

“HOW I DO IT”

Endoscopic placement of percutaneous feeding tubes



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How I do it: Endoscopic placement of percutaneous feeding tubes

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Summary

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How I Do It

John C. Fang

Introduction

Enteral feeding is the preferred method of feeding in the presence of a functional gastrointestinal tract. Enteral nutrition support has been demonstrated to be superior to parenteral nutrition and no nutrition support. Numerous studies and meta-analyses have shown enteral nutritional support decreases complications and improves patient specific outcomes. Improved clinical outcomes include: enhanced wound healing, decreased infectious complications, and shorter hospital lengths of stay. Enteral nutrition may be viewed as a therapeutic tool that can alter a patient's disease course towards a more favorable outcome.

Percutaneous enteral feeding tubes are indicated in patients requiring long-term (>4–6 weeks) enteral access. Percutaneous feeding tubes may be placed by endoscopic, fluoroscopic, or surgical methods. Ponsky & Gauderer first described percutaneous endoscopic placement of gastrostomy (PEG) tubes in 1980 [1]. Types of percutaneous feeding tubes include: PEG (percutaneous endoscopic gastrostomy), PEGJ (percutaneous endoscopic gastrojejunostomy) and DPEJ (direct percutaneous endoscopic jejunostomy). In this article we will review the indications, techniques, and complications of endoscopic placement of percutaneous feeding tubes.

Indications

Percutaneous feeding tubes are indicated for patients who are unable to consume sufficient nutrients orally but have a functional gastrointestinal tract. The most common indications for PEG placement are impaired swallowing because of neurological events, oropharyngeal or esophageal cancer, dysphagia and severe facial trauma, and poor volitional intake. Placement for supplemental feedings in highly catabolic states including burn/trauma and cystic fibrosis is also appropriate. Gastrostomy placement can also be used for delivery of medications and hydration or for gastric decompression in cases of upper gastrointestinal obstruction or motility disorder.

Small-bowel delivery of enteral nutrition with either PEGJ or DPEJ is considered when a patient's condition is complicated by gastroparesis, gastroesophageal reflux, gastric resection, pancreatitis, severe aspiration risk, or gastric feeding intolerance. PEGJ tubes may also be



preferred when enteral feeding into the small bowel with simultaneous gastric decompression is desired. If a patient has a pre-existing PEG tube, conversion to PEGJ does not require an additional skin puncture. The choice between PEGJ and DPEJ depends on local expertise and availability; however DPEJ tubes have longer functional capability but may require more expertise to place.

Contraindications

Absolute contraindications to PEG placement are the same as those for upper gastrointestinal endoscopy as well as an inability to transilluminate the abdominal wall and oppose the anterior gastric wall. Relative contraindications to PEG placement include coagulopathy, gastric varices, morbid obesity, prior gastrointestinal surgery, ascites, chronic ambulatory peritoneal dialysis, and neoplastic, infiltrative, or inflammatory disease of the abdominal wall [2]. Similar contraindications apply to PEGJ and DPEJ tubes.

Technique: Patient preparation

PEG is the second most common indication for upper gastrointestinal endoscopy and the procedure is performed using conscious sedation. PEG is considered a high bleeding risk procedure by the American Society of Gastrointestinal Endoscopy and checking preprocedural coagulation parameters is recommended. Platelet count $>50\,000/\text{mm}^3$ and international normalized ratio (INR) of 1.4 are generally acceptable. Warfarin should be discontinued for 3–5 days and low molecular weight heparin 8 hours before the procedure. Discontinuation of antiplatelet agents 7–10 days prior to the procedure should be considered, depending on the risk of thromboembolism. Prophylactic antibiotics are also recommended to prevent peristomal infection.

Patient preparation is the same for PEGJ or DPEJ unless there is a pre-existing gastrostomy for a PEGJ procedure and no new skin incision is required. In this situation I do not give prophylactic antibiotics or check coagulation parameters.

Technique: Percutaneous gastrostomy (PEG)

The most commonly performed methods for PEG placement are the Ponsky pull technique, which I use as described below, and the push technique. Two physicians or one physician and a GI assistant are required to perform either procedure. After advancement of the endoscope, the stomach is insufflated with air and an optimal site for PEG placement is determined by simultaneously transilluminating the gastric/abdominal wall and indenting the abdominal wall with a finger while visualizing that indentation endoscopically. Sterile techniques should be followed for the percutaneous component of the procedure. The abdominal wall and peritoneum are anesthetized by injection of 1% lidocaine. To help confirm that no loops of bowel are interposed



between the stomach and abdominal wall, the “safe track” maneuver should be performed. The anesthetic needle (finder needle) is advanced into the stomach while aspirating with the plunger. Simultaneously, the endoscopist confirms gastric puncture by visual inspection and with air aspiration in the syringe.

