A dissertation on

"EARLY VS DELAYED ENTERAL FEEDING IN PATIENTS UNDERGOING GASTRO INTESTINAL SURGERIES"

A DISSERTATION SUBMITTED TO THE TAMIL NADU

DR. M.G.R MEDICAL UNIVERSITY

CHENNAI.

In partial fulfilment of the requirement for the degree of

M.S.(GENERAL SURGERY)

BRANCH – I

DEPARTMENT OF GENERAL SURGERY
GOVT VELLORE MEDICAL COLLEGE

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This is to certify that the dissertation entitled **"EARLY VS DELAYED ENTERAL FEEDING IN PATIENTS UNDERGOING GASTRO INTESTINAL SURGERIES AT GOVT VELLORE MEDICAL COLLEGE AND HOSPITAL"** is a bonafide research work submitted by **DR. PRAVIN KUMAR.R,** Postgraduate student in Department of General Surgery, Govt Vellore Medical College and Hospital, to The Tamil nadu Dr. M.G.R Medical University, Chennai, in partial fulfillment of the requirement for M.S. Degree (Branch - I) in General Surgery.

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I hereby declare that the dissertation titled **" EARLY VS DELAYED ENTERAL FEEDING IN PATIENTS UNDERGOING GASTRO INTESTINAL SURGERIES AT GOVT VELLORE MEDICAL COLLEGE AND HOSPITAL "** is a bonafide and genuine research work carried out by me at Govt Vellore Medical College hospital, Vellore under the guidance of **DR.S.MANIKANNAN ,M.S.,** Associate Professor, Department of General Surgery, Govt Vellore Medical College, Vellore. The Tamil Nadu Dr .M.G.R Medical University, Chennai shall have the rights to preserve, use and disseminate this dissertation in print or electronic format for academic / research purpose.

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https://quizlet.com/58564443/enteral-nutrition-flash-cards/
https://vdocuments.mx/small-bowel-endoscopic-enteral-access.html
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4093701/

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16

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This is certify that this dissertation work titled **"EARLY VS DELAYED ENTERAL FEEDING IN PATIENTS UNDERGOING GASTRO INTESTINAL SURGERIES AT GOVT VELLORE MEDICAL COLLEGE AND HOSPITAL"** of the candidate **DR . PRAVINKUMAR.R** for the award of **M.S.** Degree in the branch of **GENERAL SURGERY.** I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **two percentage** of plagiarism in the dissertation.

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Title of the Study	-	EARLY VS DELAYED ENTERAL FEEDING IN PATIENTS UNDERGOING GASTRO INTESTINAL SURGERIES AT GOVT. VELLORE MEDICAL COLLEGE & HOSPITAL.
Principal Investigator	-	Dr.R.Pravinkumar, M.S., Post Graduate
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The request for an approval from the Institutional Ethical and Scientific Committee (IEC) was considered on the IEC meeting held on 03.11.2018 at the Conference Hall, Govt. Vellore Medical College, Vellore-11.

The Convenor, Chairperson, Member Secretary and committee members decided to approve the proposed work mentioned above submitted by the Principal Investigator.

The Principal Investigator is instructed to submit the status of this project periodically to this College Office.

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CONTENTS

ABBREVATIONS

EN-Enteral Nutrition

NG-NasoGastric

NJ-NasoJejunal

PEG-Percutaneous Endoscopic Gastrostomy

PEJ- Percutaneous Endoscopic Jejunostomy

JET-PEG- Jejunal Extension Through- Percutaneous Endoscopic Gastrostomy

INTRODUCTION

- Gut secretes and reabsorbs about 7 liters of fluid per day irrespective of oral intake, so giving ‘rest to gut and protecting anastomotic site’ is based on a false notion .
- Gut recovers from dysmotility within 24 to 48 hours in case of stomach and colon while 4 to 6 hours in case of small bowel
- So early enteral feeding prevents translocation of bacteria or virus by maintaining integrity of gut mucosa which may become atrophied if gut remains in rest for 5 days
- Many patients remain malnourished before operation; they are predisposed to more postoperative complications.
- Starvation reduces the collagen content in the scar tissue and diminishes the quality of healing, whereas feeding reverses mucosal atrophy induced by starvation and increases anastomotic collagen deposition and strength.

On the basis of above ideas , this study was to evaluate efficacy of early enteral feeding in patients undergoing bowel anastomosis.

AIM OF THE STUDY

To compare the outcome of early Enteral feeding vs routine delayed oral feeding after gastro intestinal surgeries.

0BJECTIVES

1. To study the impact of early feeding on duration of paralytic ileus and start of oral feeds following upper gastrointestinal surgery.
2. To study the rate of anastamotic leak after start of early enteral feeding
3. To study the rate of wound infection after starting early enteral feeding
4. To compare duration of hospital stay.

REVIEW OF LITERATURE

NUTRITION IN CRITICAL ILL PATIENT

In critical illness, patients are typically in a catabolic state, with activation of the systemic inflammatory response. Patients in the ICU exhibit increased disproportionate morbidity due to infections, multiorgan dysfunction, and prolonged hospitalization.

In critically ill patients, the goals of nutrition therapy are to attenuate the metabolic response to stress, prevent oxidative cellular injury, and favorably modulate the immune response. Albumin, prealbumin, transferrin, and retinol binding protein are acute-phase reactants that do not change in response to altered nutrient intake; they are not indicative of malnutrition but are markers of the severity of the inflammatory response.

Nutrition therapy should be initiated early in critically ill patients who are unable to maintain oral intake, with Enteral Feeding being preferred to Parenteral Nutrition to maintain intestinal integrity, modulate stress and the systemic inflammatory response, and attenuate disease severity.

The beneficial effects of EN compared with PN have been shown in numerous RCTs for a variety of critically ill patient populations, including those with trauma, burns, head injury, major surgery, and acute pancreatitis. EN has consistently been shown to reduce infectious complications and may also reduce hospital length of stay as well as cost of nutrition therapy. EN should be started within the first 24 to 48 hours after ICU admission, so long as the patient is fully resuscitated and stable.EN can be initiated even in the absence of bowel sounds and failure to pass flatus or stool.

Ischemic bowel injury is a rare complication of EN and is due to the increased demand for splanchnic blood flow. EN should therefore not be used hemodynamically unstable patients, especially if vasopressor agents are required or their dose is to be escalated.

EN can be cautiously given to patients on stable low doses of vasopressor agents, but they should be monitored for signs of feeding intolerance including

- Abdominal distention
- Decreased passage of stool or flatus
- Hypoactive bowel sounds
- Increasing metabolic acidosis and/or base deficit.

Intolerance to tube feeding in these patients may be a sign of early intestinal ischemia.

If patients are at high risk for aspiration or are intolerant to gastric feeding small bowel feeding should be initiated.

Enteral Nutrition

Enteral nutrition (EN) is the delivery of nutrition in the liquid form directly into the stomach/duodenum/jejunum.

Nutrients are given through a tube or stoma directly into the stomach or small intestine. The nutritionally adequate feed containing protein,carbohydrate, fat, water, minerals and vitamins is administered.

EN supports both the structural and functional integrity of the GI tract. EN sustains structural integrity by

- maintaining mucosal mass and villus height.
- stimulating epithelial cell proliferation.
- promoting the production of brush border enzymes.
- maintaining the secretory immunoglobulin (Ig)A-producing immunocytes, which make up the gut-associated lymphoid tissue (GALT).

Enteral feeding also maintains the functional integrity of the GI tract by maintaining tight junctions between the intraepithelial cells, stimulating blood flow, and inducing the production and release of various trophic endogenous agents

1. Gastrin.
2. Cholecystokinin.
3. Bombesin.
4. Bile salts.

The presence of EN leads to secretion of mucus and intestinal contractions, which help wash bacteria distally. Along with pancreatic enzymes, proteases, and lactoferrin, these mechanisms help keep the bacterial load “in check,” preventing the overgrowth of pathogenic organisms.

In a patient who can eat and drink, EN support focuses on the use of nutritional supplements, dietary counseling, and appetite stimulation. In those patients who will not or cannot eat because of some dysfunction of the GI tract, a feeding tube is necessary to provide feedings. In this situation, obtaining enteral access becomes the foundation of any attempt to provide EN.

The radiologist, gastroenterologist, or surgeon usually places enteral access devices . This can be done at the bedside, fluoroscopically, endoscopically, or in the operating room. Enteral feeding is generally considered safer than parenteral feeding.

Systematic review of randomized trials involving critically ill adults has demonstrated fewer infectious complications with enteral nutrition compared with parenteral nutrition.

The direct costs of enteral feeding are generally less than those with parenteral nutrition. Direct costs include formula,feeding pumps, and tube placement. The cost advantage for enteral feeding is even greater when indirect costs such as central line placement, infection or thrombosis, and home health care are considered.(1)

Indications for Enteral Feeding

Enteral nutrition is the preferred method of nutrition support for malnourished patients or those at risk for developing malnutrition and who have an intact gastrointestinal tract. Patients who are either unable or unwilling to eat to meet their daily needs are candidates for enteral support.

Factors influencing the timing of initiation of enteral nutrition include evidence of pre-existing malnutrition, expected degree of catabolic activity, duration of the current illness,

and anticipated return to intake by mouth.

Patients with partially functioning gastrointestinal tracts (eg, short bowel syndrome, proximal enterocutaneous fistula) often can tolerate some enteral feeding but may require a combined regimen of both parenteral and enteral nutrition to meet total caloric needs.(2)

Possible Contraindications to Enteral Feeding

- Patients with Shortbowel syndrome
- Gastrointestinalobstruction
- Gastrointestinal bleeding
- Protracted vomiting and diarrhea
- Fistulas
- Ileus
- Active gastrointestinalschemia may require a period of bowel rest.

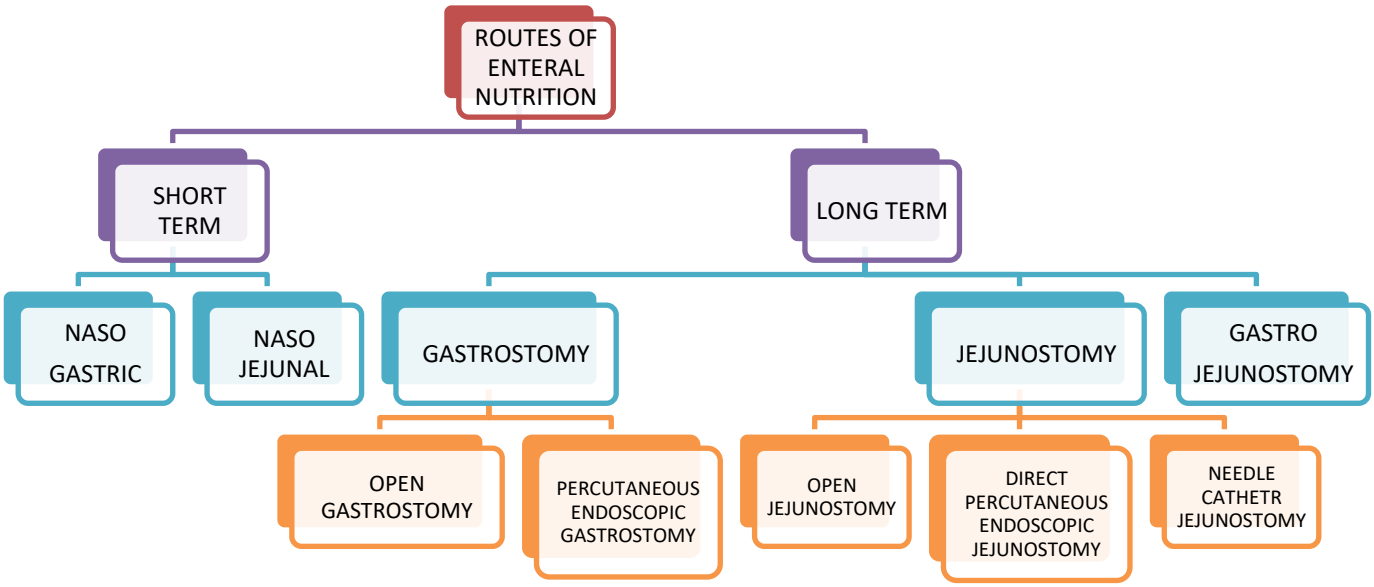
In times of physiologic stress, the body shunts blood away from the splanchnic circulation. Feeding a patient who ishemodynamicallyunstable or requires vasopressors may produce bowel ischemia in the setting of preexisting tenuous perfusion.The choice of an appropriate feeding site, administration technique, formula, and equipment may circumvent many of these contraindications.(3)

Routes of Administration

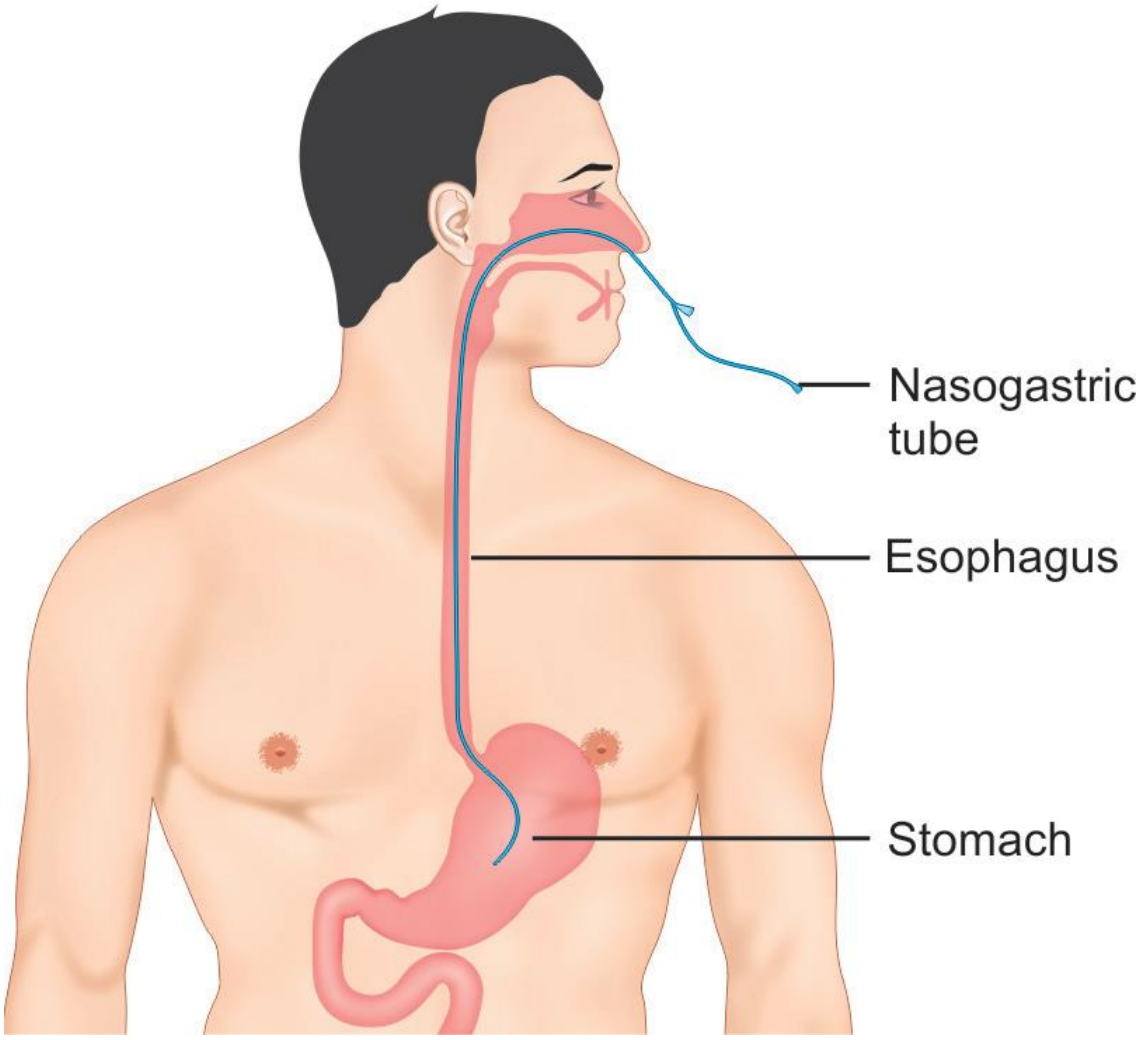
Short-term enteral nutrition which is administered to a patient for a period of less than 4 weeks is called a short-term enteral nutrition. It can be given through the following routes.

