Percutaneous Endocopic Gastrostomy – Indications and Outcome of Our Experience at the Singapore General Hospital

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ABSTRACT

Introduction: Percutaneous endoscopic gastrostomy (PEG) is widely used for patients with dysphagia from neurological causes and head and neck malignancy. We examined the indications, complication rates and long term outcome of PEG inserted in our department.

Methods: We performed a study of PEG inserted in our department between January 1995 to March 2000. Consecutive patients with PEG inserted during this period were identified from our database that contained demographic data, primary and secondary underlying medical conditions, and immediate complications after the procedure. Casenotes were reviewed and caregivers (relatives or staff at nursing homes) were contacted for information on long term outcome at the time of this study between April 2000. Data was collected in standard form designed for this study.

Results: 181 cases of PEG insertion were performed during the study period. 174 patients were successfully followed up and reviewed. The median age was 70.5 (range 24 to 93) years old and there were 111 males. Indications for PEG insertion were: cerebrovascular diseases (60.4%), Parkinson's disease and other neuromuscular disorders (10.9%), nasopharyngeal carcinoma and other upper gastrointestinal malignancies (24.7%), and head injury (4%). Superficial wound infection (22.4%) and granuloma formation (31 %) were common minor complications. Major complications were infrequent: peritonitis (2.3%) and gastrointestinal bleeding (0.6%). The mortality rates were 11.5% and 28.2% at one and six months respectively. Only one death from peritonitis was directly attributed to the procedure, most deaths were due to underlying co-morbidities with pneumonia being the most common cause. The proportion of the first PEG tubes removed or replaced were 12.2% and 35.5% at one and six months respectively. Thirty tubes were replaced due to blockage at median interval of 9.6 months. 9.7% of PEG tubes functioned longer than 24 months.

Conclusions: Our results confirm the safety of PEG tubes in elderly patients with multiple co-morbidities. Major complications of the procedure were infrequent but produced grave consequences in these elderly patients with multiple co-morbidities. As such, patients considered for PEG feeding should have reasonable prognosis and the procedure is inappropriate for patients with rapidly progressive and incurable diseases.

Keywords: gastrostomy, tubes

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INTRODUCTION

Adequate nutrition is fundamental to curative medial care. Poor outcomes accompany malnutrition in a variety of settings. Consequently, physicians and other caregivers may consider enteral feeding for patients who are unable to swallow or when oral intake is poor. The technique of percutaneous endoscopic gastrostomy (PEG) was introduced in 1980 as an alternative to surgical gastrostomy for long term feeding in patients with swallowing disorder[1]. Since its introduction in 1980, PEG has been increasingly adopted in patients with dysphagia due to advanced neurologic diseases and head and neck cancer[2].

PEG is a simple procedure to perform and easy to manage in both inpatients and outpatients settings. It carries, however, both early and late complications[2,3]. The aim of this study is to examine the indications, incidence of the different complications and long term outcome of our patients after PEG insertion in our institution.

METHODS

Patients

181 consecutive cases of PEG insertion were performed by the department of gastroenterology at the Singapore General Hospital between January 1995 to March 2000. These cases were identified from our database that has been prospectively maintained by our nutrition

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support nursing officers (NSO) since we started performing the procedure in 1995. NSOs were routinely informed before the procedure in order to educate patients' caregivers on the care of PEG. Data was collected in standard form and contained demographic data (age and sex), indications, primary underlying and secondary medical conditions, and immediate complications after the procedure.

PEG insertion

24F gastrostomy tube (Wilson-Cook Medical Inc., Winston-Salem, USA) was inserted endoscopically by the "pull" method as described previously[1,4]. Sedation was induced by using intravenous midazolam and pethidine and supplemental oxygen via nasal cannulae. Antibiotic prophylaxis with ciprofloxacin (200 mg) and cloxacillin (500mg) was given intravenously one hour prior to procedure. Ciprofloxacin (500 mg BD) and cloxacillin (500 mg QD) were routinely given through the PEG tube for three days after insertion.

Care of the feeding tube in the wards was carried out using a standardised protocol. If the patient was haemodynamically stable and there was no evidence of an ileus on the following day, infusion of dietary supplement was commenced. The rate of delivery was 50 ml per hour on the first day and this was increased to the patients' calculated requirement over 48 hours. Patients were fed in semi-recumbent position.

For patients who were discharged home, they or their caregivers were instructed in the care of the gastrostomy puncture site, and handling and flushing of the tube.

