

The role of endoscopy in enteral feeding

This is one of a series of statements discussing the use of GI endoscopy in common clinical situations. The Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy (ASGE) prepared this text. This guideline updates a previously issued guideline on this topic.¹ In preparing this guideline, a search of the medical literature was performed using PubMed. Additional references were obtained from the bibliographies of the identified articles and from recommendations of expert consultants. When few or no data exist from well-designed prospective trials, emphasis is given to results from large series and reports from recognized experts. Guidelines for appropriate use of endoscopy are based on a critical review of the available data and expert consensus at the time that the guidelines are drafted. Further controlled clinical studies may be needed to clarify aspects of this guideline. This guideline may be revised as necessary to account for changes in technology, new data, or other aspects of clinical practice. The recommendations are based on reviewed studies and are graded on the strength of the supporting evidence (Table 1).² The strength of individual recommendations is based on both the aggregate evidence quality and an assessment of the anticipated benefits and harms. Weaker recommendations are indicated by phrases such as “We suggest . . .,” whereas stronger recommendations are typically stated as “We recommend . . .”

This guideline is intended to be an educational device to provide information that may assist endoscopists in providing care to patients. This guideline is not a rule and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment. Clinical decisions in any particular case involve a complex analysis of the patient's condition and available courses of action. Therefore, clinical considerations may lead an endoscopist to take a course of action that varies from these guidelines.

The purpose of this guideline is to provide an updated, practical strategy for the use of endoscopically placed enteral feeding tubes in patients who are unable to maintain sufficient oral intake. Enteral access is the foundation of nutritional support. It is preferred over parenteral nu-

trition because of preservation of gut function, integrity and immune mechanisms, and lower risks and costs.

Nasoenteric feeding tubes are commonly used for short-term nutritional support. There are a variety of approaches to nasoenteric feeding tube placement, including blind passage, fluoroscopically assisted, endoscopic, ultrasound assisted, and magnet assisted.³ Intra-gastric feedings may be more physiologic, but small-bowel feedings are more reliable in critically ill patients, especially in those with ileus and gastric feeding intolerance. However, current data are insufficient to show a significant decrease in aspiration or pneumonia with small-bowel feeds.^{4,5}

PEG, jejunal extension through a PEG (PEGJ), or direct percutaneous endoscopic jejunostomy (DPEJ) is appropriate for persons who require long-term nutritional support. PEG was introduced in 1980 as an alternative to laparotomy for surgical placement of feeding tubes, although radiologic approaches are also commonly in use.⁶⁻⁹ PEG is typically performed with the patient moderately sedated, has low morbidity, and is successful in more than 95% of patients.^{10,11}

INDICATIONS

Enteral nutrition (EN) should be considered for patients who have an intact, functional GI tract but are unable to consume sufficient calories to meet metabolic demands. Nasoenteric feeding is the preferred approach to feeding patients who are expected to resume peroral nutrition within 30 days. When longer term EN is required, either feeding gastrostomy or jejunostomy is indicated. In patients with acute dysphagic stroke, PEG placement should be considered in those patients who do not improve after a 2- to 3-week trial of nasoenteric tube feeding.¹²⁻¹⁴ Because peroral nutrition typically exacerbates severe pancreatitis, these patients have often received parenteral nutrition. However, in a meta-analysis of patients with severe acute pancreatitis, EN leads to a statistically significant reduction in infectious complications and mortality compared with those receiving parenteral nutrition.¹⁵

Frequent clinical scenarios in which PEG placement is performed include impaired swallowing associated with neurologic conditions and neoplastic diseases of the oropharynx, larynx, and esophagus. Less commonly, PEG placement is performed in patients with head or facial trauma and in those with miscellaneous catabolic conditions who require supplemental feedings. PEG may also be useful to attain gastric decompression in selected individuals with benign or

TABLE 1. GRADE System for rating the quality of evidence for guidelines

Quality of evidence	Definition	Symbol
High quality	Further research is very unlikely to change our confidence in the estimate of effect	⊕⊕⊕⊕
Moderate quality	Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate	⊕⊕⊕○
Low quality	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate	⊕⊕○○
Very low quality	Any estimate of effect is very uncertain	⊕○○○

Adapted from Guyatt GH, Oxman AD, Vist GE, et al; GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924-6.