Nasogastric route: The site of administration is stomach.Feeding tubes which are inserted in the stomach are called“nasogastric” tubes .

FLOW CHART OF ENTERAL NUTRITION



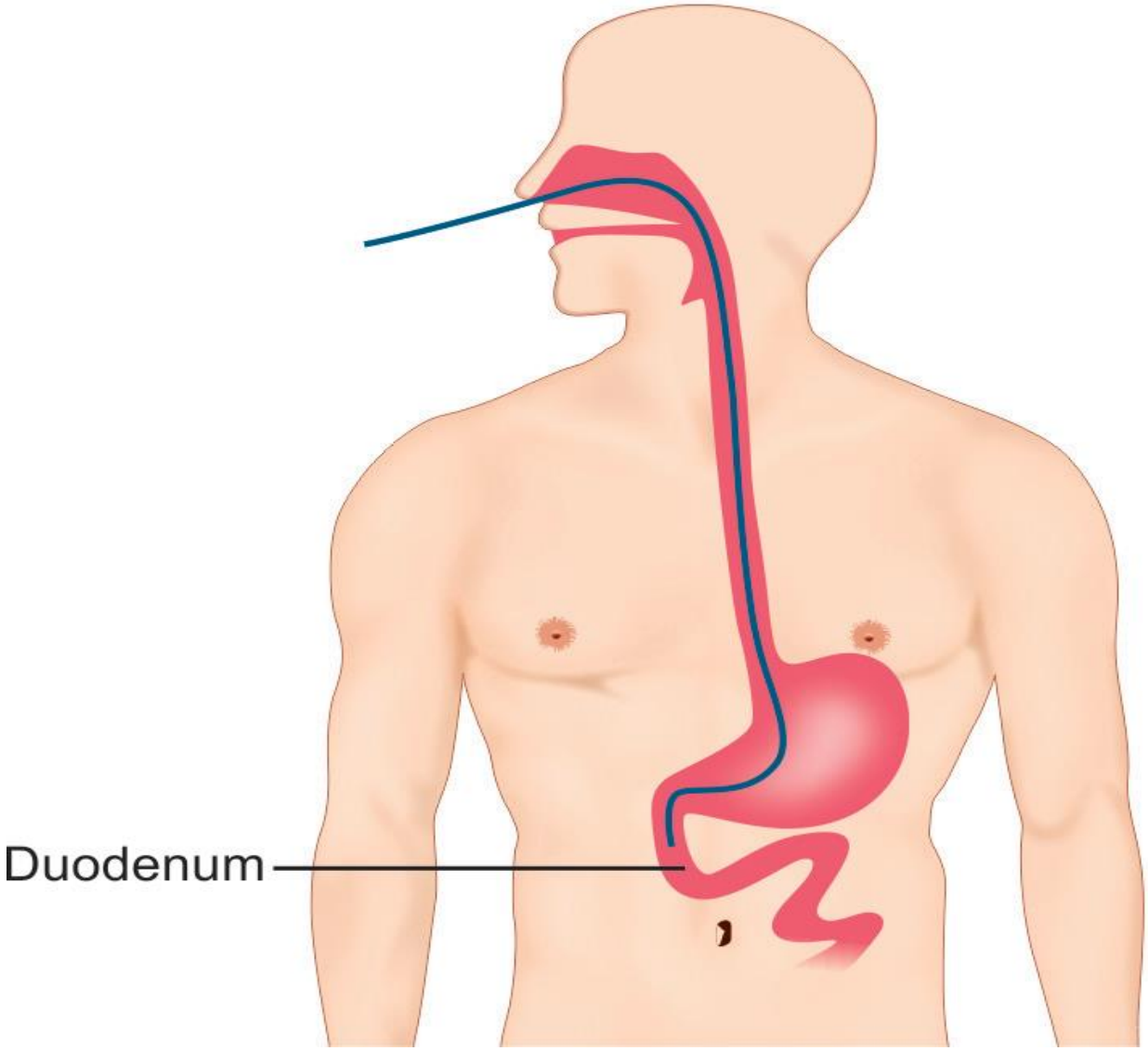
NASOGASTRIC ROUTE

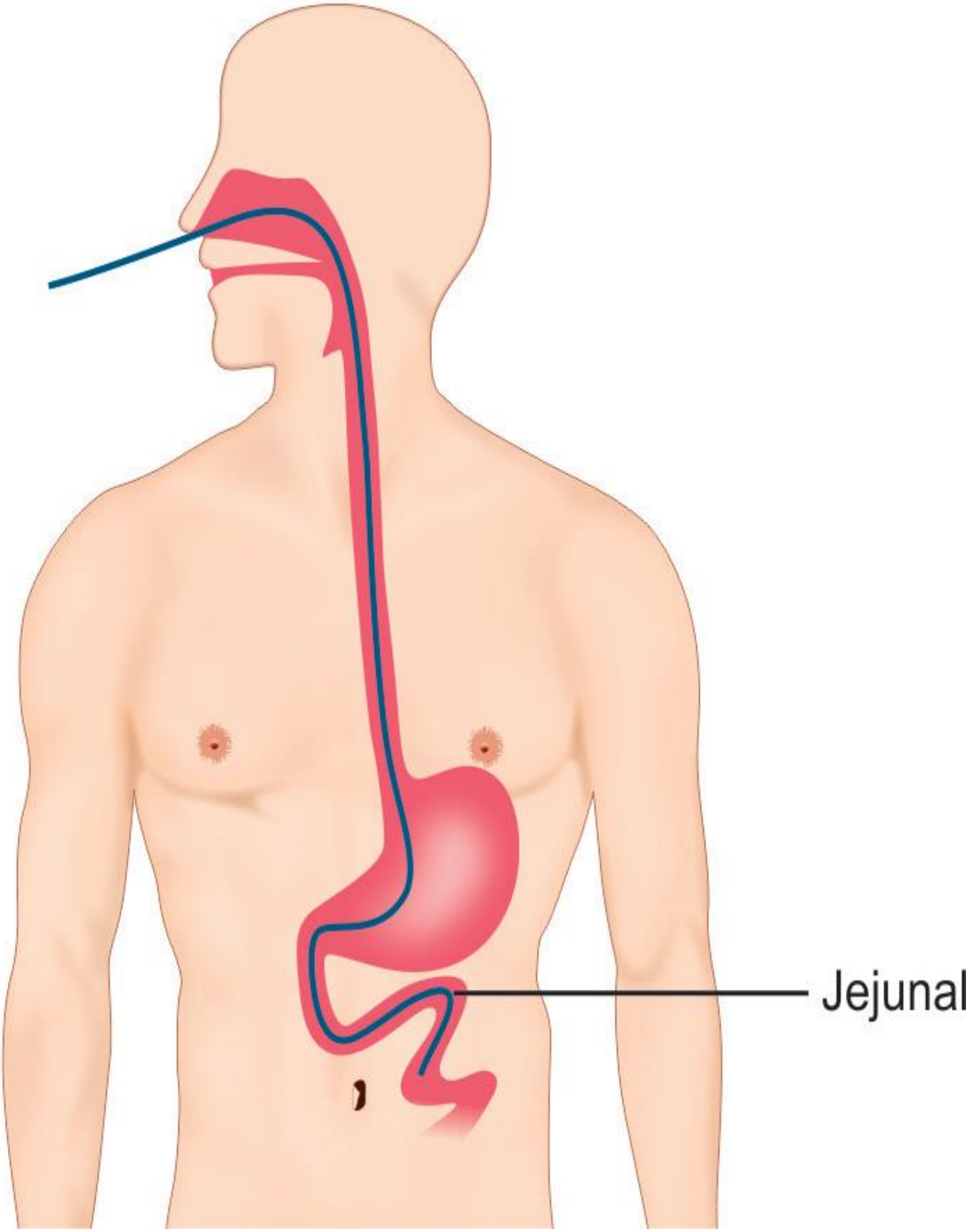


Indications: Patients who are unable to consume adequate nutrition through oral route, e.g. patient intubated, sedated and patients in hypercatabolism state with partially functional GIT.

Type of diet: The blenderized diet made from locally available food items like cereals, pulses, milk, egg, sugar, salt, oil, curd should be administered. The commercial preparations are also available; however, they are not cost effective as compared to blenderized diet made from locally available foods. Both the diets are equally effective.

Nasojejunal route and Nasoduodenal route: In nasojejunal route, the site of administration is jejunum. A tube is inserted into the jejunum. It is called jejunal tube. In nasoduodenal route, duodenum is the site of administration.




Jejunal

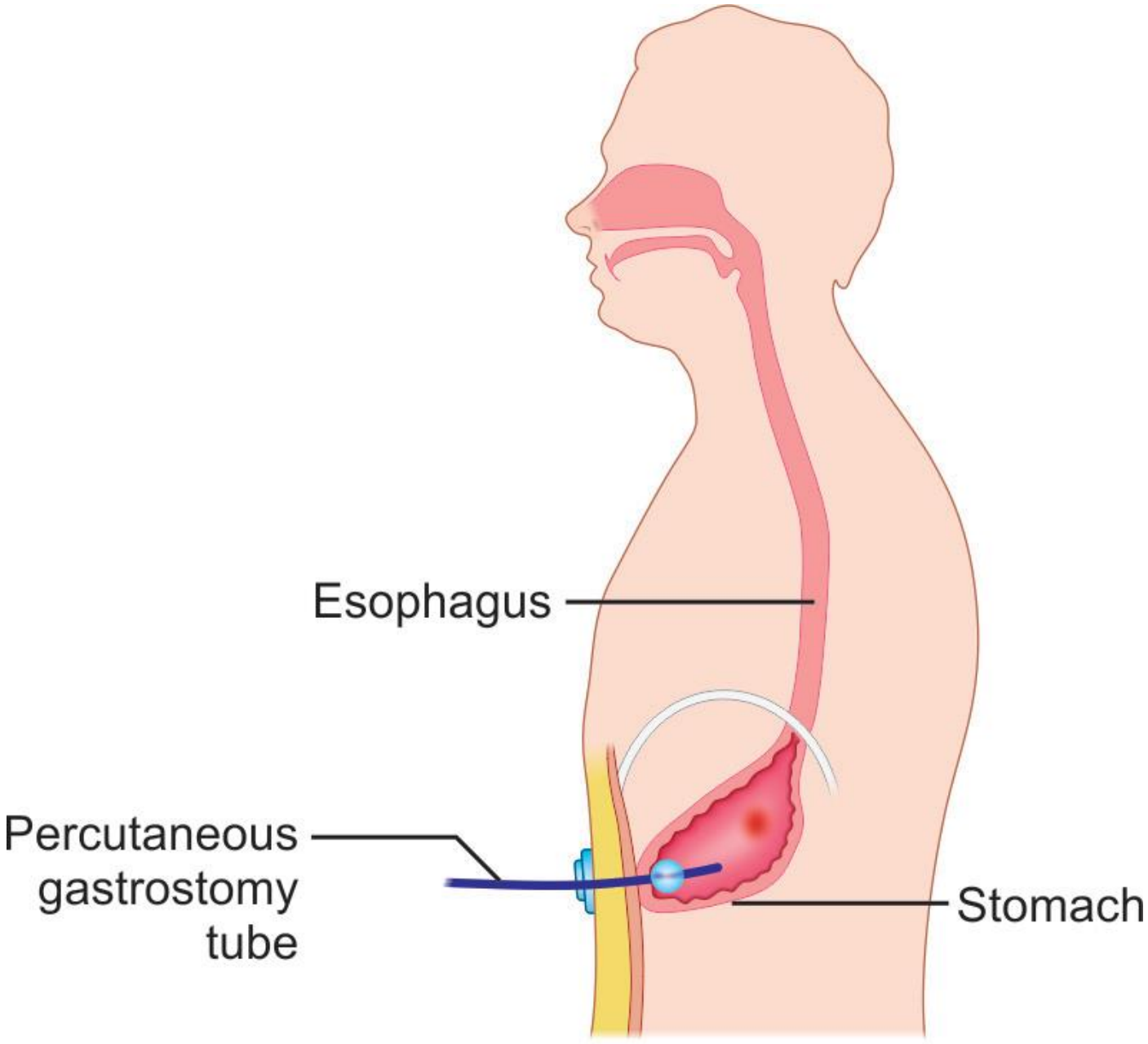
Indications: Functional GI tract with a proximal obstruction of upper GIT, inadequate gastric motility, esophageal reflux, upper GI surgery.

