

# **ENDOSCOPIC APPROACHES TO ENTERAL FEEDING: CORE CURRICULUM – December 2002**

*ASGE Committee on Training*

## **PREAMBLE**

*This document, prepared by the ASGE Committee on Training was undertaken to describe recommendations for training in techniques in endoscopic enteral feeding access. It is written primarily for those endoscopists involved in teaching endoscopy to fellows/trainees. This core curriculum was developed as an overview of techniques currently favored for the performance and training of these techniques, and to serve as a guide to published references, videotapes and other resources available to the trainer. By providing information to endoscopy trainers about the common practices utilized by experts in performing these procedures, ASGE hopes to improve the teaching and performance of these procedures for enteral feeding access.*

## **I. INTRODUCTION**

Acquiring the skills to perform techniques in endoscopic enteral feeding access safely and effectively requires an understanding of the indications, risks and limitations of these procedures. As a prerequisite, competence in upper endoscopy is required including visualization of the upper GI tract, minimizing patient discomfort, proper identification of normal and abnormal findings, and basic therapeutic techniques. ASGE documents including Principles of Training of Gastrointestinal Endoscopy, Sections of the Gastroenterology Core Curriculum, and the recently completed EGD Core Curriculum review requirements for endoscopic trainers and the training process itself. These core documents are pertinent and recommended for all endoscopy trainers and trainees. Sections of the Gastroenterology Core Curriculum reviewing training in nutrition are also pertinent, as any decision to place enteral feeding access should be done in the setting a full nutritional assessment and plan.

## **II. PERI-PROCEDURE MANAGEMENT**

### **A. Ethical Considerations, Patient Selection**

The ethics of enteral feeding remains a difficult issue, in part because there is no current evidence that tube feeding improves comfort, survival, functional status, or prevents aspiration in many patient groups including those with dementia. These complex issues should be introduced to the trainee during formal teaching sessions, as well as during each consultation where endoscopic enteral feeding access is considered. The trainee must understand that the endoscopist is uniquely positioned as both the technician who places these access devices, and the physician who should consider whether or not the procedure will benefit the patient in a meaningful way. Realistically assessing the expectations of patients, family and other caregivers, and weighing the risks, benefits and alternatives of

enteral feeding access is challenging, but is properly a responsibility of the endoscopist and ultimately, the trainee. Guidelines and reviews of these issues are noted in the reference section, and should be shared with all trainees.

All trainees must understand indications and contraindications for all endoscopic techniques of enteral access. In recent years, many contraindications to PEG placement have been rendered relative, as careful patient selection and strict adherence to proper techniques may allow successful PEG placement in some patients with ascites, severe obesity, peritoneal metastasis, or ventriculo-peritoneal shunts, for example. Trainees must also be aware of situations where short-term nasoenteric feeding is preferable to more permanent access, and conditions in which standard PEG placement will be unsuccessful or problematic such as gastric resection, outlet obstruction, gastric dysmotility and severe reflux. Jejunal feeding access may be preferable in many of these patients. The trainee should also be aware of data favoring jejunal feeding in other clinical situations such as in severe pancreatic disease, where pancreatic stimulation may be avoided with more distal delivery of feedings.

## **B. Pre-procedure Management**

Trainees must ultimately learn to choose among the wide variety of techniques for enteral access, some endoscopic and others non-endoscopic, including manual nasoenteric tube placement, radiology assisted techniques, and surgical gastrostomies and jejunostomies. When endoscopic methods are considered, the trainee needs to understand that special attention must be paid to issues of moderate sedation and airway assessment in these patients, many of whom have head and neck malignancies, stroke, altered mental status, or are elderly. ASGE clinical guidelines on moderate sedation and modification in endoscopic practice for the elderly are referenced and recommended for review. They are also available on the ASGE website (<http://www.asge.org>). As with all endoscopic procedures, a thorough understanding of the informed consent process, patient education, anticoagulation issues and antibiotic prophylaxis is required of every endoscopy trainee. Full discussion of all these issues are beyond the scope of this document, but are covered in ASGE guidelines referenced. Regarding antibiotic prophylaxis for PEG procedures, studies support the use of cefazolin or other broad-spectrum agents in decreasing infectious complications, and their use is recommended.

## **C. Patient Management and Physician Behavior During Procedures**

During endoscopic enteral access procedures, communication between the endoscopist and assistants is essential, but this skill may be underdeveloped by the early trainee focused on the technical aspects of the procedure. Similarly, the inexperienced trainee may have difficulty overseeing moderate sedation and responding to patient discomfort during the procedure itself. This may be especially true for PEG placement in patients with intact mental status, and during

prolonged procedures in the small bowel, such as endoscopic nasoenteric feeding tube placement (ENET), jejunal extension tube placement (PEG-J) and direct percutaneous endoscopic jejunostomy (DPEJ).

As with any medical encounter, patient comfort, dignity and privacy should be of paramount importance and are skills best taught to the trainee by example, supplemented with constructive feedback. Individual teaching styles vary, but the trainer should foster a positive, professional learning environment. An excellent article on professional behavior in the endoscopy suite by Boyce is referenced, and should be required reading for trainers and trainees alike.

