

# Percutaneous endoscopic gastrostomy; evidence of different prognosis in various patient subgroups

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## Abstract

**Background:** as there are no prospective randomised trials about percutaneous endoscopic gastrostomy (PEG) insertion, the medical staff and caregivers encounter great difficulty in deciding when and if to perform this procedure.

**Objective:** to explore which variables are associated with increased mortality after PEG insertion.

**Design:** prospective observational study.

**Setting:** gastroenterological unit of a 500-bed community hospital.

**Subjects:** all patients over the age of 50 years referred for PEG insertion between January 1992 and December 2002.

**Methods:** patients were studied for their indication for PEG insertion as well as their main medical problems, and demographic details and medical records were reviewed yearly until mortality.

**Results:** 674 patients were enrolled (mean age 80.1 years, 42% men). The median survival was worst in diabetic patients (128 days,  $P < 0.05$ ), patients referred from hospital (161 days,  $P < 0.01$ ) and patients over the age of 80 years with dementia (171 days,  $P < 0.001$ ). The best median survival was found among demented patients under the age of 80 (467 days,  $P < 0.05$ ) and women under the age of 80 referred from nursing homes (780 days,  $P < 0.01$ ).

**Conclusions:** the outcome after PEG insertion is variable, with survival of over a year in many of the patients. These data are important for the medical staff, the patients and their caregivers when deciding about PEG placement.

**Keywords:** percutaneous endoscopic gastrostomy, prognosis, dementia, elderly

## Introduction

Percutaneous endoscopic gastrostomy (PEG) has become the procedure of choice for enteral feeding of patients with a functioning gastrointestinal tract whose food intake is insufficient. The procedure is safe and simple technically, and the tube feeding can be handled easily at nursing homes or even by caregivers at home [1, 2].

Prospective randomised studies have shown the safety and survival benefit of PEG feeding in patients with neurological dysphagia due to stroke or with obstructing oropharyngeal malignancy [3, 4]. The first studies demonstrating the safety of the procedure included swallowing problems as the main indication, without any mention of feeding difficulty due to dementia as an indication [5, 6].

In the last decade, the demand for PEG insertion has risen significantly, encompassing feeding difficulty in demented patients as one of the main indications [7, 8]. No prospective, controlled, randomised study has been conducted to examine the efficacy of PEG insertion in those patients due to ethical reasons. Therefore, studies attempting to ascertain survival benefit of PEG placement in demented patients have to use indirect evidence.

Retrospective studies, including many thousands of patients, have demonstrated that, in general, demented patients had shorter survival than patients with neurological indications for PEG insertion [8, 9]. Few recent prospective studies examining the outcome of PEG insertion have been published and these studies usually included small numbers of demented patients or no demented patients at all [10–12]. Studies that

included demented patients demonstrated a very short survival after PEG insertion in those patients, reaching over 50% one month mortality and over 90% one year mortality [7, 9, 13].

In our experience, many demented patients survive for years after PEG insertion. Therefore, we conducted this study in order to observe the life expectancy of different subgroups of demented patients after PEG placement in comparison with patients without dementia.

## Methods

### Patients

All patients referred to the gastroenterological unit of a district general hospital between January 1992 and December 2002 for the insertion of PEG were considered eligible for this study. This hospital serves a community of 500,000 residents, about 10% of them over the age of 65 years. Patients younger than 50 years old and technical failures to insert a PEG were excluded from the study. Appropriateness of PEG placement was considered on clinical judgment as well as less than 400 kcal intake per day as assessed by a dietician.

### Clinical variables

In this prospective study, all patients had their demographic data and medical history as well as the indication for the procedure recorded before PEG insertion. Primary outcome was patients' survival rate in accordance with the indications for PEG insertion. Secondary outcomes were early and late complications after PEG insertion, place of discharge and resumption of oral eating.

In case the indication for the procedure was not clear from the referral letter or the patient's chart, the referring physician was contacted and asked about it. Dementia was defined according to the International Classification of Diseases, 10<sup>th</sup> edition, and only very severe dementia (stage 6 or 7 of the Global Deterioration Scale, Reisberg *et al.*) was included in the study as dementia [14].

Special attention was given to details about the origin of referral of patients and about the place of discharge. In case of discharge to a hospital, a follow-up by telephone was performed one month later, to find out whether the patient was still in hospital or transferred to a nursing home or back to the community. Every year during the study period and one year after the end of the study, all medical records were reviewed for patients' death and, if no mortality was recorded, the Ministry of Internal Registrations was searched. All patients still alive at the end of this year were contacted by telephone (or their caregivers in the case of demented patients).

