

PERCUTANEOUS ENDOSCOPIC GASTROSTOMY

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INTRODUCTION

Every healthy person has a range of daily oral intake for each essential nutrient, which is adequate and safe. The lower end of this range is called 'the daily dietary requirement'. If these requirements were not met, deficiencies would surface over time in the absence of nutrition supplements. The decision to begin nutrition support is based on the number and intensity of factors given in Figure-1. The objectives of optimal nutrition support (Table-1) can be easily memorized by the memory aid — FACE MTV (Table-2).¹



Fig. 1: Factors to be considered in deciding about nutritional support

Table-1: Five steps to optimal nutrition support.

- Prevent malnutrition.
- Establish and accomplish energy and protein goals.
- Select, establish and maintain an access for feeding: consider oral feeding first, then tube feeding and finally the intravenous rout.
- Choose or design an optimal formula for the individual patient considering each component.
- Monitor the patient to ensure that nutrition support is as effective and safe as possible.

Table-2: Memory aid to nutrition support.

F— Fluid
A— Aminoacids /proteins
C— Calories
E— Electrolytes
M— Miscillaneous ? Heparin ? Insulin
T— Trace elements e.g. Zinc
V— Vitamins

Nutrition support can be given parenterally or enterally. Enteral feeding when feasible is safe, less costly and is preferred over total parenteral nutrition (TPN) in patients who can not ingest adequate nutrients orally but have a functioning digestive tract. There is increasing evidence that enteral nutrition provides important nutrients not present in TPN e.g. Glutamine and short-chain fatty acids.^{2,3}

Nasogastric feeding is a type of tube feeding which is commonly employed in our country. It is appropriate for oriented and co-operative patients specially when required for short period of time but is unsuitable for disoriented and unco-operative ones (tube removed and needs to be placed again). Aspiration pneumonia is another disadvantage. Feeding through gastrostomy is appropriate when long-term feeding is planned specially when oro/nasopharyngeal passage is blocked and can not be used. Compared to nasogastric feeding, Percutaneus Endoscopic Gastrostomy (PEG) feeding significantly improves outcome in terms of nutritional status, mortality, and hospital discharge in acute dysphagic strokes.⁴

Evaluation of PEG (Figure-2): From the historic traumatic gastrocutaneous fistula of Alex St. Martin in 1822 to the concept of surgically created fistula between stomach and abdominal wall (first conceived by Egeberg in 1837 and attempted by Sellidot in 1847),⁵ surgical gastrostomy has come along way with more popular Depage-Janeway⁶ (formation of a tube of gastric wall brought out through the abdominal wall) and Stamm methods⁷ (Rubber catheter placed in the stomach through anterior gastric wall using purse-string sutures and

brought out through the anterior abdominal wall). Surgical gastrostomy requires laparotomy and often general anaesthesia.

Introduction of PEG in 1980,⁸ has galvanized the approach to enteral feeding⁹ and at present it remains the most utilized method to gain access to upper digestive tract.¹⁰



Fig-2: Gastrostomy Evolution.¹¹

Gastrostomy can also be performed radiologically under fluoroscopy. Comparison of the three, based on success rate and complications, is given in Table-3.

Table-3: Comparisons of procedural success and complication rates.¹²

Measure	Surgical Gastrostomy	PEG	Radiologic Gastrostomy
No. of patients	721	4,194	837
No. of series	11	48	9
Success rate, %	100	95.7	99.2
Procedural mortality rate, %	2.5	0.5	0.3
Major complication rate, %	19.9	9.4	5.9
Minor complication rate, %	9.0	5.9	7.8

Techniques of placing PEG tube: There are three ways to put in PEG tube: 'Pull technique' (oldest and most popular), 'Push technique' and 'Introducer technique', compared in Table-4.

Table-4: Comparison of various techniques of PEG.

Feature	Pull technique	Push technique	Introducer technique
Control of punctured stomach	Yes	Yes	No
Leakage of gastric contents	No	No	Likely
Infection from oral flora	Yes	Yes	No
Tight oesophageal stricture	May pose a problem	May pose a problem	Not a problem
Premature extrusion	Less likely	Less likely	More likely
Aspiration of feeds	Yes	Yes	Yes

Wolfsen and colleagues¹³ found that 36% of patients scheduled for PEG tube placement had endoscopic findings, such as peptic ulcer disease and gastric outlet obstruction. Their work suggests that a full oesophago-gastro-duodenoscopy be performed at the beginning of the procedure.

