Chapter

Introducer Percutaneous Endoscopic Gastrostomy in Palliative Care of Patients with Esophageal Cancer

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Abstract

In the treatment of esophageal cancer and palliative care, nutritional status plays an important role in the patients' tolerance of treatment, affects the quality of life, and outcomes. Alimentation in such patients can be achieved by enteral or parenteral nutrition but the enteral route is the preferring option. Pre-pyloric feeding is easier and may result in greater nutritional benefits than post-pyloric feeding. Gastrostomy is the conventional option for intra-gastric feeding, hydration, and drug administration. Percutaneous endoscopic gastrostomy (PEG) is a minimally invasive procedure and is currently the procedure of choice. Two PEG techniques are clinically used worldwide: pull and push or introducer method. The pull-type technique is the most commonly used method, but the concerning point is that the implantation of esophageal cancer cells into the gastrostomy stroma. The introducer method is a safe alternative and effective technique for enteral feeding to the stomach with the avoidance of cancer cells seeding.

Keywords: enteral nutrition, palliative care, percutaneous endoscopic gastrostomy, introducer PEG, esophageal cancer, dysphagia, cancer cells seeding

1. Introduction

In 2018, global cancer statistics reported that the incidence of esophageal cancer and mortality were 572,000 new cases and 509,000 deaths, ranking seventh and sixth of all cause cancer morbidity and mortality, Thus, esophageal cancer is a significant global health problem [1]. Most cases present late with advanced disease, especially in the developing countries [1]. Local tumor growth leads to esophageal lumen narrowing and dysphagia and results in increasing difficulty with eating solid food, weight loss and worsening nutritional status. Improving nutritional status is a key factor in determining patient's ability to perform activities of daily living, tolerability of multimodal anticancer treatment, long-term outcomes, and quality of life [2–6].

Percutaneous endoscopic gastrostomy (PEG) is a safe and effective minimally invasive option [7, 8]. Two primary PEG techniques are used worldwide: the pull and push/introducer methods [9, 10]. The pull technique was introduced first and more widely used but cancer seeding through the gastrostomy stroma is a rare but

concern disadvantage [11–15]. Refining the pull technique led to the development of the push or introducer technique to avoid tumor seeding to the stroma [9, 16–18].

2. History and concept of the development of the introducer percutaneous endoscopic gastrostomy

Alimentation for esophageal cancer patients can be provided via the enteral or parenteral routes [2, 19, 20]; the enteral route is preferred because it utilizes the gastrointestinal tract and avoids the complications of parenteral nutrition [21, 22]. Placing the feeding tube distally to the location of the cancer is the strategy. Enteral nutrition can be provided by pre-pyloric or post-pyloric feeding (**Table 1**). Intragastric feeding is easier and might provide greater physiologic benefits than the small bowel [23, 24]. The technical approaches of pre-pyloric nutrition include a nasogastric tube (NGT), surgical gastrostomy, and PEG.

NGT is a classic approach for the patient with swallowing difficulties [25]. For early esophageal cancer, when patients may have mild dysphagia and limited luminal obstruction, a NGT should be able to pass easily. However, with advanced disease, the passing of a NGT requires endoscopic or fluoroscopic guidance to confirm the correct position of NGT before start the feeding process [8].

A surgical gastrostomy may be performed by an open approach whereby the feeding tube is placed in the stomach via an upper midline incision. This approach is associated with potential complications such as wound infection [26–29] and respiratory compromise [27, 30–33]. The laparoscopic gastrostomy was developed to minimize the risks of the open technique but it requires substantial training, a skillful surgeon, and experience [34, 35].

PEG was first performed in 1979, using the pull-type technique [36]. This approach was associated with fewer procedural complications than surgical gastrostomy [37–40]. The pull method involves inserting a string into the intragastric space through the abdominal wall. The forceps from an endoscopy grasps the string and pulls it up to the oral cavity. A feeding tube is then passed over the guide string and pushed back down the esophagus, stomach, and then out through the abdominal wall. The pull-type technique is the most commonly used method in clinical

Enteral nutrition methods	Pre-pyloric feeding	Post-pyloric feeding	Risk of cancer seeding
Nasogastric tube (NGT)	+	—	—
Nasojejunal tube (NJT)	—	+	—
Surgical approach			
Gastrostomy	+	—	—
Jejunostomy	—	+	—
Percutaneous endoscopic gastrostomy (PEG)			
Pull technique	+	—	+
Push or Introducer technique	+	—	—
Percutaneous endoscopic transgastric jejunostomy (PEG-J)	—	+	—

+ yes; − no.