### **III. TECHNIQUES**

#### **A. Percutaneous Endoscopic Gastrostomy (PEG)**

PEG placement is the second most common indication for upper endoscopy in hospitalized patients, and most trainees end up with a great deal of experience in the performance of this basic technique. Trainees should be exposed to and aware of the variety of techniques utilized including the “pull” method first introduced by Gauderer and Ponsky, and the “push” technique introduced by Sachs-Vine. Most manufacturers offer both “push” and “pull” kits allowing for individual preferences, and there is little data to support use of one technique over the other. Another less commonly used technique by Russel utilizes a direct gastric puncture and peel-away catheters, with the endoscope used only for visualization and gastric insufflation. Whichever technique is used, the trainee must be made familiar with the contents of the particular kit, so that the procedure may proceed efficiently and safely. Trainers should emphasize the importance of a proper endoscopic exam prior to placement of the gastrostomy itself. This should include evaluation for severe reflux changes that may indicate a high risk of aspiration, gastric outlet obstruction, evidence of gastric dysmotility, surgical alterations, or finally, gastric ulcer or malignancy, which may alter the decision to place the gastrostomy at all.

Techniques used to identify a safe site for PEG placement must also be mastered by the trainee. The importance of optimal finger pressure and transillumination in assessing any potential site, and use of the “safe tract” syringe aspiration technique should be taught to trainees. In the “safe tract” technique, a fluid filled syringe is attached to the angiocath or trocar. As it is passed through the abdominal wall, suction is applied. If bubbles are seen in the syringe before seeing the trocar in the gastric lumen, the presence of bowel between the abdominal and gastric wall is assumed, and the attempt is aborted. Finally, over the course of their training, the trainee should not only master the endoscopic and percutaneous aspects of the procedure, but also develop the ability to direct the procedure step-by-step. In training institutions, most PEGs are done using two physicians. Many practicing endoscopists have adopted a method

whereby the GI assistant performs the percutaneous portion of the PEG procedure, a practice supported by the Society for Gastrointestinal Nurses and Assistants (SGNA). If appropriate assistant expertise is available, the trainee may benefit from experience leading this so-called "one-physician" approach during his training period.

## **B. Percutaneous Endoscopic Gastro-jejunostomy (PEG-J)**

Placement of a jejunal extension tube through an existing PEG tube is now best referred to as a PEG-J, with the abbreviating JPEG, JET-PEG or PEG-PEJ abandoned, in accordance with new guidelines from the ASGE Enteral Feeding Task Force. PEG-J may be indicated in those intolerant of gastric feedings or at higher risk for aspiration of gastric feedings including those with gastroparesis, severe GERD, repeated aspiration in the past, gastric resection or gastric outlet obstruction. Studies of older, less reliable techniques have failed to show improvement in aspiration rates compared to gastric feedings, but no well designed studies using proven jejunal access exists. With this in mind, the trainee should understand that decisions to place a PEG-J or convert a PEG to a PEG-J should be individualized. Studies documenting frequent complications and short effective life span of these devices are referenced here, and should be familiar to the trainee, especially when considering enteral access in patients needing long-term support. Close attention to post-procedure nursing care, and patient/staff education regarding the proper use, maintenance, and limitations of the PEG-J system should be imparted to trainees.

A wide variety of techniques for PEG-J have been developed, including the original "drag and pull" techniques, multiple wire-guided techniques, and recently, use of an ultra thin (5.3mm) endoscope through the PEG for wire placement in the jejunum. Most experts currently recommend and use these newer wire guided techniques, as they may have a higher success rate of jejunal tube placement. Use of fluoroscopy is beneficial to verify tube position, and should be used if practical. Attention to details of proper scope selection (Pediatric colonoscope, enterscope) and proper kit selection (9-Fr vs. 12-Fr, built-in plug to occlude PEG lumen, etc. ) are important for trainees. A recent detailed review of these techniques (Baskin, Techniques of Enteral Access) and the recently developed ASGE Learning Center video are available to aid the trainee in adopting proper methods and the attention to detail necessary for more consistent success. It is often difficult and may not be necessary for trainees to develop proficiency in every PEG-J technique, but all should develop expertise in 1 or 2 methods preferred by his or her trainer. It may also be beneficial for trainers to reevaluate their own experience and biases, and attempt to solidify their own expertise using these newer training aids and commercial kits now available.

Prior to performing these procedures, it may be helpful to review each individual step with the trainee and handle the accessories, wires and tubes to be used, to insure good teamwork and increase the confidence of the trainee. Initially,

virtually all trainees (and many attending endoscopists) are confused and uncomfortable with the extensive number and variety of accessories available for these procedures. This is usually overcome, as they become more familiar and comfortable with continued use specific kits and techniques. The ability of the trainee to independently perform the endoscopic portion of the procedure will also expand over time. Extensive experience in therapeutic upper endoscopy and enteroscopy is helpful to learn control of scope movement while inside the mobile small bowel, and under the suboptimal visual conditions frequently encountered during these procedures.