After the safe track has been confirmed, a small incision is made and a trocar is inserted through the abdominal wall into the stomach. A guide wire is passed through this trocar and grasped endoscopically. The guide wire is then drawn out through the mouth and a gastrostomy tube is affixed to it. Finally the guide wire is pulled back through the esophagus, stomach, and abdominal wall and held in place by the solid mushroom-type internal retention device and an external bumper. The external bumper should be placed ~1 cm or more from the abdominal wall with the dressing placed over (rather than under) the bumper to avoid wound compression, infection and tissue breakdown.

In the push technique, after the guide wire has been drawn out through the mouth, a PEG tube is pushed into place over the guide wire which extends from the mouth to the stoma site and the guide wire removed. The procedure is otherwise the same as the pull technique. Reported success rates for PEG placement range from 95% to 100%.

Technique: Percutaneous gastrojejunostomy (PEGJ)

Multiple methods have been described for PEGJ placement, but we have found the following two over-the-wire methods to be the most efficient and successful. Commercial kits are available that include 9–12-F jejunal extension tubes that can be placed through 18–28-Fr PEG tubes. The jejunal extension tube of a PEGJ can be placed immediately following PEG placement or through an existing PEG/gastrostomy stoma created previously.

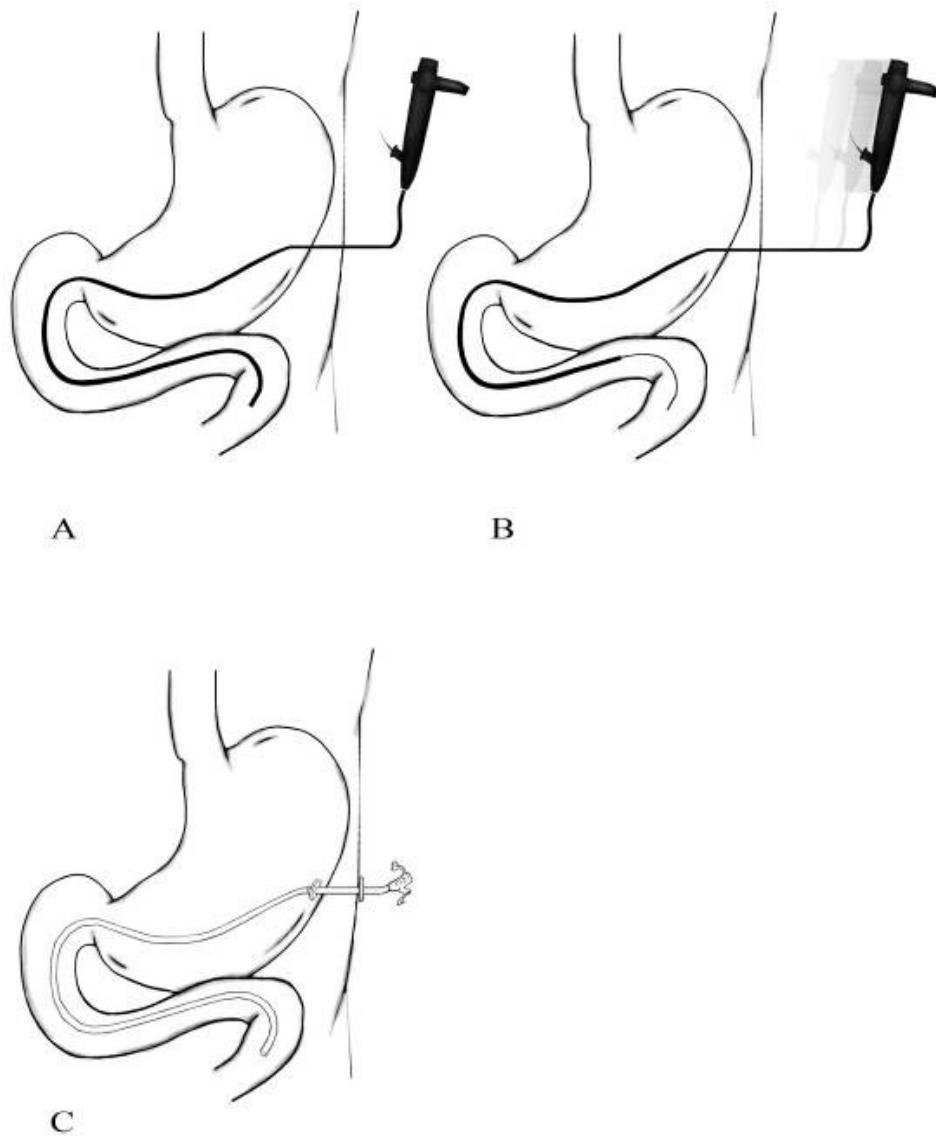
A guide wire is placed through an existing gastrostomy and is grasped endoscopically with a forceps or snare and carried into the jejunum. Using the forceps or snare to maintain the guide wire in the jejunum as the endoscope is withdrawn helps to prevent dislodgment of the guide wire. This technique requires the forceps to be pushed forward through the biopsy channel as the endoscope is slowly withdrawn. Once the endoscope is in the stomach, the guide wire can be released and the jejunal extension tube is then threaded over the guide wire into the small bowel.