malignant GI dysmotility (eg, gastroparesis) or obstruction (eg, peritoneal carcinomatosis).¹⁶

PEGJ is appropriate for patients requiring long-term EN who have severe gastroesophageal reflux, gastroparesis, or repeated tube feeding–related aspirations.^{17,18} Likewise, DPEJ has indications similar to those for PEGJ but also includes patients with anatomy precluding PEG (eg, post-surgery).^{19,20} PEGJ and DPEJ have also been shown to be beneficial in patients with chronic pancreatitis and persistent nutritional compromise.²¹

CONTRAINDICATIONS

Absolute contraindications to PEG placement include the inability to bring the anterior gastric wall in apposition with the abdominal wall, pharyngeal or esophageal obstruction, and significant coagulopathy. Relative contraindications to PEG, PEGJ, and DPEJ include ascites and neoplastic, inflammatory, and infiltrative diseases of the gastric and abdominal walls. The usual list of absolute and relative contraindications relating to the performance of upper endoscopy also apply. Previous gastric resection, hepatomegaly, and obesity may impede gastric transillumination and subsequent PEG placement. PEG should not be used for nutritional support when GI tract obstruction is present.

In esophageal cancer, some physicians prefer to avoid PEG placement before neoadjuvant therapy because of concern for tumor seeding and the inability to use the stomach as a conduit after esophagectomy.^{22,23} However,

2 single-center retrospective studies of a total of 338 patients demonstrate that PEG may be placed before neoadjuvant therapy without compromising the subsequent esophagectomy with gastric pull-through.^{24,25} In these patients, either nasogastric or jejunal feeding tubes are also options for EN.

PROCEDURE

Preprocedure considerations

There are several important considerations for patients undergoing transabdominal endoscopic enteral access. First, because many patients requiring EN are unable to provide informed consent, consent must be obtained from the patient's legal guardian or surrogate.²⁶ Routine laboratory testing before endoscopy is not indicated. Rather, pre-endoscopy laboratory tests should be performed selectively guided by history, physical examination, and risk factors.²⁷ PEG placement is considered a higher risk procedure for bleeding, and antithrombotic therapy should be adjusted according to published guidelines.²⁸ The most common complication of PEG is wound or peristomal infection. Two large meta-analyses have shown that antimicrobial prophylaxis leads to a statistically significant reduction in the frequency of peristomal wound infection.^{29,30} Antimicrobial prophylaxis is also cost-effective.³¹ Parenteral cefazolin (or another antibiotic with similar coverage) should be administered 30 minutes before PEG placement.³² Such prophylaxis is only necessary in those patients not already receiving appropriate antibiotic treatment at the time of PEG insertion. In situations in which methicillin-resistant *Staphylococcus aureus* (MRSA) is endemic, screening for MRSA and decolonization before PEG placement may decrease peristomal MRSA infections.^{33,34}

Procedure considerations

The most widely used PEG technique is the pull method introduced by Gauderer and Ponsky in 1980.^{6,7,35,36} Several modifications of the original technique have been reported. The gastrostomy tube may also be placed by a push method, which yields comparable results.^{37,38} A radiologic percutaneous method for gastrostomy placement also has been described.⁹ Advantages of this latter technique include feasibility in the presence of high-grade pharyngeal or esophageal obstruction and the ability to fluoroscopically visualize and thereby avoid bowel overlying the stomach. A detailed discussion of endoscopic techniques for enteral nutrition and comparison with radiologic and surgical approaches can be found in another ASGE document.³

The basic elements common to all these techniques include (1) the need for adequate insufflation to bring the luminal wall in apposition with the abdominal wall, (2) percutaneous placement of a tapered cannula through the abdominal wall, (3) passage of a suture or guidewire into the lumen, and (4) placement of the feeding tube or

button. Critical to the safe and successful placement of a feeding tube is that adequate insufflation be obtained for the required apposition. It is not mandatory to perform a repeat or second-look endoscopy to confirm proper placement of the internal bumper immediately after feeding tube placement but may be performed at the discretion of the endoscopist, especially if there is suspicion of improper bumper position.^{39,40}

The DPEJ technique is a modification of PEG placement. Although it is similar to PEG placement, DPEJ placement is more difficult to perform and requires the use of a pediatric colonoscope or enteroscope to reach the jejunum in those patients without previous upper GI tract surgery. Overall success is lower with DPEJ than with PEG placement.³