Evaluation of outcome

Patients discharged back to their own homes were reviewed in outpatient clinics at one month and thereafter every six months or earlier if there was any problem by NSOs running the nutrition support service. Their caregivers were instructed to contact NSOs if there was any problem in relation to the care of PEG tubes. All consultations with NSOs were documented in the hospital casenotes. These casenotes were reviewed for any complications and cause of death. In addition, relatives and caregivers were contacted and interviewed for any complications treated in the community or in other hospitals at the time of this study in April 2000. The following complications were specifically examined: local sepsis, blockage and leakage from tube, tube fracture and duration tube survival. The information was collected in standard forms designed for this study.

Patients discharged to nursing homes were not routinely reviewed after insertion as the staff at these institutions had been trained in the care and treatment of common minor complications. For the current study, patients' casenotes at these institutions were reviewed for any complications and other long-term outcomes. There could be under-reporting of minor complication which was not documented in these case notes. However, all major complications were treated back in our hospital.

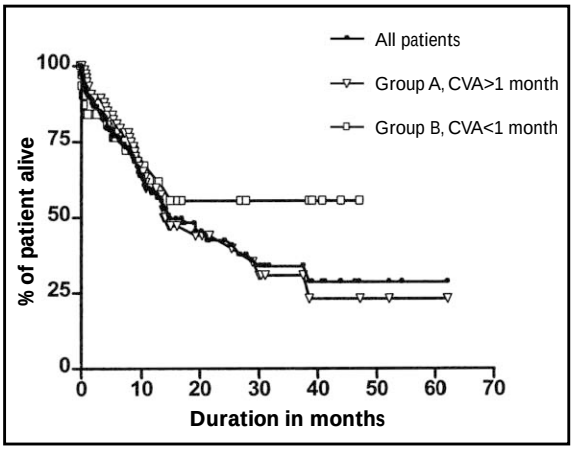
Table I. Baseline Clinical Characteristeristics.

Clinical charateristics	
Median Age (Range) in years	70.5 (24 to 93)
Cerebrovascular dis.	72.4
Parkinson's dis.	78.8
Neuromuscular disorders	58.3
Nasopharyngeal carcinoma	56.9
Other malignancies	69.3
Head Injury	55.6
Sex, Male : Female	111 : 63
Race, Chinese : Malay : Indian : Others	151 : 9 : 8 : 6
Indications for PEG, number (%)	
Cerebrovascular dis.	105 (60.4)
Parkinson's dis.	8 (4.6)
Neuromuscular disorders	11 (6.3)
Nasopharyngeal carcinoma	37 (21.3)
Other malignancies	6 (3.4)
Head Injury	7 (4.0)
Co-morbidities, number (%)	
Ischaemic heart dis.	54 (31)
Diabetes mellitus	34 (19)
Hypertension	60 (34.8)
COLD	2 (1.2)
Aspiration pneumonia	36 (20.7)
Anti-platelets agents, number (%)	
Aspirin	64 (36.8)
Ticlopidine	4 (2.3)
Antibiotic prophylaxis	
Ciprofloxacin and cloxacillin	141
Others	33

RESULTS

Patient description and indications for PEG

181 cases of PEG were inserted between January 1995 and April 2000. 174 cases were successfully followed up and reviewed; there was loss of follow up for the remaining seven patients due to loss of contacts or irretrievable casenotes. These patients were followed up for a median duration of 283 (range 2 to 1,740 days). The median age was 70.5 (range 24 to 93) years old and there were 111 males. Cerebrovascular diseases accounted for more than half of the cases (105 patients, 60.4%). Of these patients, 74 patients had either multi-infarct dementia or stroke which occurred more than one month before PEG. Parkinson's disease and other neuromuscular disorders (motor neurone disease, Wilson's disease, Guillain Barre's syndrome) accounted for another 10% of patients. Patients with nasopharyngeal carcinoma contributed to 21.3% of the cases. Other malignancies were oesophageal carcinoma (three patients) and tongue carcinoma (three patients).



Graph 1 Patients' survival curves for all of the patients, patients with early stroke of more than (group A) and less than (group B) one month before PEG insertion.

There was a high prevalence of co-morbidities such as ischaemic heart disease, hypertension and diabetes mellitus (see Table I). About 20% of patients had suffered from aspiration pneumonia before the insertion of PEG. Over a third of the patients were on aspirin at the time of insertion.

