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Percutaneous Endoscopic Gastrostomy in Clinical Practice

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Abstract: ***Percutaneous endoscopic gastrostomy (PEG) is a method of delivering long-term enteral nutrition for chronic disease patients with swallowing disorders. With an advent of endoscopic procedure, PEG has become more comfort than open gastrostomy, less invasiveness and better cost-effectiveness. In addition of PEG tubes for feeding access, it can also be used as gut decompression. There are absolute and relative contraindications for PEG placement, and there are two main complications such as major and minor complications. But, there are several ways to resolve the complications. This review tries to explain about indications, contraindications, complications, caring after PEG placement, and removal PEG.***

Keywords: percutaneous endoscopic gastrostomy, enteral feeding, chronic disease

1. Introduction

As evidenced by worldwide population trends, today we are faced with an aging society. Dementia, stroke, and malignancy are common problems among the elderly that may lead to malnutrition because of dysphagia associated with these disease. Alternate means of feeding then becomes a consideration when the patient is unable to ingest food for any reason.[1][2] Enteral feeding can be accomplished through nasogastric, nasojejunal, gastrostomy or jejunostomy tubes.[3] Nasogatric tubes have the advantage of being simple to insert, but are often poorly tolerated by the patient.[2] They are difficult to maintain in position and have a significant associated risk of aspiration pneumonia. Nasojejunal tubes are tolerated better, but easily to blocked. The most appropriate method for long-time enteral feeding is by use of a gastrostomy. Gastrostomy can be created by surgically, or endoscopically.[3][4]

In 1980 Ponsky and Gauderer, introduced a new technique into clinical practice with the creation of a feeding gastrostomy that used a percutaneous technique under endoscopic guidance. Since then, percutaneous endoscopic gastrostomy (PEG) has rapidly become the preferred method of delivering long-term enteral nutrition to those with swallowing difficulties.[5][6] PEG is indicated when an individual requires long term prepyloric feeding. With an advent of endoscopic procedure, PEG has become more preferential than open gastrostomy, less invasiveness and better cost-effectiveness. Moreover, PEG was associated with significantly faster time to start feeding. A PEG tube is usually made of silicone or polyurethane; thereby making it very durable and less likely to be damaged by gastric secretion compared to a latex tube.[7]

Aspiration pneumonia is a common complication after tube feeding, it can be a result of swallowing disturbance, which is inevitable in patients who are undergoing tube feeding, and gastroesofageal reflux. PEG feeding have been reported to reduce the occurrence of aspiration. PEG tube has rapidly become the method of choice for long term feeding than using nasogastric feeding. There is less interruption from tube displacement compared with nasogastric feeding and nasojejunal feeding. There may also be less refux and feed aspiration, suggesting that overnight feeding is relatively more safer than any methods. This is important for mobile patients who do not want to be constrained during the day.[8][9]

2. Indications for percutaneous endoscopic gastrostomy (PEG) insertion

PEG tubes have two main indications-feeding access and gut decompression. In patients who are unable to maintain sufficient oral intake, PEG 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.[2] Significant head/neck trauma and upper aerodigestive surgery that preclude oral nutrition also constitute important indications. In patients with advanced abdominal malignancies causing chronic obstruction/ileus, a PEG tube can be used to decompress the intestinal tract.[10]

PEG tubes may also be useful in the setting of severe bowel motility disorders. Table 1 includes the most frequent indications for PEG placement, classifying patients according to the chronicity of underlying diseases and its ability to recovery.

Table 1: Conditions for which patients are commonly referred for insertion of a percutaneous endoscopic gastrostomy.[2][10][11]

Indications	
I.	**Patients with potentially reversible diseases in which it is expected that the PEG can be removed once the process is solved:** Neurological diseases: Guillain-Barre syndrome, stroke, cranial trauma Anorexia nervosa Severe burns Multiple injuries and facial trauma Transplants prior malnutrition Head and neck tumors treated with chemotherapy and radiotherapy
II.	**Patients with irreversible diseases with prolonged survival in which the PEG is placed permanently and helps improve their quality of life:** Neurological diseases: ALS, multiple sclerosis, dementia, Parkinson's disease, Alzheimer's disease, stroke, post-anoxic encephalopathy, brain metastases, brain tumours, poliomyelitis, brain injury (traumatic or surgical) Progressive muscular dystrophy Facial malformations and oropharyngeal Neoplasms of the esophagus and cardias Oropharynx tumors
III.	**Patients with terminal and debilitating diseases with a relatively long life expectancy (this indication should be individualized and consensual):** Encephalitis Repeated stroke Advanced malignancies AIDS terminal stages Intestinal obstruction by peritoneal carcinomatosis Radiation enteritis Severe acute pancreatitis
IV.	**Preventing malnutrition in pediatric illnesses:** Chemotherapy in oncologic disease. Unpalatable formula in multiple food allergies Inadequate caloric intake Multiple congenital malformations Short bowel syndrome Oropharyngeal dysmotility Epidermolyis bullosa Unpalatable medications in renal failure
V.	Improving morbidity in patients undergoing radiotherapy for head and neck carcinomas