Complications of nasogastric and nasojejunal tube feeding

- Aspiration pneumonia
- Nasal mucosal ulceration
- Nasopharyngeal bleeding
- Otitis media
- Pharyngitis
- Pneumothorax
- Sinusitis
- Tracheoesophageal fistula
- Tube migration
- Tube obstruction(4)

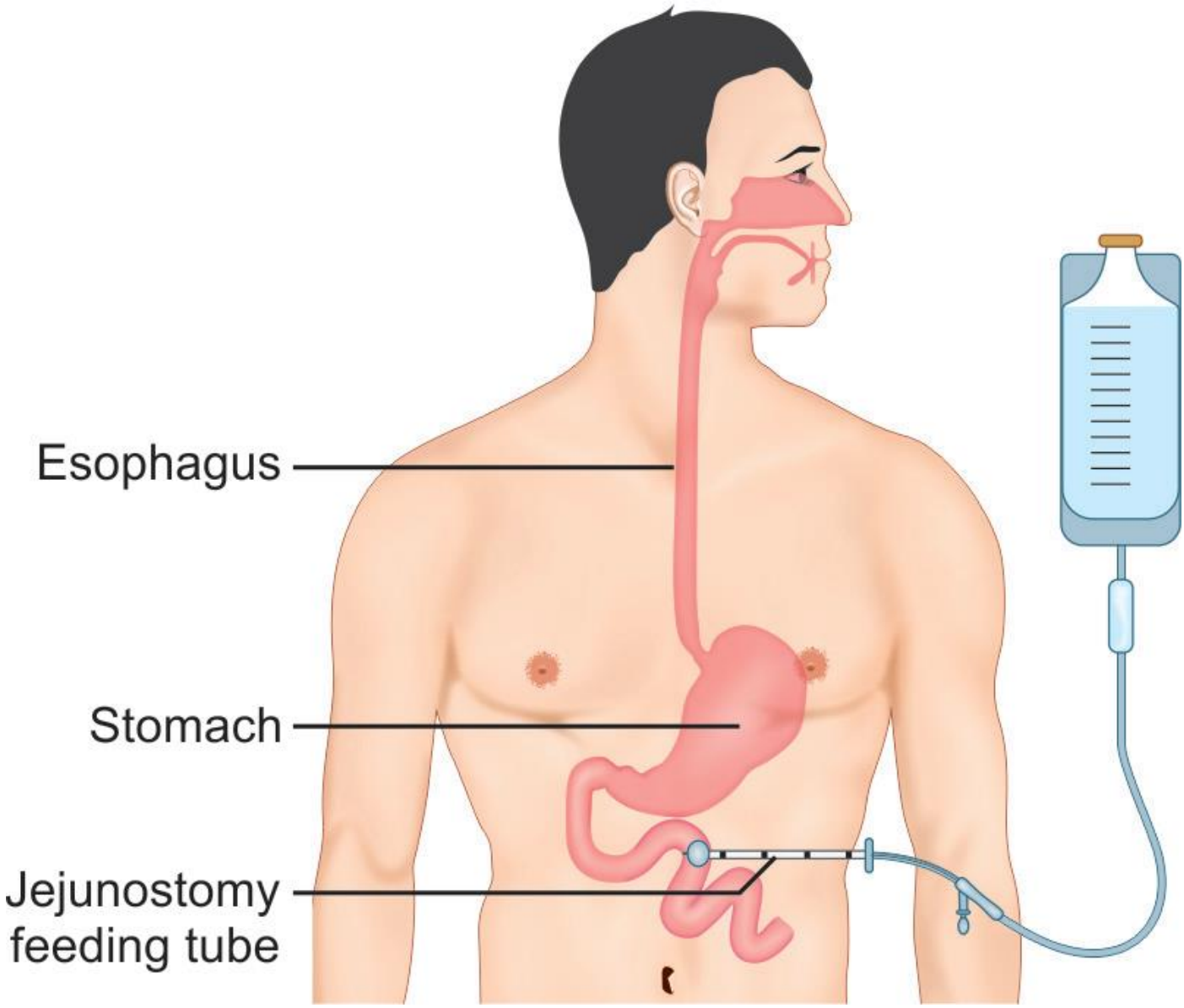
Long term enteral nutrition: Enteral nutrition support which is administered for a longer duration, i.e. more than 4 weeks is called long-term enteral nutrition. This can be given through:

***Gastrostomy*:** It is a surgical procedure for inserting a feeding tube into the stomach through the abdomen wall. The diet goes directly into the stomach.



Indications: Head and neck cancers, malignant bowel obstruction including esophageal cancer, head injury, mechanical obstruction to swallowing, e.g. esophageal strictures, long-term intestinal malfunction requiring supplementary intake, e.g. cystic fibrosis, neurological disorders of swallowing (cerebral palsy, multiple sclerosis, mparkinson's diseases, brain tumors, neonatal encephalopathy), Crohn's disease and burn patients.(5)

***Jejunostomy*:** It is an artificial opening made by surgical procedure to the jejunum through the abdominal wall for feeding a patient. The feed goes directly into the jejunum.



Indications:

- Functioning GI tract with an obstruction in the proximal jejunum (long term)
- upper GI stricture or fistula
- inadequate gastric motility
- long-term transpyloric feeding.(6)

Enteral Access Methods

Type of Access	Purpose	Duration of Need (Months)
Nasal or Oral		
Nasal or Oral gastric tube	Gastric Feeding Gastric Decompression	<1
Nasal or Oral Gastro Jejunal tube	Gastric Feeding Gastric Decompression Jejunal Feeding	<1
Nasal or Oral Small bowel Tube	Jejunal Feeding	<1
Surgical or Percutaneous		
Gastrostomy	Gastric Feeding Gastric Decompression	≥1
Gastrojejunostomy	Gastric Feeding Gastric Decompression Jejunal Feeding	≥1
Jejunostomy	Jejunal Feeding	≥1

Nasoenteric Tube Access

Nasoenteric tube placement techniques have been developed for placement at the bedside

- By Endoscopy
- Fluoroscopy
- during surgery.

These techniques all have their indications, benefits, and risks. The final position of an enteral access tube is the stomach for gastric feedings, or the jejunum for small bowel feedings.

A patient who is intolerant of gastric feedings because of gastroparesis or gastric outlet obstruction, or who has had an esophagectomy or gastrectomy, will receive small bowel feedings.

NG and nasojejunal (NJ) tubes have similar complications. The use of small bowel feedings to prevent tube-feeding aspiration events is a complicated and contentious issue. Some studies have shown fewer aspiration episodes in patients whose feedings were placed directly into the small intestine than when placed into the stomach,whereas others have not.

One prospective trial directly compared the incidence of aspiration episodes with gastric feedings and small bowel feedings in the ICU and found no difference.

It took longer to initiate small bowel feedings, however, because of the difficulty in obtaining adequate tube position. Small bowel feeding is recommended for critically ill patients at high risk of aspiration or intolerant to gastric feeding. Small bowel feedings should be initiated in patients known to have gastroparesis or patients who have had a witnessed tube-feeding aspiration event with gastric feedings.

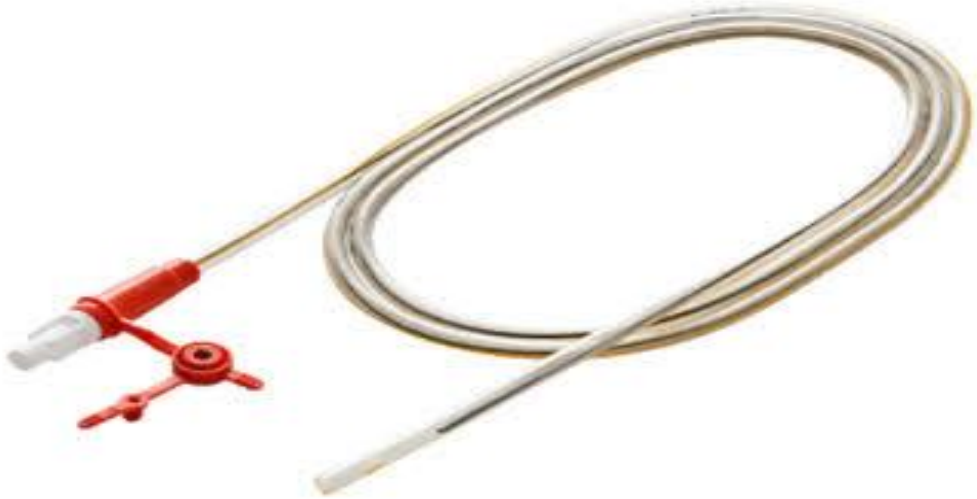
Bedside nasoenteric tube placement is the most common enteral access technique used in the hospital and long-term care environments.

There are many techniques available for passing bedside NG tubes. Typically, an 8 to 12 French NG tube is lubricated and passed into the stomach with the patient's head flexed; the patient ingests sips of water to assist in passage of the tube. Many centers advise bedside auscultation to confirm that the NG tube is in an appropriate position before its use, but this can be misleading because a tube in an inappropriate location (e.g., lung, pleural cavity, esophagus) may be misinterpreted as being in proper position by improper bedside auscultatory techniques.

To avoid intrapulmonary placement of nasoenteric tubes in high-risk patients, one can measure the length of the tube from the earlobe to the xiphoid process before insertion. Every patient should be confirmed about proper positioning of an NG or NJ tube before initiating feedings.

NASOGASTRIC TUBE

NASOJEJUNAL TUBE



It is not unusual to be faced with a patient who is comatose and therefore unable to assist with passage of a nasoenteric tube. In this case, the tube can again be passed at the bedside after tube lubrication and head flexion. The patient is monitored for coughing and wheezing consistent with a bronchial placement. Auscultation of the abdominal cavity and an abdominal plain film can confirm proper tube location. The difficulty of blindly passing a nasoenteric tube at the bedside into the small intestine has prompted development of a variety of techniques.

Success rates for placement of a postpyloric feeding tube vary and are often lower when jejunal, not duodenal, placement is used as an endpoint. If attempts to blindly pass an NJ tube at the bedside fail, fluoroscopic or endoscopic methods of passage are then used.

The preference of technique is center-dependent. In medical centers with available C-arm fluoroscopy and modified fluoroscopy beds, fluoroscopic passage of NJ tubes can be done at the patient's bedside; success of fluoroscopic guidance of NJ tube passage is approximately 90%. In institutions without bedside fluoroscopic capabilities, however, transport of patients to the radiology suite, especially critically ill patients, can be time-consuming, expensive, and hazardous.

In these cases, bedside endoscopic passage of NJ tubes is preferable.NJ feeding tubes can be placed endoscopically at the bedside with the patient moderately sedated.

In **"dragand-pull**" method, a suture is attached to the end of an NJ tube and used to drag the tube into position in the small intestine with a grasping forceps. Because it is often difficult to release the suture from the grasping forceps, and also to remove the endoscope without removing the adjacent NJ tube, a hemoclip can be used to drag the tube and then clip it to the smallintestine.

A second common technique, the **"over-the-guidewire"** technique, requires the initial endoscopic placement of a guidewire into the small intestine. The endoscope is removed and the guidewire is left in place. A feeding tube is then passed blindly or with fluoroscopic assistance over the guidewire and into position in the small intestine, with a success rate of 90% to 100%.Fang and associates have described the use of an ultrathin endoscope to perform nasal endoscopy and place a guidewire into the small intestine. After the endoscope is removed, an NJ tube is passed over the guidewire and into position. With this technique, no sedation is required.

In **through-the-scope** technique, a therapeutic endoscope is advanced into the duodenum or jejunum, and an 8 or 10 French nasojejunal tube is advanced through the biopsy channel into the intestinal lumen, sometimes with the assistance of a guidewire. The endoscope is then removed while advancing the NJ tube and requires a naso-oral exchange.Nasoenteric tube placement is the most common method of enteral access. Unfortunately, nasoenteric tubes may fail early because of tube occlusion or dislodgment, with subsequent interruption of tube feeding and medication regimens. Therefore, nasoenteric tubes should be used in patients who will require NG or NJ access for less than 1 month. The tip of the NJ tube may be anchored onto the small bowel mucosa using an endoscopic clip, a practice that seems to add a few days to the projected longevity of NJ tubes, presumably by reducing the risk for NJ tube migration. Patients who have experienced repeated early failure of nasoenteric tubes should receive more durable enteral access, such as a percutaneous

endoscopic gastrostomy (PEG), percutaneous endoscopic jejunostomy (PEJ), surgical gastrostomy, or surgical jejunostomy.

The decision to use an NJ tube warrants specific instructions regarding tube care. The lumen of an NJ tube is usually much smaller than that of an NG tube, and therefore it is prone to clogging. Jejunal feeding tubes should never be checked for residual content, because this measure is a poor indicator of the residual content of the small bowel. In addition, checking residuals through these small-bore tubes increases their probability of clogging. NJ tubes should be flushed after every tube feeding and medication instillation. Only liquid medications or completely dissolved medications should be placed through an NJ tube to reduce the chances of tube occlusion. Care should be taken to stop tube feedings during infusion of certain medications, such as theophylline or potassium chloride, products known to coagulate tube feedings and obstruct the NJ tube.