Minor complications

The most common complications were superficial wound infection and granuloma formation at frequencies of 22.4% and 31% respectively. Granuloma formation around PEG site could be easily treated with local application of silver nitrate solution. Eleven patients (6.3%) developed wound infection in the first week after insertion; all wound infection resolved with systemic antibiotics and local dressing. Five patients (2.8%) developed abscess and one patient required incision and drainage with removal of the tube. Other minor complications were transient ileus (one patient) and extrusion of the internal bumper due to necrosis of the overlying skin two months after insertion of PEG for dysphagia from stroke. The tube was removed as patient had recovered his ability to take food orally.

Major complications

We encountered major complications of peritonitis (four patients, 2.3%) and gastrointestinal bleeding (one patient, 0.6%). Three patients suffered peritonitis in the immediate period after PEG insertion. In one patient, peritonitis was suspected before feeding was started. This patient had uneventful outcome with intravenous antibiotics and nasogastric suction. In two patients, peritonitis was recognised after feeding supplement had been given; both patients were found to have contamination of the peritoneal cavity during laparotomy. One patient died from sepsis and multi-organ failure; the other patient was discharged

Table II. Incidence of complications.

Complication	Number (%)
Major	
Gastrointestinal bleeding	1 (0.6)
Peritonitis	4 (2.3)
Minor	
Superficial infection	39 (22.4)
Abscess	5 (2.8)
Granuloma	54 (31.0)
Miscellaneous	2 (1.2)

Table III. Early (<30 days) and late (>30 days) mortality related to causes of death.

Causes of death	<30 days	>30 days
Procedure related deaths: Peritonitis	1	0
Pneumonia	6	32
Myocardial infarction	2	8
Underlying diseases:		
CVA	3	6
Nasopharyngeal Ca.	4	14
Motor Neurone Dis.	0	1
Other malignancies	0	6
Others	0	2
Total	16	69

home after a long and protracted convalescence period. For the fourth patient, peritonitis was caused by misplacement of PEG replacement tube in the peritoneal cavity. She survived laparotomy and peritoneal lavage. One patient had gastrointestinal bleeding from aspirin related peptic ulcer several months after placement of PEG.

Mortality rates and long-term results

At the time of this review in April 2000, only 87 patients were still alive. The mortality rates were 11.5% and 28.2% at one and six months respectively (see Graph 1). Sixteen patients died within 30 days after insertion of PEG. Only one death from peritonitis was directly attributed to the procedure. There were six deaths from pneumonia and two from myocardial infarction. Seven patients died from underlying diseases i.e. stroke or nasopharyngeal carcinoma. Over the period of follow-up, pneumonia was the most common cause of death (38 patients).

Subgroup analysis was performed in patients with cerebrovascular disease: stable patients with multi-infarct dementia or whose stroke occurred more than one month before insertion of PEG (Group A, 74 patients) and those whose stroke was less than one month before PEG insertion (Group B, 31 patients). The median survival periods for the two groups were 13.2 $\pm$ 1l.9 (SD) months and 13.7 + 14.4 (SD) months respectively ($p<0.86$, student's t test). There was a

Table IV. Indications for PEG in patients with nasopharyngeal carcinoma.

Indications	Number of patients	Median survival (months)
Dysphagia due to cranial nerve palsies	8	11.9 (2.1 to 27.9)
Recurrent disease (no dissemination)	9	9.6 (0.1 to 17.5)
Recurrent and disseminated	11	1.9 (0.2 to 4.8)
"Prophylactic" PEG prior to radiotherapy	9	17.1 (5.4 to 38.6)

Table V. Reasons for removal and median duration of original PEG tube in situ.

Reasons	Number of patients(%)	Median survival (Range) (months)
Death	73 (42.0)	6.1 (0.7 - 38.6)
Recovery of swallowing	13 (7.5)	4.3 (1.5 - 9.1)
Blockage	30 (17.2)	9.6 (0.25 - 42.9)
Inadvertent dislodgement	18 (10.3)	5.3 (0.04 - 25.0)
Total	134 (77.0)	7.1 (0.04 - 47.1)

trend towards higher 30-day mortality in group B than A (16%, five patients in group B against 5%, four patients in group A) but this did not reach statistical significance (chi-square test, P<0.08). There was no significant difference in long-term survivals between the two groups (Fig. 1, log-rank test, p<0.36).

