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Retrospective analysis of the long-term outcomes of percutaneous endoscopic gastrostomy in critically ill patients and the satisfaction of their caregivers

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Abstract. – OBJECTIVE: Long-term benefits of percutaneous endoscopic gastrostomy and satisfaction of patients' caregivers have not been investigated in the literature in detail. Hence, this study was carried out to investigate the long-term nutritional benefits of percutaneous endoscopic gastrostomy in critically ill patients and their caregivers' acceptance and satisfaction rates.

PATIENTS AND METHODS: The population of this retrospective study consisted of critically ill patients who underwent percutaneous endoscopic gastrostomy between 2004 and 2020. Data about the clinical outcomes were obtained via telephone interviews using a structured questionnaire. The long-term benefits of the procedure in terms of weight change and the current thoughts of the caregivers about percutaneous endoscopic gastrostomy were addressed.

RESULTS: The study sample consisted of 797 patients with a mean age of 66.4 ± 17.1 years. Patients' Glasgow Coma Scale scores ranged from 4.0 to 15.0, with a median score of 8. Hypoxic encephalopathy (36.9%) and aspiration pneumonitis (24.6%) were the most common indications. There was neither change in body weight nor weight gain in 43.7% and 23.3% of the patients, respectively. Oral nutrition could be recovered in 16.8% of the patients. Of the caregivers, 37.8% stated that percutaneous endoscopic gastrostomy was beneficial.

CONCLUSIONS: Percutaneous endoscopic gastrostomy may be a feasible and effective method for long-term enteral nutrition in critically ill patients treated in intensive care units.

Key Words:

Intensive care unit, Critically ill, Enteral feeding, Percutaneous endoscopic gastrostomy.

Introduction

Percutaneous endoscopic gastrostomy (PEG) is an interventional procedure used to feed and hydrate patients without adequate oral intake for extended periods[1-2]. Besides, it can be used to administer medicines in patients who cannot take them orally or even *via* continuous administration into the duodenum in selected cases[3]. Although PEG is the standard procedure used for several neurological and neoplastic diseases, the perception, acceptance, and satisfaction levels of the patients and their caregivers about PEG remain controversial. The practices about attitudes toward PEG feeding vary depending on the country[4].

The decision-making process for PEG includes multiple discussions between the triad of the patient-caregiver-physician based on adequate information[5]. In the event of a patient with partial or complete loss of consciousness, the patient's relatives decide on PEG[1]. The cultural and social factors, which vary greatly depending on the geographic region, affect the decision-making process for PEG. Poor communication between the patient-caregiver-physician and inadequate information about the consequences of PEG may lead to challenging outcomes.

The perspectives and perceptions of the patients and their caregivers regarding PEG feeding have been questioned due to the emotional aspects, ethical dilemmas, and unexpectedly higher optimistic expectations[5-7]. However, the perspectives of the patients and their caregivers have received little attention in developing and underdeveloped countries compared to developed

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countries[7]. On the other hand, the long-term benefits of PEG in terms of nutritional support and weight gain are questionable in patients with chronic or intractable dysphasia[1,8]. Additionally, the inconvenience and the increased distress and aspiration pneumonia risk associated with PEG feeding reduces the quality of life[9]. Treatments that feature the use of PEG tubes at home may be considered a disadvantage since they require the supervision of nurses or general practitioners[10]. All these health issues affect patients' quality of life and should thus be considered during the evaluation of PEG feeding before and after its application[7,11].

Percutaneous endoscopic approaches supply enteral nutrition in patients who require supplementary enteral feeding for longer than 2-3 weeks[12]. Previous studies[12-14] have focused mainly on these techniques' clinical characteristics and technical aspects. The feasibility of PEG in patients treated in an intensive care unit (ICU) has not been studied in detail.

In this context, this study was carried out to investigate the clinical outcomes of PEG applications for patients in an ICU in terms of the long-term nutritional benefits and the acceptance and satisfaction rates of patients' caregivers.