Another technique uses an ultrathin endoscope (~5 mm diameter) passed through a 28-Fr PEG tube or mature gastrostomy tract into the small intestine [3]. A guide wire is fed through the endoscope deep into the small bowel and the endoscope removed. The jejunal tube is then passed over the wire into position and the wire removed (**Figure 1**).

With either method, we find wire placement and jejunal extension tube advancement can be done more easily with fluoroscopic guidance though it is not essential. Success rates for PEGJ range from 90% to 100%.



Figure 1 Percutaneous endoscopic gastrojejunostomy (PEGJ) placement: ultrathin endoscope method. **A** Ultrathin endoscope advanced into jejunum through gastrostomy track. **B** Endoscope removed, leaving wire in place. **C** Gastrojejunal feeding tube advanced over wire into place.



Technique: Direct percutaneous jejunostomy (DPEJ)

Direct percutaneous endoscopic jejunostomy (DPEJ) is performed in a manner similar to that of the PEG ‘pull’ technique. A pediatric colonoscope or dedicated push enteroscope is advanced to the small bowel and transillumination and finger indentation is performed over the jejunum (**Figure 2**). The site is most commonly found in the left mid/lower quadrant, but it may be anywhere on the abdominal wall as long as transillumination and finger indentation are adequate.

The site is stabilized by first snaring the anesthetic (finder) needle. Then the larger hollow trocar is passed next to the finder needle, and the finder needle is released and the trocar grasped with the snare. The insertion wire is passed through the trocar and grasped endoscopically. The safe track technique is used when passing both the finder needle and trocar, to ensure no bowel loop or stomach is interposed. The remainder of the procedure is as described for the PEG ‘pull’ technique.

Glucagon may be used to decrease small bowel peristalsis, and performing the procedure under general anesthesia may also increase success rate. Fluoroscopy has been reported to aid in locating an appropriate site though we have not found it useful. Procedure times are much longer than for PEG and comparable to those for PEGJ. Finding an appropriate site for stoma placement accounts for most of the additional time.

Direct percutaneous endoscopic jejunostomy placement is successful in 68%–100% of attempts [4].

