A PROSPECTIVE STUDY OF COMPLICATIONS RELATED TO PERCUTANEOUS ENDOSCOPIC GASTROSTOMY IN ICU PATIENTS

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ABSTRACT

BACKGROUND

The first percutaneous endoscopic gastrostomy performed on a child was on June 12, 1979, at the Rainbow Babies and Children's Hospital, University Hospitals of Cleveland, Dr. Michael W.L. Gauderer, paediatric surgeon; Dr. Jeffrey Ponsky, endoscopist; and Dr. James Bekeny, surgical resident, performed the procedure on a $4^1/_2$-month-old child with inadequate oral intake. The authors of the technique, Dr. Michael W.L. Gauderer and Dr. Jeffrey Ponsky, first published the technique in 1980. In 2001, the details of the development of the procedure were published. Gastrostomy maybe indicated in numerous situations usually those in which normal or nutrition (or nasogastric) feeding is impossible. The causes for these situations maybe neurological (e.g. stroke), anatomical (e.g. cleft lip and palate during the process of correction) or other (e.g. radiation therapy for tumours in head and neck region). In certain situations where normal or nasogastric feeding is not possible, percutaneous endoscopic gastrostomy maybe of clinical benefit. This provides enteral nutrition (making use of the natural digestion process of the gastrointestinal tract) despite bypassing the mouth; enteral nutrition is generally preferable to parenteral nutrition (which is only used when the GI tract must be avoided). The PEG procedure is an alternative to open surgical gastrostomy insertion and does not require a general anaesthetic; mild sedation is typically used. PEG tubes may also be extended into the small intestine by passing a jejunal extension tube (PEG-J tube) through the PEG tube and into the jejunum via the pylorus.

MATERIALS AND METHODS

The present study was carried out in the Department of General Medicine on 32 patients who underwent PEG placement by gastroenterologist at Gayatri Vidya Parishad Hospital, Visakhapatnam, from January 2016 to December 2016. Patients were aged 18 years and above. All patients had placement of Ponsky pull PEs either in the endoscopy room or intensive care unit.

RESULTS

A total 330 cases of PEG tube were replaced. The mean age was 56.4 ± 18.4 yrs. (range, 18 to 84) and 224 (67.9%) patients were male. Most common comorbid diseases were cerebral infarction (217 cases, 65.8%), followed by hypoxic brain damage (36 cases, 10.9%). When associated with bleeding, aspirin (43 cases, 13.0%) was the most frequently taken drug in both groups. The mean interval of PEG tube placement was 6.3 ± 2.5 months (range, 0.8 to 18.3 months) and mean procedure time was 11.2 ± 3.8 mins. (range, 4.4 to 18.2 mins.).

CONCLUSION

PEG was a safe and effective way of providing access for both short-term and long-term enteral nutrition. PEG tube placement for patients who cannot be fed orally is a minimally-invasive procedure with low morbidity and mortality.

KEYWORDS

Parenteral Nutrition E02.421.505; Enteral Nutrition E02.421.360; Stroke C10.228.140.300.775.

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BACKGROUND

Percutaneous Endoscopic Gastrostomy (PEG) has become the modality of choice for providing enteral access to patients who require long-term enteral nutrition. Although, generally considered safe, PEG tube placement can be associated with many potential complications. PEG tubes have two main indications- feeding access and gut decompression. In patients who are unable to maintain sufficient oral intake, PEG tubes provide long-term enteral access. This commonly includes patients with temporary/chronic neurological dysfunction including those with brain injuries, strokes, cerebral palsy, neuromuscular and metabolic disorders and impaired swallowing. In patients with advanced abdominal malignancies causing chronic obstruction/ileus, a PEG tube can be used to decompress the intestinal tract. PEG tubes may also be useful in the setting of severe bowel motility disorders. This study was undertaken to study the complications related with PEG in ICU patients.

