %45,5, toplam mortalite ise %23,9 olarak saptandı. Yeniden hastaneye başvuru, mortalite ve PEG ile ilişkili komplikasyonlar iki grup arasında benzerdi. PEG ilişkili komplikasyon sıklığı inme grubunda %8,8 olduğu görülürken inme geçirmemiş grupta %3,7 idi. Taburculuk sonrası 30 gün içindeki mortalite oranı inme grubunda %29,4 saptanırken bu oran inme geçirmemiş grupta %20,4 bulundu. Mortalitenin yaş (OR:1,05, %95 CI:1,01–1,08) ve

significantly associated with age (OR:1.05, 95% CI:1.01-1.08) and Charlson Comorbidity Index (OR: 1.42, 95% CI: 1.12-1.79).

Conclusion: Mortality and early readmissions to the hospital were frequent in palliative care patients receiving enteral nutrition. In palliative care settings, accurately identifying individuals for planning enteral nutrition programs is crucial.

Keywords:. Gastrostomy, stroke, enteral nutrition, mortality, palliative care, complication

Charlson Komorbidite İndeksi (OR:1,42, %95 CI:1,12–1,79) ile ilişkili olduğu görüldü.

Sonuç: Enteral beslenme alan palyatif bakım hastalarında mortalite ve erken dönemde yeniden hastaneye yatışlar sık görülmektedir. Palyatif bakım servisinde tedavi edilen hastalarda enteral beslenme planı açısından kişilerin doğru belirlenmesi önemlidir.

Anahtar kelimeler: Gastrostomi, inme, enteral beslenme, mortalite, palyatif bakım, komplikasyon

INTRODUCTION

Palliative care utilizes a multidisciplinary approach that aims to alleviate suffering and enhance the quality of life for patients and their caregivers confronting life-threatening illnesses. This care addresses both physical and psychosocial challenges. Nutritional support is important in patients who require palliative care. According to European Society for Clinical Nutrition and Metabolism (ESPEN) and American Society for Parenteral and Enteral Nutrition (ASPEN) guidelines, enteral nutrition (EN) should be planned in patients with normal gastrointestinal tract function who cannot maintain adequate oral nutrition[1]. In patients who require EN for more than four weeks, it is recommended to switch to a permanent method such as percutaneous endoscopic gastrostomy (PEG) or percutaneous endoscopic jejunostomy (PEJ)[2,3]. Dysphagia is often caused by a neurological condition, which may require insertion of a PEG tube. Some of the neurological conditions that may lead to dysphagia and require PEG include cerebrovascular disease, amyotrophic lateral sclerosis (ALS), dementia, multiple sclerosis, Parkinson's disease, ischemic encephalopathy, traumatic brain injury, as well as head, neck, and esophageal cancers[4].

PEG placement is a commonly used minimally invasive procedure that can be easily performed in the endoscopy unit. The procedure is considered safe, and complications related to the procedure are low [5]. Major complications include peritonitis, gastric perforation, pneumoperitoneum, and aspiration pneumonia, while minor complications can include wound infection, minor bleeding, and tube occlusion. Most of the complications are minor in the literature[6]. Patients with a history of infection or aspiration, particularly older adults with multiple health conditions, are more prone to developing complications[7]. Mortality related to the procedure itself is quite low and ranges between 0.5% and 2% [8].

The effects of PEG placement on survival and functionality have been examined in various studies, but the outcomes have been inconsistent[9]. Short-term (typically 30 days) mortality rate after PEG procedure due to various underlying conditions and comorbid diseases has been reported between 10-43% in studies[10,11]. The risk of early mortality has been associated with the patient's comorbidities rather than procedure-related complications[12].

The decision regarding PEG placement in multimorbid palliative care patients should consider potential benefits for quality of life and possibly survival, alongside the burdens associated with nutritional care. This decision should involve both healthcare professionals and the formal relatives of the patients. More data on early and long-term outcomes after PEG placement procedure are necessary.

This study aimed to retrospectively evaluate patients who had undergone PEG placement for stroke and other diagnoses in the palliative care service in terms of early post-discharge (1-month) readmission and mortality rates. In palliative care patients, a comprehensive medical evaluation is required to identify those who are likely to benefit from the PEG procedure because of the lower survival expectation among patients in the terminal phase of the diseases. To the best of our knowledge, our study is one of the few that has examined early mortality and complications after PEG placement in a palliative care service.