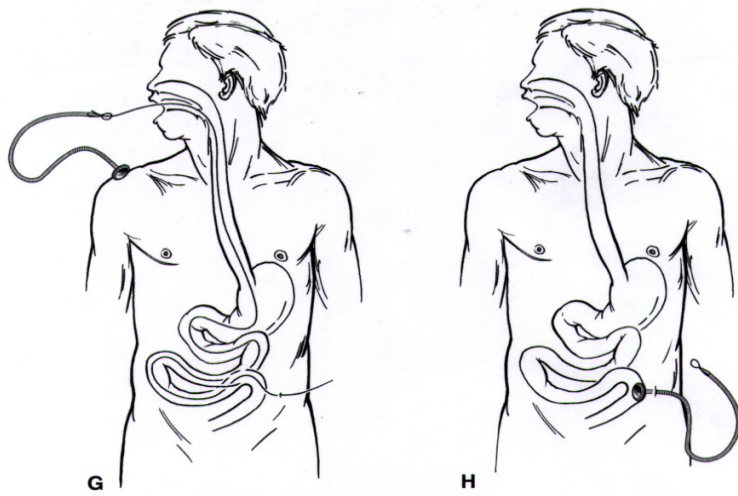
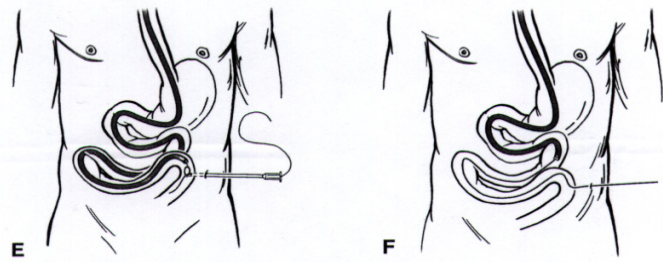
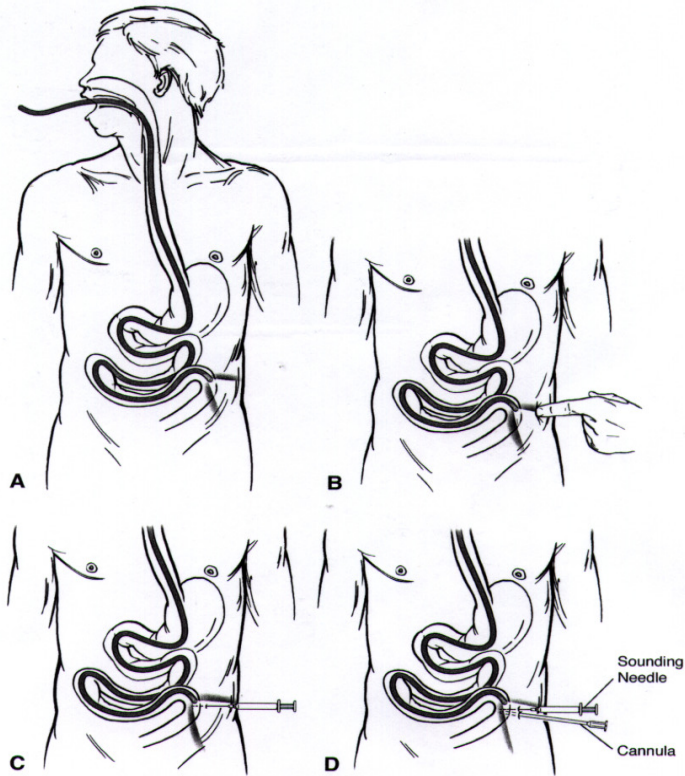
Figure 2 (part 1, A–D) Direct percutaneous endoscopic jejunostomy placement (DPEJ).

A The enteroscope is advanced until transillumination is achieved. **B** A discrete indentation should be reproducible with direct depression at the site of transillumination. **C** The sounding/anesthesia needle is inserted at the site of depression/transillumination and advanced until it is seen to enter the jejunal lumen under endoscopic visualization. **D** The needle/cannula is inserted alongside the sounding needle.

Figure 2 (part 2, E–H) Direct percutaneous endoscopic jejunostomy placement (DPEJ).

E After the needle has been removed from the indwelling cannula, the insertion wire is advanced through the cannula and grasped with a snare that extends. **F** The scope is then removed, and the insertion wire is drawn out with it, so that one end of the insertion wire extends from the mouth and the other end extends from the abdominal wall. **G, H** The attachment loop of the pull-type gastrostomy feeding tube is tethered to the mouth end of the insertion wire and the assembly is pulled internally until the feeding tube has traversed the jejunal and abdominal walls and is snug against the wall.





Post-procedure care

Feeding through the percutaneous tubes may begin after 3 hours. Decompression and medication administration can begin immediately post-procedure. The skin around tube enterostomies should be cleaned with mild soap and water, then rinsed and dried thoroughly. Use of irritant cleansers or full strength hydrogen peroxide should be avoided as they may lead to poor wound healing and leakage around the tube. Likewise, routine use of antibiotic ointments is not advised, and dressings at the tube insertion site are necessary only for the first few days after the procedure unless there is continued drainage at the site. Our patients are scheduled for a clinic ~2 weeks post-procedure, to assess for peristomal infection and stoma healing and to ensure familiarity and compliance with tube feeding on the part of patient and caregivers.

Complications

Major and minor complications rates for PEG tubes range from 0.4% to 22.5% and from 13% to 43%, respectively (**Table 1**). Procedure-related mortality is 0%–2%. The 30-day mortality varies from 6.7% to 26%, and is related to the underlying co-morbidities of this debilitated patient population [5]. Complications associated with PEGJ and DPEJ tubes are similar in nature and frequency to those observed for PEG tubes. PEGJ tubes are also complicated by frequent (53%–84%) malfunction due to retrograde tube migration into the stomach or tube dysfunction caused by kinking, clogging and/ or occlusion of the smaller (8–12-Fr) jejunal extension tubes [6]. Additional complications associated with the DPEJ tube are rare jejunal volvulus and small-bowel perforation.

