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RESEARCH ARTICLE

Size does matter: clinical outcomes of percutaneous endoscopic gastrostomy (PEG) placement in a South African tertiary endoscopy unit

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Background: Enteral access is considered the most physiological and beneficial feeding route. Percutaneous endoscopic gastrostomy (PEG) is widely used for enteral feeding in patients with functional gastrointestinal systems, but who are unable to maintain sufficient oral intake to meet daily nutritional and metabolic needs. PEG-related complications can be significant, but reported rates are variable.
Aim: To investigate the use, complications, and outcomes associated with PEG insertion in a South African tertiary-level centre.
Methods: Retrospective study including all patients who underwent PEG insertion at the Groote Schuur Hospital Gastroenterology Unit between March 2018 and June 2023. Variables obtained included patient demographics, comorbidities, PEG insertion details, and complications.
Results: A total of 149 patients undergoing 158 PEG-insertion procedures were included with a median age of 54 years (IQR: 38–64) with the majority being male (91; 61.1%). The most common indication for PEG insertion was cerebrovascular accident (CVA) at 25.5%. PEG-related complications were divided into three: insertion-related, early (within 30 days of insertion), and late (after 30 days of insertion) and observed in 64 patients (43.0%). The only factor found to be associated with an increased early complication rate was the size of the PEG, with 24Fr tubes having a higher complication rate compared with smaller tubes (25.5% vs. 3.7%, $p < 0.001$).
Conclusions: Local indications and high complication rates of PEG placement are highlighted, advocating for the judicial placement of PEGs. Early complications are notably higher with increased diameter tubing, and it is recommended that the use of 24Fr tubes be avoided if possible.

Keywords: complication rate, enteral feeding, outcomes, percutaneous endoscopic gastrostomy

Introduction

Percutaneous endoscopic gastrostomy (PEG) placement was first described in 1980 by Gauderer et al., as an alternative to the surgical approach that was considered standard of care at that time.[1] PEG placement has now become a widely used treatment modality to provide enteral feeding in those patients who are unable to maintain sufficient oral intake to meet daily nutritional and metabolic needs but have a functional gastrointestinal system.[2,3] Indications for PEG placement include patients with dysfunctions of the neurological system, such as cerebrovascular accident (CVA), severe intellectual disability, dementia, bulbar palsy, cerebral palsy, neuromuscular disorders, head and neck trauma, head and neck cancers, and patients undergoing upper aerodigestive tract surgery. In these examples, PEG tubes have emerged as a substitute for parenteral nutrition and feeding via other enteral routes, such as nasogastric tube (NGT) feeding. Enteral feeding is acknowledged as the most physiological and preferred feeding modality given the multitude of beneficial effects over parenteral feeding.[2,3]

PEG placement is an endoscopic procedure allowing the formation of a permanent or temporary communicating channel between the stomach and anterior abdominal wall, thereby allowing for direct passage of food into the stomach.[4] Other than for feeding, PEG tubes can also be used to decompress the stomach.[4] In those patients where enteral feeding is expected to exceed four weeks and the life expectancy of the patient exceeds two months, PEG insertion is favoured for its utility, safety profile, simplicity, low cost and relative ease of insertion.[5]

Compared with surgical gastrostomy, PEG insertion is minimally invasive, eliminates the need for general anaesthesia, although local anaesthesia is still needed, and requires less instrumentation[2]. It is a valued access route for enteral feeding in hospitals, nursing homes, and home environments.[6] Two different PEG placement techniques are described, the 'Pull' and 'Push' techniques, with the 'Pull' technique being more commonly utilised.[1,4] The main absolute contraindications to PEG tube placement in hospitalised patients include severe uncorrectable coagulopathy, haemodynamic instability, or distal enteral obstruction.[6] While PEG insertion is generally considered a safe procedure, complications can occur during insertion or after the procedure either in the short or long term.

An appreciation of the possible complications, as well as an understanding of the regular maintenance of PEG tubes, can improve the quality of clinical care and ensure appropriate patient referral for PEG placement.[4] There are significant differences in the reported incidence in the literature of adverse events related to PEG placement, which, together with a paucity of data on PEG usage in South Africa, makes local

data on PEG usage significantly important. The aim of this study was to investigate the use and outcomes associated with PEG insertion in a South African tertiary-level referral centre.

