Underlying disease for percutaneous endoscopic gastrostomy tube placement predicts short- and long-term mortality

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Abstract

Background: **PEG (percutaneous endoscopic gastrostomy) is a well established endoscopic procedure for enteral feeding. However, patients with a shorter life expectancy will not benefit from PEG tube placement. Furthermore, some specific evolving diseases will never benefit from PEG. The aim of the study focuses on short and long term mortality rates after PEG tube placement in a referral gastroenterology centre (Geneva University Hospital). 219 patients were enrolled in this study.**

Patients and methods: **All patients scheduled for a PEG procedure between January 2011 and December 2014 were included. Nine patient parameters were collected for further analysis as well as the main underlying disease requiring PEG tube placement. Patients were subsequently divided into 4 groups according to underlying disease: Group 1) swallowing disorders of neurologic origin; Group 2) swallowing disorders associated with upper digestive tract neoplasia ; Group 3) nutritional support for a non GI reason ; Group 4) Other.**

Results: **219 patients had undergone a PEG tube placement. 33 patients died within 60 days after the procedure. After one year, 71 patients died. Global survival was 870 days. The nutritional support group had the better survival rate with 1276 days compared to the swallowing groups and others. The multivariate analysis has highlighted the underlying disease as the only associated parameter with short and long term mortality.**

Conclusions: **PEG tube placement is associated with high short and long term mortality depending on the underlying disease. We outlined the potential role of PEG tube insertion as a supportive transient approach for nutritional support.** (Acta gastroenterol. belg., **2022,** 85, **29-33**).

Keywords: Percutaneous endoscopic gastrostomy (PEG), indication, mortality, palliative procedure, prognosis.

Introduction

Patients unable to eat are exposed to protein-calorie malnutrition. This results in alteration of tissues such as skin, but also impairs organ function. Sarcopenia is responsible for a decrease in muscle strength and muscle mobility that subsequently causes prolonged bed rest and promotes immunosuppression. This conjunction of events has been associated with the development of infections consequently extending the duration of hospitalisation (1). Maintenance of feeding is therefore essential. The enteral route is physiologic and should be preferred. Besides the physiological aspect of nutrition, the use of the digestive tract is associated with a decrease in bacterial translocation by maintaining exchange properties and protects the gastrointestinal mucosa. It improves the function of the immune system (2). Furthermore, enteral nutrition avoids the recourse to using a central venous catheter that represents potential sources of infection and a high risk of refeeding syndrome (3). Moreover parenteral nutrition is associated with biological alterations such as increased liver function tests (4). Percutaneous endoscopic gastrostomy (PEG) ensures enteral nutrition among patients unable to feed themselves and in whom nutrition through a nasogastric tube is not tolerated any longer or in patients who should receive nutritional support over the long term (5). In daily practice, patients who usually benefit from PEG are those suffering from sequelae of cerebrovascular disease or brain injury, patients with chronic neurological disease, patients with cancer and those with chronic gastrointestinal diseases (6). The most common and pivotal symptom shared by these medical conditions is represented by swallowing disorders, thus preventing sufficient quantitative nutritional intake, and often complicated by broncho-aspiration and lung infections. Although it has been clearly shown that PEG does not reduce the incidence of broncho-aspiration induced pneumonia (7), it allows adequate caloric intake and maintains the nutritional status thus preventing the occurrence of complications related to malnutrition. When gastrointestinal diseases are concerned, such as short bowel syndrome, severe Crohn's disease or cystic fibrosis, PEG can help provide nutritional support adapted to the remaining small bowel function and limit the loss of weight due to malabsorption (8). Due to the steadily increasing aging population (and consequently increasing chronically ill patients), the number of candidates for PEG has more than doubled in recent years (9). PEG placement is a relatively simple endoscopic procedure with lower morbidity compared to surgically placed PEG tubes (10). Given the usual nutritional support care aspect of the procedure, morbidity and mortality related to the technique should ideally be as low as possible. Candidates for PEG are by definition fragile patients because of their comorbidities and nutritional status. Thus, each decision for PEG placement should be

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carefully evaluated before proceeding. Although studies have already been published on complications and short-term mortality after PEG tube placement, the studied populations were somewhat heterogeneous. Indeed, the 30-day mortality rate reported in the literature varies widely from 5.8 to 30% (11-13). However, the largest retrospective series of 1'625 patients reported a 30 day mortality rate of 2.4% (13). This low rate is explained by the early implementation of the PEG tube before advanced malnutrition was installed as illustrated by low serum albumin levels.

To assess the prognosis of patients treated in Switzerland, we conducted a population-based retrospective study of all patients who benefited from PEG tube insertion in our hospital between 2011 and 2014. The main objective was to evaluate the 30 day and 60 day mortality associated with the procedure. The 60 day mortality time point was chosen to avoid losing follow-up patients. The secondary objectives were to describe the factors associated with the occurrence of death at 30 days, and to better characterize the circumstances of death.