PEG was performed for the following indications in patients with nasopharyngeal carcinoma: dysphagia due to lower cranial nerve palsies as a result of radiotherapy, recurrent disease with or without dissemination, or "prophylactic" PEG prior to radiotherapy or surgery (see Table IV). Patients with lower cranial nerve palsies could present with dysphagia many years after radiotherapy. All eight patients in this group were alive at the time of follow-up with a median survival period of 11.9 months after PEG. Patients with recurrent and disseminated disease had median survival period of only 1.9 months in contrast to 9.6 months for those patients without documented metastases. Patients with "prophylactic" PEG for nutritional support lived longest with the median survival period of 17.1 months. Three of these patients had their PEG tubes removed after their course of radiotherapy due to recovery of swallowing.

With the first PEG tube in situ, the proportion of tubes removed or replaced were 12.2% and 35.5% at one and six months respectively. At follow-up, 134 patients had their PEG tubes replaced or removed for the reasons listed in Table V. Seventy-three patients had removal of tubes due to death. Thirteen patients (eight stroke, three nasopharyngeal carcinoma, one carcinoma of tongue, one Guillain-Barre syndrome) recovered their swallowing at the median interval of 4.3 months. Eighteen patients had their PEG tubes replacement of tubes due to inadvertent removal. Thirty patients had the feeding tubes replaced due to blockage at median interval of 9.6 months. 9.7% of feeding tubes remained functional for longer than 24 months.

DISCUSSION

Since its introduction in the early 1980's, PEG has gained widespread acceptance as the insertion is a short procedure requiring only local anaesthesia. In comparison to surgical gastrostomy, PEG may have the advantages of being cheaper and with lower morbidity and mortality[5]. One recent study reported that it could be safely performed as day case procedure in stable patients with head and neck cancer[6]. Many physicians now consider PEG to be the method of choice for feeding patients with dysphagia due to either neurologic disorders or head and neck malignancies.

It has advantages over nasogastric tubes such as lack of nasal irritation, reduced risk of displacement and the ability to administer bolus feed due to wide bore tubes. PEG tubes are also more socially and cosmetically acceptable. In patients with cerebrovascular disease, PEG has been shown to be more superior in term of nutritional benefits in comparison to naso-gastric feeding[7]. Other applications of PEG include gastric decompression in patients with intestinal obstruction from carcinomatosis, treatment of gastric volvulus and provision of nutrition to hypercatabolic patients such as those with Crohn's disease[8].

In this series, cerebrovascular disease was the most common indication accounting for 60.4% of the cases. Up to 45% of all cerebrovascular accident are complicated by dysphagia[9] which has an associated mortality of 50% at six weeks[9]. Nasopharyngeal carcinoma was the next largest group with 21.3% of the patients requiring PEG.

Wound infection after placement of PEG tubes was the most commonly reported complication although it was generally minor in nature. In this study, incidence of wound infection was found to be 22.4%. It is caused by contamination of Gram negative bacteria originating from the oropharynx as the tube is pulled down into the stomach. Short course of antibiotic after insertion could decrease the rate of infection as over 80% of the infection occurred in the first four days[10]. Two other recent studies showed significant reduction in the incidence of infection with antibiotic prophylaxis[10,11] which may be a cost-effective strategy[12]. Cefotaxime, piperacillin/tazobactam and amoxycillin/clavulanic acid have been shown to reduce incidence of wound infection significantly[12]. Only one-third of our peristomal infection occurred in the first week after insertion. We

believe that this low incidence could be attributed to our routine administration of prophylactic antibiotics.

Gastric perforations, peritonitis, haemorrhage and gastrocolic fistula have all been reported as major complications after PEG. These complications occur in approximately in 3% of patients in large series[2,13]. We found similar rate of major complication in this study. Although uncommon, the occurrence of a major complication results in death in nearly one quarter of patients[2,13] due to the multiple co-morbidities in this elderly population. Peritonitis has been reported to occur at incidence of 1%[2,13] and can be caused by either premature removal of the tube or inadequate apposition of the gastric and abdominal wall. Laparotomy with peritoneal lavage should be performed if there is contamination of peritoneal cavity with feed supplements. One of our patients developed peritonitis after insertion of replacement tube into peritoneal cavity. This complication was mostly due to disruption of the gastro-cutaneous fistula tract when the replacement tube was inserted; this is more likely to occur if some time has elapsed between dislodgement and replacement of feeding tube as the fistula tract seals off within a few hours. In such situation, we would recommend the protocol of confirming the intra-gastric location of the replacement tube by either endoscopic or radiological technique before feeding is initiated if the patient presents several hours after dislodgement. This approach is even more crucial if resistance is felt during insertion of replacement tube.