Patients and Methods

Study Design

The population of this retrospective study consisted of critically ill patients who underwent the PEG procedure and were treated in the ICU in Pamukkale University Hospital, Denizli, Turkey, between 2004 and 2020. The patients were identified by typing "percutaneous endoscopic gastrostomy" into the hospital's medical information system search tool. Consequentially, all patients with a PEG enteral feeding for a minimum of four weeks were included in the study. The study protocol was approved by the Local Ethics Committee (Pamukkale University, Ethical Committee for Scientific Research and Publications, Decision number 60116787-020/34144 and date 10.06.2020). The study was carried out in accordance with the principles set forth in the Declaration of Helsinki and its later amendments. Written informed consent could not be obtained from the patients included in the study due to the study's retrospective design and voluntary participation.

Data Collection

Patients' demographic characteristics (age, gender) and clinical characteristics related to the indication for PEG feeding or the disease at the time of PEG, the scores they obtained from the Glasgow Coma Scale (GCS), and their Eastern Cooperative Oncology Group (ECOG) performance statuses were recorded[15].

PEG Tube Procedure

The PEG procedure was performed *via* the pull-through technique either in ICU or the endoscopy unit[16]. The patients and their first-degree relatives were provided detailed information about the PEG procedure, its possible benefits, and the morbidity and mortality risk. The attending physician discussed the decision about PEG enteral feeding with the patients, their first-degree relatives, and caregivers. The procedure was performed after obtaining their written consent for the PEG tube application.

Assessment of Patients' Clinical Status

The clinical outcomes of the patients were determined based on telephone interviews conducted by one of the authors with the patients or their caregivers using a structured questionnaire. If any, the medical records pertaining to the follow-up visits were also obtained.

Additionally, data was obtained about where the patients continued to receive care following the PEG application, whether in-hospital, at home, or in nursing care/palliative care center. Furthermore, the person who answered the questions and the weight changes observed after PEG feeding and oral feeding following PEG tube application were noted. The current thoughts of the caregivers about PEG were inquired *via* the following questions: "Do you think that PEG tube placement was a good decision for your patient?" and "Would you have the PEG procedure if you were in the same situation as the patient that required the nutritional support?"[15].

Statistical Analysis

The descriptive statistics were expressed as mean ± standard deviation values in the case of continuous variables determined to conform to the normal distribution, as median with minimum-maximum values in the case of continuous variables determined not to conform to the normal distribution, and as numbers and percentages in the case of categorical variables.

Table I. Demographic and clinical characteristics of the patients.

	Overall (n = 797)
Age (year)[†,‡]	66.4 ± 17.1 70.0 [15.0 – 94.0]
Length of hospital stay (day)[‡]	44.0 [1.0-227.0]
Glasgow Coma Scale score[‡]	8.0 [4.0-15.0]
ECOG Grades[§]	
Symptoms, but nearly fully ambulatory	75 (9.4)
Some bedtime, but needs to be in bed less than 50% of normal daytime	160 (20.1)
Need to be in bed greater than 50% of normal daytime	262 (32.9)
Unable to get out of bed	300 (37.6)
Disease at the time of PEG[§]	
Hypoxic encephalopathy	294 (36.9)
Aspiration pneumonitis	196 (24.6)
Cerebrovascular disease	101 (12.7)
Gastrointestinal malignant tumors	113 (14.2)
Dementia/Alzheimer's disease	45 (5.6)
Neurological diseases	42 (5.3)
Others	6 (0.8)

[†]: mean ± standard deviation, [‡]: median [min-max], [§]: n (%). ECOG: Eastern Cooperative Oncology Group scale of performance status, PEG: percutaneous endoscopic gastrostomy.

The Shapiro-Wilk, Kolmogorov-Smirnov, and Anderson-Darling tests were used to analyze the normal distribution characteristics of the numerical variables.

