









A Retrospective Analysis of All-Cause Mortality After Percutaneous Endoscopic Gastrostomy in a Single Center

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ABSTRACT

Objective: Percutaneous endoscopic gastrostomy is an effective and safe way of delivering enteral nutrition. Neurological diseases and malignancies are the leading indications. This study aimed to determine the mortality rates after percutaneous endoscopic gastrostomy placement by comparing age groups.

Methods: This retrospective cohort study included patients with percutaneous endoscopic gastrostomy placements between 2019 and 2022 in a single center. The date of percutaneous endoscopic gastrostomy placements and deaths were recorded. Patients were categorized according to age as follows: <65 years, 65-74 years, 75-84 years, and 85 years and over.

Results: A total of 476 patients were included. The median age was 79.0 (range 18-97), with 59.9% being female. The leading indications were neurological diseases (91.0%), and malignancies (5.0%). Of the 476 patients, 14.7% were <65 years, 20.6% were between 65 and 74 years, 37.4% were between 75 and 84 years, and 27.3% were 85 years and over. About 13.2% of patients died within 2 weeks and 67.2% of patients died within 12 months. About 8.6% of patients aged <65 years and 17.7% of patients aged 85 years and over died within 2 weeks. On the other hand, 60.0% of patients aged <65 years and 67.2% of patients aged 85 years and over died within 12 months. Approximately half of the patients (48.3%) died within 3 months.

Conclusion: In this study, almost half of the patients died within 3 months. The mortality rate of patients aged 85 years was higher in the short term. Current data for all institutions should be defined, and future strategies should be targeted. High-quality, controllable nutrition support teams are essential.

Keywords: Mortality, nutrition support team, percutaneous endoscopic gastrostomy

INTRODUCTION

Percutaneous gastrostomy tube placement is an effective and safe way of delivering enteral nutrition. Percutaneous endoscopic gastrostomy (PEG) is usually applied when the patient is expected to need enteral nutrition for longer than 4-6 weeks.¹ The classic indication for PEG tube placement is dysphagia secondary to neurological disorders, head and neck or esophageal cancer, and dementia.² According to the European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines on home enteral nutrition (HEN), PEG may be required for swallowing disorders due to neurological diseases, malignancies, cachexia, chronic obstructive pulmonary disease, heart

disease, chronic infections, and malabsorption/maldigestion. If life expectancy is expected to be less than 1 month, HEN is usually not recommended to be initiated.³

The choice of appropriate patients for PEG placement with accurate indication and in time is the cornerstone of this issue. There are guides published by the ESPEN and The Society of Clinical Enteral Parenteral Nutrition (KEPAN).³⁻⁵ Old age, dementia, low body mass index, high anesthetic risk, hypoalbuminemia, and high Charlson comorbidity index have been defined as potential predictive factors for mortality after PEG placement.¹ In general, it is known that survival after placement of a PEG in geriatric patients is poor. In a meta-analysis, survival was

reported as 81% after 1 month, 56% after 6 months, and 38% after 1 year.⁶ There are so many factors affecting survival rates that they change widely from country to country and even from one hospital to another in the same city. Therefore, the existence of a nutrition support team (NST) is crucial. For example, in a recently published retrospective, large-sample cohort study, the post-PEG mortality rate has decreased by approximately 40% over the last 10 years with the existence of NST.⁷

This retrospective study aimed to determine the mortality rates after PEG placement by comparing the age groups. In this way, we planned not only to encourage health-care professionals to see the mistakes and difficulties but also to promote high-quality NSTs.

METHODS

This retrospective, cohort study was carried out in a single-center hospital. The Eskişehir City Hospital ethics committee approved the study (Decision date: April 19, 2023; decision number: ESH/GOEK 2023/19). The medical records of 544 PEG placements between 2019 and 2022 were taken into consideration. Patients who applied for tube changes were excluded. In that time period, an effective NST was absent. The decisions for PEG placement in the series depended on the request of the primary physician.