MATERIALS AND METHODS

Study design and sample

Current study was conducted in the palliative care service of Adana City Training and Research Hospital. Patients aged ≥18 years who were hospitalized between March 2022 and September 2023, had undergone an endoscopic PEG procedure

for stroke or non-stroke indications within the three months prior to admission to the palliative care unit, and had accessible hospital records were included. Patients with incomplete hospital records and those who had PEG surgically placed or had PEG placed more than three months earlier were excluded from the study. Local ethics committee approval was obtained. Data collection, statistical analysis, and interpretation were performed by physicians working in the palliative care service. During the specified period, a total of 95 patients with PEG were followed in the palliative care unit. Seven patients were excluded from the study because PEG had been placed more than three months earlier. A total of 88 patients who had undergone PEG placement either within the three months preceding their admission to the service or during their intensive care unit stay were included. The flowchart of the study is shown in Figure 1. The retrospective study evaluated mortality and unplanned healthcare utilization within the first month after discharge, using hospital records. Unplanned healthcare utilization was defined as presentations for acute medical conditions post-discharge, such as fever, acute mental status changes, bleeding, or PEG displacement/blockage.
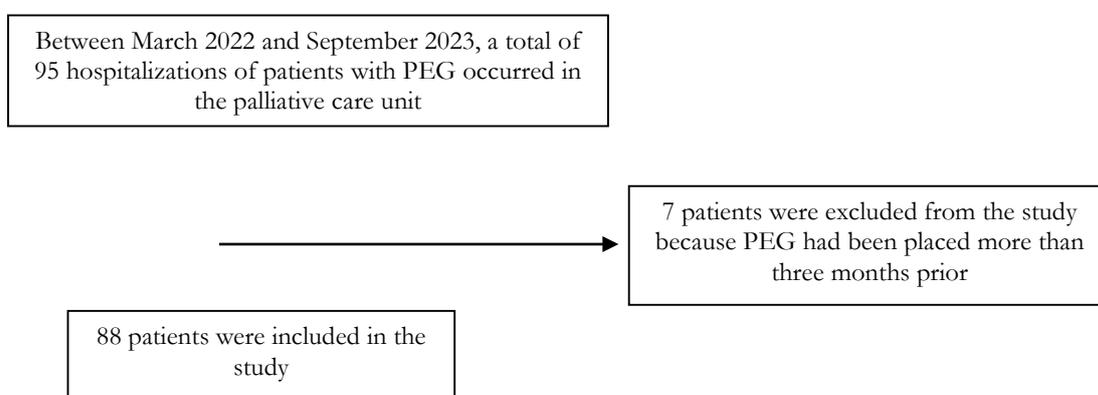
Between March 2022 and September 2023, a total of 95 hospitalizations of patients with PEG occurred in the palliative care unit

7 patients were excluded from the study because PEG had been placed more than three months prior

88 patients were included in the study

Figure 1. Flowchart of the study

The decision for PEG placement is made by the medical doctor, considering the survival benefits for the patient, along with the approval of the patient's relatives. PEG placement was performed in patients who could not meet their energy and metabolic requirements with adequate oral intake and required nasogastric tube feeding for more than four weeks. Standard PEG placement was performed by experienced gastroenterologists at the same hospital. Patients who underwent PEG placement were categorized into two groups based on their primary diagnoses: stroke-related and non-stroke-related conditions. The stroke group included patients diagnosed with hemorrhagic or ischemic stroke, while the non-stroke group comprised patients with subarachnoid hemorrhage, intracranial hemorrhage, traumatic brain injury, hypoxic encephalopathy (post-resuscitation), motor neuron disease (e.g., amyotrophic lateral sclerosis), cerebral palsy, dementia, Parkinson's disease, and solid malignancy. Demographic and clinical variables, including age, gender, Charlson Comorbidity Index (CCI), presence of tracheostomy, pressure ulcers, albumin and C-reactive protein (CRP), lymphocyte counts, 30-day post-discharge mortality, and readmission rate due to acute medical conditions, were retrospectively analyzed for both groups.