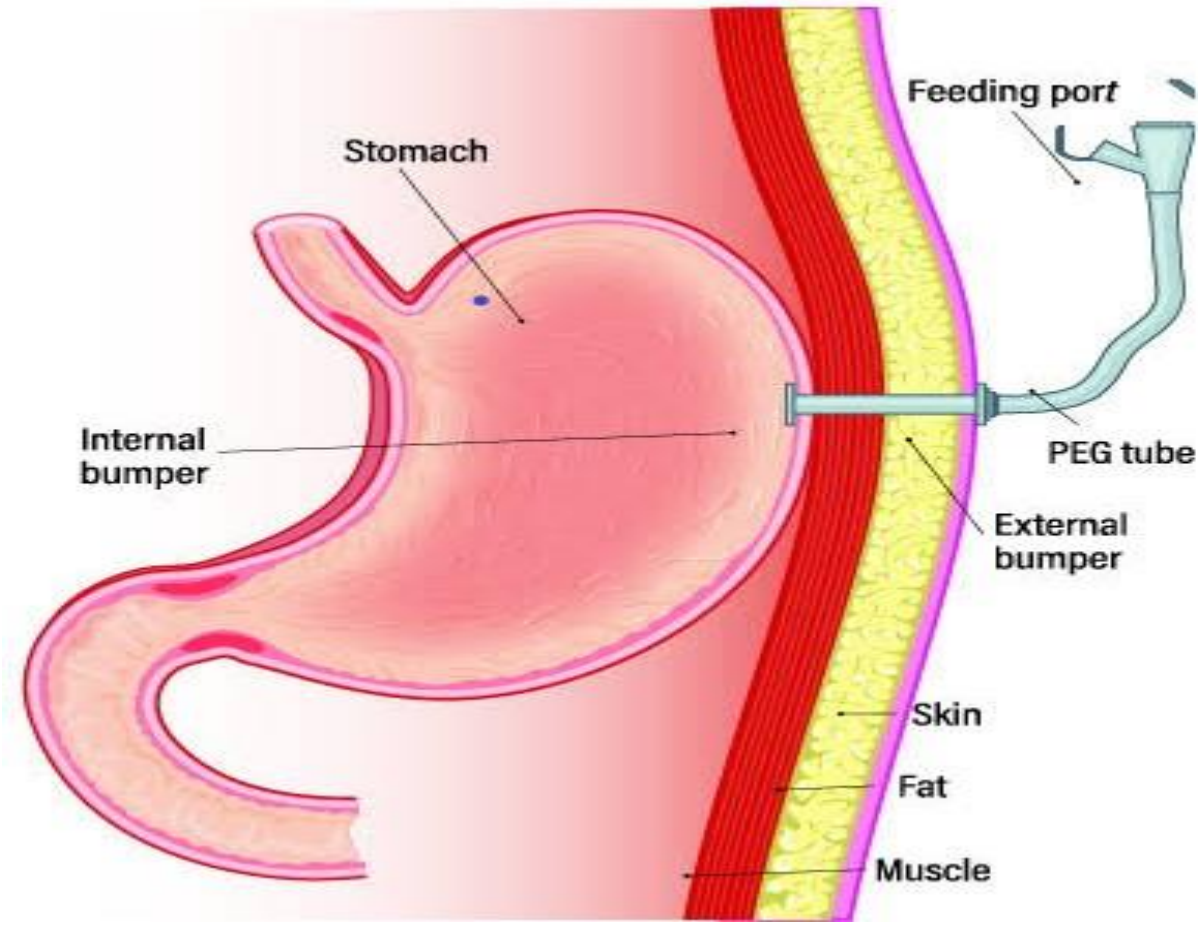
Percutaneous Endoscopic Enteral Access

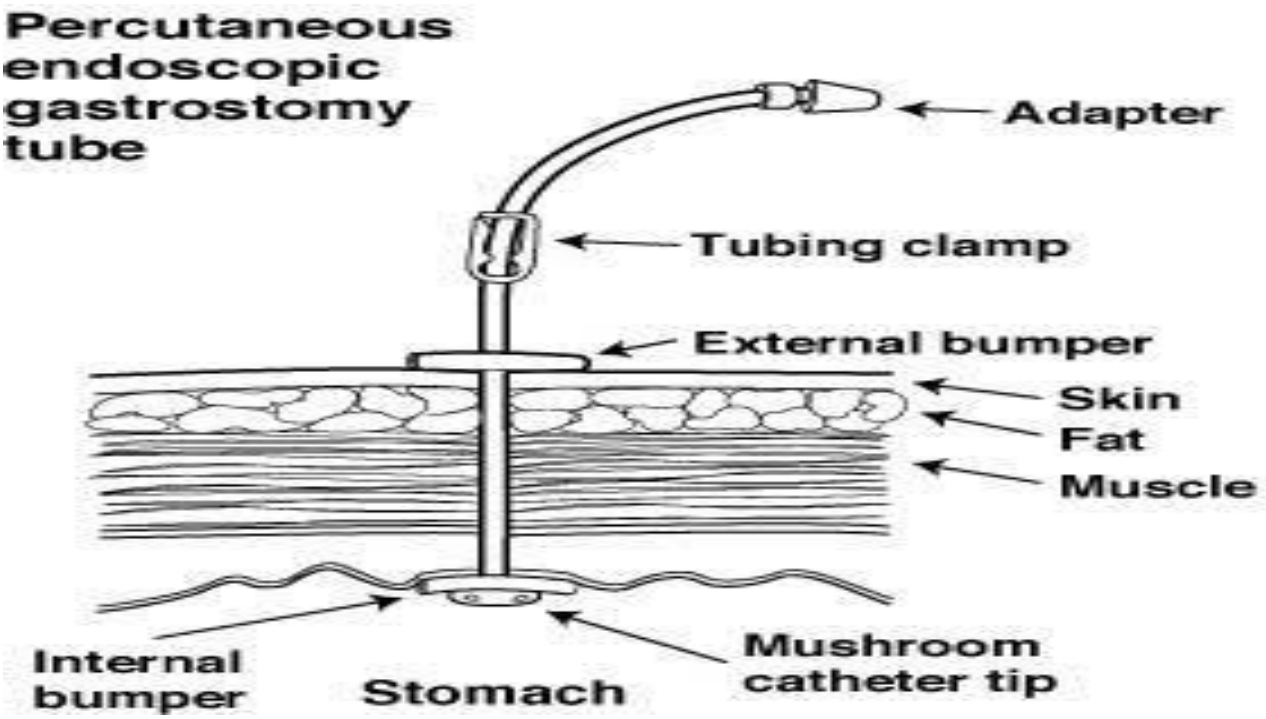
If a patient will require enteral access for longer than 1 month, a percutaneous tube is preferred, which can be placed endoscopically, including

- PEG
- Percutaneous Endoscopic Gastrojejunostomy (PEG/J)
- Direct Percutaneous Endoscopic Jejunostomy (DPEJ).

  Insertion of these tubes usually requires the use of moderate or deep sedation and can be performed in the endoscopy suite, in the operating room, or at the bedside. In comparison with NG access, PEG has been shown to be a more reliable enteral access tube, allowingpatients to receive more calories daily because of a reduction in tube dysfunction.

Percutaneous Endoscopic Gastrostomy





PEG was developed by Gauderer and coworkers in the early 1980s.The procedure involves placement of a percutaneous gastrostomy tube after endoscopic transillumination of the abdominal wall for an appropriate gastrostomy site.

The abdominal wall site where transillumination was seen should be probed with a finger, creating an indentation of the gastric wall. If there is no transillumination or discreet indentation seen, the procedure should not be performed.

The use of prophylactic antibiotics intravenously before the procedure is important to prevent peristomal infections after the procedure. An antibiotic with optimal skin coverage, such as cefazolin (1 g), should be administered intravenously 30 minutes prior to the procedure unless a patient is allergic to penicillin, in which case clindamycin can be given. In areas where methicillin-resistant *Staphylococcus aureus* (MRSA) is endemic, pre-procedural screening followed by decontamination of colonized patients has been shown to be effective in reducing the risk of MRSA peristomal infection.Prospective evaluations of PEG placement have found it to be associate with few procedure-related complications.

Indications: PEG tubes are indicated for patients who will be unable to consume sufficient nutrition for longer than 1 month, despite a functional GI tract. Patients who require PEG placement are often older and have numerous comorbid diseases. In addition to providing access for nutrition, PEG tubes are indicated for hydration and administration of medications as well as for gastric decompression. Some of the more common medical indications for PEG placement are described below. (7)

Cancer:

PEG tubes are particularly beneficial in patients with head and neck cancer, in whom it has been shown they prevent hospitalizations for dehydration and malnutrition and lead to less weight loss.

In a retrospective study of 161 patients who had a pretreatment PEG tube placed, chemoradiation occurred without interruption in 93% of patients, and the PEG tubes were used for feeding and hydration for a mean of 251 • } 317 days.

In patients with malignant bowel obstruction, a PEG tube can also be safely and effectively used for intestinal decompression. Such a "venting" PEG obviates the need for an NG tube, alleviates nausea and vomiting, and can allow end-of-life patients to be discharged from the hospital tolerating some degree of an oral soft diet.

Stroke:

Data support the use of PEG tubes in patients with stroke-related dysphagia. Compared with NG feeding, early PEG placement was found to be associated with a lower incidence of ventilator-associated pneumonia. In contrast, Dennis and colleagues have reported an increase in the death rate and poor outcome in stroke patients randomized to PEG tube feedings as opposed to nasoenteric tube feedings. In a recent Cochrane meta-analysis, compared with NG tube feeding, PEG feeding was associated with a reduction in treatment failures, and with a higher overall delivery of feeds. There was no difference in case fatality or the composite outcome of death or dependency.

Dementia:

Dementia is a frequent disorder of older adults and a common indication for referral for PEG. More than 36,000 older patients with dementia receive a PEG tube each year. The use of PEG in the dementia population remains a subject of great debate and ultimately a prospective RCT will be required to answer the question definitively.

Disabling Neurologic Conditions:

The use of PEG tubes for patients with disabling motor neuron diseases, such as amyotrophic lateral sclerosis (ALS) and multiple sclerosis (MS), has been examined. Both these diseases are associated with progressive dysphagia, leading to reduced oral intake, weight loss, and an increasing risk of oral aspiration.

Katzberg and co-workers did an extensive literature search of patients with ALS who received PEG and only identified retrospective studies and prospective cohort studies. Using these data, however, they concluded, “the ‘best’ evidence to date suggests a survival advantage for some patients with ALS/motor neuron disease, but these conclusions are tentative”; an effect on quality of life has not been demonstrated.Small case reports have demonstrated an improvement in comorbid disease states (e.g., pressure ulcer healing) in patients with MS and dysphagia who receive tube feedings.

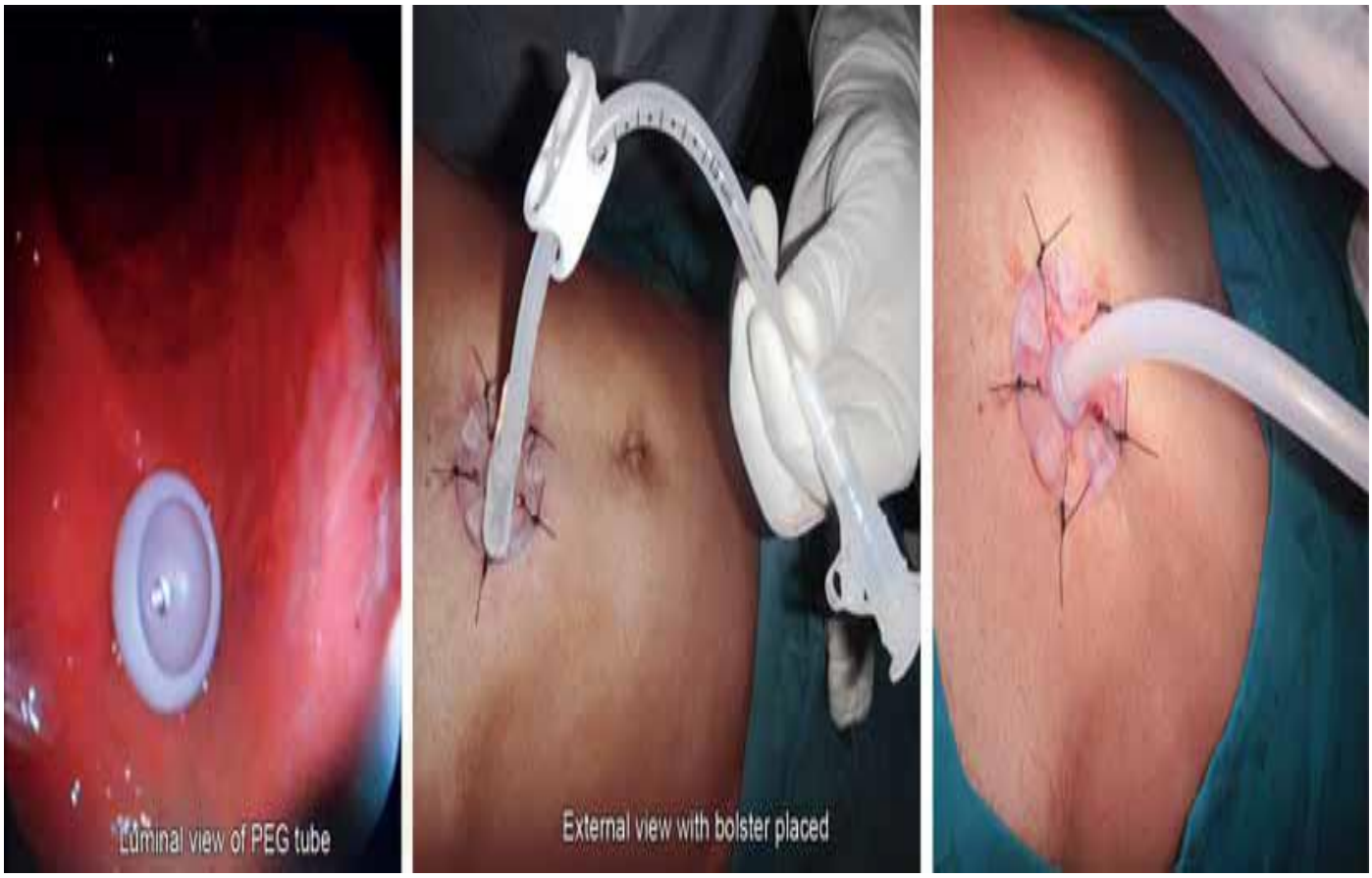
Procedure

Placement of a PEG tube can be accomplished by the **Ponsky (pull) or Sachs-Vine (push)** techniques, depending on physician preference; both are equally effective.An older technique, the push-through or introducer technique first described by Russell et al., has started to make a resurgence.

In **Russell's technique**, T-fasteners are placed percutaneously to attach the wall of the stomach to the abdominal wall; an incision is made in the abdominal wall, and a fistulous tract is created into the stomach and sequentially dilated. Ultimately, a PEG tube with a balloon internal bolster is passed through the newly created insertion site, as is done with balloon replacement tubes. PEG kits are commercially available from a number of manufacturers . The most common PEG tube sizes for adult patients range from 16 to 24 French.

Most PEG tubes are made of silicone, although some are constructed of polyurethane, which is more resistant to deterioration. In general, PEG tubes start to degrade 1 to 2 years after placement, usually from yeast implantation and degradation of the PEG tube wall. PEG tubes are less likely to clog than nasoenteric tubes because of their larger size.

Obstructed PEG tubes may be cleared by flushing them with warm water; in some cases, pancreatic enzymes mixed in a bicarbonate solution can also be effective. There are no data to support the use of juices, soft drinks, or me at tenderizers tounclog a PEG tube. Commercially available PEG tube cleaning brushes are also available.


Luminal view of PEG tube
External view with bolster placed

Relative contraindications for PEG placement include

- the presence of gastric varices
- major gastric resection
- significant disease of the gastric
- abdominal wall
- coagulopathy.

once a traction-removable PEG tube malfunctions, degrades, or is no longer needed, it can be removed at the bedside just by pulling it out. Some PEG tubes labeled as endoscopic removal tubes have a stiff internal bolster and can be removed only with an endoscope. Although there is an increase in cost with the use of endoscopic removal PEG tubes because of the need for a repeat upper endoscopy for removal, they may be safer to use in patients who are confused or combative and at risk for pulling their PEG tube out after initial placement. Some authors have suggested cutting the PEG tube at the abdominal wall level and allowing the remaining tube and internal bolster to pass through the GI tract; this should be avoided, especially in patients with dysmotility, previous abdominal surgery, or anatomic abnormalities of the GI tract.

There have been reports of these cut internal bolsters having led to small bowel obstruction. The gastrostomy site should be cleaned with mild soap and water, rather than hydrogen peroxide, which can irritate the skin and lead to stomal leakage. To avoid excess tension,drain sponges should be cut and placed over the external bumper rather than under it. A dressing is optional and is not used at all institutions. Because of the risk of peristomal skin maceration and breakdown, occlusive dressings should not be used. Topical silver nitrate can be applied to remove excess granulation tissue at the gastrostomy site.

Most post-PEG complications arise from a patient's comorbidities

- poor wound healing
- aspiration
- coagulopathy.

To reduce the risk of aspiration, caregivers should raise the head of the patient's bed to 30 to 45 degrees during feeding and for 1 hour afterwards.

Peristomal wound infection

The most common complication of PEG is peristomal wound infection. Excessive tightening of the PEG tube external bolster against the abdominal wall can cause wound leakage and necrotizing fasciitis.

Risk factors for peristomal infection include

- diabetes
- obesity
- Malnutrition
- chronic glucocorticoid use
- small incisions at the PEG insertion site
- lack of antibiotic prophylaxis
- excessive pressure of the external bumper on the PEG site.