Methods

Study design and population

This was a retrospective descriptive cohort study including all adult patients (≥ 18 years) who underwent PEG tube insertion in the Gastroenterology Unit at Groote Schuur Hospital between March 1, 2018 and June 30, 2023. All included patients were followed up until the end of the study period. The objectives of the study were to determine the clinical indications, comorbidities, and demographics of patients referred for PEG placement, and to investigate the immediate, early, and late complications associated with PEG tubes. A secondary objective was to determine whether any factors could be identified that were associated with increased complications. All adult patients referred for PEG insertion during the study period were assessed for inclusion. Those requiring a scheduled change of gastrostomy tube and those where a standard 'pull-through' PEG could not be performed, or where the procedure could not be completed, were excluded. As this was a retrospective review, no sample size calculation was performed and all patients meeting the inclusion criteria during the defined study period were included.

PEG insertion procedure (Figure 1)

The standard PEG insertion technique in our unit uses the modified pull-through technique as described by Gauderer et al.[1] After informed consent is obtained the patient is placed supine after receiving topical pharyngeal lignocaine and conscious sedation (individualised combinations of fentanyl and midazolam or propofol) with nasal prong oxygen, procedural blood pressure, pulse, and oxygen saturation monitoring. A single prophylactic dose of intravenous co-amoxyclavulanic acid is routinely given (routine practice since January 2020 and adjusted if any known allergies). An appropriately sized PEG placement kit is chosen considering the individual patient's size (weight, height, and body mass index) and proposed PEG usage. A full diagnostic upper gastrointestinal endoscopy is first performed, after which maximal gastric distension is achieved by continuous insufflation to ensure direct contact of the stomach with the anterior abdominal wall. The assistant prepares the abdomen in a sterile fashion and identifies an appropriate site for the PEG placement by using digital pressure to achieve concurrent visible gastric distortion on endoscopy allowing for appropriate gastric positioning. Care is taken with any previous surgical sites in anticipation of intra-abdominal adhesions and a minimum 2 cm gap is left from the rib margin to facilitate comfortable external flange/bumper positioning. The proposed PEG site is infiltrated with lignocaine; an appropriately sized skin incision is made through which a 14G cannula is introduced percutaneously perpendicularly until it is endoscopically visible within the gastric lumen.