Table 1.
Methods for enteral nutrition in esophageal cancer patients.

practice. However, a rare complication is the implantation of esophageal cancer cells into the gastrostomy stroma [11, 12].

The push or introducer method is an alternative PEG technique that avoids seeding cancer cells seeding by direct inoculation during the procedure [13–15, 17, 18]. The push technique involves inserting a guidewire into the stomach through the abdominal wall and then passing the feeding tube over the wire to rest in the stomach [41, 42]. In the Russell technique, once the guidewire is in the intragastric space, a dilator with a sheath is passed over the wire. After removing the dilator and guidewire, the feeding tube is inserted into the sheath, and the sheath is then peeled off [43]. The push method is associated with fewer complications than the pull method [10, 16, 41, 42].

Both PEG methods are also associated with better short-term outcomes over surgical gastrostomy in terms of shorter operative duration, less post-operative pain, and shorter hospitalization [17, 18].

3. Introducer percutaneous endoscopic gastrostomy in palliative care

In palliative care, advanced esophageal cancer patients have suffered from many symptoms such as pain, dysphagia, malnutrition, and psychological problems that depend on the tumor location with staging and the cancer current treatments [44]. Nutritional support is one of the critical roles for symptom management, especially for dysphagia and malnutrition. Also, nausea and vomiting might be the other symptom caused by chemotherapy, radiation, medication, and psychiatric issues that affected the patients' nutritional status [44, 45].

Enteral nutrition is a suitable option for managing these conditions for improving nutritional status, increasing tolerating for chemoradiation therapy, and enhancing the patients' quality of life. The preference for enteral nutrition of advanced esophageal cancer should be safe, minimally invasive with the ability to help in nutritional status. The introducer PEG is a practical choice for advanced esophageal cancer patients who had been included in palliative care [46–48].

4. Indications and contraindications

Clinical assessment to create accurate clinical staging is a crucial step for guiding the optimal management of esophageal cancer patients. Endoscopic resection is an option for the treatment of early esophageal cancer. Tri-modality therapy is an alternative for patients who have more advanced local disease and for patients with metastases group, palliative and supportive care are indicated to improve quality of life [49–51].

Esophageal cancer is often cause anorexia and dysphagia that lead to decreased oral intake and poor nutritional status, dehydration, imbalance of blood chemistry, and malnutrition. Assessing patient's performance status is a crucial for drawing up the treatment plan, irrespective of stage of the disease. Nutrition support is a key element and is indicated in patients whose nutritional status is compromised who cannot be adequately supported by eating and drinking normally. Enteral feeding is the route of first choice and preserves intestinal integrity, has a low risk of complications, and is more cost effective than the parenteral route [2, 52, 53].

NGT is a common practice for enteral nutrition. Passing a nasojejunal tube (NJT) is another enteral nutrition technique but this is technically more challenging [54]. Both NGT and NJT are intended for short-term nutritional support, usually up to four weeks [8, 9], and both require that the esophageal lumen is patent enough to accept the tubes.

Indications
For esophageal cancer
Enteral nutrition support with pre-pyloric feeding
Minimize the risk of cancer seeding from PEG procedure
Apply for gastric decompression
Contraindications
Patient factor
Unstable vital signs
Sepsis
Uncorrected coagulopathy
Gastric outlet obstruction or intestinal obstruction
Endoscopic factor
Viscus perforation
Gastric pathology
Severe abdominal wall infection (especially at the site for the feeding tube)
Massive ascites
Pregnancy
Caustic esophageal or gastric injuries
Previous intra-abdominal surgery

Table 2.
Indications and contraindications.

Although surgery plays a long history of enteral nutrition, the various procedures have developed to reduce complications, pain, and additional cosmetic results. Pull-type or introducer PEG is a favored method for a minimally invasive procedure, avoiding the risk of cancer seeding compared to surgical gastrostomy [17, 18]. In addition to patients with esophageal cancer, the introducer PEG could also use in patients who indicated enteral nutrition support with pre-pyloric feeding, demand for long-term enteral feeding, the patients with head and neck cancer that could diminish the risk of cancer seeding from PEG procedure, and apply for gastric decompression [9, 25, 55, 56].