To minimize the latter complication, the external bolster of the PEG tube should be maintained approximately 1 cm from the anterior abdominal wall to avoid tissue compression and wound breakdown. Peristomal wound infections are often treated for 7 days with an oral antibiotic such as cephalexin to cover skin-related microorganisms. The infected area should also have daily topical cleansing with or without antibiotic ointment; however, the benefit of topical antibiotic

ointments for both the prophylaxis and treatment of peristomal wound infections has not been studied. The PEG tube should be removed in cases of worsening infection.

Other common complications include

- peristomal leakage
- fever
- ileus
- cutaneous gastric ulceration
- tube dislodgement or migration proximally or distally within the GI tract. (8)

Peristomal leakage

Leakage around the gastrostomy site is a common and under-recognized problem.

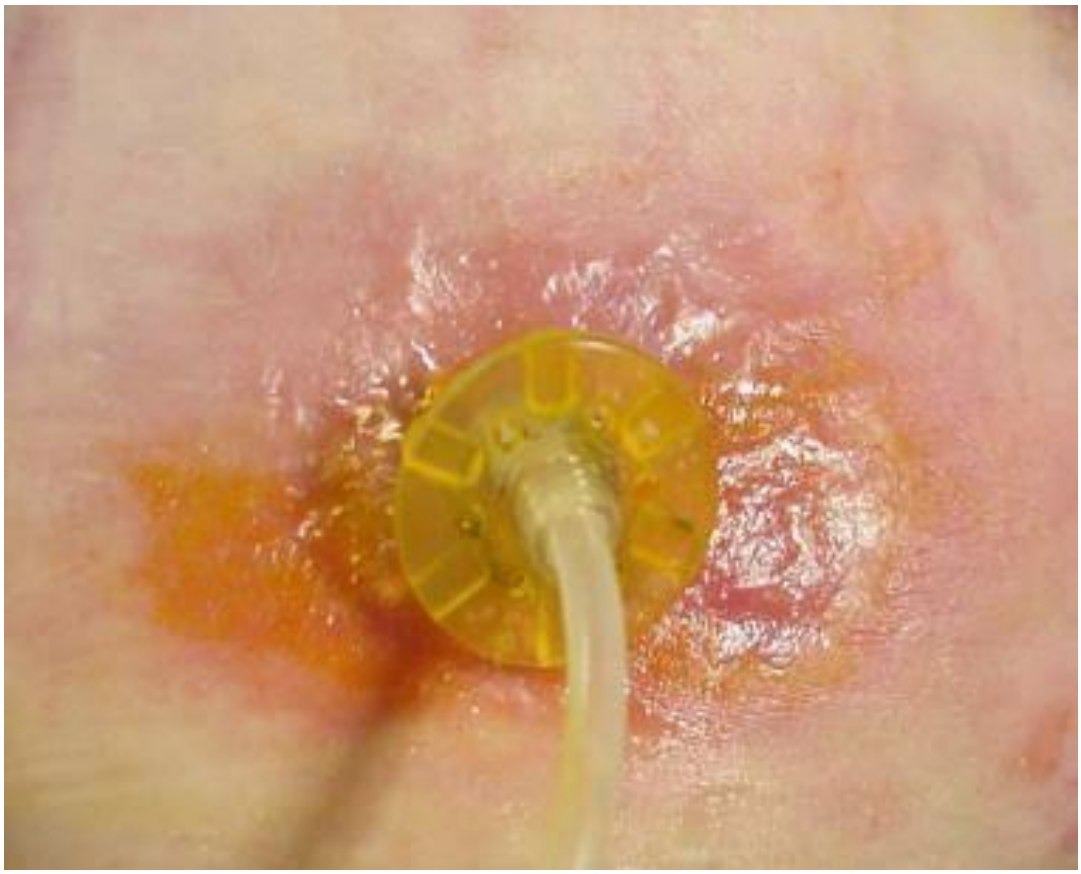
Risk factors for peristomal leakage include the use of

1. Glucocorticoids
2. Chemotherapy
3. Excessive cleaning with hydrogen peroxide or iodine
4. Excessive tension and side-torsion of the tube
5. Absence of an external bumper.

Leakage of gastric acid or bile around the PEG tube can cause erythema that is often mistaken for infection. Treatment includes keeping the site dry with frequent dressing changes, topical zinc oxide, maintaining the external bumper 1 cm from the skin, stabilizing the gastrostomy tubing above the external bumper to prevent excessive tension, and the use of proton pump inhibitors.

Pneumoperitoneum is common after PEG placement and is not diagnostic of a perforation in the absence of peritoneal signs. After PEG placement, careful clinical evaluation of a patient with questionable peritonitis from perforation or leak should include a contrast study through the PEG tube to avoid unnecessary surgical exploration.

PERISTOMAL WOUND INFECTION



PEG tube migration

It results from inadequate stabilization and can lead to vomiting and aspiration if the tube migrates proximally, or to gastric outlet obstruction and dumping syndrome if the tube migrates distally .

Major complications of tube migration

- intra-abdominal bleeding
- hematoma formation
- Peritonitis
- necrotizing fasciitis
- gastric or colonic perforation
- hepatogastric, gastrocolic and colocutaneous fistula formation.

  A colocutaneous fistula results from inadvertent placement of a percutaneous feeding tube through the colon before it enters the stomach and can be suspected when the patient has “diarrhea” immediately upon or following feeding through the PEG tube.

Buried bumper syndrome

It is a complication that occurs when the internal bumper embeds into the mucosa .The severity varies from simple erosion beneath the internal bumper to complete outward erosion of the tube through the intestinal and abdominal walls. (9)

Risk factors for buried bumper syndrome

- Excessive pressure between the internal and external bumpers
- Poor wound healing
- Significant weight gain
- Malnutrition
- Stiff internal bumper.

Patients may present with

- Peristomal inflammation or infection
- Increased leakage
- Breakdown or enlarging of the ostomy site
- Pain with enteral feeding
- Inability to rotate or mobilize the tube.

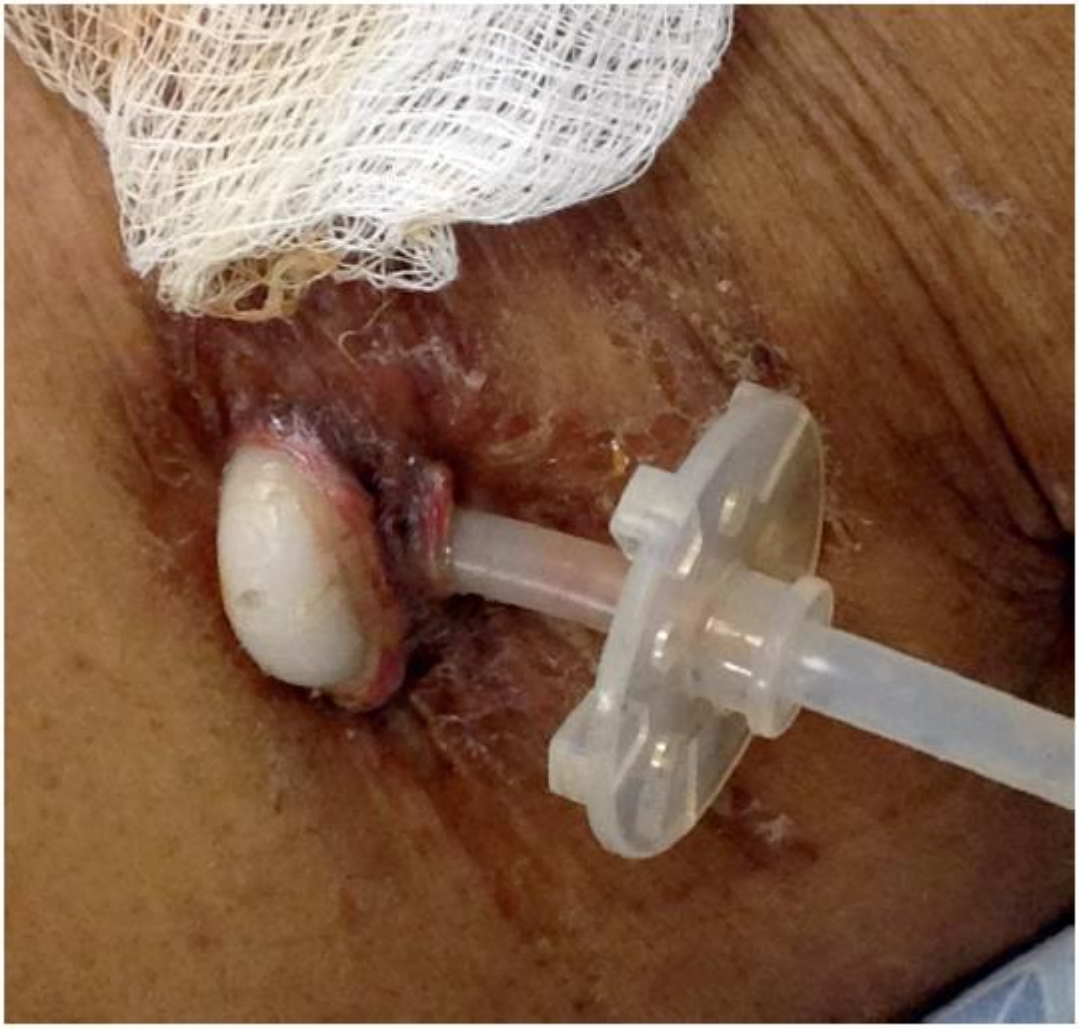
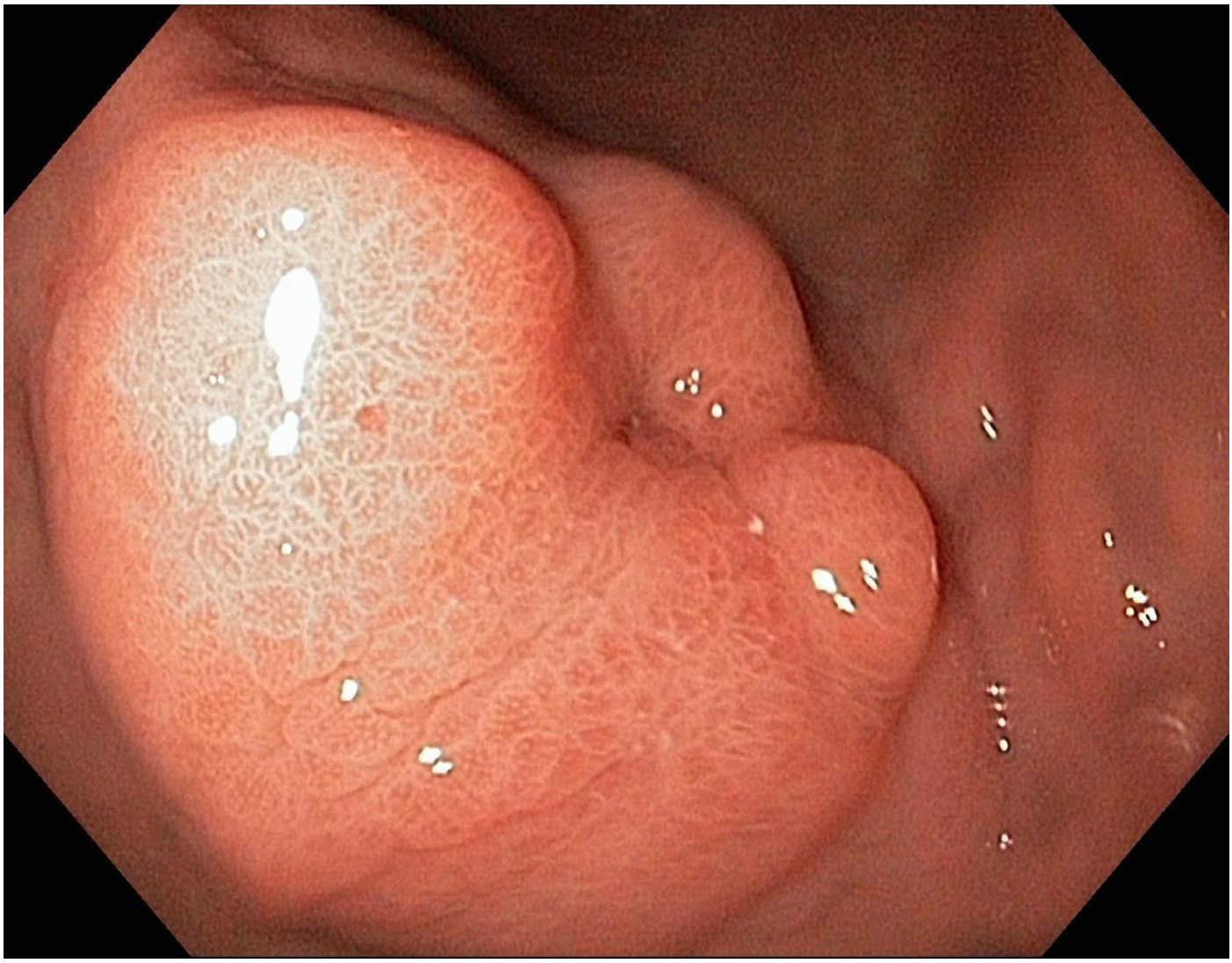


FIGURE 6-3. Buried bumper syndrome.



Treatment usually consists of PEG tube removal and replacement, with loosening of the external bumper so that the tube can be pushed in and out at least 1 cm; patients may require gastric decompression with jejunal feeding to allow the site to heal. Upsizing the PEG tube should be avoided because it can compound the problem.