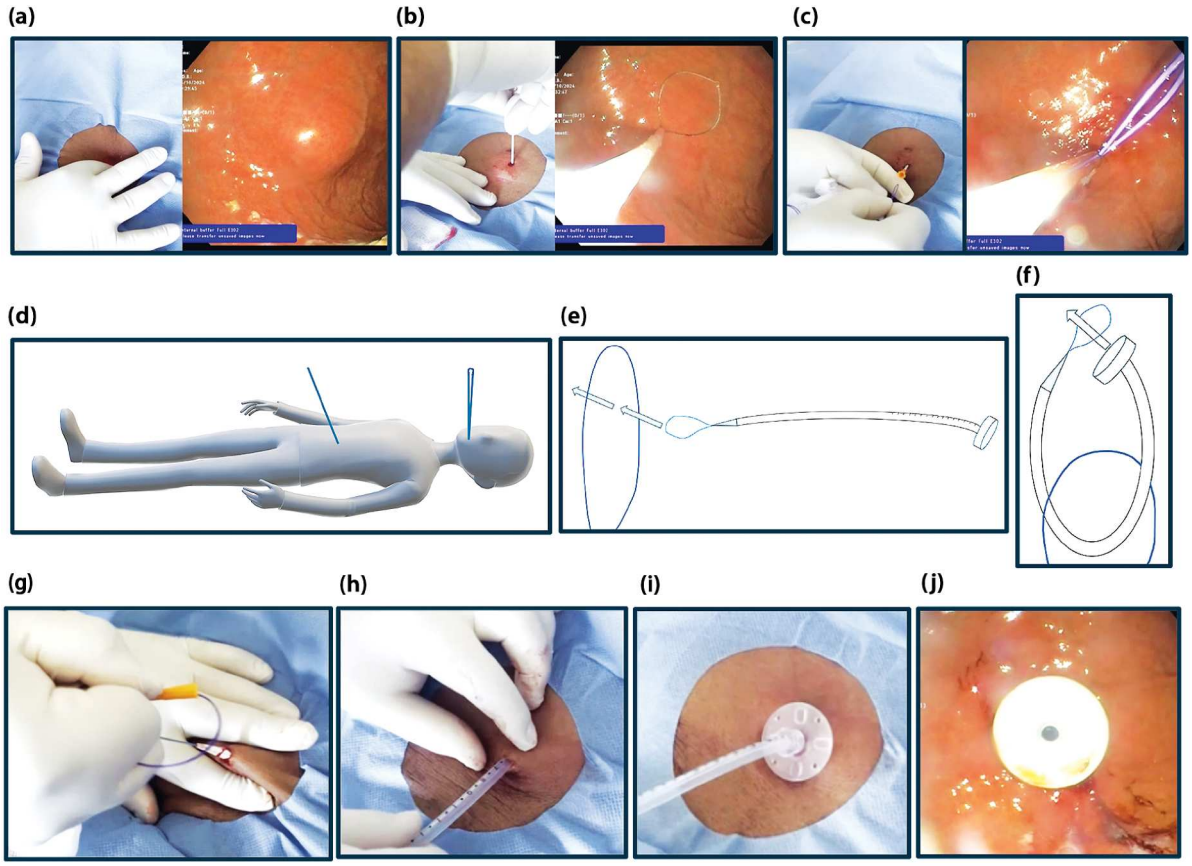

Figure 1: PEG insertion technique. (a) Maximal gastric distension with continuous insufflation with abdomen cleaned in a sterile fashion: visible gastric distortion from external digital pressure seen endoscopically. (b) Cannula (14G) introduced percutaneously into the stomach with endoscopic snare ready to receive the guidewire. (c) Guidewire (purple) fed via the cannula and grasped with endoscopic snare in the stomach and pulled out through the mouth. (d) Patient now with guidewire running percutaneously into the stomach and then out through the mouth. (e) PEG tube pushed through loop of guidewire. (f) Bumper of PEG tube pushed through the loop on the tip of the PEG tube and pulled tight — PEG tube now secured to guidewire. (g) PEG tube pulled into the mouth and out through the abdominal wall using controlled traction on the guidewire. (h) PEG tube now completely pulled through — important to note the depth of the tube as marked at the skin. (i) External flange secured to ensure the PEG sits comfortably but is not too tight. (j) Endoscopic view to confirm the internal bumper is sitting flush with the gastric mucosa but can still rotate.

The supplied guidewire is then fed through the cannula into the stomach, which is then grasped by an endosnare and subsequently extracted orally on removal of the endoscope. The PEG tube is looped to the guidewire with the assistant then pulling the wire back again, allowing the PEG tube to follow. Purposeful but controlled traction is required to pull the tapered PEG tubing tip through the abdominal wall. Once the tubing is visible, gentle traction continues until there is resistance felt as the internal flange/bumper offers resistance. At this point the endoscope is passed back into the stomach to assist with securing an appropriate height of the external flange/bumper. The tube is secured at skin level using the provided flange, ensuring the internal PEG bumper is snug against the gastric mucosa, but with the assistant still able to externally rotate the tubing comfortably, so avoiding pressure necrosis of the abdominal wall with associated sepsis. The endoscope is extracted finally as the appropriate clamp and feeding port supplied within the kit are attached to the external PEG tubing with the site cleaned on completion. Once discharged from the recovery room, the attending dietitian is informed so that enteral feeds may be started on the patient's return to the referral ward. The choice of feed and rate thereof is at the discretion of the dietitian. The patient is reviewed by the PEG insertion team for 48 hours to ensure that no insertion-related or early intra-abdominal complications have occurred.

Locally absolute and relative contraindications to PEG tube insertion include patients with pre-existing ventriculoperitoneal shunts (VP shunt), advanced malignancy such as stomach or peritoneal metastatic cancers, previous subtotal or total gastrectomy, pregnancy at time of PEG insertion, tense ascites, gastroparesis, or any obstruction of the stomach or distal thereto.[7]

Definition of complications

Complications that occurred during hospitalisation were graded according to severity using the Clavien–Dindo classification[8] for surgical complications.

Complications were further divided into three categories relating to timing of occurrence:

(1) Insertion-related: these were defined as adverse events occurring during or immediately following the placement of a PEG tube, primarily due to mechanical trauma, procedural missteps, or physiological responses to the intervention. These complications varied in severity, ranging from minor, self-limiting conditions to life-threatening events requiring urgent medical intervention.