Results

The study sample consisted of 797 patients who had PEG tube placement. The mean age of the patients was 66.4 ± 17.1 years. The female to male ratio of the sample was 350/447. Patients' GCS scores ranged from 4.0 to 15.0, with a median score of 8. The most common ECOG performance statuses were 4 and 3, determined in 37.6% and 32.9% of the patients, respectively. Hypoxic encephalopathy (36.9%) and aspiration pneumonitis (24.6%) were the most common indications at the time of PEG application (Table I).

The clinical details pertaining to the post-PEG tube placement period are presented in Table II. Patients' data were mainly obtained from the family members (43.7%) and the nurses who provided care (21.9%). Most patients (33.5%) received care at home for recovery after the PEG tube placement. There was no change in the weights of 216 (43.7%) patients. On the other hand, weight loss and weight gain were detected in 27.3% and 23.3% of the patients, respectively. Oral nutrition could be achieved in 115 (16.8%) patients.

The results of the questionnaire that addressed the caregivers' perspectives regarding

Table II. Clinical details of the post-PEG tube placement period.

	Overall (n = 797)
Responders[§]	
Attending physician	65 (10.6)
Nurse	134 (21.9)
Family members	267 (43.7)
Missing/no response	145 (23.7)
Place of recuperation[§]	
Home	267 (33.5)
Hospital for recuperation	65 (8.2)
Nursing or palliative care facilities	134 (16.8)
Non-survived	102 (12.8)
Missing/unknown	229 (28.7)
Weight changes[§]	
Weight loss	135 (27.3)
Stable	216 (43.7)
Weight gain	115 (23.3)
Missing/unknown	28 (5.7)
Oral nutrition[§]	
Yes	115 (16.8)
No	351 (51.4)
Missing/unknown	217 (31.8)

[§]: n (%). PEG: percutaneous endoscopic gastrostomy.

Table III. Results of the questionnaire for the caregiver perspectives regarding PEG-tube placement (n = 466).

	Overall
Do you think performing PEG tube placement is a good decision for your patient?[§]	
Yes	176 (37.8)
No	290 (62.2)
Would you wish to accept the PEG application if you were in the same situation as the patient for nutritional support?[§]	
Yes	103 (22.1)
No	294 (63.1)
I am not sure	69 (14.8)

[§]: n (%). PEG: percutaneous endoscopic gastrostomy.

PEG-tube placement are given in Table III. A total of 176 (37.8%) caregivers stated that PEG tube placement was beneficial. Of these caregivers, 103 (22.1%) believed that they would accept PEG tube placement if they were in the same situation as the patient that required nutritional support.

Discussion

The study findings revealed that hypoxic encephalopathy and aspiration pneumonitis were the most frequent diseases in patients with PEG application. In almost three-quarters of the patients, there was a weight gain or stabilization of the baseline weight following PEG feeding. 37.8% of the caregivers expressed their satisfaction with the PEG application.

The indications for PEG applications varied, yet cerebrovascular disorders, aspiration pneumonia, and dementia are reportedly the primary diseases that necessitate tube feeding *via* any approach[8,15-18]. In comparison, the most common conditions that necessitated tube feeding in the patients included in this study were hypoxic encephalopathy and aspiration pneumonitis. Hypoxic encephalopathy or cerebral hypoxia might be related to the clinical diagnosis of the patients who were explicitly treated in the ICU[16]. Non-neurological disorders, such as ventricular fibrillation, cardiac arrest, and carbon monoxide poisoning, leading to reversible or irreversible cerebral hypoxia, were included in this diagnostic category. 23% of the cohort included in Gundogan's study[16] was grouped as patients with non-neurological disorders. Ferraro et al[13] used the diagnosis of cardiorespiratory insufficiency for 46% of the critically ill patients with PEG receiving treatment in a general ICU, contrary to the terminology used to group the diagnoses in this study as well as in a few other studies[8,15].