Patients were divided into groups according to age categories, defined by the World Health Organization as follows: <65 years, 65-74 years, 75-84 years, and 85 years and over. The survival of all participants was recorded in the Turkish national death registry from the last PEG procedure date until they died or at the end of January 2023.

Statistical Analysis

Statistical Package for the Social Science 23.0 (IBM SPSS Corp., Armonk, NY, USA) was used for statistical analysis. The normality tests of variables were performed using visual (histograms and probability plots) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk's test).

Main Points

- The leading indications for percutaneous endoscopic gastrostomy (PEG) were neurological diseases (91.0%) and malignancies (5.0%).
- Almost a quarter of patients (26.7%) died within 1 month, and half of the patients (48.3%) died within 3 months.
- This study highlighted the high all-cause mortality rates after PEG regardless of the disease or indication.
- The choice of appropriate patients for PEG placement with an accurate indication and in time is crucial.

Categorical variables are summarized as counts and percentages. Mean \pm SD and median (25 percentile-75 percentile) were used to present normally and non-normally distributed variables, respectively. The chi-square test or Fisher exact test, where appropriate, was used to compare proportions. Kaplan–Meier survival analysis was performed, and groups were compared with the log-rank test. Kaplan–Meier survival plots were presented as a figure according to age categories. The *P*-value of <.05 was considered statistically significant.

RESULTS

After excluding duplicate cases, a total of 476 patients were included in the final analysis. The median age was 79.0 (range 18-97), with a 59.9% (*n*=285) female rate. The median (25 percentile-75 percentile) follow-up duration was 74 (26-248) days. The majority of patients (91.0%) received PEG placement due to chronic neurological diseases (mainly including stroke, dementia, and Parkinson's disease). Malignancy was the second leading indication (5.0%) (Table 1). Of the 476 patients, 14.7% were <65 years, 20.6% were between 65 and 74 years, 37.4% were between 75 and 84 years, and 27.3% were 85 years and over. All patients were followed up for at least 1 year, other than death.

Two-week, 1-month, 3-month, 6-month, and 12-month mortality rates of patients according to age categories are presented in detail in Table 2. About 13.2% of patients died within 2 weeks and 67.2% of patients died within 12 months. Approximately half of the patients died within 3 months. About 8.6% of patients, aged <65 years, and 17.7% of patients, aged 85 years and over, died within 2 weeks. On the other hand, 60.0% of patients, aged <65 years, and 67.2% of patients, aged 85 years and over, died within 12 months. Kaplan–Meier survival graphs of patients according to age categories are given in Figure 1.

DISCUSSION

In this study, we presented the mortality rate after PEG placement, performed between 2019 and 2022, in a single center. About 27.3% of patients were aged 85 years and older. Sixty-three of the patients (13.2%) died within 2 weeks after PEG. Therefore, almost a quarter of patients (26.7%) died within 1 month and half of the patients (48.3%) died within 3 months. Six-month mortality rates were 55.7%, 44.9%, 60.1%, and 70.8% for patients aged <65 years, between 65 and 74 years, between 75 and 84 years, and 85 years and over, respectively. This study highlighted the high all-cause mortality rates after PEG regardless of the disease or indication.

Table 1. Baseline Characteristics of Patients	
	Total (n = 476)
Age, Median (minimum–maximum)	79 (18-97)
Sex, female, n (%)	285 (59.9)
Age categories, n (%)	
• <65	70 (14.7)
• 65-74	98 (20.6)
• 75-84	178 (37.4)
• ≥85	130 (27.3)
Indications	
• Neurological diseases (stroke, dementia, and Parkinson's)	433 (91.0)
• Malignancies	24 (5.0)
• Others	19 (4.0)
Follow-up duration (days), median (25 percentile-75 percentile)	74 (26-248)