(2) Early complications (within 30 days): these referred to complications that occurred within 30 days post-insertion, resulting from procedural trauma, infection, or device-related issues (accidental removal, blockage, buried bumper syndrome etc.), but excluding the insertion-related complications. Buried bumper syndrome is caused by excessive tension between the stomach wall and the skin leading to ulceration of the gastric wall at the site of the bumper.[9]

(3) Late complications (after 30 days): these were defined as complications that arose after discharge and usually relate to tubing issues (accidental removal, tube or connector breakages, blockage, buried bumper syndrome, etc.). It was only possible to identify late complications when patients were referred back to the unit with complications during the study period, and these were likely under-reported as some complications may have been managed in other hospitals or institutions.

Complication rates for the three categories listed above were presented using the total number of PEG tubes inserted as the denominator. Direct or indirect complications of PEG insertion such as procedural cardiac and/or respiratory arrest, aspiration, acute respiratory distress syndrome, or intestinal perforation causing death were defined as PEG-related mortality.[9] Progression of underlying disease resulting in death was not considered a PEG-related mortality.

Data collection and management

All patients requiring a PEG during the study period and meeting the inclusion criteria were identified from two prospective and ethically approved endoscopy registries at Groote Schuur Hospital: the Upper Gastrointestinal Surgery Registry (HREC R013/2015) and the Medical Gastrointestinal Registry (HREC R043/2015). Data were retrospectively collected, with the data points collected being age, gender, body mass index (BMI), performance status (based on the performance status classification by the Eastern Cooperative Oncology Group[10]), indication for PEG insertion, comorbidities, smoking, white cell count (WCC), haemoglobin (Hb), international normalised ratio (INR), platelets, and complications. Data were retrieved and appropriately anonymised to ensure patient confidentiality.

Statistical analysis

Data exploration and analysis was done using Microsoft Excel (Microsoft Corp, Redmond, WA, USA) and IBM SPSS Statistics (version 28.0.1.1; IBM Corp, Armonk, NY, USA). Patient demographics, comorbidities, PEG insertion, and complication details were described using simple descriptive statistics. Parametric data were described using mean with standard deviation and non-parametric data were described using median with interquartile range. BMI was divided into three groups as underweight (< 18.5 kg/m^2), normal (18.5–24.9 kg/m^2) and overweight (> 24.9 kg/m^2). Univariate analyses to assess for associations between early complications and multiple patient factors (including age, sex, BMI, performance status, and comorbidities) and PEG-insertion factors (these included factors related to endoscopic factors such as need for oesophageal dilatation, presence of gastritis but also factors related to the PEG itself, such as indication for PEG insertion and the diameter of the tube) was performed using the chi-square test for categorical data and the Kruskal–Wallis test to allow for comparison of multiple groups with non-parametric data. Further post-hoc multiple comparison analyses using the Mann–Whitney *U* test were performed on any variables shown to be statistically significant. A p-value of < 0.05 was considered statistically significant.

Results

Patient characteristics and PEG-insertion indications

A total of 149 patients were included, undergoing 158 PEG insertion procedures during the study period. The median age was 54 years (IQR: 38–64 years) with the majority being male (91; 61.1%). BMI was classified as underweight in 42 patients (28.2%), normal in 68 patients (45.6%), overweight in 18 patients (12.1%), and unknown/not recorded in 21 patients (14.1%).

Indication for PEG insertion (Table 1) was categorised into five main groups: neurological, post-traumatic, malignancy,

Table 1: Overview of indications for PEG insertion

Indication for PEG[a] (*N* = 149)	*n*	%
CVA[b]	38	25.5%
Head and neck malignancy	32	21.5%
Progressive neurological condition	23	15.4%
Traumatic brain injury	12	8.1%
Trauma — neck/facial	11	7.4%
Oesophageal malignancy	7	4.7%
Benign oesophageal	6	4.0%
Cerebral palsy	5	3.4%
Pharyngeal and oesophageal fistula	5	3.4%
Optimisation for lung transplant	4	2.7%
Other	6	4.0%

[a]PEG = percutaneous endoscopic gastrostomy; [b]CVA = cerebrovascular accident.

benign oesophageal, and other causes. Neurological disorders comprised the largest group, which included CVA (38; 25.5%), progressive neurological diseases (23; 15.4%), and cerebral palsy (5; 3.4%). Post-traumatic causes included traumatic brain injury (12; 8.1%), and traumatic neck and facial injuries (11; 7.4%). Oncological conditions included resectable obstructive oesophageal malignancy for nutritional prehabilitation (7; 4.7%), benign oesophageal conditions (6; 4.0%), and other causes (6; 4.0%).