The contraindications for a PEG include: patients with unstable vital signs, sepsis, uncorrected coagulopathy, gastric outlet obstruction or intestinal obstruction as well as patients who have endoscopic contraindications such as a viscus perforation, gastric pathology or severe abdominal wall infection especially at the site for the feeding tube, massive ascites, pregnancy, caustic esophageal or gastric injuries, and previous gastric or intra-abdominal surgery (**Table 2**) [9, 57].

5. Principle of techniques for introducer percutaneous endoscopic gastrostomy

The introducer PEG is performed with the patient in the supine position under local anesthesia, intravenous sedation, or general anesthesia. EGD is necessary for visualization of the stomach during the procedure. For the patients with advanced local disease and dysphagia, the standard diameter endoscope (8–12 mm) [58] might not pass through the narrowed esophageal lumen, necessitating the use of the pediatric endoscope, which has a smaller diameter (4.9–6 mm) [59].

Gastropexy is a technique that anchors the stomach wall to the abdominal wall before the feeding tube is inserted; one method is the double needle gastropexy (**Figure 1**). The double-needle gastropexy is a device with two parallel, 20-gauge needles, and a suture-holding loop. The suture-holding loop inserts through the first needle and the suture inserts through the second needle which is grasped with

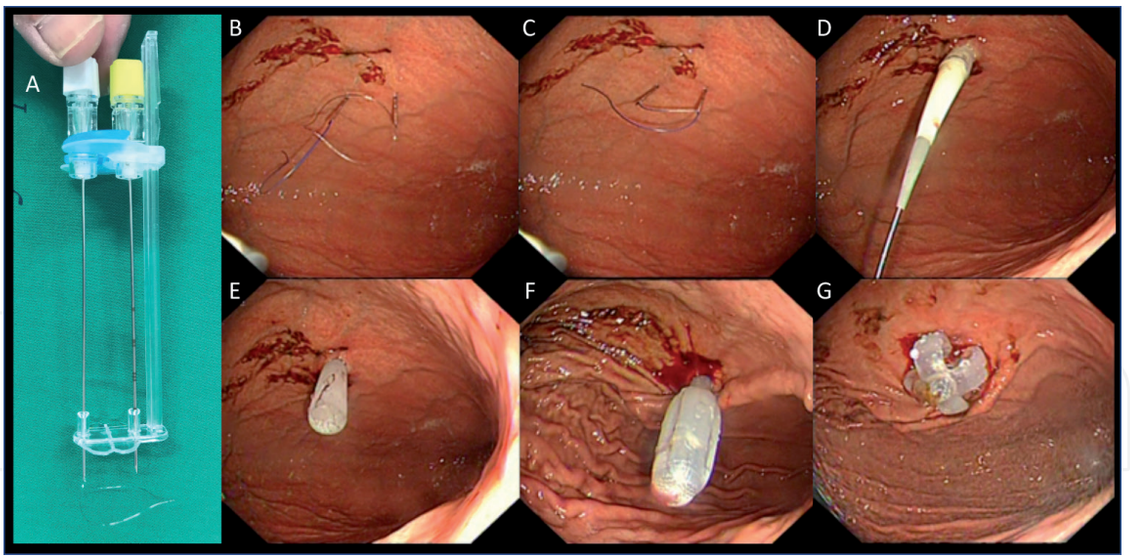

Figure 1.
Percutaneous Endoscopic Gastrostomy (PEG); Endoscopic view of introducer technique. (A) Double-needle gastropexy. (B) Puncture of the double-needle gastropexy and forming the loop to hold the suture. (C) The suture from one of the needles passes through the loop wire from the other needle and tightens the loop. The double-needle device is removed. (D) Puncture and insertion the dilating catheter over the guidewire. (E) The dilating catheter and guidewire are removed. (F) The gastrostomy tube is inserted through the sheath, and then the sheath is peeled away. (G) The bumper of a 24 Fr bumper-type gastrostomy tube (IDEAL PEG Kit; MD-43430; Akita Sumitomo Bakelite Co. Ltd., Akita, Japan).

the snare. The needles are withdrawn, and the suture is tied to the left upper quadrant of the anterior abdominal wall. A second gastropexy is performed 2–3 cm apart in the same way. The gastric wall is then punctured and the dilator inserted over the guidewire, followed by the gastrostomy tube (**Figure 1**) [16, 17].