ALS: Amyotrophic lateral sclerosis; AIDS: Acquired immune deficiency syndrome.

3. Contraindications for percutaneous endoscopic gastrostomy (peg) insertion

Medical necessity, like any other surgical intervention, must be clearly established prior to PEG tube insertion. Some of the local problems and absolute contraindications of PEG tube placement are summarized in Table 2. Besides the absolute contraindications conditions such as the presence of non-obstructing oropharyngeal or esophageal malignancy, hepatomegaly, splenomegaly, peritoneal dialysis are also consider relative contraindications.[12][13]

Table 2: Contraindications for the insertion of a percutaneous endoscopic gastrostomy.[14][15]

Contraindications	
I.	**Due to local problems:** Nonswelling esophageal obstruction Active gastric pathology Total gastrectomy Extreme obesity Previous midline laparotomy (can hinder the location of the puncture site)
II.	**Absolute contraindications:** Colonic interposition Partial or subtotal gastrectomy Massive ascites Portal hypertension (gastric varices) Peritoneal dialysis Active gastric pathology Coagulation disorders Sepsis Cardiorespiratory disease that prevents the endoscopy Pyloric stenosis Expected survival < 2 months (NGT is preferred)

NGT: nasogastric tube

4. Complications

PEG tube insertion is usually considered a safe procedure, however, complications can occur with a variable rate based on the study population. These complications can be classified as minor or major complications. Although there is low procedure-related mortality in most studies, the mortality rate may increase in patient with underlying comorbidities.[13]-[15]

4.1 Major Complications

Major complications are not common but can occur after PEG insertion. As mentioned, mortality after PEG us very rare and is usually due to underlying comorbidities.[12][13]

4.1.1 Hemorrhage

Produced by accidental puncture of a vessel. If bleeding occurs in the stomach it can be seen as an upper gastrointestinal bleeding, and if it is produced by peritoneal puncture of a vessel as hemoperitoneum. This complication is more common in patients with portal hypertension.[12]

4.1.2 Acute Peritonitis

It is produced by the passage of gastric contents into the peritoneal cavity. It has been described in patients whose probe was tried to be changed within 2–3 weeks. In these cases, the fistulous tract may not yet be ripe and the end of the replacement tube instead of entering the stomach is located in the peritoneal cavity. What can also occur if the probe is placed with excessive tension is an ischemic necrosis of the gastric wall and a migration of the probe towards the peritoneal cavity.[14]

4.1.3 Bronchial Aspiration

It is the most common major complication. It can occur during the procedure of the placement of the probe. It is therefore important to aspirate the oropharyngeal secretions throughout the procedure. It can also occur following the administration of nutrition. To prevent it, the patient should

be incorporated 30° while he/she is fed, and shall be kept in this position for the following 2 h.[14][16]

4.1.4 Necrotizing Fasciitis

It is the most serious complication but also the less common and is associated with high mortality. It is an infection and subsequent necrosis of the soft tissues of the abdominal wall. It is accompanied by fever, cellulitis and edema, and subcutaneous emphysema can be observed. It requires treatment with broad-spectrum antibiotics and surgical debridement.[13][17]

4.1.5 Gastrocolic fistula

It occurs when the transverse colon is placed between the gastric wall and the abdominal wall by placing the PEG. It can cause acute symptoms of intestinal obstruction or peritonitis, or evolve in a hidden way, with chronic subocclusive symptoms. Sometimes this complication is found when the first replacement of the probe takes place and the end of the replacement tube is placed at the level of the light of the colon, causing diarrhea when nutrition is administered. To solve this, it may be enough to remove the tube to close the fistula spontaneously, but occasionally surgical treatment will be required.[12][14]