The most common comorbidities were other chronic neurological conditions (30; 20.1%), with hypertension (35; 23.5%) as the leading non-neurological condition, while smoking (42; 28.2%) was the most prevalent substance use. Human immunodeficiency virus (HIV) infection (11; 7.4%), diabetes (10; 6.7%), and ethanol use (7; 4.7%) were less frequent. Table 2 demonstrates comorbidities and substance use.

Complications (insertion-related, early and late)

Overall, 64 patients (43.0%) experienced a total of 76 separate complications, including insertion-related, early and late complications (Table 3). Severe complications were infrequent, with only two patients (2.6%) requiring general anaesthesia for management of the complication (Clavien–Dindo IIIb), while the rest required mainly endoscopic management without general anaesthesia (53 patients, 69.7%, Clavien–Dindo IIIa) or only pharmacological therapy (18 patients, 23.7%, Clavien–Dindo II). No patient developed organ dysfunction requiring intensive care. There were no mortalities linked to the PEG insertion in this cohort. Table 3 outlines the reported complications.

Table 2: Patient comorbidity and substance use

Comorbidity (*N* = 149)	*n*	%
Other chronic neurological condition	30	20.1%
Hypertension	35	23.5%
Malignancy	24	16.1%
Chronic lung disease	15	10.1%
HIV[a]	11	7.4%
Diabetes	10	6.7%
Other	24	16.1%
Substance use (*N* = 149)	**No.**	**%**
Smoker	42	28.2%
NSAIDs[b]	2	1.3%
Recreational drugs	3	2.0%
Chronic corticosteroid use	1	0.7%
Regular ethanol use	7	4.7%

[a]HIV = human immunodeficiency virus, [b]NSAIDs = non-steroidal anti-inflammatory drugs.

Table 3: Insertion-related, early, and late complications of PEG placement, and Clavien–Dindo classification for all complications

Complications (*N* = 158)	*n*	%
Insertion-related complication rate	17	10.8%
Early complication rate (≤ 30 days)	28	17.7%
Late complication rate (> 30 days)	31	19.6%
Insertion-related complication		
Sedation-related complication	12	7.6%
Laryngospasm	2	1.3%
Accidental tooth extraction	1	0.6%
Bite block dislodgement	1	0.6%
Bleeding	1	0.6%
Early complications (≤ 30 days)		
Accidental removal	15	9.5%
PEG[a]-site sepsis	6	3.8%
Buried bumper	4	2.5%
Significant leaking around PEG site	3	1.9%
Blocked PEG	1	0.6%
Insertion through transverse colon	1	0.6%
Late complications (> 30 days)		
Accidental removal	20	12.7%
Significant leaking around PEG site	8	5.1%
Buried bumper	6	3.8%
Necrosis of PEG tract	2	1.3%
Blocked PEG	2	1.3%
PEG-site sepsis	1	0.6%
Incisional hernia	1	0.6%
Clavien–Dindo classification for all complications (*n* = 76)		
Grade I	3	3.9%
Grade II	18	23.7%
Grade IIIa	53	69.7%
Grade IIIb	2	2.6%
Grade IVa	0	0.0%
Grade IVb	0	0.0%
Grade V	0	0.0%

[a]PEG = percutaneous endoscopic gastrostomy.

The insertion-related complication rate was 10.8% (17 cases of 158 PEG tubes inserted), with the majority attributed to sedation issues with 12 patients (7.6%) requiring sedation reversal. Significant laryngospasm occurred in 2 patients (1.3%). The early complication rate (< 30 days, not including the insertion-related complications) was 17.7% (28 cases) with accidental PEG removal the most common occurrence (15; 9.5%). Buried bumper syndrome featured with almost equal frequency as both an early complication (4 cases; 2.5%), and a late complication (6 cases; 3.8%). PEG site sepsis was seen as an early complication in six cases (3.8%). All six of these cases developed cellulitis, requiring antibiotics and topical wound management only.