In comparison studies, DPEJ has been demonstrated to have greater longevity and less need for re-intervention compared with PEGJ [7]. This is likely due to the greater stability in the jejunum and larger diameter of DPEJ tubes compared with PEGJ feeding tubes. Despite expert opinion, the data are controversial as to whether more distal feeding with either type of jejunal tube significantly decreases a patient's aspiration risk.

Conclusion

Placement of percutaneous enteral feeding tubes is safe and effective by endoscopic methods. Consideration of the appropriate device, level in the gastrointestinal tract, and insertion method are critical to ensure optimal outcomes. In addition, appropriate aftercare and monitoring with early recognition and treatment of any complications are crucial to the success of percutaneous enteral nutrition access. The expert endoscopist should be able to place and manage all types of percutaneous feeding tubes.



Table 1 Major and minor complications of enterostomy tube placement.

	Reported frequency, %
<i>Major complications</i>	
Aspiration	0.3–1.0
Hemorrhage	0–2.5
Peritonitis/necrotizing fasciitis	0.5–1.3
Procedure-related mortality	0–2.1
<i>Minor complications</i>	
Peristomal infection	5.4–30
Peristomal leakage	1–2
Buried bumper	0.3–2.4
Inadvertent removal	1.6–4.4
Fistulous tracts	0.3–6.7

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Comment

Suneil A. Kapadia

Introduction

Dr. Fang has provided a comprehensive review regarding placement of percutaneous endoscopic feeding tubes. Nevertheless there are some differences in emphasis and I will aim to highlight these as well as the similarities.

I would agree that enteral nutritional support is the preferred method of feeding where the gastrointestinal tract is not only functioning but also accessible. I also agree that many studies have demonstrated better clinical outcomes for enteral nutritional support compared with no nutrition or parenteral nutrition.

Enteral nutrition may take the form of enteral feed supplements, nasogastric tube feeding, or percutaneous enteral tube feeding. Percutaneous enteral tube feeding in the vast majority of cases is done with percutaneous endoscopic gastrostomy (PEG) tubes as described by Ponsky & Gauderer. As Dr. Fang has highlighted, these can also be placed surgically or radiologically. In addition, PEGs can be converted into percutaneous gastrojejunostomy (PEGJ) tubes or alternatively the jejunum can be accessed directly by a direct percutaneous endoscopic jejunostomy (DPEJ).

Indications

It has been stated that percutaneous enteral feeding tubes are indicated for patients requiring enteral feeding for more than 4 weeks. It has to be acknowledged that this figure is arbitrary, and deciding which patients will fall into this category is fraught with difficulty. A multidisciplinary nutrition team taking into account all aspects of nutritional support is best placed to select appropriate patients for PEG insertion.

I would agree that the most common indication for PEG placement is impaired swallowing as a result of neurological events. This might be related to cerebrovascular causes or more chronically progressive neurological conditions such as motor neurone disease and multiple sclerosis. PEGs can also be placed electively for patients undergoing head and neck surgery where access to a functioning gastrointestinal tract is temporarily prevented. Concerns have been raised about the risk of PEG stoma metastases when the pull-through technique is used and one might wish to



consider the alternatives. I would also agree with Dr. Fang's assertion that the delivery of medication, fluid for hydration, gastric decompression, and long-term enteral nutritional support for motility disorders are potential indications for PEG placement.

The rationale for PEGJ and DPEJ has been expertly and comprehensively explained by Dr Fang and I have nothing to add or dispute.

Contraindications

In my view, appropriate patient selection is as important as absolute contraindication. The terminal phase of dementia or malignant disease is associated with failure of oral intake and a poor prognosis. Death is usually imminent and unaffected by nutritional intervention; therefore PEG placement under these circumstances is invariably inappropriate [1,2].

Provided the patient is able to have an upper gastrointestinal endoscopy there are very few contraindications to PEG placement. Tense ascites, an uncontrolled coagulopathy, and active systemic infection should be regarded as contraindications [3,4].

In our unit the relative contraindications described by Dr. Fang would be classified as significant co-morbidity. In these clinical scenarios the risk of potential complications is undoubtedly increased but has to be weighed against the benefits. In such situations, it is of crucial importance to obtain informed consent from the patient or their guardian.