Pull Technique⁹ (Ponsky-Gauderer Technique)

A full oesophago-gastro-duodenoscopy should be performed to begin the procedure. Stomach is inflated and site for placement of PEG tube is located by trans-illumination on the abdominal wall and impression of finger pressure endoscopically. (Figure-3) With the gastroscope in the stomach maintaining distension, a small skin incision is made under local anaesthesia at the selected site followed by 18 gauge needle catheter pushed through the anterior abdominal wall into the stomach. (Figure-4) A guide-wire is then passed through it into the stomach and grasped with a polyp snare passed through the gastroscope. The gastroscope with snare (holding the guide-wire) is then withdrawn with the free end of the wire remaining outside the abdominal wall. (Figure-5) The PEG tube is then tied to the wire at the mouth and pulled into the stomach by pulling on the free end of the wire at the abdominal wall. Position of the PEG tube is confirmed by check endoscopy. (Figure-6)



Fig. 3



Fig. 4



Fig. 5



Fig. 6

Push Technique (Sacks-Vine Technique):¹⁴ The “push method” or Sacks-Vine technique is similar to the pull method except that the PEG tube is pushed over the taut guidewire.¹⁵ Guide-wire is passed into the stomach and pulled through the mouth just as ‘pull’ technique. A special tube, with taper dilator end, is pushed over the tightly held guide-wire through the oesophagus until the tapered end appears at the anterior abdominal wall. The tube is then grasped and pulled to its final position.

Introducer Technique (Russel Technique):¹⁶ The Russel or “introducer method” uses Seldinger technique for the placement of a balloon-tipped PEG tube directly into the stomach, using direct endoscopic visualization and a dilator peel-away sheath.¹⁶ Stomach is trans-illuminated and dis-

tended via air insufflation through gastroscop. With finger pressure on anterior abdominal wall as viewed through the gastroscop in the stomach, best site is selected. Small cutaneous incision is made under local anaesthesia and through this incision a needle is passed into the stomach and then a guide-wire is passed through the needle. The needle is removed leaving the guide wire in the stomach. An introducer with outer ‘Peel away’ sheath is passed over the guide-wire in to the stomach. The wire and introducer are removed leaving only the sheath in the stomach. A urinary catheter is introduced through the sheath in to the stomach, and its balloon inflated. The sheath is removed and balloon of the catheter is pulled up to its proper place.

Indications and contraindications for Gastrostomy

Indications (Table-5) for gastrostomy are expanding as awareness of its utility is increasing among both the medical professionals and patients. Contraindications are given in Table-6.

Table-5: Indications for PEG.

Neurological conditions	Head trauma, Stroke ¹⁷ Multiple sclerosis Amyotrophic lateral sclerosis Alzheimer’s disease Senile dementia Vegetative state Pseudobulbar palsy Parkinsons disease ¹⁷
Aerodigestive disorders	Oropharyngeal trauma Injuries to larynx, upper trachea Severe facial injuries Tumours of the oropharynx ¹⁸ Gastric decompression (second most common indication for PEG tube placement) ¹⁹
Biliary	Biliary conduit ²⁰
Muscular disorders	Myaesthesia gravis Dermatomyositis ¹⁸
General	Protein-calorie malnutrition

Contraindications to PEG: Not all patients considered for PEG would be fit to undergo the procedure. Stomach can not be approximated to the anterior abdominal wall in the presence of massive ascites with consequent leakage of gastric contents and peritonitis. Local and systemic sepsis would increase the chance of severe peri-stomal

infection. Oesophago-gastric varices may bleed severely because of direct trauma to the varix and coagulopathy due to background liver disease. Patients with intestinal obstruction are not fed enterally, as a general rule. It will be considered unethical to place PEG tube in patients with rapidly deteriorating multi-organ failure or patients with life expectancy of less than 3 months. PEG is performed under local anaesthesia and easily done when the patient is in compos mentis and cooperative. It will be extremely dangerous to attempt PEG in uncooperative, agitated and severely confused patient.

Table-6: Contraindications for PEG.

Abdominal factors	Massive ascites Intrabdominal sepsis Oesophageal or gastric varices Severe gastro-oesophageal reflux, Intestinal obstruction
Technical factors	Inability to intubate the oesophagus safely Inability to transilluminate stomach or see the Finger-Pressure sign
Systemic factors	Systemic sepsis Rapidly deteriorating patients with multiorgan failure Coagulopathy
General factors	Life expectancy < 3 months Uncooperative patient

Complications: Surgical gastrostomy, apart from the risks of general anaesthesia, has got the potential for post-operative ileus, bleeding, infection, wound dehiscence and hernia. Oesophageal damage, gastro-colic fistula, stromal leakage and interference with future gastric surgery are other potential complications.

PEG related general complications, with increasing frequency are infection, bleeding, perforation, and cardiopulmonary complications.

Pulmonary complications include aspiration, atelectasis, laryngospasm and/or bronchospasm and respiratory arrest not attributable to medication used. Careful attention and repeated suction of oral secretions during the procedure may prevent most of the pulmonary complications.

Cardiac complications include transient ECG changes (not uncommon) and rare fatal arrhythmia e.g. ventricular fibrillation, especially in patients with ischaemic heart disease. Careful monitoring and rapid conduct of the procedure in high-risk patients will minimize the risk.

Major complications of PEG tube placement e.g. peritonitis, hemorrhage, aspiration, peristomal wound infection, buried bumper syndrome, and gastro-colic fistula, occur in approximately 3% of the patients.²¹⁻²³

Perforation of a viscus e.g. Gastro-colic fistula,²⁴⁻²⁶ Perforation of the left lobe of liver,²⁷ can be prevented by inflation of stomach with air which easily displaces the stomach (if no previous gastric surgery) anteriorly with liver sliding cephalad and colon falling caudally and dorsally. Precise location of the site for gastrostomy tube using trans-illumination along with finger pressure will further reduce the chances of such complications.