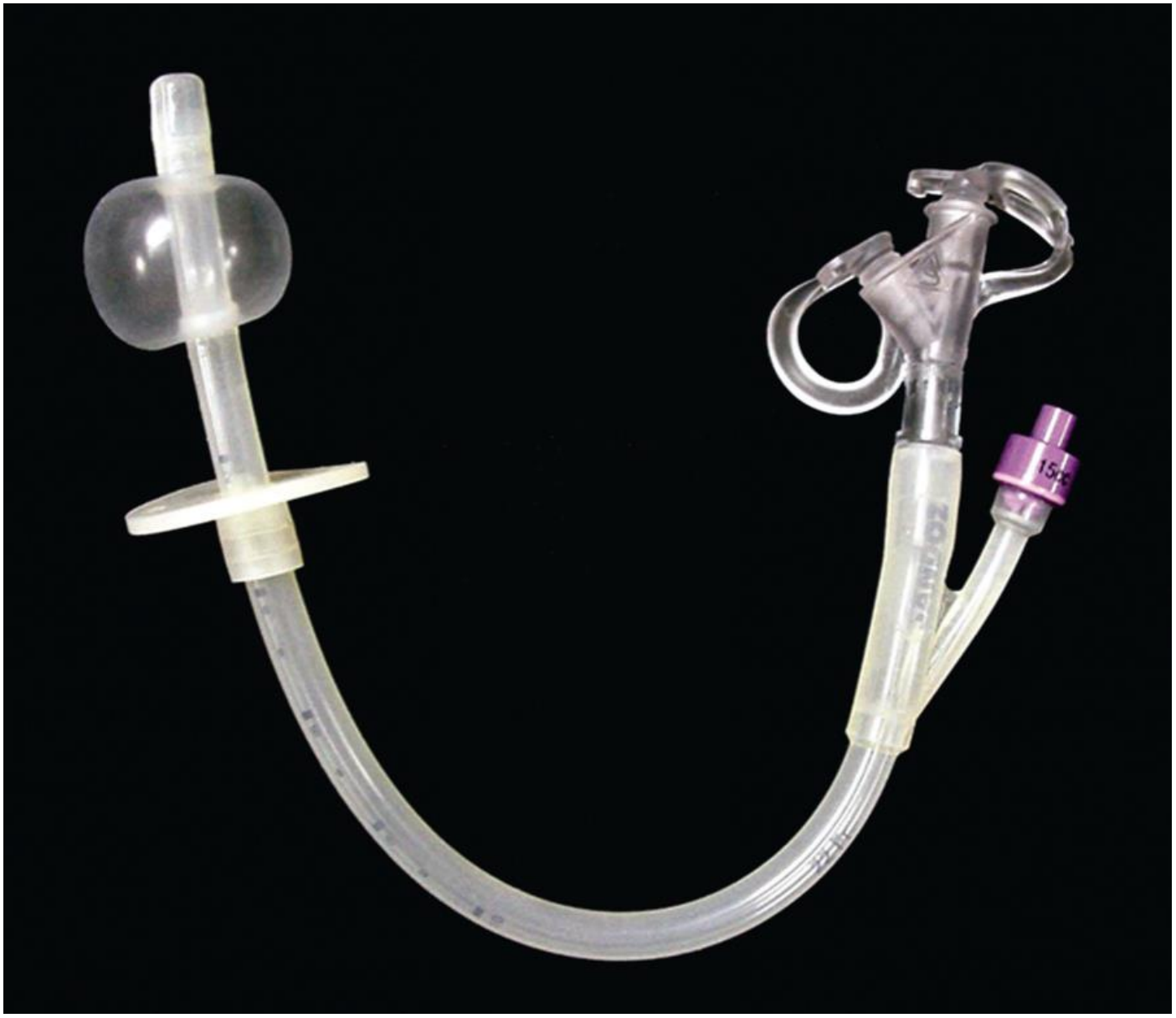
If a PEG tube dislodges within 4 weeks of placement, fluoroscopy can be used to replace it at the bedside, or endoscopic replacement may be repeated. The concern in this situation is that the abdominal and gastric walls have separated from one another when the PEG tube was dislodged. If there is evidence of peritonitis, the patients should be treated with intravenous antibiotics, NG decompression, and surgical evaluation.

If the PEG tube is dislodged more than 4 weeks after placement, the tract may be mature enough to blindly replace the PEG tube at the bedside without fluoroscopic or endoscopic monitoring.Proper placement should be confirmed with a contrast radiologic study through the PEG tube prior to using the tube for feedings.

Replacement PEG tubes are broadly divided into 2 categories:

1)Replacement gastrostomy tubes
2)Low-profile devices.

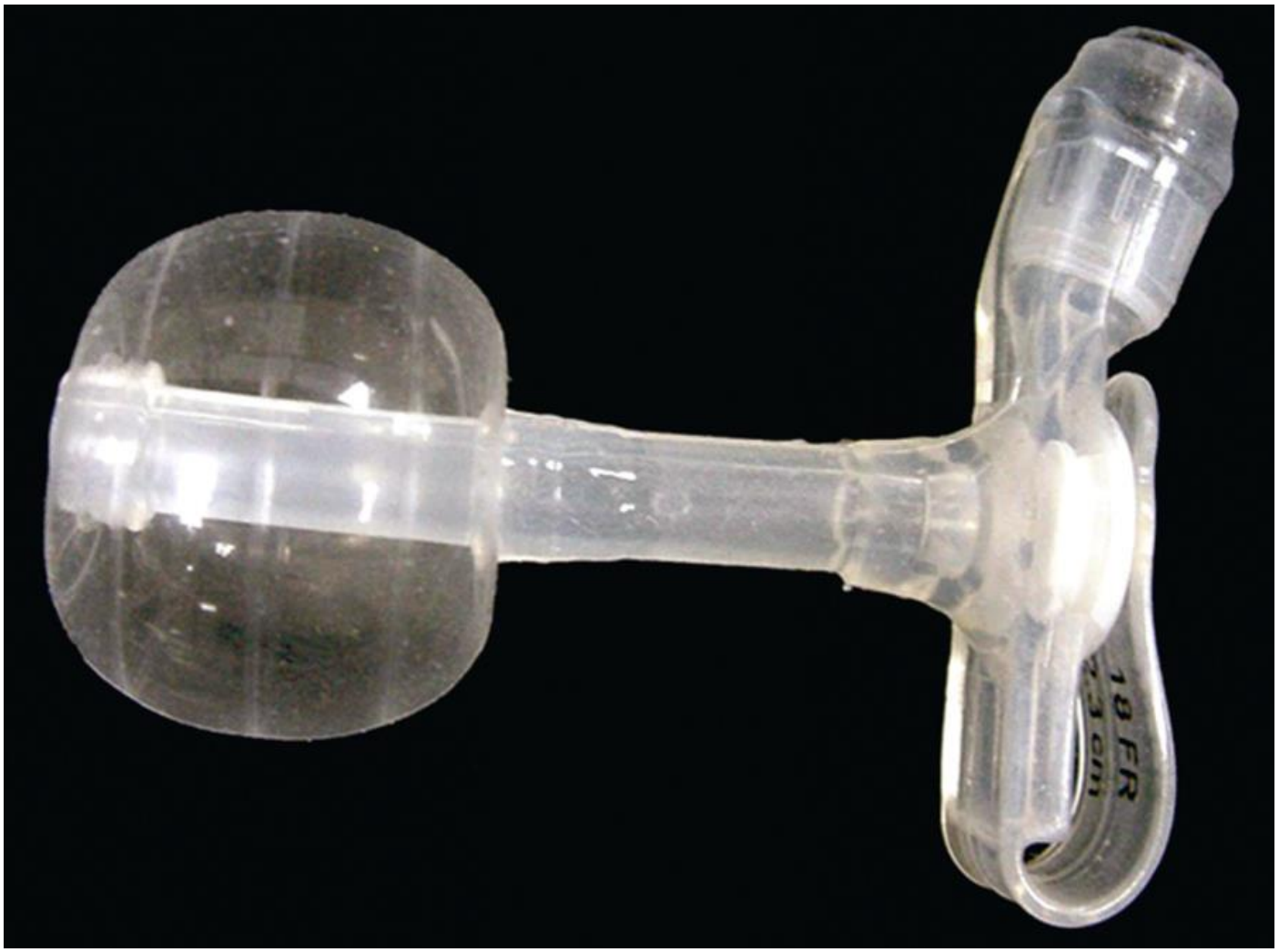
Replacement gastrostomy



These tubes usually have a balloon-type internal bolster . These balloon tubes can be inserted blindly through the gastrostomy site into the gastric lumen. The balloon is inflated to serve as the

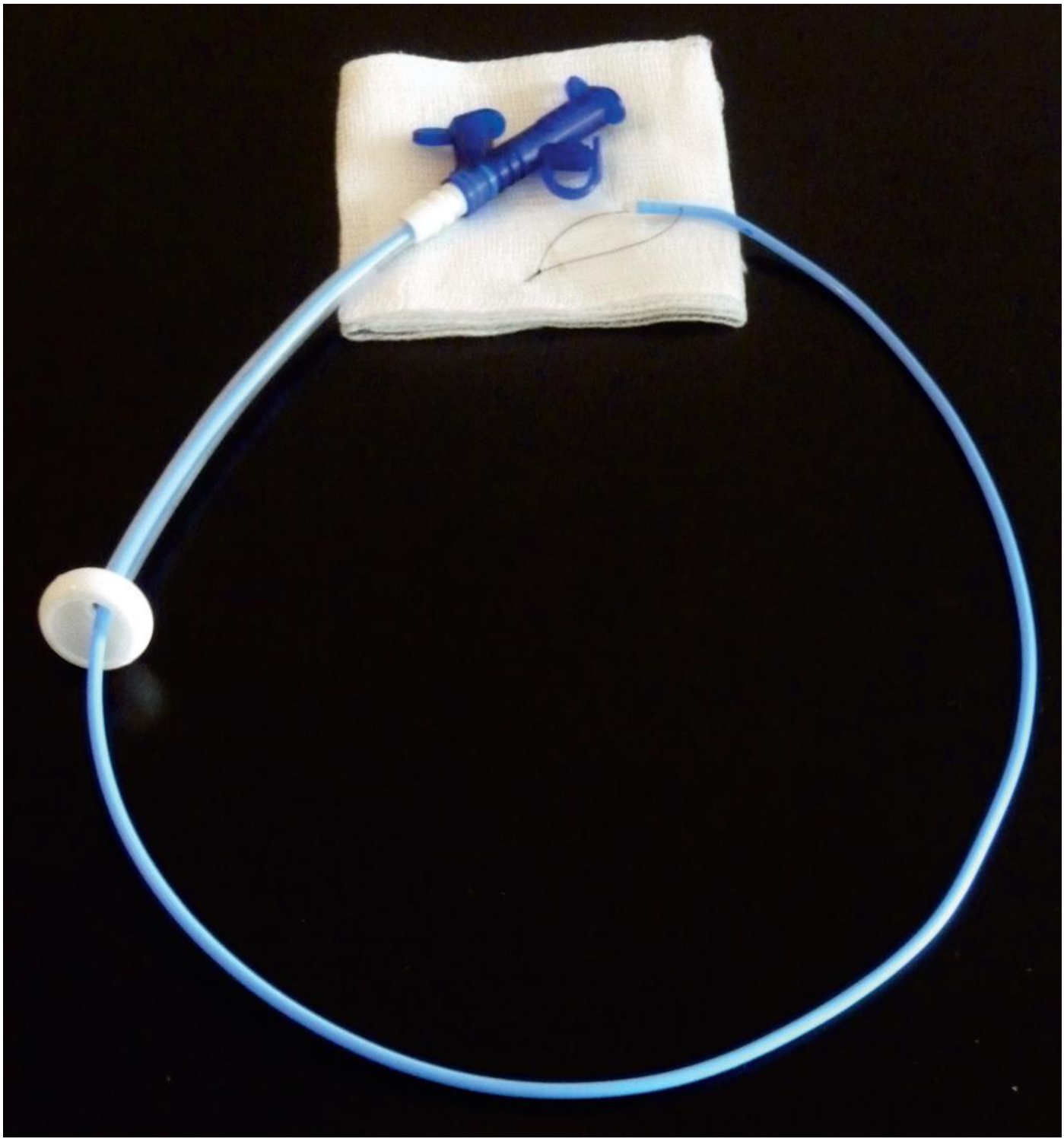
internal bolster, and an external bolster is slid down the external tube against the abdominal wall to keep the PEG tube from migrating. If the balloon replacement tube is inserted too far or migrates, small bowel obstruction and retrograde intussusception can occur. Because of balloon breakage, the tube often requires replacement within 3 to 6 months. There are also replacement PEG tubes with a distensible internal bumper. The internal bumper is stretched with a stylet and pushed blindly through the gastrostomy site; the stylet is then removed, allowing the internal bolster to assume its previous shape. The direction of the gastrostomy tract should be known so that stylet passage does not damage or rupture the tract.PEG tubes may also be replaced with low-profile gastrostomy devices.(10)

LOW PROFILE GASTROSTOMY DEVICE

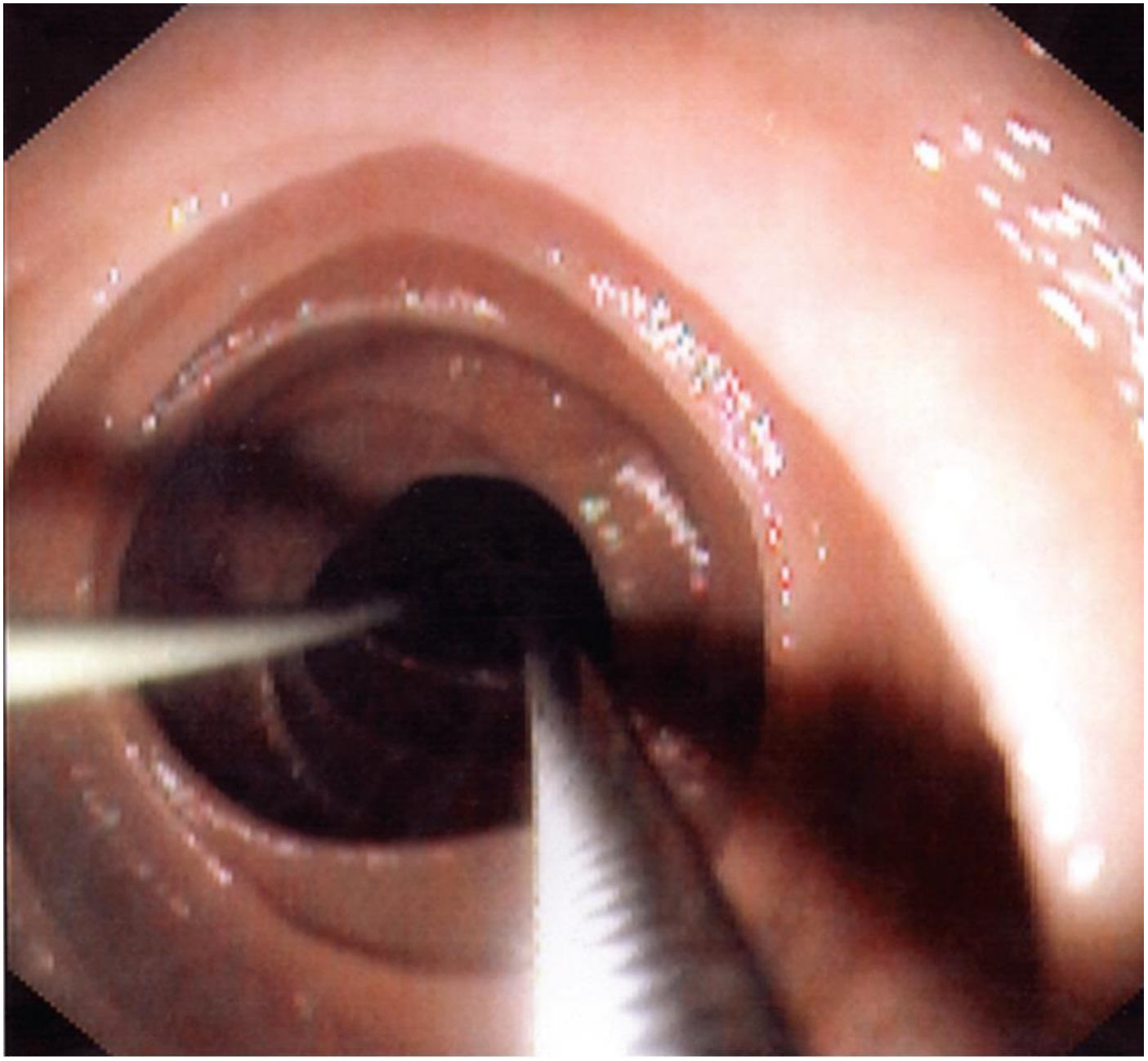


These devices provide skin-level access to the gastric lumen and may be particularly useful for disoriented patients who may habitually tug at their bedclothes and pull out their tube connections. The internal bolster of these low-profile devices may be an inflatable balloon or a distensible internal bolster that requires a stylet for placement. Complications of replacing a gastrostomy tube with a stylet include fistula disruption and hemorrhage. Low-profile PEG tubes come in predetermined lengths, and the gastrostomy tract length must be measured to choose the correct device length. To access the low-profile device for feeding or gastric decompression, a separate access tube must be used to engage a valve in the top of the device.