### **C. Direct Percutaneous Endoscopic Jejunostomy (DPEJ)**

This method of long-term jejunal feeding tube placement is a modification of basic PEG technique, but is more technically difficult. In DPEJ, a smaller diameter PEG tube is pulled directly into the jejunal lumen after enteroscopy identifies a suitable spot by transillumination and finger pressure. Use of a sounding needle to initially enter and then stabilize the jejunal loop is recommended by many endoscopists experienced in the technique. The updated ASGE Learning Center video and recent technical review (Ginsberg, in *Techniques in Enteral Feeding*) are excellent resources for those wishing to optimize their technique. Given the increased difficulty in manipulation of the scope within the jejunum and the need for a stabbing, purposeful trocar entry into the lumen of the jejunum, this procedure is best learned only after the trainee has obtained substantial enteroscopy and gastrostomy experience.

Success in DPEG placement depends in part on the patient's body habitus, with the presence of abdominal wall and omental fat, limiting the ability to transilluminate bowel adequately. Procedures in patient's previous surgical gastrojejunostomy will also generally have a higher rate of success and may be most suitable for earlier experience by the trainee. During the training process, as in PEG placement, the trainee should gain experience in both the endoscopy and "outside" roles, and later learn to assume leadership of the procedure.

### **D. Endoscopic Placement of Nasoenteric Tubes (ENET)**

Nasoenteric tubes (NET) are widely used for nutritional support of the short-term, generally considered to be less than or equal to one month. Since patients requiring these tubes are often acutely ill, bedside procedures in an ICU setting are common. Despite a paucity of evidence to date, many experts feel that feedings beyond the ligament of Treitz may minimize aspiration risk, especially when combined with gastric decompression. The trainee should also understand that not all patients require jejunal feedings or require endoscopic placement. The passage of nasoenteric tubes may be performed non-endoscopically and under fluoroscopic guidance, often with considerable success in expert hands. However, as non-endoscopic techniques may not always be successful and radiologic expertise may be limited, the need for endoscopic techniques to obtain

enteral access will remain strong. To date, endoscopic placement of nasoenteric tubes (ENET) has had a poor reputation among endoscopists, based on the challenging and occasionally frustrating nature of these techniques. From a training program perspective, it is important that one or two endoscopists with sufficient endoscopic expertise and commitment to these procedures be identified to properly teach these techniques to trainees.

A wide variety of endoscopic methods have been developed with no single technique universally accepted to date. Traditional “drag and pull” methods utilize suture material attached to the end of the NJ-tube, which is grasped with forceps through the endoscope, and pulled into the jejunum by advancement of the endoscope. Difficulties in releasing the suture with the grasping forceps and retrograde movement of the feeding during scope withdrawal are frequent problems and have prompted development of alternative techniques. A variety of over-the-guidewire techniques also have been developed whereby the nasoenteric tube is pushed into position over a guide wire, which had been previously placed using endoscopic guidance. This technique requires oral/nasal transfer of either the wire or feeding tube following initial placement, which can be problematic. This technique generally requires use of fluoroscopy to verify successful tube placement, as the endoscopist cannot monitor tube position during its placement. Another modification of the over-the-guidewire technique has shown some initial promise, whereby one large (0.052”) or two 0.035” guidewires are placed through the NET for stiffening, and the tube passed transnasally into the stomach. The endoscope is used to visualize and direct the tip of the NET using a biopsy forceps. The stiffness of the NET tube allows it to be pushed into proper position with only directional guidance by the endoscope.

Newer techniques including a through-the-scope technique require use of a large channel scope capable of allowing an 8-Fr or 10-Fr feeding tube through its working channel. Once the endoscope is passed into the distal duodenum or proximal jejunum, the feeding tube is advanced through the working channel as the scope is withdrawn. This technique also requires final oral/nasal transfer step similar to that used for nasal biliary tubes. Finally, the trainee may be exposed to the transnasal method, if a smaller caliber (5.5mm) transnasal endoscope is available. This modification of the over-the-guidewire technique entails passage of a guide wire into the duodenum or proximal jejunum by the transnasal endoscope with passage of the nasal enteric tube over guidewire. This technique avoids the requirement of an oral/nasal transfer at the end of the procedure.

Trainees should ideally gain experience with a variety of these techniques within the limits of local expertise and availability of equipment. Recently, a review of these techniques with excellent technical detail has been published and is referenced. (DeLegge, *Techniques in Gastrointestinal Endoscopy*.) When instructing trainees, trainers should also focus not only on the basic steps of the techniques, but pass along the tricks that make the procedure successful in their hands. Finally, trainees should understand that there is little expertise regarding

proper use of these feeding tubes by the nursing or house staff caring for the patient. The importance of flushing each tube immediately after infusions, avoiding crushed pills or barriers should be understood by the trainee and in turn reinforced to the nursing and house staff. Techniques to prevent inadvertent tube removal should be taught to the trainee. Attachment of the tube to the face or neck using commercial fixation devices (those originally designed for intervention radiology percutaneous tubes), or use of a nasal bridle technique to secure the feeding tube securely to the nares have been successful. Use of a hemoclip device to secure the distal end of the feeding tube to the jejunal mucosa has also been described and may be helpful in preventing retrograde migration of the tube.