Technique: Patient preparation

Many patients undergoing PEG placement have significant co-morbidity which increases the risk of complications [2,4]. Therefore patient preparation needs to take this into account before the patient enters the endoscopy suite. The majority of patients have the procedure under conscious sedation and local anesthetic. However, by the time patients with chronic neurological disease present for PEG insertion, their ventilatory function is often significantly impaired. Under these circumstances I invariably enlist the help of an anesthetist to facilitate careful sedation and airway management. Where sedation is to be avoided at all costs, PEG tubes can be placed radiologically. As an alternative, I have placed these endoscopically, using only anesthetic throat spray and a local anesthetic into the abdomen. Speed and an experienced team are critically important from the patient's point of view.

The British Society of Gastroenterology (BSG) recommend a platelet count of more than 100 000/mm³ and an INR less than 1.4 [4]. However, like Dr Fang I think it is reasonable to consider the procedure in patients with a platelet count as low as 50 000/mm³.

I would not stop all antiplatelet agents 7–10 days prior to the procedure. BSG guidelines suggest that clopidogrel should be stopped 1 week beforehand but continuance of aspirin is reasonable [5]. Before stopping clopidogrel I would ascertain the rationale for its prescription and



if necessary liaise with the patient's cardiologist. Warfarin should be stopped 3–5 days before the procedure. If anticoagulation is for a high risk condition such as use of mechanical heart valves then heparin can be used as a substitute and stopped 6–8 hours before the procedure. Low molecular weight heparin should be avoided on the day of PEG placement. Warfarin can be recommenced on the day of the procedure and low molecular weight heparin on the day after [5].

Patients on peritoneal dialysis should have their dialysis stopped 2–3 days prior to PEG placement. Patients with portal hypertension can have a PEG placed with the aid of endoscopic ultrasound to avoid gastric varices.

I am in entire agreement with Dr. Fang's comments on PEGJ and DPEJ.

Technique: Percutaneous gastrostomy

Dr. Fang's technique for PEG insertion is essentially similar to mine with a few differences worth highlighting. He has not mentioned patient position at the time of endoscopy. Unlike routine upper gastrointestinal endoscopy where patients are in the left lateral position, I carry out this procedure with patients in a supine position. This facilitates transillumination and indenting the abdominal wall as already described. Where there is concern about patients lying on their back, PEG insertion can be done with the patient in the left lateral position. This position is generally a little more awkward for the person introducing the trocar but not for the endoscopist.

A comparison of 12-Fr and 20-Fr PEG tubes showed no difference regarding long-term patency or complications [6]. The 15-Fr PEG tube is one of the most widely used in the United Kingdom, in contrast to the larger sizes used in the United States [7]. I therefore find the incision size required is rarely more than 5 mm and is approximately the same as the width of the scalpel provided in the 15-Fr PEG kit we use. Once the trocar has penetrated the stomach I ensure that this is grasped with a snare prior to the introduction of the guide wire. This prevents the trocar's being accidentally displaced if the patient were to cough or retch. The guide wire and gastrostomy tube should be pulled with gentle traction. (I liken this to pulling on the placenta – perhaps an experience not shared by many gastroenterologists!)

Once the PEG has been pulled into position it is important to ensure the internal retaining device is against the gastric mucosa. My preferred method is to check the external markings on the gastrostomy tube which provides an indication of the depth of the retaining device. For the majority of patients this is rarely more than 3 or 4 cm. When there is doubt one can repeat the gastroscopy to visually inspect the internal fixing device.

Unlike Dr Fang I have no strong views as to whether the dressing should be placed under or over the bumper. Indeed many would argue that a dressing is not necessary, particularly if there is a snug fit around the PEG. I would however be emphatic that the external device should not be more than 1 cm beyond the abdominal wall. In my view this helps reduce the risk of



pneumoperitoneum and leakage by keeping the gastric wall in close contact with the anterior abdominal wall and reducing lateral movement of the tube.

Prophylactic antibiotics are ideally given at the time of sedation to reduce the risk of early infectious complications [8].

Technique: Percutaneous gastrojejunostomy

I would agree with the description given by Dr. Fang with some notable exceptions. These relate to differences between the UK and USA in the size of PEG tubes used. One of the most commonly used sizes in the United Kingdom is 15-Fr which will easily accommodate a 9-Fr jejunal extension tube. A 28-Fr PEG tube is rarely used and therefore the use of an ultrathin endoscope or bronchoscope equally uncommon.