Percutaneous Endoscopic Gastrojejunostomy



For patients in whom small bowel feedings are desired, endoscopic percutaneous access to the small intestine may be obtained by 2 methods. With the first method, percutaneous endoscopic gastrojejunostomy (PEG/J), also known as a ***jejunal extension through PEG*** **(JET-PEG)**, a PEG is placed in the standard fashion, after which various techniques may be used to place a jejunal feeding tube through the PEG into the small intestine. Usually a 9 or 12 French J tube is passed through the existing PEG and into position in the small intestine over a guidewire .



The average longevity of this tube system was about 120 days when patients who died from comorbid diseases were excluded from the analysis. A 1-piece gastrojejunostomy (G/J) system is available and generally used as a replacement device passed through a preexisting PEG tube tract. This tube can be dragged into position by a suture at the end of the G/J system during endoscopy or passed over a guidewire during endoscopy or fluoroscopy. The internal bolster on this system is a balloon. Management of PEG/J tubes is similar to that of PEG tubes. Jejunal tubes must be flushed

aggressively to avoid clogging. Reported clogging rates of J tubes have ranged from 3.5% to 35%. Administration of semi-dissolved medications and bulking medications (e.g., fiber through the J-tube) and checking J-tube residuals lead to an increased incidence of tube occlusion. In contrast, medications may be given through the gastrostomy tube because of its larger diameter; the gastrostomy tube can also be used for decompression of gastroparesis or gastric outlet obstruction.

Complications of PEG/J tubes include those already discussed for a PEG tube. In addition to clogging, the jejunal tube may migrate in a retrograde direction or become kinked so that it no longer functions; more than 50% of PEG/J tubes require reintervention within 6 months. Tube migration occurs most commonly in patients who have persistent vomiting or in cases where the J-tube has been placed improperly. Other factors for tube migration include failure to cut the PEG tube down to a short enough length (<10 cm), shortened length of the jejunal tube, and placement of the PEG tube too high in the body or fundus, causing the jejunal tube to loop in the stomach. Placing the PEG tube in the antrum, avoidance of looping the jejunal tube in the stomach, and securing the distal end of the jejunal tube with a hemoclip can prevent proximal migration.

Direct Percutaneous Endoscopic Jejunostomy

The second method of jejunal access, direct percutaneous endoscopic jejunostomy (DPEJ), directly places a J-tube into the small intestine using an enteroscope or a pediatric colonoscope to reach a puncture position beyond the ligament of Treitz. Success with this procedure has been reported by Shike and associates. Technical success rates vary from 68% to 98%, with success rates higher in patients with altered surgical anatomy and lower BMI. Placement uses a standard pull technique . It is imperative that there is a discreet focus of transillumination that corresponds with indentation of the abdomen, since light can be reflected by the jejunum to a different site on the abdomen. Knowing what the patient's needs are for jejunal access can help decide which enteral access is appropriate.

Short-term access is probably best achieved by an NJ tube. Patients who require jejunal access for less than 6 months or those requiring concomitant gastric decompression would do well with a PEG/J system.

Longterm jejunal access (i.e., >6 months) is best achieved with a DPEJ tube. Comparisons of PEG/J and DPEJ for jejunal access have found fewer tube-related complications, such as jejunal tube migration and jejunal tube occlusion, with the DPEJ tube.

Immediately after DPEJ placement, it is helpful to leave the J-tube unclamped so that the substantial amount of air that was insufflated during the procedure may escape and thereby decompress the small bowel. Management of DPEJ tubes is otherwise similar to that of PEG tubes.

Enteral feeding should be administ

Complications of DPEJ tubes include

- Bleeding
- abdominal wall abscess
- colonic perforations
- peristomal infections
- enteric ulcers
- volvulus
- intraperitoneal leakage

Tube-related malfunctions similar to those with PEG tubes have also occurred. When replacing a jejunostomy tube, an internal bolster tube should be used because a balloon-type internal bolster can lead to small bowel obstruction and peristomal leakage. (11)

Surgical Enteral Access

A number of studies have compared surgical gastrostomy with PEG and have shown cost savings, operative time savings, or a reduction in morbidity with PEG. In the standard surgical gastrostomy tube placement, a gastrotomy is created and a gastric tube is placed into the gastric lumen. The gastric wall is then fixed to the abdominal wall. Surgical gastrostomy first was described by Stamm in 1894 and can now be performed laparoscopically. Surgical jejunostomy was first performed by Bush in 1858 in a patient with inoperable cancer and in 1891, Witzel described the most well-known technique for jejunostomy, which subsequently has undergone a number of modifications. Commonly done type is Stamm's gastrostomy. It is serous-lined temporary gastrostomy.

PROCEDURE

Upper midline incision is done. Stomach is held upwards towards wound using two Babcocks forceps applied at lesser and greater curvatures near middle of the stomach. In the midpoint of the stomach closure to greater curvature, marker stitch is placed. Purse string seromuscular suture is placed with a 2 cm diameter using 2-0 silk or vicryl. Using two Allis tissue holders, left edge of the cut linea alba is held apart; 2 cm vertical or horizontal incision is made on the skin over the middle of the rectus muscle; anterior rectus sheath is incised; rectus muscle is split; posterior rectus sheath and peritoneum is incised. Alternatively same can be achieved by a stab incision from skin towards the peritoneum under vision. Haemostat (medium sized or large) is passed from inside (peritoneum) out (towards skin) to grasp the selected gastrostomy tube (20 French Malecot/Foley's catheter/

mushroom catheter) which is pulled into the peritoneal cavity. Incision is made within the purse string, suture placed (gastrotomy) using 15 number blade or cautery; tip of the gastrostomy tube is passed into the gastric lumen. Tip is usually directed downwards. If Foley's catheter is

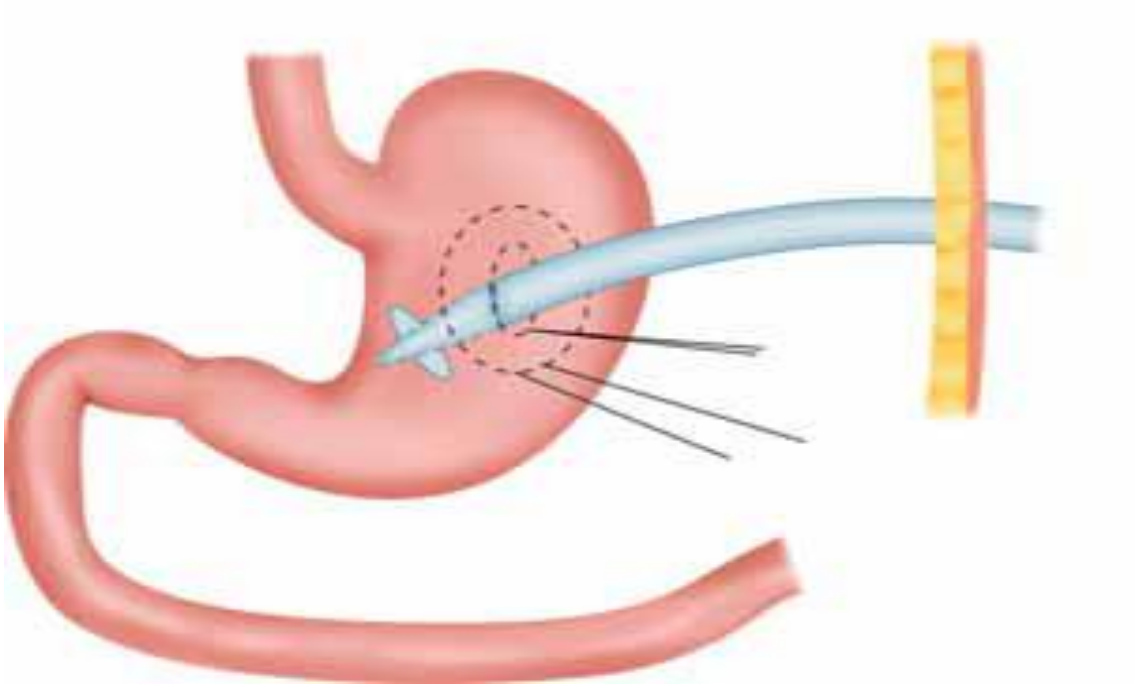
used, it is inflated with distilled water. Purse string suture is tied with knot to create inversion of serosa snugly on to the tube. It is supported by 2nd layer of purse string suture using 2-0 silk. This also ensures rapid closure of the stomach opening after removal of gastrostomy tube. Tube

should be anchored to abdominal wall to prevent leak and spillage of the gastric contents. It is achieved by taking seromuscular bites from the stomach and to the peritoneal (or peritoneum with posterior rectus sheath) layer of the abdominal wall; 4 interrupted 2-0 silk or vicryl sutures are placed and kept untied initially. Once all four sutures are placed, they are tied and cut to anchor the tube to abdominal wall. Tube is fi xed outside to the skin. Linea alba is sutured using polypropylene

continuous sutures; skin is closed using stapler or nonabsorbable interrupted sutures

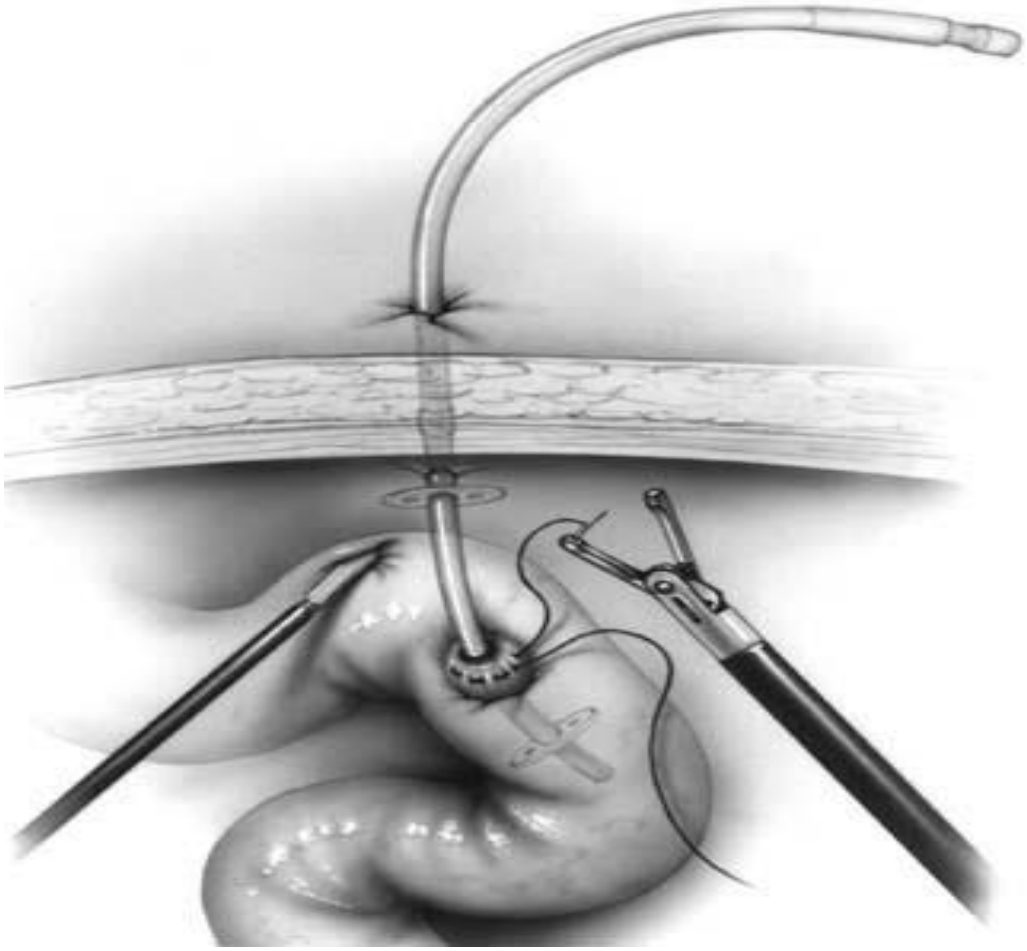
Temporary gastrostomy can be used for function in 48 hours. It should not be removed earlier than 3 weeks until proper sealing and track has formed.(12)

STAMM GASTROSTOMY



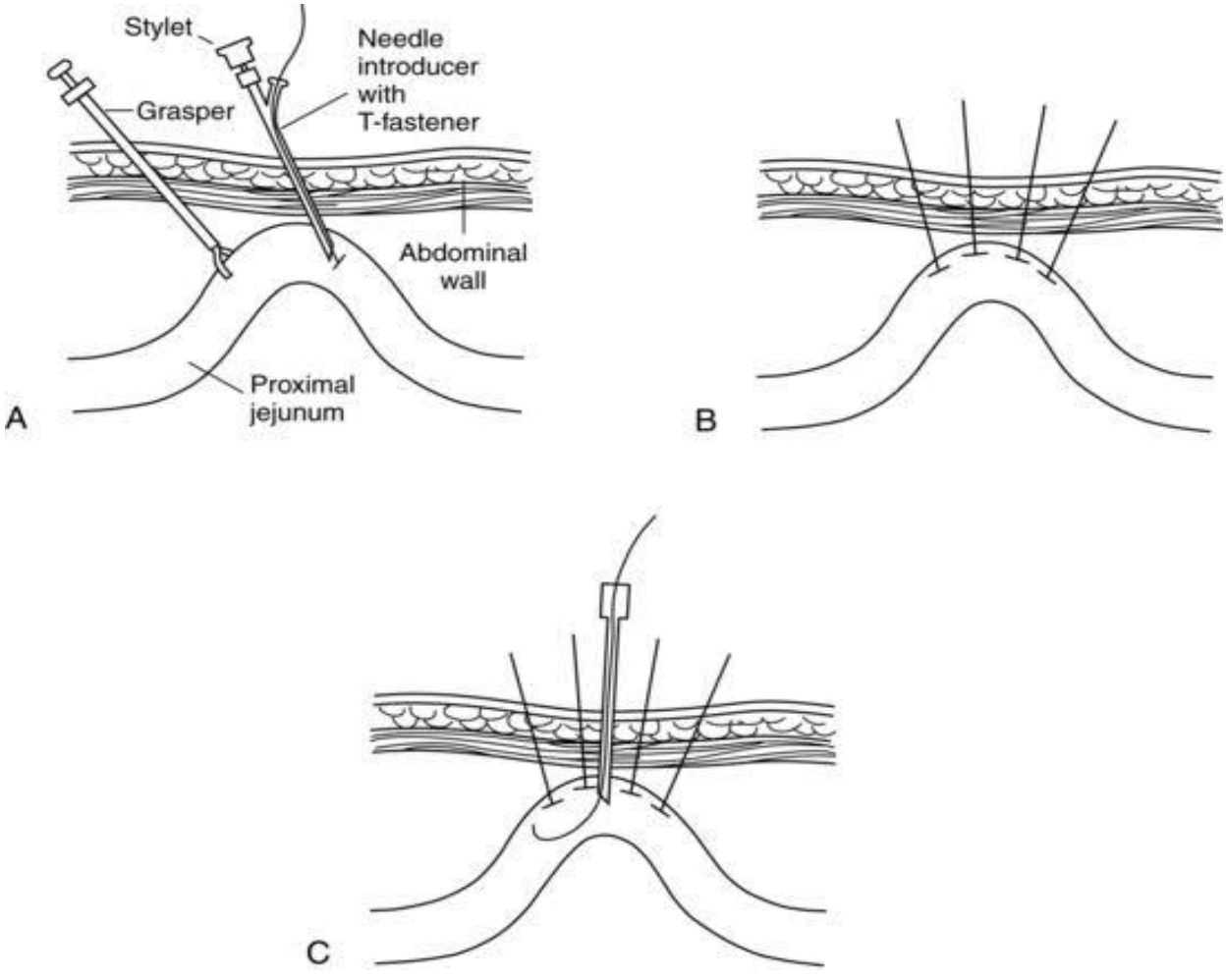
Laparoscopic placement of J-tubes and G-tubes