Data collection

The CCI was calculated based on hospital records. Albumin, CRP, and lymphocyte counts were obtained from the laboratory values measured at the patient's initial admission to the palliative care unit. Post-PEG placement complications, such as bleeding, peri-gastrostomy infection, and buried bumper syndrome, were also evaluated from hospital records. Due to the retrospective design of the study, obtaining informed consent from patients prior to data access was not feasible; however, all data were anonymized and patient confidentiality was maintained.

Based on the reference reporting a 2.26% incidence of the PEG procedure, a minimum sample size of 71 patients is required to achieve a 95% confidence level with a 5% margin of error[13].

Statistical analysis

Categorical data were defined as numbers and percentages, while parametric numerical data were represented by the mean and standard deviation. Non-parametric numerical data were represented by the median, minimum, and maximum values. Nominal values were assessed using the chi-square test or Fisher's exact test in both groups, while numerical values were analyzed with either the t-test or the Mann-Whitney U test, depending on the data distribution.

Logistic regression analysis was used to identify which variables were associated with mortality, as the study was cross-sectional study. As potential variables for mortality, age, comorbidity index, tracheostomy, pressure ulcer presence, length of stay, and diagnosis of stroke in deceased patients within the first month after discharge were evaluated using logistic regression analysis. SPSS Statistics 23 was used to conduct statistical analyses (IBM). A p-value < 0.05 was accepted as statistically significant.

RESULTS

A total of 88 patients were included in the study; 34 underwent PEG placement due to stroke, while the remaining patients underwent the procedure for non-stroke-related reasons. The median age of patients in the stroke group was 73.5 years, compared to 51.0 years in the non-stroke group ($p<0.01$). Comorbidities such as diabetes mellitus (DM) (52.9%), hypertension (HT) (58.8%), and atrial fibrillation (AF) (35.3%) were more prevalent in the stroke group, whereas hypoxic encephalopathy (27.8%), tracheostomy (66.7%), and longer hospital stays (86.26 ± 63.02 days) were more common in the non-stroke group. The mean CCI was significantly higher in the stroke group (6.08 ± 1.48) than in the non-stroke group (3.01 ± 2.42) ($p<0.01$). Conversely, the stroke and non-stroke groups showed no difference in readmission rates (41.2% vs. 48.1%, p = 0.52), mortality rates (29.4% vs. 20.4%, $p = 0.33$), history of intensive care unit (ICU) stay (94.1% vs. 96.3%, p = 0.63), or post-PEG complications (8.8% vs. 3.7%, $p = 0.37$) (Table 1).

Table 1. Characteristics of the patients according to PEG indications

Variables	Patients diagnosed with Stroke (n=34)	Non-stroke diagnoses (n=54)	*p*-value
Sociodemographic Characteristics			
Age, median (n, min–max)	73.5(37-89)	51(19-93)	**<0.01**
Gender (female)	52.9	38.9	0.19
DM (%)	52.9	20.4	**<0.01**
HT (%)	58.8	25.9	**<0.01**
ACD (%)	26.5	20.4	0.51
AF (%)	35.3	3.7	**<0.01**
Solid Malignancy (%)	0	3.7	0.52
Neurodegenerative Disease (%)	8.8	22.2	0.10
Hypoxic Encephalopathy (%)	2.9	27.8	**<0.01**
Tracheostomy (%)	26.5	66.7	**<0.01**
Pressure injury (%)	70.6	63.0	0.46
Charlson Comorbidity Index	6.08±1.48	3.01±2.42	**<0.01**
Intensive Care Unit Hospitalization History* (%)	94.1	96.3	0.63
Laboratory Findings			
CRP (mg/L)	69.74±46.58	69.83±51.38	0.66
Lymphocytes (per microliter)	1494±645	1809±728	0.72
Albumin	2.79±0.45	2.85±0.45	0.94
Morbidity and Mortality			
Length of Hospitalization (days)	60.47±24.27	86.26±63.02	**<0.01**
PEG procedure complication*	8.8	3.7	0.37
Patients readmission rate (%)	41.2	48.1	0.52
Mortality (%)	29.4	20.4	0.33

DM: Diabetes Mellitus, HT: Hypertension, ACD: Atherosclerotic cardiovascular disease, AF: Atrial Fibrillation, CRP: C-reactive protein, PEG: Percutaneous Endoscopic Gastrostomy; *Fisher's exact test

Across all 88 patients, the early hospital readmission rate was 45.5%, and the overall mortality was 23.9%. Mortality and hospital readmission rates after discharge showed no significant differences between the stroke and non-stroke groups (*p*>0.05). The regression analysis found no significant associations between mortality and factors such as tracheostomy, gender, ICU stay history, pressure ulcers, length of hospital stay, or stroke diagnosis. In contrast, mortality was positively correlated with older age (OR:1.05, 95% CI: 1.01-1.08) and higher CCI scores (OR:1.42, 95% CI: 1.12-1.79) (Table 2).