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Aims and Objectives

1. To study the complications of PEG placement in ICU patients.
2. To evaluate the usefulness of PEG in ICU patients during their stay in ICU.

MATERIALS AND METHODS

The present study was carried out in the Department of General Medicine on 32 patients who underwent PEG placement by Gastroenterologist at Gayatri Vidya Parishad Hospital, Visakhapatnam, from January 2016 to December 2016. Patients were aged 18 years and above. All patients had placement of Ponsky pull PEs either in the endoscopy room or intensive care unit.

Patient age, indications for PEG placement, antibiotic prophylaxis, duration of hospital stay, complications and in-hospital mortality were studied.

The study was approved by institutional ethics committee. Informed consent was obtained from all the participants of the study.

Patients who were aged 18 years or more and required long-term enteral nutrition due to medical and/or surgical conditions precluding adequate oral food intake were taken up for the study.

We used the Pull technique, which is the widely used method for the silicon made PEG tube placement. Standard procedure protocol included parenteral antibiotic (one gram intravenous cefotaxime thirty minutes prior to the procedure), conscious sedation (2 mg intravenous midazolam) and topical pharyngeal spray of 4% Xylocaine solution given before the insertion of the endoscope. The main steps involved in the PEG placement are routine upper GI endoscopy, localisation of the place for the PEG placement, determination of the safe tract, incision and placement of the cannula and guidewire mediated placement of the tube. The upper gastrointestinal endoscopy involved endoscopic visualisation of upper gastrointestinal tract up to second part of the duodenum and to exclude any other pathology. The stomach is insufflated resulting in closed apposition of the stomach to the abdominal wall. A point is chosen in the mid epigastrium, where there is maximal transillumination and indentation of the gastric lumen with direct pressure of a blunt pointer. A local anaesthetic is then infiltrated into the area around the puncture site. The needle used to the local anaesthesia is used as a pilot needle to enter the stomach and visualised by the endoscopist. Once the safe tract is determined, a small skin incision was made and a cannula was inserted through it into the stomach through, which a guidewire was threaded in the stomach cavity and grasped by endoscopy snare. The guidewire was pulled out from the mouth, through which PEG tube was tied and then PEG tube was passed into the stomach cavity by pulling of the guidewire through an incisional hole created at the anterior abdominal wall. PEG tube was secured using external bolsters. Positioning of PEG tube was confirmed with re-endoscopy of the stomach. Standard post procedure protocols included no feeds for at least 24 hours, gradual reintroduction of feeds, regular dressing and reassessment of the hydration and nutritional parameters.

Inclusion Criteria

1. Age above 18 years.
2. All the patients who were admitted to ICU who were advised enteral nutrition, but could not be kept and maintained on NG tube feeds.

Exclusion Criteria

1. Patients in whom no standard 'pull-through' technique with or without preceding Savary-Gilliard dilation (SG-dilation) was possible due to stenosis of the hypopharynx or oesophagus.
2. Patients in whom PEG could not be performed without additional imaging (computed tomography).
3. Patients in whom PEG placement had to be terminated prematurely due to respiratory or other complications.
4. Missing written consent.
5. PEG tubes were not placed in patients with relative contraindications to placement, including those with severe ascites, peritonitis, peritoneal carcinoma, serious coagulation disorders (International Normalised Ratio >1.5, Quick test <50%, partial thromboplastin time >50 secs or platelet count <50,000/mm3), interposed organs (e.g. liver, colon), gastric outlet obstruction, previous gastric surgery, severe psychosis, clearly limited life expectancy and haemodynamic instability.

RESULTS

A total 330 cases of PEG tube were replaced. The mean age was 56.4 ± 18.4 yrs. (range, 18 to 84) and 224 (67.9%) patients were male. Most common comorbid diseases were cerebral infarction (217 cases, 65.8%), followed by hypoxic brain damage (36 cases, 10.9%). When associated with bleeding, aspirin (43 cases, 13.0%) was the most frequently taken drug in both groups. The mean interval of PEG tube placement was 6.3 ± 2.5 months (range, 0.8 to 18.3 months) and mean procedure time was 11.2 ± 3.8 mins. (range, 4.4 to 18.2 mins.).