In our study, the major indication for PEG placement was chronic neurological diseases, including stroke, dementia, and Parkinson's disease. In a review, 12 studies had neurological disease as the main indication for PEG, and 4 studies had dementia as the main indication for PEG.² Similarly, Hasırcı et al⁸ presented the data of 386 patients between 2008 and 2020 with a mean age of 70 ± 12.8 . The main indication for PEG was neurological disease (84%). That was close to our data. They also found the mortality rates for 1 week, 1 month, and 6 months to be

Table 2. Mortality Rates According to Age Categories from 2 Weeks to 12 Months					
	2 Weeks	1 Month	3 Months	6 Months	12 Months
All patients	63 (13.2)	127 (26.7)	230 (48.3)	282 (59.2)	320 (67.2)
Age, <65	6 (8.6)	15 (21.4)	32 (45.7)	39 (55.7)	42 (60.0)
Age, 65-74	5 (5.1)	17 (17.3)	37 (37.8)	44 (44.9)	52 (53.1)
Age, 75-84	29 (16.3)	45 (25.3)	84 (47.2)	107 (60.1)	129 (72.5)
Age, ≥85	23 (17.7)	50 (38.5)	77 (59.2)	92 (70.8)	320 (67.2)

12%, 29%, and 49%, respectively. These rates were lower than those found in our study.

In our study, 91% of patients had chronic neurological disease. We had no data about the rate of severe dementia, which may affect the mortality rates. Therefore, higher mortality rates may be due to PEG placement, lately. A Cochrane review found no evidence that tube feeding improves survival or quality of life in patients with severe dementia.⁹ Therefore, redundant PEG placement for patients who are expected to survive less than 1 month is a challenging issue. Another systematic review and meta-analysis indicated that tube feeding is associated with an increased mortality rate and tube-related complications.¹⁰

We found the 30-day mortality rate after PEG to be 26.7%. The 30-day mortality rates were 21.4%, 17.3%, 25.3%, and 38.5% for patients aged <65 years, between 65 and 74 years, between 75 and 84 years, and 85 years and over, respectively. In a recently published systematic review, the 30-day mortality rate varied from 2.4% to