Technique: Direct percutaneous jejunostomy

Again I would agree with Dr Fang's description for the placement of a DPEJ. However, we would tend to use hyoscine butylbromide instead of glucagon and I would not go as far as resorting to a general anesthetic or fluoroscopy to aid placement.

Post-procedure care

Patients normally have nil by PEG or mouth and are observed hourly, for 4 hours. If the observations are satisfactory, feeding can be introduced via the PEG thereafter. Some of our patients, after a satisfactory 4-hour period of observation, return directly to the nonmedical institution from which they were referred. Under these circumstances I allow clear fluids to be infused via the PEG after 4 hours but defer feeding until the following day.

The PEG site should be treated as a surgical wound and the use of dressings should be discouraged and unnecessary after the first 48 hours. I agree with Dr Fang's view on the avoidance of irritant skin cleansers and antibiotic ointments. Patients and their carers are given guidance about PEG care and appropriate dietetic and nursing support in the community.

Complications

The true incidence of complications related to percutaneous enteral tube feeding is difficult to quantify. The differences in population and definitions largely account for the variation in complication rates. Complications can be classified according to when they arise and whether they are major or minor. Those arising within 48 hours of the procedure are categorized as immediate; those occurring within 2–4 weeks as early; and those occurring after 4 weeks, or when the fistula is fully formed, as late.

Directly procedure-related mortality rates are low and usually less than 1% but may be as high as



2%. The 30-day mortality rates can vary from 10% to 28% depending on patient selection and underlying disease [4].

Major complications as tabulated by Dr. Fang occur in about 3% of PEG placements [4]. They are related to a number of factors including extreme old age, diabetes, and significant underlying comorbidity [2]. The minor complications upon which Dr. Fang comments are probably more common than is reported in the literature and occur in approximately 20% of patients.

I would agree that complications of DPEJ are similar to those of PEG but moderate or severe complication rates have been reported to be as high as 10% [9]. I also have the view that tube dysfunction in PEGJ is a particular problem due to a combination of length, narrow diameter, and poor care.

Conclusion

The provision of a percutaneous enteral tube feeding service should be routine for most gastrointestinal units. Optimal outcomes can only be achieved through careful patient selection, pre-assessment, and post-procedural care, as part of a multidisciplinary team.

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“HOW I DO IT”



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Summary

Spiros D. Ladas

Drs. Fang from the USA and Kapadia from the UK have excellently presented how they perform percutaneous endoscopic gastrostomy (PEG) and jejunostomy procedures. They both agree on the indications, contraindications and patient preparation. They describe in detail the technique of the PEG procedure, so that their text can be used by junior endoscopists as a reference guide. I am going, therefore, to focus on issues related to the avoidance of complications and the aftercare for PEG.

Currently available endoscopic techniques include percutaneous endoscopic gastrostomy (PEG), jejunostomy (PEJ) and gastrojejunostomy (PEGJ). The commonest indications are provision of nutrition in patients who cannot swallow due to neuromuscular impairment (e.g. cerebral vascular accident [CVA], myopathies, or polyneuritis) or obstruction (e.g. head and neck cancer), in children with failure to thrive (e.g., because of cystic fibrosis), and gastric decompression (e.g., with intestinal pseudo-obstruction).

PEG is a major nonsurgical procedure. Patient selection is of paramount importance in minimizing complications and mortality. PEG feeding is justified for patients who need tube feeding for more than 30 days [1], because the 30-day mortality may be as high as 30% in hospitalized patients, mostly related to underlying comorbidities [2].

Informed consent processes

Published studies have indicated that many of those making decisions (patients or relatives) are not satisfied with the quality of information given before informed consent. A survey of our institution showed that although 93% of the decision-makers considered that their opinion had been taken into account when the procedure was done, 25% said that they had not been adequately been informed about alternative methods, and 38% about the complications of the procedure [3]. It is therefore important to fully inform decision-makers before asking them to sign the informed consent document. This will avoid medicolegal consequences.

Selection of PEG tube size

OMED "How I do it" descriptions are intended for use all over the world, i.e., in developed and developing countries, and the families of patients using PEG tube feeding could be of varying socioeconomic status; this has a bearing on the selection of PEG tube size.