### Technique of PEG insertion

The PEG was placed in all patients endoscopically, by the 'pull' technique, after a small dose of intravenous midazolam. A single physician, the same one for all the study period, inserted all gastrostomy tubes as described in detail elsewhere [15]. The PEGs were all made of silicone with a diameter of 20–24 FR (USE or MIC Companies).

## Analysis

Data analysis was performed with the statistical package SAS (Version 8.2). Survival data are summarised by medians, as is usual with skewed, censored data. Survival curves were calculated by the Kaplan–Meier method, and differences between groups tested by the log-rank test. Cox proportional hazards regression was used to assess the simultaneous effect of different factors on survival, selecting the significant variables by a backward stepwise procedure [16]. When relevant, 95% confidence intervals are presented with the results.

## Results

Seven hundred and thirty-six patients were referred for PEG insertion during this 10-year period. After excluding 51 patients aged 50 years or less, 12 failures to insert a PEG and another nine patients with incomplete data, 674 patients were enrolled in the study. Their mean age was 80.1 years (range 51–103 years), 283 were men (42%) and the mean follow-up was 538 days. A total of 126 patients were referred from the community (18.7%), 244 (36.2%) from hospital and 304 (45.1%) from nursing homes. The two main indications for PEG insertion were neurological dysphagia due to stroke and feeding difficulty usually due to dementia (Table 1). Six patients were thought to be inappropriate for PEG placement due to an acute illness such as suspected pulmonary oedema or rapid atrial fibrillation. Three of them had the PEG inserted later, when their medical condition improved.

### Complications

Early complications occurred in less than 2% of the patients with most of the complications being completely reversible. There was a procedure-related mortality rate of 0.3% (mortality within 48 hours after the procedure or due to complications beginning less than 48 hours after the procedure; Table 2).

Late complications during the long-term follow-up of more than a year occurred in about a quarter of the patients (Table 2). All patients or caregivers received oral and written explanation about the complications and how to deal with them. Most late complications were local and could be handled easily either after technical advice at the patient's home or nursing home, or at the outpatient clinic.

### Discharge destination

Three hundred and fifty patients (52.5%) were discharged to nursing homes, especially those who came from there and they included almost twice as many female as male

**Table 1.** Indications for PEG insertion (*n*=674)

	Number (%) <sup>a</sup>
Dysphagia due to stroke	362 (53.7)
Feeding difficulty	280 (41.5)
Recurrent aspiration	76 (11.3)
Stupor, coma	24 (3.6)
Head & neck malignancy	14 (1.9)

<sup>a</sup>Because some patients had more than one condition, the number of patients across all of the indications is more than the total number of patients.

**Table 2.** Complications after PEG insertion ( $n=674$ )

	Number (%)
Early complications	
Severe wound infection	3 (0.4)
Peritonitis	4 (0.6)
Mortality	2 (0.3)
Reversible apnoea	4 (0.6)
Total number of patients	11 (1.6) <sup>a</sup>
Late complications	
Self-extubation	79 (11.7)
Local irritation	43 (6.4)
Leakage	35 (5.1)
Tube obstruction	28 (4.2)
Haematemesis	14 (2.1)
Buried bumper	5 (0.7)
Total number of patients	176 (26.1) <sup>a</sup>

<sup>a</sup>The total number of patients is less than the total sum of complications because some patients had more than one complication.

patients (32.9% versus 17.4%). Home discharge was achieved in 161 patients (24.1%) with more men than women among them (57.5% versus 44.2%). A total of 156 patients (23.4%) were still in hospital a week after PEG insertion, most of them (91.3%) were those referred from hospital for the procedure.

### Survival

One hundred and twenty-one patients died within 30 days, i.e. 30-day mortality rate of 18.0%. Six-month mortality rate was 43.6%, 1-year 54.3%, 2-year 73.2% and 3-year mortality rate 84.9%. Oral feeding, with no more need for gastrostomy, was resumed by 9.2% of the patients, with a median of 136 days between PEG insertion and PEG extraction. The Kaplan–Meier survival curve of all patients in the study shows that about a quarter of the patients died within 30 days of the procedures and over 50% during the first year (Figure 1).

