SUMMARY

Percutaneous endoscopic gastrostomy (PEG) facilitates nutritional support in patients with dysphagia or critical illness, but is associated with specific complications. The optimal timing of placement for these tubes should be based on clinical judgment, experience, and patient condition. PEG tubes are appropriate if greater than 4 weeks of enteral nutritional support is expected.

RECOMMENDATIONS

- **Level 1**
  - Early feeding within 4 hours of PEG placement is safe.

- **Level 2**
  - PEG should be considered in the following situations:
    - Anticipated need for ≥ 4 weeks of enteral nutrition support
    - Esophageal obstruction
    - Neurologic dysphagia
    - Supplemental nutrition for patients undergoing chemo- or radiation therapy
    - Life expectancy greater than 4 weeks

- **Level 3**
  - Timing of PEG tube placement should be based on clinical judgment.

INTRODUCTION

The first PEG tube was placed in 1980 by Dr. Michael W.L. Gauderer, pediatric surgeon, Dr. Jeffrey Ponsky, endoscopist, and Dr. James Bekeny, surgical resident using a “push” method. Since that time, the procedure has undergone many upgrades and has evolved into the commonly used “pull” method. When placing these tubes, three basic tenets are followed for safe practice: 1) the stomach must be distensible, 2) the endoscopist must be able to identify a blunt push on the stomach from the assistant, and 3) the abdominal wall must transilluminate. If these three tenets are followed, a PEG can be placed without complication or difficulty greater than 95% of the time.

LITERATURE REVIEW

PEG tubes are designed to give patients a reliable, comfortable way to receive enteral nutritional support when oral intake is not feasible. There are clear indications and contraindications for the placement of PEG tubes.

**Indications**

The need for nutritional support, including the reason for the patient’s feeding difficulty, should be clearly identified. Appropriate indications generally include esophageal obstruction, neurological conditions with dysphagia, inability...
to swallow, and need for supplemental nutrition in patients undergoing chemotherapy or radiation therapy. A comprehensive list of indications and contraindications is listed in Table 1. In the geriatric patient population, there is no proven benefit in markers of nutrition among patients with impaired oral intake who receive PEG tubes (1,2). There is retrospective evidence to support early PEG tube placement in patients with severe traumatic brain injury (TBI) (3). PEG tube placement in severe TBI patients is also more cost-effective than open gastrostomy (4). In patients with metastatic gastrointestinal obstruction, palliative decompressive / venting PEG tubes can significantly reduce symptoms of nausea and vomiting with minimal complications (5).

**Contraindications**

Multiple authors and consensus statements agree that there are situations where PEG tubes are contraindicated. PEG tubes should generally not be offered to patients who will resume normal oral intake within four (4) weeks. These patients may be managed with nasoenteric feeding tubes as their ability to eat returns. During the procedure, if the surgeon is unable to distend the stomach with adequate insufflation, cannot see finger invagination of the stomach through the abdominal wall, or cannot trans-illuminate the abdominal wall, the procedure should be aborted. A PEG tube should not be offered if life expectancy is less than 4 weeks, there is no chance for physiological recovery, or PEG cannot improve the patient’s quality of life (1,2,5,6).

Table 1: Indications and Contraindications for the placement of a Percutaneous Endoscopic Gastrostomy (modified from Friginal-Ruiz and Lucendo) (6)

<table>
<thead>
<tr>
<th>Patients with potentially reversible diseases where PEG removal is expected once the process has resolved</th>
<th>Indications</th>
<th>Contraindications</th>
</tr>
</thead>
</table>
| Neurological diseases  
- Guillain-Barre syndrome, stroke, cranial trauma  
Anorexia nervosa  
Hyperemesis gravidarum  
Severe burns  
Multiple injuries and facial trauma  
Transplants with prior malnutrition  
Head & neck tumors requiring chemotherapy / radiotherapy  
Diseases of the esophagus | Non-swelling esophageal obstruction  
Active gastric pathology  
Total gastrectomy  
Extreme obesity  
Hostile abdomen from previous surgery |

<table>
<thead>
<tr>
<th>Patients with irreversible diseases, but prolonged survival anticipated, where PEG will improve their quality of life</th>
<th>Indications</th>
<th>Contraindications</th>
</tr>
</thead>
</table>
| Neurological diseases  
- Amyotrophic lateralizing sclerosis, multiple sclerosis, dementia, Parkinson’s disease, Alzheimer’s disease, stroke, post-anoxic encephalopathy, brain metastases, brain tumors, polymyositis, brain injury (traumatic or surgical)  
Progressive muscular dystrophy  
Head & neck tumors  
Facial malformations and oropharyngeal neoplasms  
Dermatomyositis and polymyositis  
Amyloidosis  
Cystic fibrosis  
Short bowel syndrome  
Inflammatory bowel disease  
Scleroderma | Colonic interposition  
Partial or subtotal gastrectomy  
Massive ascites  
Portal hypertension (gastric varices)  
Peritoneal dialysis  
Active gastric pathology  
Coagulation disorders  
Sepsis  
Cardiorespiratory disease that prevents endoscopy |