Two types of nutrients may be used for PEG tube feeding. The first type are commercially available nutrient solutions, which may be given with continuous drip or pump through the PEG tube. The daily cost of home enteral nutrition in most European countries is 10€–25€ and it is fully funded in many countries [4]. The second type is home-cooked food, which is blended, diluted with tapwater and injected using a 60-ml syringe through the PEG tube. However, the cost of commercial solutions is much higher than that of home-cooked food. The endoscopist should discuss with the caregiver which type of nutrient he/she prefers to use for the patient, and place a 15-Fr PEG tube for use with commercially available nutrient solutions, or an 18- or 20-Fr PEG tube for home-cooked food.

Safe PEG tube placement

Transillumination of the abdominal wall and clear visualization of the indentation and movement of the stomach wall during ballottement is necessary to detect the best abdominal wall puncture site and to avoid puncturing neighboring organs such as the colon. Dr. Fang uses the “safe track” technique, i.e, he slowly advances a syringe, partially filled with saline, with the barrel of the syringe pulled back to create negative pressure. If air is aspirated before the needle appears in the gastric lumen, it is very likely that an interposed hollow viscus has been punctured.

Wound infection

Wound infection is the most common complication of the PEG procedure, with a reported incidence of 4.3%–16%. In addition, 3%–8% of patients may develop local cellulitis or abscess formation. Necrotizing fasciitis is the most severe end of the spectrum of local infectious complications. Measures to prevent wound infection should include:

- a strictly aseptic insertion technique
- skin incisions of adequate size to avoid skin ischemia and necrosis
- avoidance of excessive tension of the retention discs which may also lead to edema and ischemia of the skin and gastric mucosa
- use of prophylactic antibiotics, and perhaps
- the use of mouthwash with antiseptic solutions
- good post-insertion care of the PEG site.

A meta-analysis of randomized control trials confirmed that a single intravenous dose of a broad-spectrum antibiotic, given approximately 30 minutes before PEG is effective in reducing the incidence of wound infection [5]. The most frequently used antibiotics are either intravenous amoxicillin + clavulanate 2.2 g or one dose of a second- or third-generation cephalosporin given



30 minutes before the procedure.

Post-procedure care

Accidental PEG removal

Since the gastrostomy fistula heals completely within 24–48 hours after removal of the PEG tube, I advise caregivers that in case of accidental PEG tube removal, the family physician should introduce a Foley catheter into the gastrocutaneous fistula to keep it patent. This will give time to transfer the patient to hospital for a tube replacement on an outpatient basis the next day. If the fistulous tract is shrunk (stenosed) and a replacement PEG tube cannot be introduced, I dilate it with a Savary dilator over a guide wire introduced into the stomach through the fistulous tract.

PEG tube removal and replacement

PEG tubes are frequently used for temporarily feeding patients in intensive care units or after a stroke, and therefore removal of the tube is often done, after the patient has recovered and can start oral feeding. After PEG tube removal the external orifice of the fistulous tract is covered with a sterile compress and the patient can immediately start oral feeding. Leak of gastric content is minimal and stops within 1–3 days.

The durability of a PEG tube is related to careful handling, and they may remain in situ for more than 1 year. However, PEG tubes need to be replaced when they become clogged from food or because the external catheter cap is broken or the tube's integrity is altered. Tube blockage results from protein-enriched formulae, medications, and most importantly, from insufficient tube care. The smaller-sized tubes (e.g. 9 Fr) are prone to clogging. Polyurethane materials are recommended in preference to silicone PEGs as the latter are more susceptible to material deterioration and tube failure [7].

PEG tube replacement does not require a new endoscopy and it is done in the office setting. I usually remove a PEG tube as follows. The patient is placed supine and the abdominal skin round the PEG fistula is prepared with a topical antiseptic, e.g. povidone-iodine. The tube is then well lubricated and it is advanced into the stomach to lubricate the fistulous tract. I place my hand against the abdominal wall, near the fistula orifice, and with the other hand grasp the PEG tube and pull it out with steady, sudden tension. In this way the bumper (mushroom-type) of the PEG tube is deformed and comes out. A replacement gastrostomy tube or button (balloon-type) is then inserted through the fistulous tract.

An alternative way of removing the PEG tube is to cut away the external catheter and either remove the internal fixation bumper endoscopically by catching it with a snare or allow it to be passed naturally. In children, PEG tubes must be removed endoscopically. Certain types of PEG tube, e.g. the Freka, cannot be removed by external traction because the gastric bumper is not



flexible. There are several reports of ileus and need for operation after the external catheter had been cut away, leaving the bumper to pass out naturally. However, recently published reports describe uneventful passing of the Freka internal bumper with feces [8].

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