Previous abdominal surgery of the upper abdomen is a relative contraindication because of altered intra-abdominal anatomy [9, 60]. However, there are reports that safe PEG introduction can be achieved safely with the use of transillumination (using an endoscope passed through the abdominal wall with clear endoscopic intra-gastric visualization by external palpation) [61], a plain abdominal film with air insufflation technique, and computed tomography guided PEG [62–64], and laparoscopic-assisted PEG. These techniques aim to avoid intra-abdominal organ injury [18, 65].

Although the introducer PEG is a proven effective and safe procedure, it suffers the limitation of requiring endoscopy. Passing the endoscope beyond the tumor may be difficult and there is a risk of esophageal perforation in severe esophageal luminal occlusion. In advanced cases, surgical gastrostomy and laparoscopic-assisted PEG are the alternative procedures [17, 18]. A recent study published the comparison of both techniques, and the laparoscopic-assisted PEG had advantages in the procedural duration, blood loss, postoperative pain, and hospitalization [18].

6. Complications

Although the push/introducer PEG is a minimally invasive technique that demonstrates a method in enteral nutrition [10, 17, 18, 66, 67], it is associated with several complications [9, 17, 68], including death in patients with underlying comorbidities [69].

Bleeding is the most common complication and is usually minor and manifest as oozing around the feeding tube. Apply the simple compression should stop the bleeding. If the bleeding more severe, it might be due to injury to e.g. gastric and

gastroepiploic arteries. A pressure dressing is often effective but if bleeding continues, it can be treated by endoscopy, embolization, or surgery [9, 17, 57]. Selecting carefully the correct anatomical site and correcting a coagulopathy, if present, should prevent or minimize the risk of bleeding complications.

Abdominal organ injuries to the small bowel, colon, liver, and spleen may occur caused by the interposition of these organs between the gastric wall and the abdominal wall [9, 57, 70–73]. EGD should always be performed using transillumination, for clear intra-gastric visualization, and external palpation to identify and interposition of the internal organs [61]. If there is doubt, then laparoscopy can be performed to assure direct visualization of the intra-abdominal cavity [18].

Aspiration pneumonia is a severe complication and is associated with a mortality of PEG [9, 57]. Esophageal cancer patients, especially in elderly, heavy smokers with or without chronic obstructive pulmonary disease (COPD), have a higher risk of aspiration pneumonia compared to other patients and is related to residual liquid or food in the esophagus proximal to the obstruction. By technical for advanced esophageal cancer patients, the pediatric endoscope often chosen for the PEG procedure. The endoscope's small diameter is followed by the small endoscopic channel, resulting in less suction performance than the standard endoscope. Measures to reduce the risk of aspiration include the use of topical pharyngeal anesthesia rather than sedation, frequent mouth suction, and the reverse Trendelenburg position [74, 75].

The buried bumper syndrome (BBS) occurs when the internal bumper erodes into the wall of the stomach and sometimes becomes entirely buried within the gastric wall. It might cause by a disproportionate size and length of the feeding tube with the thickness of the abdominal wall. The main causative factor is excessive tightening of the external bumper, leading to increased pressure of the internal bumper on the wall of the stomach, local ischemia and gastric wall erosion (**Figure 2**). Additional risk factors include obesity, weight gain, malnutrition, corticosteroid therapy, and poor wound healing. BBS is a late complication and usually occurs > one year post PEG but it may be seen within several weeks of PEG placement. It may be asymptomatic or cause pain. Malfunction of the PEG is common, leading to leakage around the entry site, difficulty administering the feeds, fluids or drugs, infection, abscess or peritonitis [76, 77]. If BBS occurs, the tube should be removed by endoscopy, surgical intervention, or external traction, depending on the type of feeding tube and the patient's situation [9, 77, 78].

Necrotizing fasciitis is the rare and severe PEG complication and is associated with a high mortality. Local ischemia leads to bacterial infection with a mix of anaerobic and aerobic organisms from gastrointestinal tract and skin. The infection progresses rapidly along with fascial plane and causes extensive abdominal fascia necrosis [79]. Treatment includes urgent aggressive and wide surgical debridement, intravenous broad-spectrum antibiotics and close clinical monitoring in the intensive care unit [9, 80–82]. The prognosis is very poor.

Granuloma formation is a minor but common complication that results from peristomal hyper-granulation due to friction of the PEG tube and humidity due to tube leakage [83, 84]. Patients are prone to local infection and contact bleeding. Treatment includes topical antibiotics, topical steroids, electrocauterization, or cauterizing by silver nitrate. Surgical debridement may be required for sizeable peristomal granulomas [9, 83, 85].