Recovery with oral feeding following the nutritional tube placement is a quality-of-life parameter yet with an increased aspiration pneumonia risk[9,17]. In a study from Japan[9], the authors reported that seven of the 14 patients successfully resumed oral feeding after one year of feeding tube placement. Although they included all patients with PEG and nasogastric tubes, they concluded that the consciousness level of the patients was the main factor in the recovery with oral feeding. Hossein et al[17] found that oral feeding was successful in 27% of the patients. Kusano et al[15] reported the rate of patients who recovered with oral feeding as 17.0%. Similarly, less than one-fifth of the patients in this study resumed oral feeding. The relatively lower rate of patients who recovered with oral feeding in this study may be attributed to the fact that the patients included in this study were critically ill patients receiving treatment in ICU with short-term survival expectations. Hence, prospective studies[17] with extended follow-up times are needed to clarify the impact of several variables, including patient characteristics, ethnocultural differences, and socioeconomic levels.

Several concerns arise regarding the evaluation of the PEG application. As a reason, the underlying disease might be a more limiting condition for the morbidity and mortality in the patients concerned[1]. Patients in the terminal stages of the primary disease with a short life expectancy are likely to be more prone to morbidity and mortality due to the factors secondary to the underlying illness[1]. It is challenging to eliminate such confounding factors in retrospective studies.

Several factors may affect the patients' and family members' overall satisfaction with the

PEG procedure. In a study conducted with 104 patients who underwent the PEG procedure, Martin et al[10] found the patients' satisfaction level was 73% following the second month of the procedure application. However, the relative proportion of patients with neurological diseases in the study cohort and the absence of patient's incapable of self-responding make it challenging to generalize the study results to larger populations. In some studies[8,15], approximately 60% of the relatives were satisfied with their patients' quality of life after PEG. Similarly, in a study[7] conducted in Pakistan, 60% of the patients/caregivers stated that they would have PEG feeding again if required. In contrast, the satisfaction rate of the caregivers was found to be 37.8% in this study. Significant differences exist between the satisfaction rates for the PEG procedure reported in studies conducted in Western countries and Japan[8,19-21]. Hence, the discrepancies between the relevant results of these studies may be attributed to the cultural differences between the study populations. Specifically for this study, the relatively low satisfaction rate may be attributed to the poor health condition of the critically ill patients treated in the ICU.

Actual nutritional gain is a term that has gained popularity in recent years[7]. It is generally accepted that a PEG tube improves nutrition[5]. However, the nutritional benefits of PEG tube placement could not be measured in this study due to the retrospective study design. Periodic weight measurements, in addition to laboratory tests, including the measurement of serum albumin levels, have been proposed for patients who underwent the PEG procedure[7]. Almost one-quarter of the patients lost weight following PEG feeding. The remaining patients gained weight or neither gained nor lost weight. This rate may be indicative of the feasibility and efficiency of this study's PEG procedure for enteral nutrition. In the literature, patients' relatives reported improvement in the nutritional status in 20.9% to 32.2% of the patients with PEG feeding[8]. In comparison, although the nutritional status of the patients included in this study was not measured, the rate of patients with weight gain or a stable weight may be attributed to the nutritional benefit of the PEG procedure.

Limitations of the Study

The larger sample size compared to relevant studies available in the literature was the primary strength of this study. On the other hand, the study's retrospective design was its primary limitation, which prevented obtaining data about the complications and the survival of the patients.

Conclusions

Hypoxic encephalopathy and aspiration pneumonitis were the most common diagnoses that prompted the application of the PEG procedure in critically ill patients. The PEG procedure may be a feasible and effective method for long-term enteral nutrition in patients treated in ICU. Further prospective large-scale studies are needed to corroborate the satisfaction levels of the caregivers with the application of the PEG procedure in critically ill patients.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Ethics Approval

The study protocol was approved by the Local Ethics Committee (Pamukkale University, Ethical Committee for Scientific Research and Publications, Decision number 60116787-020/34144 and date 10.06.2020). The study was carried out in accordance with the principles set forth in the Declaration of Helsinki and its later amendments.

Informed Consent

Written informed consent could not be obtained from the patients included in the study due to the study's retrospective design and voluntary participation.

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