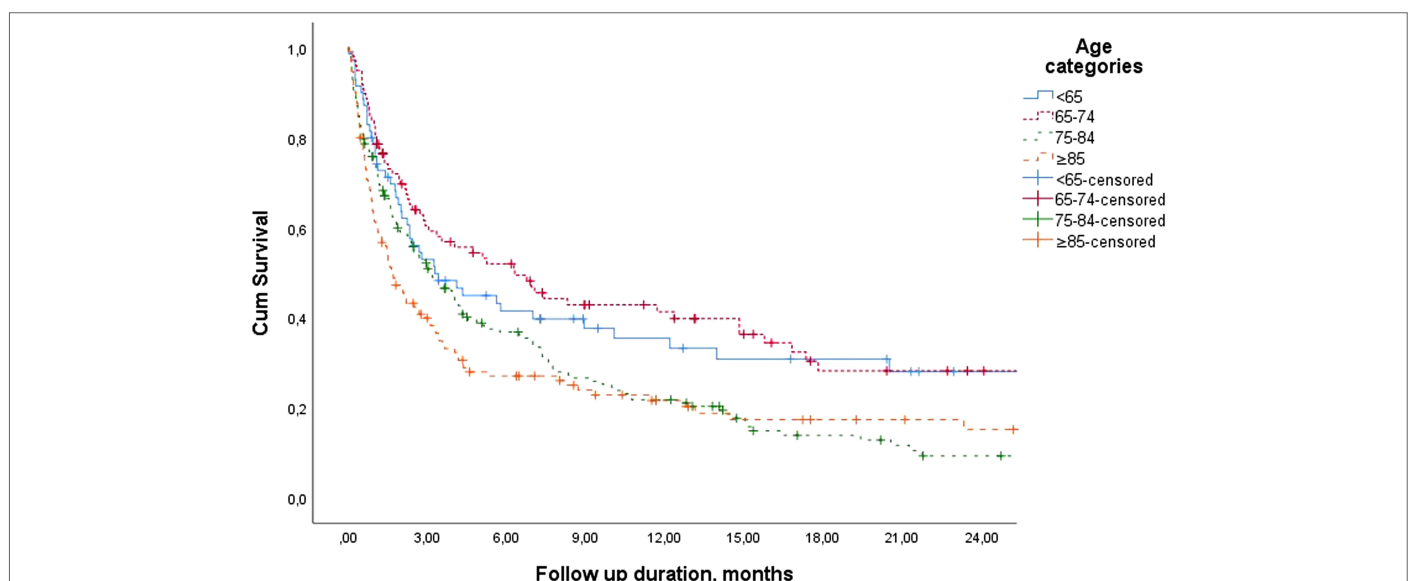


Figure 1. Kaplan–Meier survival analysis of patients.

23.5%.² Lima et al¹¹ evaluated the data of 277 patients. The indications for PEG placement were almost neurological diseases (89.5%) like ours. They found the 30-day mortality rate to be 13%. Duzenli et al reported the rate of 30-day mortality as 12.6% in 253 patients. Another study revealed a high mortality rate after PEG placement, especially within the first month (over 13%). Also, the most frequent indications were neurological diseases and malignancies, like ours.¹ In a study from Turkey about the evaluation of 644 PEG placements, the 30-day mortality rate was 9.7%, and the 1-year mortality rate was 36.4%. Neurological disorders and malignancy were the leading causes.¹² Our 30-day mortality rates were higher than in all of these studies. On the other hand, a study from palliative care (118 patients) reported the 90-day mortality rate after discharge as 40%.¹³ In our study, the 90-day mortality was 48.3%.

The all-cause mortality rates after PEG placement should be researched by all institutions, and deficiencies and mistakes should be investigated. High-quality NSTs certified for this area should be built, and control mechanisms should be constituted. Therefore, a coordination and follow-up procedure will reduce not only the complication rates but also the mortality rates after PEG insertion.³ A retrospective national cohort analysis of 87 862 patients from England reported the 30-day mortality after PEG tube placement from 2007 to 2019. The 30-day mortality rate was found to be 8.9%. It had fallen by 60% over 13 years. According to them, multidisciplinary NSTs provided better patient selection and pre- and post-procedural care.¹⁴ In a recently published retrospective, large-sample cohort study, the post-PEG mortality rate has decreased by approximately 40% over the last 10 years despite apparently similar patient characteristics and rates of complications.⁷

As we stated above, the indications for PEG placement and timing are the main topics. For example, patients with malignancies can receive more benefits than others. In a retrospective study, the all-cause mortality was 15% at 30 days and 28% at 90 days. Malignancy was found to be associated with increased mortality at 90 days. They claimed that patients with malignancies may benefit from an earlier referral for PEG. They also found that older age, diabetes, heart failure, C-reactive protein level, and body mass index are associated with the risk of adverse outcomes, and they suggested considering these in pre-operative PEG risk assessment in routine health care.¹⁵ Mortality rates after PEG insertion usually depends on the indication and selection of patients. Although several studies show some improvement in the nutritional state, the effects on functionality, mortality, and quality of life remain unclear.⁴ It would be rational to develop

disease-specific targets and algorithms after analyzing national data.

Study Limitations

Due to its retrospective design, insufficient and limited data were obtained from medical records. We could not give information about in-hospital and after-discharge mortality separately. There were no data about the patient's risk of malnutrition. We could not find information about PEG-related or hospital-related complications. Future prospective cohort studies should be designed, and all factors affecting the mortality rate should be analyzed in detail. On the other hand, this study provides data from a populous hospital to play a role.

In conclusion, almost a quarter of patients (26.7%) died within 1 month and half of the patients (48.3%) died within 3 months. Current situations for all institutions should be defined, and future strategies should be targeted. High-quality NSTs are essential.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Eskişehir City Hospital (Date: April 19, 2023, Number: ESH/GOEK 2023/19).

Informed Consent: Written informed consent was obtained from patients or their relevant two who participated in this study.

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