#### **IV. POST PROCEDURE MANAGEMENT**

##### **A. Routine Care/Follow-up**

Following endoscopic enteral feeding access procedures, communication of findings and planning for follow-up care is extremely important, and must be emphasized to the trainee, who may feel initially that their role ends when the procedure itself ends. The importance of proper and complete procedure reporting cannot be overemphasized to the trainee. Trainer and trainees alike should utilize the accepted minimum standard terminology (MST) in their computerized procedure reporting system or dictated reports, to foster standardization of reporting and data collection throughout the endoscopic community. This may be more challenging for the more complex enteral feeding access procedures, and may require some ad lib reporting to fully describe the procedure.

The trainee should be taught by example to feel responsible for, and take “ownership” of follow-up care in PEG patients as well as those patients with other types of endoscopic enteral access. Discussions with the patient and/or family and effective communication to the primary caretakers regarding tube care and maintenance is not only important for continuity, but will also likely result in fewer clogged or otherwise dysfunctional feeding tubes, and may even limit post-procedure complications.

##### **B. Routine PEG Removal/Replacement**

PEG removal may be accidental, indicated due to tube dysfunction or as a result of improvement in a patient’s ability to feed orally. Accidental removal is discussed in the section on complications below.

Regarding elective removal, most currently available PEG kits are designed for external traction removal. The interval between PEG placement and safe traction removal has not been determined definitively by study, but many investigators recommend 6-12 weeks before maturation is sufficient enough to allow safe, external traction removal.

When PEG replacement is needed, the trainee should be well versed in the types of replacement tubes available their institution, and have an understanding of other options available. A recent ASGE technical review includes a complete and updated list of all types of enteral feeding devices, including replacement tubes and low profile devices. Foley catheter use has rightly fallen out of favor, due to the lack of an external bumper and the subsequent risk of outlet obstruction from the migrated Foley balloon. Balloon-tipped replacement tubes and a variety of low profile devices may be used, depending on the needs and desires of the patient and caretakers. Techniques for tract measurement and safe placement must be carefully taught to the trainee. The need for verification of proper tube position by exam, aspiration of gastric contents and radiographic contrast study should be part of this training. At a minimum, contrast studies to prove proper positioning of the replacement device should be performed in patients with depressed mental status, patients in whom replacement was difficult or felt “wrong”, patients with relatively new tracts, and patients with discomfort after replacement or small volume “test” instillation. Other experts suggest contrast study verification of all replacement tubes prior to feeding.

### C. **Complications**

The trainee must be fully knowledgeable in the prevention, identification and treatment of all complications related to PEGs and other enteral feeding devices. Didactic lectures and clinical conference discussions should include these topics. Special attention should be paid to the evaluation of the “problem PEG” by teaching the trainee how to suspect and identify complications by focused history taking and examination. As many of these complications are rare, when actual complications do arise, if feasible, the trainer should use the opportunity to demonstrate the findings and management to a number of trainees, not just the one immediately involved. Prevention of complications by proper patient selection, attention to optimal technique, and need for proper follow-up can also be reinforced effectively at this time, when the reality of the complication is still fresh in trainees’ minds.

**Accidental PEG removal or dislodgement** may allow for soilage of the peritoneum and can be a serious problem. The PEG tract is not be mature for at least for 7-10 days in most patients, and may be delayed to 3-4 weeks in patients taking steroids, malnutrition, occult ascites, or those taking steroids. If removal is detected immediately, a new PEG placed in or near the old tract may be successful in preventing clinically significant peritonitis. If recognition is delayed, NG suction and broad spectrum antibiotics are indicated. PEG replacement can generally be performed after several days to a week if no signs of peritonitis develop. Obviously, the conditions that allowed accidental removal to occur must be corrected to prevent a recurrence. Trainees should be taught to consider the risk of accidental removal in all patients when communicating post-PEG orders to

the primary team. Close follow-up of high-risk patients is essential to verify preventative measures have been taken.

Accidental removal of longstanding PEG is not a true emergency unless signs and symptoms of tract disruption and peritonitis occur, but trainees must be alert to the rapid closure of the tract in these patients. Methods to prevent tract closure including placement of a temporary thin (Foley) tube or wire into the tract, and use of PEG tract dilators to reconstitute the tract should be familiar to trainees, who may get the first call from family members, nursing homes or ER staff.

**Peristomal infection** is a relatively common complication of PEG, one-step PEG-J, or DPEJ placement, but is usually mild, responding well to antibiotics. The trainee must be aware of risk factors for site infection such as obesity, diabetes, steroid treatment, malnutrition, or procedure related factors such as inadequate length of skin incision, excessive traction on the tube in follow-up care, or failure to use antibiotic prophylaxis, as previously noted. The trainee should also be aware of the possibility for severe soft tissue infection after PEG. Necrotizing fasciitis or abscess can occur, requiring rapid diagnosis and surgical debridement.