<table>
<thead>
<tr>
<th>Patients with terminal and debilitating diseases with a relatively long-life expectancy</th>
<th>Indications</th>
<th>Contraindications</th>
</tr>
</thead>
</table>
| Encephalitis  
Repeated stroke  
Advanced malignancies  
AIDS (terminal stages)  
Intestinal obstruction by peritoneal carcinomatosis  
Radiation enteritis  
Severe acute pancreatitis | | |
Timing
There is no Level I data associated with the timing of PEG placement except in patients with recent stroke. The prospective, randomized FOOD trial demonstrated that following acute stroke better functional outcomes were seen in patients fed through a nasogastric tube vs. a PEG in the first 2-3 weeks (7). There was no significant difference in survival, however.

Complications
There is a wide host of complications associated with PEG tube placement. Most PEG-associated complications are technical errors and carry a high mortality (8). In one retrospective study, the complication rate was cited at 36%, although most were minor complications (9). The most common complication was PEG tube dislodgment. Common complications are listed in Table 2.

Table 2: Complications of PEG: Causes and Attitudes of Resolution (modified from Friginal-Ruiz and Lucendo) (6)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Prevention / Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necrotizing fasciitis</td>
<td>Necrosis of the superficial fascia</td>
<td>Broad-spectrum antibiotics</td>
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<tr>
<td></td>
<td></td>
<td>Surgical debridement</td>
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<tr>
<td>Bleeding from the puncture site</td>
<td>Surrounding vessel injury</td>
<td>Increase traction on the tube to obtain compressive hemostasis</td>
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<tr>
<td>or the gastric mucosa</td>
<td></td>
<td>If unsuccessful, remove tube and perform endoscopic coagulation</td>
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<tr>
<td>Aspiration</td>
<td>Aspiration of refluxed content from the stomach</td>
<td>Raise the head of the bed</td>
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<td></td>
<td></td>
<td>Consider adjusting feeding rate</td>
</tr>
<tr>
<td>Irritation / infection of the</td>
<td>Excessive pressure on the stoma</td>
<td>Adjust the distance between the external retention ring and the</td>
</tr>
<tr>
<td>skin surrounding the stoma</td>
<td>Lack of peristomal hygiene</td>
<td>stoma</td>
</tr>
<tr>
<td>Obstruction of the PEG tube</td>
<td>Dried food or product clogging the tube</td>
<td>Clean the stoma daily</td>
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<tr>
<td></td>
<td>Lack of water flushing after and between food / medication</td>
<td>Place a single layer of gauze beneath the retention ring and</td>
</tr>
<tr>
<td></td>
<td>administration</td>
<td>change daily</td>
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<td></td>
<td></td>
<td>Consult a wound care / ostomy nurse</td>
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<tr>
<td>Tube dislodgement</td>
<td>PEG tube comes out accidentally or voluntarily</td>
<td>Immediately replace tube</td>
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<td>Tube cannot be rotated</td>
<td>Burial of the tube in the abdominal wall</td>
<td>Rotate and push tube gently inward</td>
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<tr>
<td></td>
<td></td>
<td>If unable to turn, remove and substitute tube</td>
</tr>
<tr>
<td>Nausea / vomiting</td>
<td>High osmolarity of the formula</td>
<td>Appropriately dilute the formula</td>
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<td></td>
<td>Infusion excessively fast</td>
<td>Return to previous infusion diet</td>
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<tr>
<td></td>
<td>Lactose-intolerance</td>
<td>Lactose-free diet</td>
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<td></td>
<td>Excessive fat content in the diet</td>
<td>Use low-fat diet</td>
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<tr>
<td>Diarrhea</td>
<td>Hyperosmolar solution</td>
<td>Use isotonic diets and/or dilute hyperosmolar ones</td>
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<tr>
<td></td>
<td>Lactose intolerance</td>
<td>Suppress lactose</td>
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<td></td>
<td>Poor absorption of fats</td>
<td>Use low-fat formulas</td>
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<tr>
<td></td>
<td>Diet cold</td>
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<tr>
<td>Constipation</td>
<td>Low-fluid administration</td>
<td>Administer fluids in adequate amounts</td>
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<td></td>
<td>Insufficient fiber intake</td>
<td>Increase dietary fiber</td>
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<td>Peristomal granulation</td>
<td>Proliferation of granulation tissue around the stoma</td>
<td>Resection and/or cauterization of tissue</td>
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</tbody>
</table>
Early versus delayed feeding of PEG tubes
There is evidence supporting early (<4 hours after PEG placement) vs. delayed (>24 hours after PEG placement) feeding. Several observational studies and RCTs have evaluated the differences between the two groups and a meta-analysis of six RCTs comparing early vs. delayed feeding found no significant difference in complications (10). There was a significant increase in gastric residual volumes on day 1 in the early feeding group, but this did not pose any increase in complication rate. Early feeding is safe and tolerated well by patients.

REFERENCES