The late complications (> 30 days) were most frequent at 19.6% (31) with the vast majority relating to accidental removal (20; 12.7%). Other late complications included significant leakage

around the insertion site (8; 5.1%), buried bumper syndrome (6; 3.8%), and PEG tube blockage (2; 1.3%). Infrequent complications irrespective of timeline included insertion through the transverse colon, accidental tooth extraction, bite block dislodgement into the pharynx, bleeding, and incisional hernia. The PEG insertion through the colon was only diagnosed seven

Table 4: Univariate analyses of associations between numerous patient and PEG insertion factors and early complication rate

Factors		Early complication		*p*-value
Patient factors ($n = 149$)				
Age	≥ 50 years	15	17.4%	0.623
	< 50 years	13	20.6%	
Gender	Female ($n = 58$)	11	19.0%	0.966
	Male ($n = 91$)	17	18.7%	
BMI[a] ($n = 128$)	< 18.5 ($n = 42$)	6	14.3%	0.241
	18.5–24.9 ($n = 68$)	13	19.1%	
	>24.9 ($n = 18$)	5	27.8%	
Indication for PEG[b] Insertion	CVA[c] ($n = 38$)	7	18.4%	0.327
	Head/neck malignancy ($n = 32$)	9	28.1%	
	Progressive neurological condition ($n = 23$)	3	13.0%	
	Traumatic brain injury ($n = 12$)	3	25.0%	
	Trauma — neck/facial ($n = 11$)	3	27.3%	
	Oesophageal malignancy ($n = 7$)	1	14.3%	
	Benign oesophageal ($n = 6$)	0	0.0%	
	Cerebral palsy ($n = 5$)	0	0.0%	
	Pharyngeal/oesophageal fistula ($n = 5$)	0	0.0%	
	Optimisation for lung transplant ($n = 4$)	0	0.0%	
	Other	2	33.3%	
Diabetes	Not diabetic ($n = 139$)	28	20.1%	0.116
	Diabetic ($n = 10$)	0	0.0%	
Hypertension	Not hypertensive ($n = 114$)	23	20.2%	0.437
	Hypertensive ($n = 35$)	5	14.3%	
Chronic lung disease	No chronic lung disease ($n = 134$)	28	20.9%	0.050
	Chronic lung disease ($n = 15$)	0	0.0%	
CVA	No CVA ($n = 117$)	20	17.1%	0.312
	CVA ($n = 32$)	8	25.0%	
Other Neurological condition	No other neurological condition ($n = 119$)	24	20.2%	0.393
	Other neurological condition ($n = 30$)	4	13.3%	
Traumatic brain injury	No traumatic brain injury ($n = 139$)	28	20.1%	0.116
	Traumatic brain injury ($n = 10$)	0	0.0%	
Malignancy	No malignancy ($n = 125$)	23	18.4%	0.781
	Malignancy ($n = 24$)	5	20.8%	
Smoker	Non-smoker ($n = 107$)	21	19.6%	0.678
	Smoker ($n = 42$)	7	16.7%	
Ethanol	No regular alcohol use ($n = 142$)	27	19.0%	0.755
	Regular alcohol use ($n = 7$)	1	14.3%	
ECOG[d] performance status ($n = 127$)	PS 0 ($n = 19$)	7	36.8%	0.550
	PS 1 ($n = 28$)	4	14.3%	
	PS 2 ($n = 29$)	5	17.2%	
	PS 3 ($n = 22$)	7	31.8%	
	PS 4 ($n = 29$)	5	17.2%	
PEG insertion factors ($n = 158$)				
PEG size ($n = 148$)	Size 24Fr ($n = 102$)	26	25.5%	**< 0.001**
	Size 20Fr or smaller ($n = 54$)	2	3.7%	
Presence of gastritis	No gastritis ($n = 130$)	23	17.7%	0.984
	Gastritis ($n = 28$)	5	17.9%	
Requiring oesophageal dilatation	No oesophageal dilatation ($n = 145$)	25	17.2%	0.599
	Oesophageal dilatation ($n = 13$)	3	23.1%	

[a]BMI = body mass index; [b]PEG = percutaneous endoscopic gastrostomy; [c]CVA = cerebrovascular accident; [d]ECOG = Eastern Cooperative Oncology Group.
Bold indicates statistical significance ($p < 0.05$).

days post PEG insertion when faecal material was seen draining from the tract (the patient was clinically well with a soft, non-tender abdomen). The incisional hernia developed more than 3 years post the initial PEG insertion. Both were addressed surgically with good postoperative outcomes.