Postprocedure considerations

Although endoscopists have historically delayed initiation of feeding for 24 hours after PEG placement, a meta-analysis of 6 randomized, controlled trials of 467 patients found no difference in complications or short-term mortality in patients who received early PEG feeding (≤ 4 hours) compared with delayed or next day feeding.⁴¹

In the past, abdominal binders have been placed in patients considered at risk of inadvertently pulling their feeding tube.¹⁰ However, abdominal binders may increase the risk of stomal breakdown by mechanical pressure caused by torsion.⁴² In cases of repeat PEG tube dislodgments, a low-profile button can be placed.

Leakage of gastric contents or tube feeds around the PEG site has been reported to occur in 1% to 2% of patients. Potential risk factors for tube feed leakage include peristomal infection, hydrogen peroxide use for cleansing, torsion on the tube, absence of external bolster, and buried bumper syndrome.⁴³

Endoscopically placed feeding tubes often become clogged by tube feeds and/or medications. Feeding tubes should be flushed with 30 to 60 mL of water after administration of nutrition or medications. When the feeding tube becomes clogged, installation of warm water, carbonated beverages, or pancreatic enzymes may be effective in restoring tube function.⁴⁴

Initially, PEG tubes were typically removed under endoscopic guidance by cutting the feeding tube just external to the skin and endoscopically removing the internal bumper. A nonendoscopic technique for PEG removal known as the "cut-and-push" technique involves cutting the external portion of the tube as close to the skin as possible and then pushing the internal bumper into the stomach with a Foley catheter with spontaneous rectal passage of the internal bumper. In 2 series of a total of 137 patients undergoing the cut-and-push technique, 3 patients (2.2%) required endoscopic removal of the internal bumper.^{45,46} Case reports have described bowel obstruction with this nonendoscopic technique such that the cut-and-push technique should not be used in patients with GI

dysmotility, previous abdominal surgery, or anatomic abnormalities of the GI tract.⁴⁷⁻⁴⁹ Another common approach for nonendoscopic removal is application of gentle manual traction and removal of the PEG tube with its internal bumper through the gastrostomy site. In this technique, the patient may experience transient discomfort of varying severity. Administration of local anesthesia at the gastrostomy site may decrease discomfort on PEG removal.^{50,51}

COMPLICATIONS

Patients undergoing PEG are often at high risk of complications caused by associated comorbidity. The overall PEG complication rate is reported to range from 4.9% to 10.3%.⁴³ Serious complications of PEG placement occur in 1.5% to 4% of cases and include aspiration, bleeding, injury to internal organs, perforation, buried bumper syndrome, prolonged ileus, wound infections, necrotizing fasciitis, and, rarely, death.⁴³ Minor complications associated with PEG placement occur in approximately 6% of patients and include tube occlusion, maceration from feeding tube leakage, and peristomal pain.⁵² In a meta-analysis, procedure-related mortality was reported to be 0.5%, with a 30-day all-cause mortality of 15%.⁵² Patients with head and neck cancer may be at increased risk of major complications compared with patients undergoing PEG for other indications.⁵³ The risk of tumor seeding in patients with oropharyngeal tumors who undergo PEG placement is considered to be less than 1%.⁵⁴ Rarely, the PEG tube is inadvertently inserted into or through the colon. In a review of 28 cases with this complication, the most common presenting symptoms were diarrhea and fecal discharge around the PEG site.⁵⁵ In many cases, these symptoms occurred only after the PEG was replaced. If a colocolic or gastrocolic fistula is identified, the PEG may be removed with spontaneous closure, or, in some cases, surgical repair may be required. Pneumoperitoneum occurs commonly after PEG. Pneumoperitoneum is usually clinically insignificant unless accompanied by signs and symptoms of peritonitis.^{56,57}

A mature fistulous tract is required to safely replace a percutaneous gastrostomy tube or button. Nonendoscopic replacement of a dislodged tube or button is contraindicated in the absence of a mature tract because of the potential for intraperitoneal spillage. In the absence of peritonitis, nonoperative management of early dislodgment of PEG usually requires nasogastric decompression, intravenous antibiotics, and PEG replacement several days later.