Materials and method

All subsequent patients receiving PEG tube placement between January 1, 2011 and December 31, 2014 were included. Information of prior assessments of patients, including underlying disease (ie. indication) for PEG tube placement were collected. The technique of PEG tube insertion was performed according to the British Society of Gastroenterology (BSG) practice guidelines (14) and the French Digestive Endoscopic Society (SFED) practice guidelines (15). This study was approved by the Ethics committee in Geneva, with a waiver of informed consent due to the disproportionate difficulty in obtaining informed consent linked to the nature of the study. Briefly, esophago-gastro-duodenoscopy and PEG tube insertion using the pull technique were performed under sterile conditions. Two grams of ceftriaxone were intravenously administered as prophylaxis 30 min prior to the interventional procedure. A skin shave was performed. Neither oral cavity nor gut were decontaminated with antibiotics. A 1-cm skin incision prior to insertion of the PEG was done after positive transillumination in all patients. Freka PEG 15 charrière (Fresenius Kabi AG, Bad Hamburg, Germany) was the only medical device used in this study and was used in accordance with the manufacturer's recommendations. Fixation of the PEG tube was reinforced by means of an exterior retention plate without sutures. Although the pull technique in patients presenting with ear, nose and throat cancer is not recommended, our experience was unique using only the Freka PEG 15 Charier between 2011 and 2014.

Patient characteristics and detailed procedures were extracted from institutional databases. The interval in days between procedure and occurrence of death was obtained for each patient. Patient follow-up with death notification was performed until December 31, 2015. ASA score (American Society of Anesthesiology) was used for scoring the anesthetic risk and considered as a surrogate marker of patient comorbidities. Haemoglobin, platelets, prothrombin time, albumin, creatinine and C-reactive protein (CRP) levels were part of the biological markers included in our study (16,17). CRP was recorded before (day -7 to day 0) and after (day 0 to day + 3) PEG tube placement. Operator's experience was arbitrarily qualified as senior when he performed more than 10'000 endoscopic procedures (all categories) in his career. Propofol and midazolam were the main drugs used for sedation. Some patients had no sedation at all. Four groups were defined according to underlying diseases requiring PEG tube placement: 1) swallowing disorders of neurological origin (cerebrovascular diseases, chronic diseases of the central nervous system), 2) swallowing disorders due to ear-nose and throat (ENT) neoplasia, 3) nutritional support for non-gastrointestinal reasons (psychological disorders, chronic liver disease, liver transplantation) and 4) other reasons (dementia, gastric decompression, prolonged coma). For each group, mortality was calculated and the groups were then compared. Univariate analysis and multivariate logistic regression were performed to identify factors associated with death in each group.The Anova test was used to compare baseline characteristics of patient in each of the four indication groups. P-value is given with CI when the results are < 0.05.

Results

Between January 1, 2011 and December 31, 2014, 219 PEG procedures were performed. Endoscopic technical success was 98.6%. Three PEG (1.4%) were inserted with recourse to a hybrid approach between radiology and endoscopy techniques, allowing placement of the gastric tube as reported by Dobos et al. (18).

When considering the characteristics of those who survived versus those who did not, no significant differences were observed among the two groups. Interestingly, the magnitude of the alteration of the biological parameters illustrates the poor health condition of our patients. Indeed, albumin (normal values 34 to 54 g/L) was as low as 28.7 ± 5.8 g/L. The anesthetic risk defined by the ASA score was 3 and more for the majority of the patients. Of the 219 patients who underwent PEG placement, 13 (5.9%) died at one month and a total of 33 (1%) died within 60 days. After one year, 71 (32.4%) patients died. The cause of death was due to pulmonary sepsis and other infectious conditions. In multivariate analysis, the underlying disease that required the PEG tube was the only parameter statistically associated with the occurrence of death.

Interestingly, patients who received PEG placement for non GI disease (group 3) had a mortality rate significantly lower and a better prognosis compared to the other groups, as shown in Figures 1 A and 1 B. The whole