**Peritonitis** is a severe complication which may occur in 0-1.25% of PEG cases and carries a high mortality rate. Accidental removal or tube dislodgement is the most common cause, but peritonitis can also complicate G-tube replacement, or conversion to a skin-level device. Early recognition is the key and based on clinical exam, leukocytosis, and fever. All trainees must realize that pneumoperitoneum may be seen in up to 38% of patients after initial PEG placement and is not a useful diagnostic sign in that setting, nor alone constitute grounds for surgical exploration.

**Buried bumper syndrome** occurs when the internal bumper erodes and migrates into and through the gastric wall. This complication may present early or late with abdominal pain with feeding, or signs of resistance to flow, peritubular leakage, abscess or other soft tissue infection. Trainees should be taught to examine PEG sites closely for a palpable internal bumper beneath the skin, site tenderness or fluctuance, and specifically, test for fixation of the internal bumper by attempting to slide the PEG in and out of the tract. A wide variety of endoscopic treatments have been described, including needle knife incision of the gastric wall to expose and pull back the internal bumper, a “push-pull” technique whereby a snare is used to pull the buried PEG back down and out, and wire-guided balloon dilation techniques. Another relatively simple technique described by Fay, et al utilizes a standard PEG kit alone, and allows removal and PEG replacement in a single step by pulling out the buried PEG in the front of the tapered tip of the new PEG. Trainees should be aware of several of these methods, and gain experience with them as clinical exposure allows. Risk factors that promote buried bumper syndrome should be familiar to the trainee and include excessive tension on the

PEG tract (at initial placement or due to weight gain or subsequent nursing care) stiff internal bumper material, small internal bumper diameter, and malnutrition.

**Gastrocolic fistula** may occur can be prevented in most cases by avoiding PEG placement where finger pressure and translumination are suboptimal. Use of the “safe tract” technique described previously and exercising caution when attempting PEG placement in patients with prior abdominal surgery are also important. Trainees need to understand the natural history and presentation of these iatrogenic fistulas, which may present acutely or after several months when G-tube replacement is required.

**Hemorrhage** and/or ulceration may occur as a complication of PEG placement in up to 2.5% of patients. Hemorrhage at the time of PEG placement may be the result of direct puncture of a vessel in the gastric wall or from traumatic erosion. Late bleeding, if due to the PEG at all, is usually due to ulceration of the internal bumper into the gastric wall due to excessive tension (as in buried bumper syndrome), or ulceration of the opposite gastric wall due to chronic irritation from the internal bumper or balloon. Treatment may include standard endoscopic treatment of ulcer base stigmata, and PEG removal or repositioning.

**PEG site leakage:** Although leakage around the PEG site is a relatively common problem in hospitalized patients, literature on the etiology and treatment of this clinical problem is lacking. In general, the trainee must develop the ability to differentiate insignificant PEG leakage from pus reflecting an underlying abscess, feeding solution spillage due to buried bumper syndrome, stool from a gastrocolic fistula, or excessive gastric fluid or feedings due to gastric outlet obstruction or severe dysmotility. A careful examination of the PEG site is always warranted and frequently, upper endoscopy is helpful to confirm buried bumper syndrome, gastric outlet obstruction, gastric ulceration or other pathology. Use of promotility agents or proton pump inhibitors to decrease gastric volume may also be helpful, but have not been tested rigorously in this setting.

In many inpatients, leakage around the G-tube site reflects gastric dysmotility or more diffuse gut dysmotility often related to their acute decompensation or illness. Successful treatment may rely on addressing the underlying conditions such as sepsis, narcotic use or electrolyte abnormalities that precipitate or worsen the dysmotility, instead of seeking to “plug the hole” with a bigger PEG tube.

G-tube replacement or a change to a completely new PEG site may ultimately be required in some cases of PEG site leakage, especially in cases when the PEG tract is noted to be patulous. This may occur in patients whose PEG is located close to the diaphragm, in whom constant tension on the tract with respiration causes enlargement. For other patients with a patulous PEG site, some authors advocate removal of the PEG for a day or two to allow the tract to contract, followed by G-tube replacement.

**Tube clogging:** Trainees should be aware of methods to unclog PEGs and other feeding tubes utilizing special cleaning devices, or pancreatic enzyme/bicarbonate solutions. The oft-tried soft drink instillation has been shown to be only marginally better than water, and should probably be abandoned. Tubes that do not return to full function after declogging should be replaced. Successful unclogging or replacement should be followed promptly by additional teaching to caregivers about proper tube maintenance.

**Aspiration** and subsequent pneumonia can occur as an immediate complication of PEG placement or long after the PEG is placed. The trainee should be aware that gastric overinflation and supine positioning are risk factors for aspiration during the procedure itself. Elderly or neurologically impaired patients are at highest risk. In these patients, as in all patients, the procedure should be done expeditiously with suctioning of gastric contents upon entering the stomach at the beginning of the procedure.