DPEJ is associated with the same type of complications as seen with PEG. In a large retrospective study from a single expert center, the mortality rate with DPEJ was 0.3% with serious adverse events occurring in 4.2%.²⁰ A unique complication associated with DPEJ is jejunal volvulus.^{20,58}

OUTCOMES

The long-term outcomes of patients who undergo PEG depend on the underlying indication for the PEG. In a cohort of 7369 veterans who underwent PEG, 24% died during the hospital admission during which the PEG was placed, and the median survival was only 7.5 months.⁵⁹ In another study of 81,105 Medicare beneficiaries who underwent gastrostomy placement (59,969 endoscopically and 21,136 operatively placed), in-hospital mortality occurred in 15%.⁶⁰ The 1- and 3-year mortality rates were 63% and 81%, respectively. The short-term mortality after PEG is frequently attributable to the patient's underlying comorbidities rather than procedure-related complications.⁶¹ Among 598 patients undergoing PEG at a single institution, 154 patients recovered an adequate oral diet to allow the PEG to be removed after 169 ± 244 days (range 6-1337 days).⁶²

SPECIAL CONSIDERATIONS IN A PEDIATRIC POPULATION

Feeding gastrostomy tube placement is most commonly indicated in children with neurodisability and/complex congenital cardiac disorders.^{63,64} In the former group, gastrostomy is often combined with a surgical antireflux procedure, and, therefore, the gastrostomy is commonly placed surgically either laparoscopically or via limited laparotomy.⁶⁴ The technique for endoscopic placement of PEG tubes is the same as for adults; however, general anesthesia is typically used. Overall complication rates are low and comparable to those of the adult population.⁶³⁻⁶⁵ A significant risk factor for postprocedure bacterial sepsis specific to the pediatric population is a previous ventriculoperitoneal shunt.⁶⁵ Endoscopic placement may not be possible in children with congenital orofacial anomalies or injury and may not be ideal for individuals with epidermolysis bullosa or spinal muscular atrophy or for very small infants.^{66,67} One study showed that complication rates were similar for PEG tubes and button placement.⁶⁸

ETHICAL CONSIDERATIONS

Although enteral access will provide patients with nutritional support, decisions regarding placement of feeding tubes is complex and depend on a variety of factors, including patient preferences, quality of life, and prognosis. Although nutrition is considered to be one of the most basic human needs, the use of feeding tubes to provide this nutrition may not match societal values in some situations. Given that tube placement is invasive and may be painful, one must consider whether the benefits of the treatment outweigh the burdens for each patient.⁶⁹ The implications of long-term nutritional support with a PEG may have major implications for both the patients and

their families.⁷⁰ For a more detailed and thorough review of the ethical and medicolegal aspects of PEG placement, the reader is referred to the ASGE Task Force on Enteral Nutrition document.⁷¹ Recommendations for PEG placement should be individualized with consideration given to quality of life and prospects for recovery. Some authors have proposed criteria to assist in the decision-making process regarding feeding tube placement.⁷²

RECOMMENDATIONS

1. We suggest nasoenteric feeding as the preferred approach to feeding patients who are expected to resume peroral nutrition within 30 days. (⊕⊕○○)
2. We suggest that a variety of factors, including patient preferences, quality of life, and prognosis be addressed with the patient and the family before placement of feeding tubes. (⊕⊕○○)
3. In patients not predicted to resume peroral nutrition within 30 days, we suggest that nutrition be provided via a percutaneous endoscopic feeding tube. (⊕⊕○○)
4. We suggest that PEGJ or DPEJ are indicated in patients with severe gastroesophageal reflux, gastroparesis, or repeated tube feeding-related aspirations. (⊕⊕○○)
5. We recommend a prophylactic dose of antibiotic be given intravenously before percutaneous endoscopic feeding tube placement. (⊕⊕⊕⊕)
6. We suggest that tube feeds may be safely started in most patients within 4 hours of endoscopic percutaneous tube placement. (⊕⊕○○)

DISCLOSURE

All authors disclosed no financial relationships relevant to this publication.

Abbreviations: DPEG, direct percutaneous endoscopic jejunostomy; EN, enteral nutrition; MRSA, methicillin-resistant Staphylococcus aureus; PEGJ, jejunal extension through a PEG.

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