We observed one incidence of gastrointestinal haemorrhage related to aspirin. Haemorrhage can occur in up to 2.5% of cases after PEG insertion[2,13]. It is caused by gastric ulceration beneath the internal bolster as a result of pressure necrosis[14] or laceration of abdominal wall vessels during placement[15]. 36.8% of our patients were on aspirin and despite its anti-thrombotic effect, we did not observe any increased incidence of bleeding. A recent guideline from the American Society for Gastrointestinal Endoscopy states that it is safe to continue with aspirin and other nonsteroidal anti-inflammatory drugs during mucosal biopsy, colonic polypectomy and biliary sphincterotomy[16]. We would, however, recommend that anti-coagulation should be discontinued prior to PEG insertion.

Consistent with other reports, mortality after insertion of PEG in the first month has been found to be substantial[17,18]. In this study, only one death due to peritonitis could be directly attributed to the procedure. This is consistent with other reports of low rate of procedure related mortality of 1%[2]. However, we found the 30-day mortality rate to be substantial at 11.5%. One study reported 30-day mortality to be 23.9%, reaching 63% at one year and 81.3% by three years[18]. Death is frequently caused by underlying diseases and is rarely procedure-related. There was higher incidence of adverse events after PEG insertion in patients hospitalised with acute illness than in stable patients with dementia[19]. Our 30-day mortality rate is lower in comparison to the finding of the study on Medicare population in the United States[18]. This could be explained by the inclusion of stable patients with dementia and post-stroke of more than one month duration (74 patients, 63%). Early mortality could be reduced if PEG placement is delayed in patients with stroke or head injury as a proportion of these patients would succumb to their underlying illness during the early period. Some authors would recommend a "grace period" of nasoenteric feeding for 60 days before PEG insertion in that mortality would level off after this time[20]. Other predictors for adverse outcome were the presence of multi-organ failure[21] and hypoalbuminaemia[22].

Pneumonia was the most commonly recorded terminal events for most patients (38 patients, 21.8%). This could be due to over reporting as radiological confirmation of pneumonia was not performed in most patients who died in nursing homes. The diagnosis was based on documented cause of death in casenotes. Several studies showed that nasoenteral tube feeding could be associated with increased risk of aspiration pneumonia with mortality rate of over 50%[2,23]. It is hypothesised that nasogastric tube may impair lower oesophageal sphincter, thereby promoting the risk of reflux and aspiration. However, PEG has not been shown to decrease incidence of gastroesophageal reflux and pneumonia[2,7,24]. In fact, pneumonia is more likely to be due to aspiration of patients' own saliva and nasopharyngeal secretions rather than gastroesophageal reflux of feed supplements[24]. Extending a jejunal tube through the PEG tube may therefore not reduce the incidence of pneumonia.

It is unclear whether PEG feeding leads to improved quantity or quality of life. A critical study by Kaw and Sekas suggested that nursing home patients demonstrated little improvement in functional and nutritional status following the procedure[25]. In contrast, another randomised study comparing PEG with nasogastric tube feeding after acute dysphagic stroke showed lower mortality rates at six weeks for patients randomised to PEG (12% vs 57%)[26]. The reason for this improved outcome could be due to superior nutritional state of patients randomised to PEG as a result of less interruption with feeding. The benefits are less clear in patients with advanced malignancy. We found that patients who had "prophylactic" insertion of PEG prior to radiotherapy for nasopharyngeal carcinoma had excellent outcome with median survival

of 17.1 months. Tumour implantation at the stoma site has been described but this complication was not observed in this study[16]. For patients with disseminated disease, the outcome was poor with most patients succumbing to their disease within 30 days. With its potential morbidity and complications, the benefits PEG are questionable in patients with projected early mortality.

Our results confirm the practicalities of inserting PEG tubes under intravenous sedation in elderly patients with multiple co-morbidities. Most tubes remained functional for median duration of 9.6 months. Minor complications are common and although major complications are rare, the outcome is grim in these patients with multiple co-morbidities. In view of the potential morbidity, patients considered for PEG feeding should have reasonable prognosis. It is inappropriate in patients with rapidly progressive and incurable diseases.

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