During the initial endoscopy before PEG placement, the finding of severe reflux esophagitis, or retained food or bezoar in the stomach should prompt some consideration of jejunal tube placement rather than completing the PEG. PEG placement should also be avoided in favor of jejunal feeding techniques in patients with a known history of aspiration pneumonia related to reflux. Unfortunately, standard reflux studies such as 24-hour pH probe esophageal manometry, barium swallow, may not predict the development of post-PEG aspiration. Once a PEG is placed, trainees should be aware the routine post PEG orders should include elevation of the head of bed (or better, reverse trendelenberg position) during feeding and after for two hours.

**Complications of percutaneous endoscopic gastrojejunostomy (PEG-J) endoscopic nasoenteric (ENET) and direct percutaneous endoscopic gastrostomy (D-PEJ) tubes** may also occur and the trainee should be well versed in their diagnosis and treatment. D-PEJ complications include bleeding, perforation, peritonitis, cellulitis or inadvertent organ puncture and are generally similar in etiology and presentation to the analogous PEG complication.

Specific PEG-J and ENET complications include aspiration due to retrograde migration of the jejunal tube into the stomach or duodenum, kinking or early clogging. The importance of verifying jejunal position before relying on Peg-J or NJ tubes to provide jejunal feedings cannot be overemphasized. Repeat radiographic studies to recheck the position of the tube before resuming feedings is also important after a period of retching or vomiting, or when other clinical signs raise the possibility of retrograde migration of the tube. If the tube is found to be proximal to the ligament of Treitz, a trial of promotility agents and time may be reasonable before tube replacement.

## **CORE CURRICULUM IN ENDOSCOPIC ENTERAL FEEDING ACCESS GENERAL REFERENCES**

### **VIDEOS**

McClave SA, Delegge MH: Endoscopic techniques in enteral access. *ASGE Learning Resource Center*, **Video**: Milner-Fenwick, Timonium, MD; 2001.

SAGES; Percutaneous endoscopic gastrostomy/jejunostomy. *ASGE Learning Resource Center*, **Video**: Milner-Fenwick, Timonium, MD; 2001.

Ponsky JL: Therapeutic endoscopy: Approach to foreign bodies, gastrointestinal strictures and endoscopic feeding. *ASGE Learning Resource Center*, **Video**: Milner-Fenwick, Timonium, MD; 2001.

### **BOOKS/REVIEWS/CHAPTERS**

Enteral Nutrition. Shike M, Bloch AS (ed): *Gastrointestinal Clin North American* 8, 1998.

*Gastrointestinal Endoscopy: Beyond the basics*. Baillie J. Newton, MA: Butterworth-Heinemann, 1997.

Wong RCK, Ponsky, JL: Percutaneous endoscopic gastrostomy. *Gastroenterologic Endoscopy*, 2<sup>nd</sup> edition, Sivak MV (ed), WB Saunders, 813-825, 1999.

*Percutaneous endoscopic gastrostomy: Advances in techniques, prevention and management*, 2<sup>nd</sup> edition, Foutch PE, Barkin JJ, O'Phelan CA (ed): Raven Press Ltd., 175-184, 1994.

*Techniques in Gastrointestinal Endoscopy: Techniques in Enteral Access*: McClave SA, Wilcox CM (ed):3:1,2001.

### **GUIDELINES/ARTICLES**

ASGE Technology Assessment Committee, Endoscopic Feeding Tubes: *Gastrointestinal Endoscopy* 1994.

Disario JA, Baskin WN, Brown RD, DeLegge MH, Fang JC, McClave SA. Endoscopic approaches to enteral nutritional support. *Gastrointestinal Endoscopy* (In preparation) June, 2002.

ASGE Technology Assessment Committee, Endoscopic enteral nutrition access devices. *Technology status evaluation report – ASGE, 2002* (in preparation).

## REFERENCES BY TOPIC

### I. INTRODUCTION

ASGE. Principles of training in gastrointestinal endoscopy. *Gastrointest Endosc* 1999; 49(6):845-853.

The Gastroenterology Leadership Council: American Association for the Study of Liver Diseases, American College of Gastroenterology, American Gastroenterological Association, and American Society for Gastrointestinal Endoscopy: Training the gastroenterologist of the future: The Gastroenterology Core Curriculum. *Gastroenterology*. 1996;110:1266-1300.

*ASGE Guidelines for Clinical Application*. Modifications in endoscopic practice for the elderly, 2001.

ASGE: Role of PEG/PEJ in enteral feeding: *Gastrointest Endosc*. 1998;48:699-701.

### II. PERI-PROCEDURE MANAGEMENT

#### A. Patient Selection, Ethical Consideration

Rabeneck L, Wray NP, Petersen NJ. Long-term outcomes of patients receiving percutaneous endoscopic gastrostomy tubes. *Journal of General Internal Medicine*. 1996;11(5):287-93.

Van Rosendaal GM, Verhoef MJ, Kinsella TD. How are decisions made about the use of percutaneous endoscopic gastrostomy for long-term nutritional support? *American Journal of Gastroenterology*. 1999;94(11):3225-8.

Rabeneck L, McCullough LB, Wray NP. Ethically justified, clinically comprehensive guidelines for percutaneous endoscopic gastrostomy tube placement. *Lancet*. 1997;349(9050):496-8.