Table 2. The association between mortality and patients characteristics

Variables	Mortality		
	β	OR (95% CI)	*p*-value
Age	0.05	1.05(1.01-1.08)	**<0.01**
Gender(male)	0.43	1.53(0.57-4.10)	0.39
Intensive Care Hospitalization	0.07	1.07(0.10-10,83)	0.96
Charlson Comorbidity Index Score	0.34	1.42(1.12-1.79)	**<0.01**
Tracheostomy	-0.07	0.94(0.35-2.50)	0.90
Pressure Ulcer	0.23	1.26(0.46-3.48)	0.66
Length of Hospitalization	0.01	1.00(0.99-1.01)	0.89
Stroke	-0.49	0.61(0.23-1.66)	0.34

Odds Ratio, CI: Confidence interval.

DISCUSSION

The study found that palliative care patients who underwent PEG placement within three months prior to admission and were diagnosed with stroke had a higher age and a comorbidity burden compared to non-stroke patients. Additionally, nearly half of the patients who were readmitted to the hospital and those with early mortality rates showed similar patterns in both stroke and non-stroke diagnoses. Mortality was associated with advanced age and a higher comorbidity burden.

In the literature, the effect of PEG placement on mortality has not been identified in patients with neurodegenerative diseases (dementia, Parkinson's disease), traumatic brain injury (subdural, intracerebral and subarachnoid hemorrhage) with or without a diagnosis of stroke[14]. While several studies have reported the positive effect of the PEG procedure on mortality in ALS, the efficacy of tube enteral feeding to patients suffering from advanced dementia is not clear[15,16]. Studies involving larger patient samples demonstrated that certain factors increase the risk of mortality in patients receiving EN. These included older age and systemic diseases, including chronic kidney disease and congestive heart failure. Certain factors decreased the risk of mortality, such as being female, having diabetes, and having had

a stroke[13]. Studies indicate that EN can enhance survival in patients with life expectancies over 2–3 months by preventing malnutrition, maintaining muscle mass, and lowering infection risks[17]. However, its benefits are less certain in cases of advanced dementia or end-stage cancer, where artificial nutrition may not extend meaningful survival and could increase discomfort[17,18]. A personalized approach, considering the disease trajectory and patient goals, is crucial to ensure that EN aligns with quality-of-life priorities[19].

In the literature, the relationship between functional status, survival, and PEG placement is complicated. In a meta-analysis of 36,000 patients, tube feeding was not found to be beneficial in survival for patients with advanced dementia[20]. In an 11-year follow-up study examining the effect of PEG application on mortality in stroke patients, it was found that PEG placement decreased mortality at 3 months; however, mortality rates increased at 6 and 12 months. This might be linked to increased risks of aspiration and embolism due to movement constraint[21]. In the multicenter randomized controlled FOOD study conducted in patients with stroke, the effects of oral nutrition support, early tube feeding or PEG feeding on health outcomes after stroke were investigated. While the results did not reveal a benefit of oral supplements, it was determined that the survival rate increased when tube feeding was started in the early

period. The best outcome was reported in the nasogastric tube feeding group. These findings have created uncertainty regarding the optimal timing for gastrostomy feeding in these patients[22].

In another large-scale study of patients who underwent PEG procedure, the median age was 69 years, and 30-day mortality was 8.9%. It has been reported that PEG placement caused a 60% decrease in 30-day mortality and a reduced the risk of aspiration pneumonia by 16% in the first 7 days after the procedure. Increasing age, PEG performed in emergent situations, and increased comorbidity burden have been reported to increase the 30-day mortality risk. Other neurological conditions, dementia, and esophageal cancer have been related to increased mortality risk compared to stroke patients[23].