4.2 Minor Complications

Minor complications consist of: (1) Infection of the stoma: it is the most frequent complication. It is managed with antibiotics and local treatment. It is sometimes necessary to withdraw the probe; (2) Extrusion of the probe (buried bumper syndrome): it consists of the migration of the internal retainer towards the gastric wall, leaving an impact on it and sometimes being completely covered by gastric mucosa, hindering or preventing both nutrition and the replacement of the tube. Atencio DP et al state that, The only major complication found in their cohort was buried bumper syndrome which occurred in approximately 10% of patients.[19][20] To avoid this we must avoid excessive tension on the external retainer by loosening the outside retainer and by regularly rotating the probe on its axis; (3) Overflowing: it consists on the oozing of gastric contents around the tube, causing skin irritation and interfering with the patient's care and hygiene; (4) Miscellaneous: complications that can usually be resolved without major difficulties are: hematoma of the abdominal wall or stomach, fever, subcutaneous emphysema, asymptomatic pneumoperitoneum, granuloma of ostomy, catheter obstruction, rupture of the tube and others.[12]-[14][18]-[21]

5. Some tricks to resolve some complications

5.1 Burial of the Retainer in the Gastric Wall (Buried Bumper Syndrome)

There are several ways to resolve this complication: (1) Introduce a dilatation balloon or a savary dilator with a diameter slightly greater than that of the probe through the lumen of it and push to the gastric cavity until the retainer is unstuck. For this maneuver, we can help ourselves by pulling the dilator with a polypectomy snare introduced through the working channel of the endoscope; (2) Putting a new probe by the pull method, inserting the guidewire through the lumen of the buried probe; in this way, when we pull the wire the new probe will drag the old and it will become unstuck; (3) Make incisions with a needle knife sphincterotome or with argon plasma coagulation, on the lining that covers the internal retainer to release and remove it.[12][21][22]

5.2 Stenosis of the Stoma

Very often if the probe is removed and the substitution probe is not placed promptly, the fistulous tract narrows, preventing the entry of the substitution probe. To solve this complication we can: (1) Dilate the fistula with Savary plugs or balloon dilators; (2) Introduce the replacement tube over a biopsy forceps used as a guide which are introduced by the stoma to the stomach; (3) Introduce a guidewire by the fistulous tract and then perform the complete first implant procedure.[11]-[13][17][21]

5.3 Peritube Leakage of Gastric Contents

It can be solved: (1) Removing the probe for several hours for the fistulous tract narrow and then placing the replacement probe; (2) Replacing the probe with another one with a larger caliber; (3) Removing the PEG and finally placing a new tube in another location.[12][23]

6. Patient care after percutaneous endoscopy gastrostomy (PEG) insertion

It is recommended to take bed rest for at least 6 hours after placement and to monitoring closely all vital signs as well as any occurrence of abdominal pain, fever or gastrointestinal bleeding. It is advisable to keep a peripheral venous line inserted for at least 6 hours in case complications arise. Additionally, some analgesia may be required during the first two days, especially in the case of children.[11]-[14] Many patient report abdominal discomfort after PEG insertion due to inflation of the stomach during the procedure. Traditionally, feeding was delayed until the next day due to the fear of peritoneal leakage risk after feeding. Many studies invertigated the safety of early feeding from 1 h to 6 h after PEG insertion, including a meta-analysis which found that feeding initiated as early as 4 h after PEG insertion is safe.[11][24][25]

7. Removal of percutaneous endoscopic gastrostomy (PEG)

Removal of the PEG tube is recommended when the tube is no longer needed or when complications such as persistent leakage or buried bumper syndrome require its removal. However, report of serious and sometimes fatal complications such as small bowel perforation and obstruction favor the use of endoscopic removal of PEG tube.[11][12][23] In general, the PEG tract will be closes in the first few days after PEG removal, however, occasionally a gastrocutaneous fistula persists, local infection, and

underlying poor tissue healing contribute to delayed maturation of the PEG tract. Method used to close the fistula include hemoclip placement and endoscopic band closure.[26][27]

8. Conclusion

The PEG procedure is technically simple and accessible to any endoscopist, providing quick, inexpensive enteral access with few complications. In this chapter we have reviewed in a concise way the indications,contraindications, complications, some tricks to resolve some complications**,** and care after PEG placement until removal of the PEG. However, the decision to place probes for artificial feeding, especially in the final stages of life, must be based on the expectations of the progression of the disease, the chances of obtaining benefits and the desires of the patient and his family.

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