Wolfsen HC, Kozarek RA, Ball TJ, Patterson DJ, Botoman VA, Ryan JA. Long-term survival in patients undergoing percutaneous endoscopic gastrostomy and jejunostomy. *American Journal of Gastroenterology*. 1990;85(8):1120-2.

Lazarus BA, Murphy JB, Culpepper L. Aspiration associated with long-term gastric versus jejunal feeding: A critical analysis of the literature. *Archives of Physical Medicine & Rehabilitation*. 1990;71(1):46-53.

## **B. Pre-procedure Management**

Kearns P, Chin D, Mueller L. The incidence of ventilator associated pneumonia and success in nutrient delivery with gastric versus small intestinal feeding: A randomized clinical trial. *Crit Care Med.* 2000;28:1742-1746.

Montecalvo M, Steger K, Farber H. Nutritional outcome and pneumonia in critically ill patients randomized to gastric versus jejunal tube feedings. *Crit Care Med.* 1992;20:1377-1387.

Gillick M. Rethinking the role of tube feeding in patients with advanced dementia. *The New England Journal of Medicine.* 2000;342(3):206-210.

McClave SA, Greene LM, Snider HL, et al: Comparison of the safety of early enteral vs parenteral nutrition in mild acute pancreatitis. *JPEN.* 1997;21:14-20.

Kalfarentzos F, Kehagias J, Mead N, Kokkinis K, Gogos CA. Enteral nutrition is superior to parenteral nutrition in severe acute pancreatitis: results of a randomized prospective trial. *Br J Surg* 1997; 84:1665-9.

Jain NK, Larson DE, Schroeder KW, et al. Antibiotic prophylaxis for percutaneous endoscopic gastrostomy. A prospective, randomized, double-blind clinical trial. *Annals of Internal Medicine.* 1987;107(6):824-8.

Gossner L, Keymling J, Hahn EG, Ell C. Antibiotic prophylaxis in percutaneous endoscopic gastrostomy (PEG): a prospective randomized clinical trial. *Endoscopy.* 1999;31(2):119-24.

Kulling D, Sonnenberg A, Fried M, Bauerfeind P. Cost analysis of antibiotic prophylaxis for PEG. *Gastrointestinal Endoscopy.* 2000;51(2):152-6.

Kiyici N, Dharmarajan TS, Pitchumoni CS. Percutaneous endoscopic gastrostomy in the elderly: clinical and ethical aspects. *Practical Gastroenterology.* 2001;12-23.

ASGE: Guideline on the management of anticoagulation and antiplatelet therapy for endoscopic procedures *Gastrointest Endosc* 1998;48: 672-675.

ASGE: Informed Consent for Gastrointestinal Endoscopy  
*Gastrointest Endosc* 1988: 34(Suppl):26S-27S

Kirby DF, Delegge MH, Fleming CR. American Gastroenterological Association technical review on tube feeding for enteral nutrition. *Gastroenterology.* 1995;108(4):1282-301.

## **D. Patient Management and Physician Behavior During Procedures**

ASGE Committee on Training: Training in patient monitoring and sedation and analgesia. ASGE Publication No. 1031, 1998

---

Boyce HW. Behavior in the endoscopy room. *Gastrointestinal Endoscopy* 2001; 53(1):133-136.

### **III. TECHNIQUES**

#### **A. Percutaneous Endoscopic Gastrostomy (PEG)**

Gauderer MW, Ponsky JL, Izant RJ, Jr: Gastrostomy without laprotomy: A percutaneous endoscopic technique. *Journal of Pediatric Surgery* 1980;15(6):872-5.

Russel TR, Brotman M, Norris F: Percutaneous gastrostomy: a new simplified and cost-effective technique. *Am J Surg.* 1984;148:132.

Asenberg J, Cohen L, Lewis BS: Marked endoscopic gastrostomy tubes permit one-pass Ponsky technique. *Gastrointest Endosc.* 1991;37:552-553.

Safadi BY, Marks JM, Ponsky JL: Percutaneous endoscopic gastrostomy. *Gastrointestinal Endoscopy Clin North Amer.* 1998;8:551-68.

Baskin WN: Percutaneous endoscopic gastrostomy and placement of jejunal extension tube. *Techniques in Gastrointestinal Endoscopy.* 2001;3:30-41.

Foutch PB, Talbert GA, Waring JP, et al: Percutaneous endoscopic gastrostomy in a patient with advanced ovarian carcinoma and recurrent intestinal obstruction. *Am J Gastroenterol* 88:1946-1948. (Safe-tract technique reference)

Consensus Conference: placement of a percutaneous endoscopic gastrostomy (PEG) tube. Position paper, Society for Gastroenterology Nurses and Associates, *Gastroenterology Nursing.* 1998;21:225-226.

#### **B. Percutaneous Endoscopic Gastrojejunostomy (PEG-J)**

Ponsky JL, Aszodi A: Percutaneous endoscopic jejunostomy. *American Journal of Gastroenterology.* 1984;79(2):113-6.

Disario JA, Fotch PG, Sanowski RA: Poor results with percutaneous endoscopic gastrojejunostomy. *Gastrointest Endosc.* 1990;36:257-260.