In a similar study conducted by Ha & Hauge in Norway[24], the median age was 77 years in the stroke group and 67 years in the non-stroke group (p=0.01). In the present study, the median age of the stroke group was 73.5 years, which was higher than the non-stroke group (p<0.01). The non-stroke group primarily comprised younger trauma patients in the present study. Our study found that the length of stay was significantly longer in the non-stroke group compared to the stroke group, likely due to prolonged intubation, the need for tracheostomy, and more frequent infectious complications in the non-stroke group.

In a study including 492,727 patients aged over 65 who underwent PEG placement after stroke, it was reported that patients with dementia received PEG more frequently than those without dementia. No significant differences were observed between patients with and without dementia in 30- and 60-day readmission rates, and the most common causes of patient readmissions were sepsis, aspiration pneumonia, and PEG-related complications[25]. Another large-scale study demonstrated that 21.06% of patients who underwent PEG placement after stroke were readmitted to the hospital within the first month after discharge, with sepsis being the most common reason for readmission[26].

Hypoxic encephalopathy and tracheostomy are more frequent among non-stroke patients. This is because the non-stroke group consists mainly of younger patients. Studies reveal that patients over 70 years old have significantly higher mortality rates after cardiac arrest, and those who are successfully resuscitated after cardiac arrest may develop hypoxic brain damage[27,28]. Thromboembolic events and neurodegenerative conditions that may cause disability or central nervous system sequelae are seen at a lower prevalence in younger patients[29].

The rate of atrial fibrillation, hypertension, diabetes mellitus, and CCI scores were significantly higher in the stroke group. This result is an expected situation in which the burden of chronic diseases increases with age[30]. Vascular risk factors such as hyperlipidemia, hypertension, diabetes mellitus, atrial fibrillation play an important role in thromboembolic events[31].

A study conducted in the geriatric age group demonstrated that PEG placement in stroke patients resulted in higher mortality compared to those who underwent PEG for other neurological indications[32]. In a prospective study, James et al. examined 126 stroke patients who had PEG placement. They found that the early mortality rate was 23%[33]. Similarly, our study did not find difference in the readmission and mortality rate in the first month after discharge between patients who received PEG procedure for stroke and non-stroke reasons. Additionally, in a study by Ha et al. the early mortality rate was 19% in stroke patients and 17% in the non-stroke group[24]. We hypothesize that the underlying neurological condition and subsequent immobilization, pressure injury, and tracheostomy have a severe impact on the life expectancy of patients in both patient groups.

According to a study conducted by Jiang et al. in China, potential factors to consider for selecting patients likely to survive more than 3 months after PEG placement include age, ASA (American Society of Anesthesia) score, and albumin level. The study found that patients who survived more than 6 months had a significantly lower mean age (75.9 ± 9.0 years vs. 83.0 ± 4.9 years, p<0.001)[34]. In another retrospective study including 277 patients, anemia and a prior history of intensive care unit admission were identified as predictors of one-month mortality following PEG placement [35]. In a study including 135 patients, elevated CRP levels after PEG placement were shown to be a predictor of 30-day early mortality. In our study, no relationship was observed between albumin and CRP levels and mortality in patients who underwent PEG placement.

The present study has some limitations. Firstly, it was performed in a single center, which may limit the generalizability of our findings. Additionally, the

study was retrospective. The follow-up period was also relatively short, which may have affected our ability to detect certain outcomes. Furthermore, we were unable to provide detailed information on the causes of mortality or admission to healthcare institutions within one month. Finally, the total number of patients in our study was small, and due to the insufficient number of patients in the subgroups within the non-stroke group, subgroup analysis could not be performed for the non-stroke group. Besides, our study has numerous strengths. This study was performed at a tertiary referral center to evaluate early mortality, adverse health outcomes, and complications related to PEG placement in patients with a high rate of intensive care admissions over the last three months. The diverse group of dependent palliative care patients was assessed using real-life data. Our study is one of the few in the literature to evaluate adverse health outcomes following PEG placement in palliative care units.

Mortality rates among palliative care patients were associated with age and comorbidity burden, and early hospital readmissions were common among patients receiving EN. However, the survival benefit of EN in palliative care patients, especially in the terminal phase of disease, remains debated. A comprehensive assessment of patients receiving palliative care is essential to identify those who are likely to benefit from EN. Future follow-up studies will help explore the short- and long-term effects of PEG on survival and functional improvement.

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