Factors associated with early complications

Univariate analysis was performed to assess for factors associated with an increased risk of early complications. None of the factors analysed (including demographics, comorbidities, BMI, indication for PEG placement, presence of gastritis, or need for oesophageal dilatation), other than the size of the PEG tube, showed a positive association (Table 4). Overall, the 24Fr PEG was the commonest size, utilised in 102 cases (68.9%), and was responsible for early complications in 26 cases (25.5%). Compared with smaller tubes, this rate of early complications was significantly higher and reached statistical significance (25.5% vs. 3.7%, $p < 0.001$).

Discussion

PEG placement is considered a relatively safe procedure. However, life-threatening complications may occur and can arise at any stage of post-procedural care.[3] Our study found that almost half (43.0%) of the included patients experienced complications following PEG tube placement. This surprisingly high percentage, however, includes the whole spectrum of insertion-related, early, and late complications, highlighting the potential morbidity of the procedure. We found that neurological disorders were the most common indication, with CVA reported at 25.5%. These findings are similar to a study carried out by Abdel Azim Morsy Afifi et al., where stroke with bulbar symptoms was reported as the most common indication for PEG insertion at 45%.[2]

Internationally, the complication rates vary greatly across settings, with overall rates in adult cohorts ranging from approximately 16% (Lockett et al.) to 32–44.9% (Afifi et al.; Alhasani et al.) and a paediatric study by Gang and Kim reporting short-term rates as high as 84.6%.[2,3,11–14] Insertion-related complications were often related to patient factors such as sedation and aspiration and ranged from minor issues to serious adverse events. Aspiration pneumonia, particularly in patients with neurological disorders, was a significant complication. The risk of aspiration was noted to be exacerbated by factors like the level of sedation, supine positioning during the procedure, and impaired protective airway reflexes.[15] Nicholson et al. emphasised that patients with severe respiratory disease may be too frail for the sedation necessary for endoscopy, further elevating the risk of aspiration.[16] According to the National Confidential Enquiry into Patient Outcome and Death (NCEPOD), 9% of patients undergoing PEG required reversal of sedation, indicating potential oversedation and associated respiratory complications. Some 3% of patients also experienced hypoxaemia ($SpO_2 \leq 90\%$) during the procedure, underscoring the need for careful sedation management.[17]

Short-term complications, occurring within days to weeks after PEG insertion, were generally more frequent, and had the highest percentage of infection-related issues such as local site infections, bleeding, and tube dislodgement. Blomberg et al. reported a 39% complication rate within one month, while a study done in the United Arab Emirates in 2012 reported a 39% complication rate at two weeks.[18,19] In contrast, long-term complications, dominated by tube issues such as buried bumper syndrome, tube blockage, or granulation tissue formation, were typically less common but still clinically relevant. Furthermore, Gundogan et al. (19.5% at one year) and Alhasani et al. (44.9% within a year) highlight that adverse events can persist or emerge over time.[3,20]

An earlier study from our institution of 36 patients by Watermeyer et al. demonstrated comparable morbidity, mortality, and long-term outcomes.[21] However, only a small number of patients were studied, where minor complications were reported in 36% of cases, which occurred commonly within the first week following the procedure.[21] The wide range in complication rates is most likely due to differences in patient characteristics (e.g. age, health, healthcare access). The early post-procedural period (within 30 days of PEG placement) appears to carry the highest risk for complications, particularly minor ones, reinforcing the need for vigilant monitoring and standardised care protocols during this phase.

Accidental removal was noted in our study as the most common complication seen both as an early complication at 9.5% and as a late complication at 12.7%. These numbers are much higher than those reported by Schrag et al., who reported a rate of 1.6%–4.4%, with this complication commonly reported in confused and/or combative patients.[4] The higher rate seen in our study could be because the majority of our patients, once discharged, are not managed by trained carers/nurses but families at home who manage the wound as best they can, and who may have undergone little or no training on PEG management.

Buried bumper syndrome is a potentially dangerous complication with an incidence of 0.5–2.4%.[2,4] In our study, occurrence of buried bumper syndrome featured with almost equal frequency as both an early complication (2.5%) and a late complication (3.8%). These numbers are slightly higher than the standard reported international rate of 0.3–2.4%.[2,7,9,18]