Delegee MH, Patrick P, Gibbs R: Percutaneous endoscopic gastrojejunostomy with a tapered tip, nonweighted jejunal feeding tube: improved placement success. *Am J Gastro.* 1996; 91:1130-1134.

Baskin WN, Johansen JF: Trans-PEG endoscopy for rapid PEJ placement. *Am J Gastroenterolo.* 1994;49:292-296.

Wolsen HC, Kozarek RA, Ball TJ, et al: Tube dysfunction following percutaneous endoscopic gastrostomy and jejunostomy. *Gastrointestinal Endosc.* 1990;36:261-263.

Adler DG, Gostout CJ, Baron TH: Percutaneous transgastric placement of jejunal feeding tubes with an ultrathin endoscope. *Gastrointestinal Endosc.* 2002;55:106.

Baskin WN: Percutaneous endoscopic gastrostomy and placement of jejunal extension tube. *Techniques in Gastrointestinal Endoscopy.* 2001;3:30-41.

### **C. Direct Percutaneous Endoscopic Jejunostomy (DPEJ)**

Shike M, Latkany L, Gerdes H, Bloch AS. Direct percutaneous endoscopic jejunostomies for enteral feeding. *Gastrointestinal Endoscopy.* 1996;44(5):536-40

Rumalla A, Baron T. Results of direct percutaneous endoscopic jejunostomy, an alternative method for providing jejunal feeding. *Mayo Clin Proc.* 2000;75:807-810.

Ginsberg GG: Direct percutaneous endoscopic jejunostomy. *Techniques in Gastrointestinal Endosc.* 2001;3:42-49.

### **D. Endoscopic Placement of Nasoenteric Tubes (ENET)**

Hudspeth DA, Thome MT, Wayne-Meredith J: A simple endoscopic technique for nasoenteric feeding tube placement. *J Am Coll Surg* 180:229-230, 1995.

Bosco J, Gordon F, Zelig M, et al: A reliable method for the endoscopic placement of a nasoenteric feeding tube. *Gastrointest Endosc* 40:740-743, 1994.

Dranoff JA, Angood PJ, Topazian M, et al: Transnasal endoscopy for enteral feeding tube placement in critically ill patients. *Am J Gastro* 94:2902-2904, 1999.

DeLegge MH: Enteral Access – The foundation of feeding: Endoscopic nasoenteric tube placement. *Techniques in Gastrointestinal Endosc.* 2001;3:22-29.

Zweng TN: An improved technique for securing nasoenteric feeding tubes. *J Amer Coll Surg*. 183: 269-71,1996

Ginsberg GG, Lipman TO, Fleisher DE: Endoscopic clip assisted placement of enteral feeding tubes. *Gastrointestinal Endoscopy*. 1994;40:220-222.

#### **IV. POST PROCEDURE MANAGEMENT**

##### **A. Routine Care/Follow-up**

McCarter TL, Condon SC, Aguilar RC, Gibson DJ, Chen YK. Randomized prospective trial of early versus delayed feeding after percutaneous endoscopic gastrostomy placement. *American Journal of Gastroenterology*. 1998;93(3):419-21.

Choudhry U, Barde CJ, Markert R, Gopalswamy N. Percutaneous endoscopic gastrostomy: a randomized prospective comparison of early and delayed feeding. *Gastrointestinal Endoscopy*. 1996;44(2):164-77.

Joint Committee for Minimal Standard Terminology of European Society for Gastrointestinal Endoscopy, American Society for Gastrointestinal endoscopy and Organization Mondial d'Endoscopie Digestive: Digestive Endoscopy Minimal Standard Terminology: International Edition, 1998.

##### **B. Complications**

McClave SA: Managing complications of percutaneous and nasoenteric feeding tubes. Techniques in *Gastrointestinal Endoscopy*, 3:62-68, 2001.

Marcuard SP, Stegall KL, Trogdon S. Clearing obstructed feeding tubes. *JPEN*. 1989;13:81-3.

Gauderer MWL, Stellato TA: Gastrostomies: Evolution, techniques, indications, and complications. *Curr Probl Surg* 23:661, 1986.

Greif JM, Ragland JJ, Ochsner MG, Riding R: Fatal necrotizing fasciitis complicating percutaneous endoscopic gastrostomy. *Gastrointest Endosc* 32:293, 1986.

Gottfreid EB, Plumser AB, Clair MR. Pneumoperitoneum following percutaneous endoscopic gastrostomy. *Gasstrointest Endosc* 32: 397-9, 1986

Foutch PG: Complications of percutaneous endoscopic gastrostomy and jejunostomy: Recognition, prevention and treatment. *Gastrointest Endosc Clin N Am* 1992; 2: 231.

Fay DE, Luther R, Gruber M. A single procedure endoscopic technique for replacing partially extruded percutaneous endoscopic gastrostomy tubes. *Gastrointest Endosc* 1990; 36: 298-300.

Pofahl WE, Ringold F. Management of early dislodgment of percutaneous endoscopic gastrostomy tubes. *Surgical Laparoscopy, Endoscopy & Percutaneous Techniques*. 1999; 9:253-6.