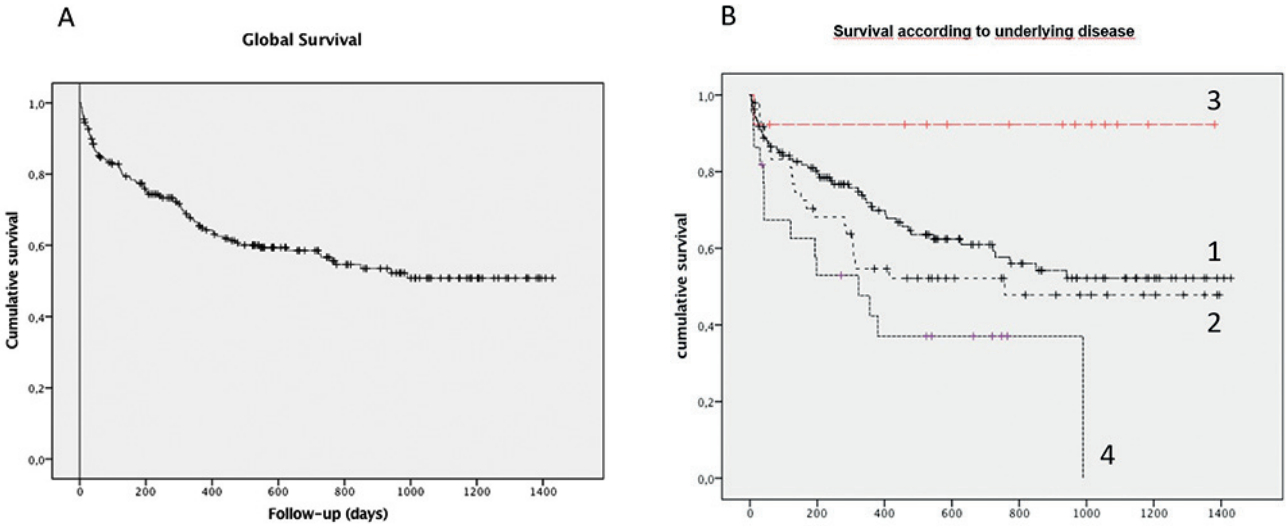

Figure 1. — Kaplan and Meyer survival curves: A: Global Survival; B: Survival according to indication for PEG tube insertion in the four groups. Group 1: Neurologically disabled patient, Group 2: Ear Nose and Throat (ENT) neoplasia, Group 3: Nutritional support, Group : 4 Others.

Table 1. — **Baseline characteristics of the population**

	Alive (n= 131)	**Dead (n=88)**	**p value**
Age (mean)	66.5 ±4.7	69.1 ±9.2	0.11
Male sex, n (%)	87(66)	62 (70)	0.45
PT (%)	90.9 ±10.1	90.6 ±14.1	0.32
Haemoglobin (g/L)	120 ±14.3	114 ±17.6	0.18
Platelets (G/L)	299 ± 94.2	299 ±75.3	0.62
Creatinine (umol/L)	67 ±13.2	62 ±9.5	0.39
Albumin (g/L)	29 ±3.6	27 ±5.1	0.44
Senior Endoscopist, n (%)	49 (55)	73 (55)	0.62
ASA score, n (%) **I** **II** **III** **IV**	 1 (0) 19 (15) 95 (72) 16 (12)	 0 (0) 8 (9) 61 (69) 19 (22)	0.68
Sedation, n (%) **- Propofol** **- Midazolam** **- No sedation**	 111 (85) 5 (4) 15 (11)	 68 (77) 6 (7) 14 (16)	0.73

PT : Prothrombin Time; ASA : American Society of Anesthesiology

cohort global survival was 870 ± 234 days (Figure 1A). Group 3 survival was 1276 ±176 days as compared to groups 1, 2 and 4 (902 ± 139 days, 779 ± 123 days and 456 ± 94 days respectively) (Figure 1B).

Table 2 shows patients' characteristics according to the underlying disease that required PEG tube placement. Swallowing disorders of neurologic origin (Group 1) was taken as reference because it represented the majority of patient who underwent PEG procedure. Differences between groups were observed when baseline characteristics of patient were compared (Table 3). In group 4, mean haemoglobin level was slightly lower whereas in group 3, mean creatinine level was higher compared to other groups. Age, CRP level, Prothrombin Time (PT), platelets and albumin were not different among groups.

In our retrospective cohort, CRP level was only available in 45 out of 219 patients Despite this incomplete data, we found that CRP level > 21.5 mg/L and serum albumin <31.5 g/L were found to define a high-risk group of patients at further risk of complications. We speculate that these parameters might be associated with an excess mortality rate as previously reported (9). At the end of the observation period, 86 (39%) patients had died. The cause of death was largely due to the occurrence of pulmonary sepsis (48%, n = 41). Other causes of death

Table 2. — **Distribution of mortality among groups**

	N=	Dead/Alive	Odd Ratio	95% IC	p value
GROUP 1 Neurological	135	50/85	1 (reference)	-	-
GROUP 2 Neoplasia	49	23/26	0.58	03-1.137	ns
GROUP 3 Non GI disease	13	1/12	0.07	0.09-0.53	P=0.01
GROUP 4 Other	22	14/8	0.44	0.25-0.8	P=0.07