PEG site sepsis was seen commonly as an early complication at 3.8% in comparison with late complications at 0.06%. This rate is lower than has been reported in other studies such as that by Alhasani et al., who reported a rate of 9.2% and Richter-Schrag et al., at 11.1%.[3,7] Thus, infection remains the less common complication associated with PEG tubes with the advent of routine prophylactic antibiotic use.[3] The use of antibiotic prophylaxis is reported to reduce the occurrence of infection by 3%.[4] In our study age played no role in infective risk post-PEG placement. Poor nutritional status is expected to delay healing in malnourished patients and a high BMI potentially should be related to more infective issues due to the length of the tract through the abdominal adiposity, yet the extreme BMI ranges were not associated with any increased complications in our cohort. In stroke patients and patients on cardiac supportive apparatuses, thrombocyte aggregation inhibitors (e.g., acetylsalicylic acid [Aspirin®, Bayer Schering Pharma, Germany] or clopidogrel [Plavix®, Bristol-Myers Sanofi Pharmaceuticals Partnership, USA]) were generally not discontinued before PEG insertion, nor was treatment with low molecular weight heparin (LMWH enoxaparin; Clexane) prohibitive to placement.[12,21,22]

Blockage of PEG tube featured in equal frequency as both an early complication at 0.6% and a late complication at 1.3%. This is lower than what Schrag et al. reported in their study where PEG tube blockage occurred in up to 45% of cases.[4] Abdel Azim Morsy Afifi et al. reported a 2.1% incidence of

minor PEG tube blockage and a 0.3% incidence of major blockage requiring tube exchange.[2] Alhasani et al. reported a blockage rate of 2%.[3] PEG tube leakage, on the other hand, has been reported as more likely in older patients, possibly due to weaker immune systems, or decreased abdominal muscle tone, which can delay healing and increase infection risk. Similar findings were observed in a study conducted by Lee et al., where older age and diabetes were risk factors for complications.[13]

Following multivariate analysis, the only positive association within this cohort for increased risk of early complications was the diameter of the tubing. A 24Fr PEG was the commonest size utilised (68.9%) and was responsible for higher early complications (25.5% vs. 3.7%, $p < 0.001$). With an odds ratio of 1.26 for increasing 1-Fr increments, a Korean study conducted by KASID research (Korean Association for the Research of Intestinal Diseases) also demonstrated a significant relationship between PEG tube diameters and the occurrence of adverse events.[22] Conversely, a study conducted by Shangab and Shaikh showed a high correlation between PEG tube diameter and minor adverse events, with smaller PEG tube sizes being associated with PEG tube blockage and removal.[19]

An increase in complication rates may be due to study duration. Other studies concentrated on shorter time periods, whereas our study included any late adverse event beyond 30 days occurring within the overall study period.

Limitations

This study faced several limitations due to its retrospective design. First, reliance on existing medical records introduced challenges related to data completeness and accuracy. Some files lacked comprehensive documentation, particularly regarding complications and follow-up, potentially leading to underreporting. Additionally, several patients were referred from external facilities and were subsequently lost to follow-up.

Selection bias was another concern, as participants were not randomly selected but were included based on record availability, possibly skewing the data. Documentation bias also posed a challenge; minor or subjective complications may have gone unrecorded due to variability in clinician reporting practices. The observational nature of the study also limited our ability to draw definitive causal inferences.

Confounding variables, such as comorbidities, procedural differences, and disparities in post-PEG care, could not be fully controlled for, thus potentially influencing the frequency and type of complications observed. Furthermore, the absence of standardised definitions and classification criteria across records led to inconsistencies in how complications were reported.

Finally, the lack of long-term follow-up data likely resulted in an underestimation of late-onset complications, and the absence of a prospective control group limited comparative analysis. These factors collectively impacted the generalizability and interpretability of our findings.

Recommendations for future research

Future advancements in retrospective studies on PEG complications can be realised through several avenues. Expanding research through multicentre collaboration presents an opportunity to increase sample sizes, improve population diversity, and enhance the external validity of findings by capturing a wider spectrum of clinical practices and patient profiles. Longitudinal data collection through national registries or institutional databases would enable tracking of long-term outcomes, offering insights into delayed complications and improved follow-up completeness. Establishing a universally accepted framework for defining and reporting PEG-related complications would also improve consistency and allow for more reliable cross-study comparisons.

Conclusion

PEG tube insertion remains a rapid, readily accessible, and vitally important feeding route for many patients in our setting but is associated with a high complication rate, although most complications are mild and this is comparable to other international data. The most significant finding was that larger tube size was associated with an increase in early complications in our setting, which warrants further investigation. We advocate for appropriate patient selection, good patient follow-up, and, most practically, the use of 20Fr sized tubes to reduce these complications.

Ethics statement

This study was approved by the University of Cape Town Human Research Committee.

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