Misplacement of PEG tube in the oesophagus (because of breakage of suture used for pulling the tube) used to be a problem in the past with 'Pull technique'. Improvement in the quality/material of the suture and increasing the length of the PEG tube has minimized the chances of misplacement of PEG tube in the oesophagus.

Leakage of gastric contents may occur leading to peritonitis.

Pneumoperitonium occurs in 30-40% cases but is usually of no clinical significance.²⁸ Benign pneumoperitonium resolves within five weeks. Increasing pneumoperitoneum suggests perforation of a hollow viscus or inadequate approximation of the stomach to the abdominal wall.²⁹

Iman et al³⁰ found peri-stomal infection in 11.6% cases which were treated successfully with enteral antibiotics. Sadik et al¹⁸ reported 16%, Schurink et al³¹ 13% and Anis MK et al³² reported 3-15% peri-stomal infection. Jain and colleagues³³ showed that the incidence of peri-stomal wound infection could be reduced from 28.6% to 7.4% with the administration of 1 g of cefazolin half hour before the procedure.

Wound infection may be more severe and at times be necrotizing fasciitis.^{34,35} Incidence of infection can be minimized by oral toileting with antiseptic solution, giving peri-procedure intravenous prophylactic antibiotic shots and giving at least 1 cm long skin incision to prevent inspissation of oral secretions in the wound.

When to start feeding after PEG placement? Typically, the patient is not fed through PEG tube in the first 12-24 hours after its placement. During this time vital signs are carefully monitored and

patient is assessed for bleeding and leakage at the PEG site. After this interval, PEG feedings can be initiated.³⁶ Attempts have been made to reduce this PEG non-feeding time from 24 hours to 12 hours.³⁰ (Iman et al), 4 hours³⁷ and 3 hours³⁸ to reduce hospital stay without compromising safety. This essentially makes it an outpatient procedure thus helping to reduce cost further.

Does PEG improve survival? Survival benefits due to feeding through PEG have been noted in certain indications e.g. acute stroke⁴ but not in all e.g. Dementia.³⁹ While survival remains multi-factorial in such patients, the author believes that nutritional support through PEG improves care conveniently.

Acceptability of PEG: Acceptability of tube feeding by the patients and caregivers has always been a challenge. PEG is placed and maintained by a team of three i.e. caregiver, patient and Physician or Gastroenterologist. The primary decision and education of caregiver/patient about PEG placement would stem from the incharge physician or gastroenterologist. Proper indication, ethics of the procedure and awareness about the availability of the procedure/expertise locally are the main determinants of the physician's acceptance to offer PEG to a patient. Naso-gastric feeding is a common scene in our hospitals and is readily accepted by both patients and caregivers. Fear of both getting exposed to a new procedure and not being able to look after the PEG tube along with the higher cost (compared to naso-gastric tube) are few reasons why our patients do not accept PEG tube easily. Low JA et al⁴⁰ report on the acceptability of tube feeding ('no' to naso-gastric feeding (69%), 'no' to PEG feeding (71%) and 'yes' to modified oral feeding despite of risk of aspiration (75%).

Cost: PEG is certainly cheaper than surgical gastrostomy, Table-7⁴¹ but expensive than naso-gastric tube. The cost of PEG tube is around Rs. 8000/- while a simple naso-gastric tube costs around Rs. 100/- in our country.

Table-7: Procedural costs in US Dollars.⁴¹

Procedure	Surgical Cost (\$)	Endoscopic Cost (\$)	Radio-logic Cost (\$)
Gastrostomy	3694	1861	1985

Maintenance of PEG: Proper care of the PEG tube is important. Table-8 gives common problems in the maintenance of PEG tube and appropriate solution if such problems are encountered. Edu-

cation of the patient and caregivers in this regard is of paramount importance.

Table-8: Gastrostomy: Maintenance problems and their prevention/solutions.

Care related	Prevention/Solution
Skin irritation Moniliasis Tube plugging	Avoid occlusive dressing Avoid narrow bore tube, Plain water +/- Citrus juice after each feed (protein in the feed would not stick to the tube and clog it)
Inadequate feeding	Proper education of care giver
Tube related problems	
Granulation tissue Leakage	Cauterization Avoid too large/too stiff tube
Inadvertent removal	Avoid bringing the tube through linea alba Uncooperative patients is the usual cause; Educate the patient
Internal migration (obstruction)	Pull back the tube to the stoma
External migration (Abscess, Extrusion)	Remove and replace the tube
Postural problems (Lying prone, Swimming)	Educate the patients: highlight the benefits
Psychological problems	Educate the patient: highlight the benefits
Persistent gastro-cutaneous fistula (after the tube removal)	Gastrostomy Button

CONCLUSION

PEG is cheap, safe and effective way of establishing a route for enteral feeding in patients with diseases of diverse nature with one common feature i.e. requiring nutritional support.

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