Table 3. — **Baseline characteristics among groups**

	Group 1 neurological	Group 2 neoplasia	Group 3 Non GI disease	Group 4 other	p value
Age (range)	68 (65-71)	67 (64-70)	55 (40-70)	65 (54-76)	0.31
Prothrombin time (%)	90 (88-92)	92 (89-95)	92 (85-98)	90 (89-92)	0.26
Hb (g/L)	121(118-124)	113 (108-118)	117 (103-131)	108 (99-116)	0.004
Platelets (G/L)	314 (296-332)	265 (233-298)	266 (205-327)	315 (262-368)	0.03
Albumin (g/L)	28 (28-29)	29 (27-31)	28 (24-31)	26 (22-30)	0.16
Creatinine (umol/L)	61 (57-66)	58 (53-62)	113 (33-192)	72 (54-89)	<0.001

were neoplastic progression (16%, n = 14), progression of the neurological disease (20%, n = 17) or various other causes (16%, n = 14). No death due to complications of the PEG procedure was observed.

Discussion

Since its introduction PEG has become a very well established endoscopic procedure for enteral feeding of patients. The aim of the procedure is to avoid additional weight loss and to increase or stabilize the patient's weight (5). Despite the fact that this method is simple and quick, it still remains associated with significant morbidity and mortality. Therefore, for ethical reasons, several guidelines recommend inserting PEG tubes for nutrition supplementation only in patients who are expected to survive for more than 30 days post-insertion (19).

Our study provides a new perspective on the outcome of patients benefiting from PEG tube placement. Regardless of patient characteristics, their prognosis remains strongly influenced by the pathology related to nutrition impairment. The swallowing disorders, whether of neoplastic or neurological origin, are not improved by PEG placement and are burdened with increased mortality, as illustrated by the high proportion of patients who die of pulmonary sepsis. The underlying disease for PEG placement, which is associated with the best prognosis, is nutritional support of non-digestive origin. These patients do not suffer from swallowing disorders and have no progressive neurological or oncological disease that will actually impair their survival. Thus, caloric intake provided by the PEG is most beneficial and illustrates the benefits of this procedure without the prognosis being triggered by underlying disease. No death due to pulmonary sepsis was observed in the nutritional support group.

Although we collected a number of biological parameters that could have helped predicting the complications that might occur after PEG, we must declare that we cannot draw firm conclusions because the collection of data was incomplete in our retrospective study. We can speculate that most of the altered biological parameters only reflect a longstanding hospitalization associated with multiple nutritional deficiencies a feature predominantly found in patients suffering from dementia. These latter patients are indeed very fragile and most observers agree to say that PEG tube placement in this condition is historically associated with a bad prognosis. Indeed, the 30 as well as 60 day and one year mortality observed in our study is higher than those reported in other series (20) Patients included in our retrospective cohort were perhaps in a poorer health condition, as illustrated by the albumin level and the ASA score. The choice of PEG-tube placement in conditions such as dementia was mostly made for comfort reasons. This is in accordance with the paper by Goldberg et al that revealed 54% mortality at 1 month and 90% mortality at 1 year in patients with dementia (21). Many patients and their families have in fact limited understanding of the terminal nature of the diseases that affect their relatives. It is therefore mandatory to discuss this point in detail with families, nursing staff and the patient, if possible, before scheduling PEG tube placement. The role of comfort care needs to be redefined

because continuing to feed a patient by mouth for quality of life or comfort remains associated with high risks of aspiration, aspiration pneumonia or even death.

These findings reflect the gastroenterology medical practice in a referral centre in Switzerland, where PEG placement remains primarily a nutritional procedure in patients with advanced disease. In our study, dementia, for example, does not remain a good indication for PEG tube insertion due to a high mortality rate. Despite a careful selection process, which takes place for every request for PEG tube placement, there is a substantial risk of death linked to the prognosis of the underlying disease, as we have shown in this study. Life expectancy is always difficult to assess. Nevertheless, 30 day and 60 day mortality rates should be as low as possible otherwise placing a PEG tube would simply be a futile effort. In the selection process of patients who could benefit most from PEG tube placement, we should now consider, in addition to individual characteristics of each patient, the underlying disease responsible for malnutrition. The need for a PEG tube should be considered as a marker of underlying disease severity, a feature that has to be discussed with all care providers and patient family members before planning PEG tube insertion with a clear care plan clarifying what are the benefit/risk ratio, and why we have to begin and when to stop the artificial nutrition support.

Finally, the benefit of an early (versus late) implementation of PEG as a palliative care support has also to be considered in non-curable diseases. Indeed, recent clinical oncology guidelines (22) state that PEG has to be discussed in patients with advanced cancer early in the course of their disease, concurrent with active treatment because it can optimize quality of life by anticipating, preventing, and treating suffering.

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