Peristomal leakage and local infection are also minor complications that causing discomfort, pain and annoyance for patients and their families. Good peristomal hygiene and dressings combined with reducing the volume of feeds and minimizing PEG tube movements are treatment options. If these failed, removing the PEG tube and placing it in another area can be done or abandoning PEG enteral feeding for another form [9, 57, 68].

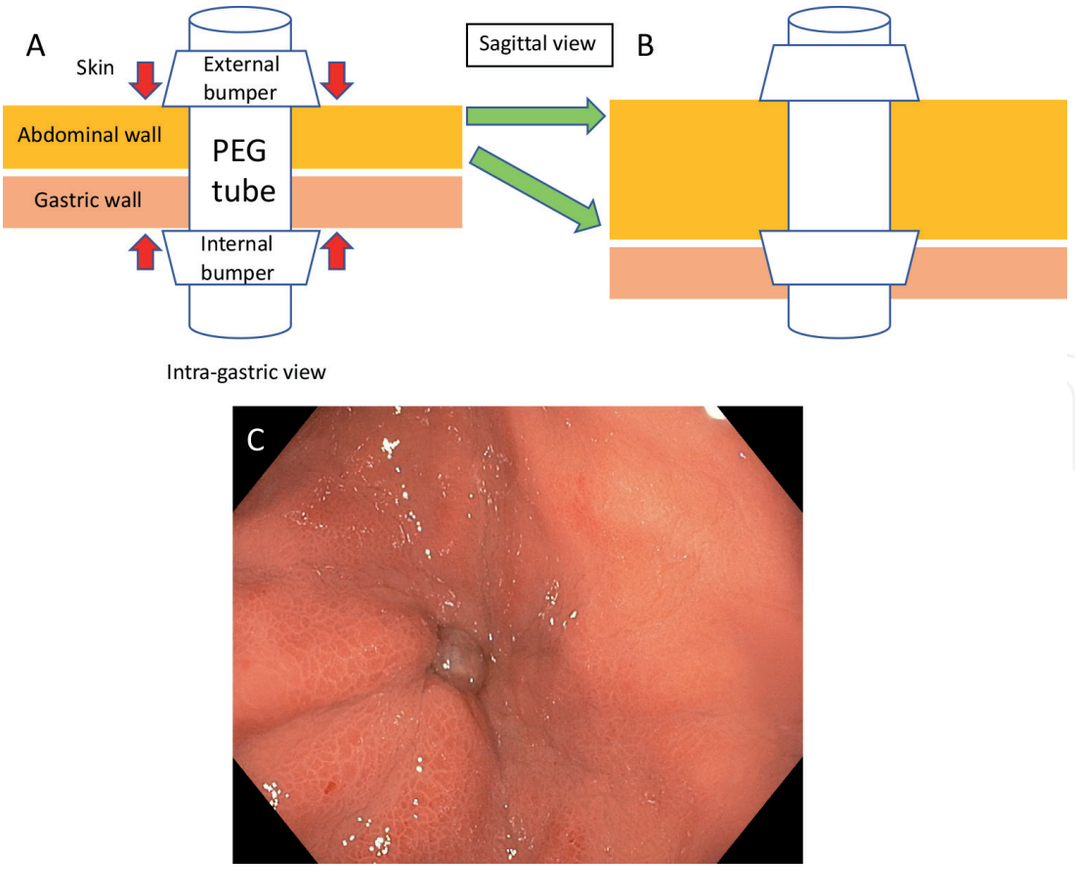

Figure 2.
Buried bumper syndrome. (A, B) The external and internal bumper held correctly in position (A) but with pressure and ischemic necrosis, the internal migrates through the gastric wall into the abdominal wall (B). (C) Endoscopic examination of a patient with the Buried Bumper syndrome.

7. Conclusion

Percutaneous endoscopic gastrostomy is a minimally invasive procedure for the patients who need enteral nutrition support, hydration, and medications. For esophageal cancer patients and palliative care, the introducer technique is the optimal technique and prevents cancer seeding from the operative procedure.

Acknowledgements

The author would like to thank Assistant Professor Jirawat Swangsri M.D., Ph.D. (Department of Surgery, Siriraj Hospital, Mahidol University) for the first case technical assistance with the introducer PEG procedure in Thammasat University Hospital.

Conflict of interest

The author declares no conflict of interest.

Notes/thanks/other declarations

Special thanks to Dr. Bob Taylor for assistance in editing the English version of this chapter.

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