Routine replacement performed in 264 (79.8%) cases was the most common indication followed by PEG site infection (n=37, 11.2%), and of persistent leakage around gastrostomy site (n=14, 4.2%).

The mean age of this patient population was 54 ± 19 years. The duration of parenteral and/or enteral nutrition support before PEG insertion averaged 38 days (range- 10-112 days) (Table 1). The majority of patients (51%) received nutrition via Nasogastric (NG) tube prior to PEG tube placement, while 33% and 14% were fed via parenteral nutrition and oral liquids, respectively. The most common indications for PEG tube placement were CVD (62.7%) and cerebral hypoxia occurring after non-neurological medical disorders such as ventricular fibrillation, cardiac arrest and carbon monoxide poisoning (23%).

Age/Years Mean ± SD (Range) adult patients	 62 ± 12.84 (18-93)
Sex Female Male	 119 232
Bodyweight/kg Mean ± SD (Range)	 57.8 ± 25.35 (3-158)
Preoperative diabetes mellitus	21
Alcohol abuse	79
Nicotine abuse	85
Neurological diseases*	50
Malignant diseases†	199
Non-malignant, non-neurological diseases‡	102
Deceased	145

Table 1. Patient Characteristics

Of the 128 patients studied, 60 (47%) were diagnosed with pneumonia, 8 (6%) with urinary tract infections and 4 (3%) with catheter-related bloodstream infections during the hospitalisation prior to PEG tube placement. A total of 70 patients had chronic comorbidities with hypertension being the most commonly observed condition (20%). Prophylactic antibiotics were given 7% of the patients who were not receiving additional antibiotics prior to the PEG procedure (Table 2). A total of 57 (45%) of the 128 patients were breathing through a tracheotomy at the time of the procedure. Midazolam was the choice of sedation in 96% of the patients during the PEG tube placement, while 4% received propofol. A total of 16% of patients received Acetylsalicylic Acid (ASA) and 26% received low molecular weight heparin before the PEG tube insertion as a component of therapy for underlying disease states, but these were suspended as appropriate before the procedure.

The most common acute procedure-related complication was insertion site bleeding, which occurred in 4% of patients. Long-term complications during the one year following PEG insertion were insertion site cellulitis (14%), the most common such complication and others as outlined in Table 2. The PEG tube had to be changed in 15 patients (12%) due to tube malfunction or dislodgement or gastric contents leakage (Table 2). A total of 20% of the 128 patients studied died within 28 days of PEG tube insertion, while 38% had died within one year of the PEG; one-year mortality was unrelated to the indication for PEG tube insertion. Only 13% (17/128) of patients who were alive at one year were able to have their PEG tube removed and be fed completely by the oral route.

Minor	
Local infection	115 (11.1)
Gastroparesis	7 (0.7)
Severe	
Post-PEG bleeding	5 (0.5)
Peritonitis	14 (1.3)
Followup	53 (5.1)
Buried bumper, n	21
Leakage or blockage, n	33
PEG-associated mortality, n	0

Table 2. Complications Following Percutaneous Endoscopic Gastrostomy (PEG) Complications

Three patients were excluded (study exclusion- missing impression or missing transillumination or positive aspiration test (n=1); respiratory insufficiency (n=1) or spontaneous tumour bleeding (n=1).