**Table 3.** Cox regression of survival after PEG insertion in 674 patients

	Number of patients	Hazard ratio	Confidence interval	P values
Male	365	1.22	1.00–1.47	<0.05
Feeding difficulty	280	1.22	1.00–1.49	<0.05
Referral from hospital	244	1.44	1.19–1.74	<0.001
Diabetes mellitus	98	1.40	1.09–1.80	<0.01
Age >80 years	365	1.39	1.15–1.68	<0.001

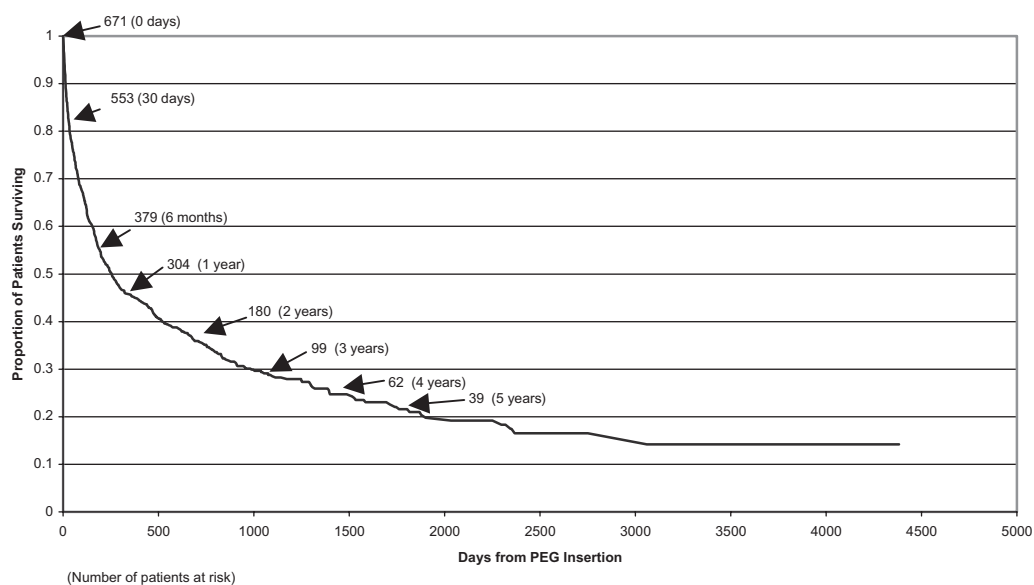
The calculated median survival of various groups of patients is shown in Appendix 1 available as supplementary data on the journal's website ([www.ageing.oupjournals.org](http://www.ageing.oupjournals.org)), together with the number of patients in each group. The shortest survival was found in diabetic patients (128 days,  $P < 0.05$ ), and the longest in women younger than 80 years from nursing homes (780 days,  $P < 0.01$ ).

The Cox proportional hazards model shows that male gender, feeding difficulty, referral from hospital, diabetes mellitus, and age over 80 were significant predictors of mortality (Table 3).

### Discussion

This is a single-centre prospective study designed to evaluate the outcome of demented patients after PEG placement. It was performed as a cohort study, with over half of the patients over the age of 80, and the age distribution is similar to that of PEGs performed in the USA [9]. There was almost an equal distribution between the main two indications for PEG insertion: neurological dysphagia due to stroke and feeding difficulty due to dementia (Table 1). The referral source represents both the community, hospital and nursing homes.

The major procedure-related complication rate of 1.6% and mortality rate of 0.3% are in the lower edge of the range

**Figure 1.** Kaplan–Meier survival curve of patients undergoing gastrostomy insertion.

published in recent large series (Table 2) [16–18]. This may be due to the physician performing the procedure, which was the same single physician for all the procedures, thus gaining wider experience in that area. The minor complication rate of 26.1% is also within the range of other published studies. Most of the minor complications could be avoided or corrected by appropriate education of the patients or their caregivers.

About half of the patients, mostly women, were discharged to nursing homes. Home discharge was achieved in a quarter of the patients, with more men than women amongst them. This is probably due to the fact that women usually take care of their husbands much more than the contrary.

The 30-day mortality rate of 18.0% in this study is in agreement with published data and reflects the severity of the comorbid conditions of those patients [4, 8–10, 19]. A one-year mortality rate of 54.3% is slightly lower than among American hospitalised Medicare beneficiaries (63%) [9] or in a large review of 28 studies (62%) [19]. The Kaplan–Meier curve demonstrates that after the high mortality rate at 30 days after the procedure and in the first year, the rate of mortality became much slower with about a third of the patients surviving more than two years (Figure 1). Resumption of oral feeding within a median of about four months, mostly in patients with neurological indication for PEG insertion, is known from the existing literature [10, 19].