DISCUSSION

Multiple studies conducted over the last three decades suggest that PEG is a safe and effective means of providing long-term enteral nutrition.[1,2,3,4,5,6] A number of studies have demonstrated the effectiveness of enteral feeding using PEG tubes in patients with CVD/hypoxia, dysphagia, head and neck cancer and head trauma.[7,8,9] Our data adds to the information of a study by Gencosmanoglu et al in Turkish population of hospitalised adults with CVD, cerebral hypoxia, cranial trauma, head and neck cancers and MND. The current study is the largest to date and comparable to the study on PEG-related clinical outcomes of hospitalised patients in Turkey by Gencosmanoglu et al.[10] Limitations of our study include the study's observational nature, the lack of comparative efficacy data on another PEG placement technique versus our institution's standard methods described here and the lack of data on the incidence of aspiration pneumonia, prior patient nutritional status and enteral nutrition intake before and after PEG tube insertion. Gencosmanoglu et al conducted a retrospective study of PEG-related morbidity and mortality in Turkey involving 115 patients admitted to a neurosurgical intensive care unit; 60 were males and 55 females with the median age of 67 years.[10] The mean age of the patients in our study was 54 years and the median age of our patients with neurological disorders was 64 years. Patients in the Gencosmanoglu study had procedure-related mortality, 30-day mortality and overall mortality rates of 0%, 3.5% and 17.4%, respectively.[10] The overall 28 day (20%) and one year mortality (38%) in our patient population was higher than their series potentially due to a more heterogeneous critically-ill patient mix. Gencosmanoglu et al and we report one-year mortality rates as an index of the severity of underlying diseases in the population studied. In the Gencosmanoglu study, the PEG tube was able to be removed in 14% of patients and required changing in 10% patients. These rates are nearly identical to our study in which 13% patients were able to have the PEG tube removed and 12% required the PEG tube to be changed. In another retrospective Turkish study by Koc D et al of 31 critically-ill patients, 18 (58%) received enteral nutrition via Nasogastric (NG) tube and 10 (32%) received Parenteral Nutrition (PN) prior to PEG insertion.[11] In our study, the majority of patients (51%) received nutrition via a NG tube prior to PEG placement, while 33% were fed via PN. Ermis et al conducted a retrospective study in 81 patients on PEG tube experience in Turkey. The most prevalent indication for PEG in their study was neurologic disorders in 71 (92%) patients.

PEG-associated complications, we observed in 14 patients (18%).[12] In our patient population with similar clinical characteristics, PEG-related complications occurred in 15 patients (12%).

Several studies have explored PEG-related complications including cellulitis/peristomal infection in 136 patients studied by Finocchiaro et al (49% with cancer) only 4.4% developed a PEG site infection,[13] while Zopf et al in a prospective study of 390 patients (81% with cancer) found a peristomal infection rate of 34%. Zopf et al identified four risk factors were established as relevant for local infection after PEG-specific institution (OR 6.69; P=0.0001), size of PEG tube (15 Fr versus 9 Fr; OR 2.12; P=0.05), PEG experience of the endoscopist (≤100 vs. >100 procedures; OR 0.54; P=0.05) and the existence of a malignant underlying disease (OR 2.28; P=0.019).[14] Akkersdijk et al and Gossner et al found that using the pull technique plus prophylactic antibiotic use, decreased procedure-related complications and peristomal infection rates after PEG.[15,16] In our study, at the time of the pull technique PEG procedure, a total of 62% of subjects were receiving antibiotics due to underlying infection or as prophylactic agents. The rate of insertion site infection in our study (14%) may thus be due to the experience of the gastroenterologists, use of antibiotics and/or the low prevalence of cancer in our study cohort. Routine antibiotic prophylaxis is not recommended in ESPEN artificial enteral nutrition guidelines.[17] Prophylaxis was given to 7% of our patients and 55% of the patients were already on antibiotics during the periprocedural period. The remainder of the patients did not receive any antibiotic prophylaxis according to the operator's choice.

CONCLUSION

PEG was a safe and effective way of providing access for both short-term and long-term enteral nutrition. PEG tube placement for patients who cannot be fed orally is a minimally-invasive procedure with low morbidity and mortality.

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