The main innovation of this study is the great variability in survival rates of different subgroups of the study cohort (Appendix 1). The shortest median survival was in diabetics, probably due to a high incidence of cardiovascular and cerebrovascular events or because of the increased risk of infectious diseases in those patients [20, 21]. Patients referred from hospital also had a very short median survival which is in agreement with recent published data [22].

The longest survival was seen in nursing homes, with females under the age of 80 reaching a median survival of 780 days. Studies attempting to compare outcome in demented patients with and without artificial enteral feeding have found conflicting results. One of these reports found a modest prolongation of life in nursing home patients with swallowing disorders who received a feeding tube compared with similar patients not receiving tube feeding [23], while a similar study found a worse outcome in those with a feeding tube [24]. A third study found prolonged survival in nursing home patients with advanced dementia, but with no difference between those with or without a PEG [25]. The dissimilarity between those studies can probably be explained by different functional and health status of the residents. We hope our study, due to the relatively large number of participants and the long-term follow-up, can provide additional data about survival after PEG placement.

Of special interest was the great heterogeneity in demented patients. While the median survival of patients suffering from dementia over age 80 was 171 days ( $P < 0.001$ ) and in those with both dementia and stroke 181 days ( $P < 0.05$ ), it reached 423 days in demented patients

from nursing homes ( $P < 0.01$ ) and 467 days in ‘younger’ demented patients ( $< 80$  years,  $P < 0.05$ ). The short survival of patients with dementia and stroke could be explained by the poor outcome of vascular dementia, which is probably related to cardiovascular and cerebrovascular mortality [26]. The long survival among nursing home patients might reflect the awareness of the staff in nursing homes to the nutritional status of their habitants and earlier referral for PEG insertion.

The relatively long survival time of some patients (about a third lived more than 2 years and 20% more than 4 years) and especially of demented patients (demented patients under the age of 80 had a median survival of 467 days) deserves special discussion. In the state of Israel, the Ministry of Health is responsible for financial support of medical treatment of patients fed by gastrostomy tubes. In contrast, the medical insurance is responsible for patients fed by nasogastric tubes. Therefore, there may be some pressure from the medical insurance companies to exchange nasogastric tubes for PEGs. This might have led to earlier PEG placement and better outcome in our study. In a previous study in Israel, although there was a high short-term mortality, the median survival of acutely hospitalised patients with advanced dementia was 195 days, which is similar to our results [27].

Cox’s proportional hazards statistical analysis shows that male gender, feeding difficulty, referral from hospital, diabetes mellitus and age over 80 were simultaneous predictors of mortality after PEG insertion (Table 3). The short survival time of patients with feeding difficulty might be explained by the advanced stage of the disease in these patients when referred for PEG placement. Age was also an important factor in outcome of patients, with nearly double survival of patients younger than 80 years in comparison to those over 80 years. The effect of age on survival, especially in patients with poor general condition, is well known [28], and has been demonstrated in previous studies of PEG outcome [9, 25].

What are the clinical implications of our findings? Should we recommend not inserting a PEG in patients who are hospitalised or are over 80 years old, or should we avoid the procedure in male subjects because they constitute risk factors for 30-day mortality? In our opinion, the answer is not clear-cut. This information is valuable for medical staff and for family members, giving them better tools in deciding on PEG insertion. The decision to place a feeding tube in end-stage demented patients is usually made by a family member. This decision can be influenced by cultural or religious background, which is not always grounded in medical data [29].

This procedure is a minimal invasive one, with low procedure-related major complication and mortality rates. Its benefit in some patients is probably in improving the quality of life even when there is no evidence of prolonging survival. For some patients it is much easier to be fed by a PEG than by a nasogastric tube, which often requires physical or chemical restraint. Even hand feeding through the mouth while struggling with the patient for each spoonful swallowed is usually more difficult for the patient and caregiver than a PEG.



Our study provides evidence that the long-term outcome after PEG insertion is variable, with one-third of the patients living more than a year and 20% more than 2 years. These data should be placed before the medical staff, patients and family members when deciding whether and when to perform PEG insertion.

### Key points

- There is a great difference in survival of subgroups of demented patients.
- Demented patients with stroke or over the age of 80 have a median survival of less than six months.
- 'Younger' demented patients (under age 80) or those referred from nursing homes have a median survival of a year or more.

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