It began in the early 1990s because it was believed that these procedures would be associated with less morbidity and operative stress than the standard surgical jejunostomy and gastrostomy. It was soon learned, however, that these laparoscopic techniques added no significant advantage over standard surgical gastrostomy or jejunostomy with regard to operative time or associated procedure morbidity. (13)



Needle catheter jejunostomy (NCJ)

It involves placement of a 5 or 7 French catheter into the jejunum via a submucosal tunnel. It was hypothesized that this technique would have fewer procedure-related complications than standard jejunostomy because of the smaller entrance created to the jejunum. Multiple studies have reported reduced infectious complications of NCJ compared with standard surgical jejunostomy, but there is a significant increase in tube occlusions and dislodgment with the smaller NCJ.



Fluoroscopic Percutaneous Enteral Access

Placement of PEG and PEG/J tubes with fluoroscopic guidance has continued to gain acceptance since the introduction of this technique in the early 1980s.These procedures are usually performed by interventional radiologists in the fluoroscopy suite and can be done using the push, pull, or introducer technique. In the introducer technique first described by Russell, after administering topical anesthesia to the abdominal wall, occasionally with additional moderate sedation, the inferior margin of the liver is identified by ultrasonography and marked on the patient's abdominal skin surface. An NG tube is passed into the stomach, after which the stomach is insufflated and punctured with an introducer catheter; some but not all radiologists then attach the stomach to the anterior abdominal wall with T-fasteners. A guidewire is placed into the stomach through the introducer, and the puncture site is serially dilated over a guidewire to a size of 10 to 14 French.

A gastrostomy tube is passed over the guidewire, through the dilated puncture site, and into the stomach or the small intestine if a gastrojejunostomy tube is desired. This fluoroscopic approach to enteral access has a reported technical success rate of over 95%.

Most of the reported complications involve inadvertent puncture of contiguous abdominal organs or separation of the abdominal and gastric wall during gastrostomy tract dilation; the latter may lead to peritonitis, intraperitoneal leakage, and even death. Frequent occlusion of these feeding tubes because of their typically smaller internal lumen size has been shown to be avoidable if larger gastrostomy tubes (18 to 22 French) are used. A meta-analysis that evaluated the effectiveness and safety of endoscopic, radiologic, and surgical gastrostomies reported radiologic techniques to have higher success rates than endoscopic techniques (99.2% vs. 95.7%; $P < 0.001$) and equal success rates compared with surgical techniques (99.2%vs. 100%). There were fewer major complications with radiologic gastrostomies than PEGs or surgical gastrostomies (5.9% vs. 9.4% PEG group vs. 19.9% surgical group; $P < 0.001$).

Surgical gastrostomies had the highest 30-day mortality rate (2.5% vs. 0.3% radiologic gastrostomies and 0.53% PEGs; $P < 0.001$). More recent studies have reported similar outcomes for radiologic and endoscopic gastrostomies. In a systematic review comparing radiologic and endoscopic gastrostomy tube placement, respectively, in head and neck cancer patients, the pooled fatality rate was similar (1.8% vs. 2.2%), but the major complications rate was slightly higher (8.9% vs. 7.4%) with the radiologic technique. Percutaneous radiologic jejunostomy tube placement can also be performed, but accessing the mobile jejunum can be quite challenging, with success rates of 87% to 100% and complication rates of 0% to 15%.There have been no studies comparing PEJ with percutaneous radiologic jejunostomy.(14)

Enteral Feeding

Patients may receive their tube feedings by bolus, intermittent, or continuous methods. Bolus feeding delivery allows a relatively large volume of tube feeding (200 to 400 mL) to be delivered over a short period of time by a syringe. Intermittent feedings are delivered over a few hours by pump or by gravity drip using a bedside pole. Intermittent feedings may be practical for patients who cannot tolerate bolus feedings and who do not require the precise delivery method of continuous enteral pump feedings. Continuous feedings are usually delivered over 12 to 24 hours by a mechanical pump.

Patients who receive small bowel feedings are almost always fed using continuous feedings. An intermittent or continuous feeding regimen, rather than the rapid bolus method, may be used to limit the risk of tube-feeding aspiration. Tolerance of enteral feeding should be monitored by assessing for complaints of abdominal pain and/or distention, persistent nausea and vomiting, passage of flatus and stool, and a dilated small intestine or colon on abdominal imaging. Gastric residual volumes do not correlate well with the incidence of regurgitation, aspiration, or pneumonia, or as well as with measures of gastric emptying. Measures to reduce the risk of aspiration include keeping the head of the bed elevated 30 to 45 degrees in intubated ICU patients, changing the feedings to continuous infusion, using promotility drugs (metoclopramide or erythromycin) or narcotic antagonists (naloxone or alvimopan), and converting to postpyloric feeding. In the absence of signs of intolerance, EN should not be withheld for gastric residual volumes less than 500 mL. Based on current literature, PEG tubes can be used for feedings within 2 hours in adults and 6 hours in infants and children. Brown and coworkers randomized patients to begin feedings 3 or 24 hours after PEG placement and found no differences in tolerance or complications that required discontinuation of tube feedings, although wound infections were more common in the delayed feeding group.

McCarter and colleagues randomized patients to begin feedings at 4 or 24 hours after PEG placement, with no differences in adverse events despite increased gastric residual volumes on day 1 of feeding in the 4-hour feeding group. In a meta-analysis of 6 RCTs that compared next-day feeding with early feeding (≤4 hours after PEG placement), the latter was associated with delayed gastric emptying but no difference in complications or 3-day mortality.

Water Requirements

After choosing an enteral formula, one must pay attention to the amount of free water a patient receives each day. Allcommercial enteral formulas contain a certain amount of free water. The more calorie-concentrated a formula, the less free water it contains. To meet fluid requirements, additional water flushes should be administered intermittently throughout the day.

Advancement of Tube Feedings Once initiated, advancement of tube feedings is an imperfect science. Patients are usually begun on continuous tube feedings at a rate of 10 to 40 mL/hr. Feedings are advanced at a rate of 10 to 20 mL every 6 to 12 hours as tolerated until the patient's goal rate is reached. Signs of tube feeding intolerance prompt temporary cessation of tube feeding or a reduction in the tube feeding rate. When patients reach their goal rates, they may be maintained on continuous 24-hour tube feedings or changedto 18- or 12-hour continuous tube feedings, intermittent tube feedings, or bolus tube feedings.

Enteral Formulations

Many formulations for enteral feeding are available, including blenderized, polymeric, predigested, specialty, modular, and supplemental regimens.

Blenderized Formulations

Blenderized formulations are made by blending table foods, such as various meats, fruits,vegetables, milk, carbohydrates, fats, and water. As a result, they havemore fiber and higher viscosity and osmolarity than standard enteral formulas, and they require a functional GI tract to be digested and absorbed. They are not recommended for use in small-caliber feeding tubes because of their propensity for causing tube clogging.

Standard Polymeric Formulations

Lactose-free, gluten-free, polymeric formulations are the basic feeding formulas designed for long-term use. These formulations are denoted as polymeric because the macronutrient components are intact and not predigested. Standard formulations contain 15% to 20% calories from proteins, 45% to 60% calories from carbohydrates,and 30% to 40% calories from fats.

Generally, these formulations provide 1 kcal/mL, although they may be concentrated to 1.5 to 2 kcal/mL. As the calorie content per millilitre volume of tube feeding increases, the free water content of the formula decreases and the osmolarity increases.

Most 1-kcal/mL enteral formulas are 80% to 85% free water. Formulas that are higher in protein are designated as HN (high nitrogen).

Predigested Formulations

Predigested enteral formulations, also called ***elemental, semi-elemental,* or *small peptide formulations.***

They are designed for patients with limited digestive capacity. The protein and carbohydrate components of these formulations have been broken down into smaller substrates for easier absorption, and because of the presence of multiple smaller particles they are highly osmotic.

These formulas are generally also low in fat content or contain a significant amount of MCTs to improve GI tolerance for patients who have fat malabsorption disorders.

Specialty Formulations

Specialty formulations are designed for patients with special nutritional requirements based on specific disease processes, such as diabetes, renal failure, hepatic failure, pulmonary disease, or severe stress or trauma. There are little to no data to show that these specialty formulations improve survival when used for their intended disease states.

Immune-Modulating Formulas

Immune-modulating formulas contain higher amounts of

- Arginine
- Glutamine
- omega-3 fattyacids
- Antioxidants
- Nucleotides substances shown to be important in immune modulation.

` Arginine is needed for

1. cell growth and proliferation
2. wound healing
3. nitric oxide production
4. lymphocyte differentiation.

Arginine requirements increase in critical illness, and supplementation may facilitate wound healing. There is concern, however, that arginine supplementation may lead to increased nitric oxide production, resulting in excessive vasodilation and hypotension. More recently, other immune-enhancing nutrients, such as borage (starflower) oil, have been examined. Patients most likely to show a benefit from immune-enhancing formulas include

- those about to undergo elective GI surgery
- patients who have trauma (abdominal trauma index scores >20)
- burns (total body surface area >30%)
- and head and neck cancer
- critically ill patients on mechanical ventilation (who are not severely septic).

If possible, administration of an immune-enhancing formula should be initiated for 5 to 7 days prior to elective surgery. In such cases, feedings should be advanced as tolerated until 1500 mL are administered daily or more than 50% to 65% of calculated nutrient goals are met; the effect appears to be dose dependent.

Evidence suggests that immunemodulating formulas reduce subsequent infectious complications, antibiotic needs, ventilator days, and episodes of multiple organ dysfunction, as well as decrease hospital stay. A meta-analysis of 6 RCTs of standard EN compared with immune-modulating formula showed the latter was associated with a decrease in length of stay and infections

but had no effect on survival. In patients with head and neck cancer, studies have shown reduced local wound complications, shorter length of stay, and a survival benefit with arginine.Some newer immune-enhancing formulas are showing promise in changing clinical outcomes for patients with acute respiratory distress syndrome.

The consensus recommendations by the U.S. Summit on Immune-enhancing Enteral Therapy are that malnourished patients about to undergo GI or major head and neck surgery would benefit from preoperative immune-enriched EN.

Three large RCTs of an enteral formula with antioxidants and anti-inflammatory lipids, including omega-3 fish oils (specifically eicosapentaenoic acid) and borage oil (gamma-linolenic acid), in patients with acute respiratory distress syndrome and severe acute lung injury have shown a reduction in

- ICU length of stay
- Duration of mechanical ventilation
- Organ failure
- Mortality as compared with a standard formula.

A recent randomized double-blind, placebo-controlled trial of patients with acute lung injury, however, showed no benefit in clinical outcome and possible harm with omega-3 fatty acids, gamma-linolenic acid, and antioxidants. As a result, controversy exists over the ideal dosage, composition of fatty acids, and individual immune-modulating nutrients that should make up these formulations.

Renal Formulas

Enteral formulations for patients with renal dysfunction are calorically dense and electrolyte restricted. Formulations for pre-dialysis patients are protein restricted, whereas formulations for dialysis patients contain higher levels of protein because of their higher protein needs. Their needs can often be met by a standard calorically dense formula, but they may benefit from a renal formulation if they develop persistent hyperkalemia or hyperphosphatemia. Patients who are on hemodialysis or continuous renal replacement therapy should be given a maximum of 2.5 g/kg/day of protein. Furthermore, in patients with renal insufficiency, protein should not be restricted in order to prevent or delay initiation of dialysis therapy. Renal failure patients should receive a formula with a balance of essential and nonessential amino acids.

Enteral Feeding Complications

GI side effects of tube feedings are reported in 15% to 30% of patients

- nausea,
- vomiting,
- abdominal distention,
- abdominal cramping
- diarrhea.

Nausea, vomiting, and abdominal distention can often be resolved by slowing the delivery rate of the feeding.

Diarrhea is the most common complication. Its pathophysiology is complex but is commonly due to mediations and *Clostridium difficile* enterocolitis. Frequently, medications are changed from tablet to liquid form for easy instillation through the feeding tube. These liquid medications often have a sorbitol base, which is a known cathartic. Magnesium-containing medications, hypertonic medications, and promotility agents may also promote diarrhea. High-osmolarity tube feedings, the osmolality of which is as high as 600 to 700 mOsm/kg, are often cited as a cause of diarrhea, although studies have demonstrated tolerance to them.

In a patient with new-onset diarrhea who was previously tolerant to an enteral formula, an assessment should be made for medication-induced and infectious diarrhea prior to changing the formula.

There are no data to support the recommendation that commercial enteral formulations be diluted in an attempt to improve their GI tolerance.

For patients with small bowel malabsorption, especially fat malabsorption, pre-digested lower-fat formulas may improve absorption and reduce diarrhea. Hypoalbuminemia may lead to small bowel

wall edema and resultant diarrhea; there are no data to support the use of intravenous albumin to improve diarrhea in hypoalbuminemic patients.

In these circumstances, the use of anticholinergic agents to slow bowel motility may help improve absorption, thus decreasing diarrhea. Soluble fiber supplementation may improve diarrhea, although the effect of fiber on diarrhea remains controversial. Studies have provided evidence for and against fiber's efficacy in treating diarrhea associated with tube feeding.

A number of fiber-supplemented commercial enteral formulas are available. Metabolic complications are less common with EN than with PN feeding. Dehydration and fluid shifts may occur with formulas of high concentration, especially if insufficient water is supplied. Hyperglycemia may occur with high rates of carbohydrate delivery in patients with glucose intolerance. Medication delivery may also be affected by concurrent tube feeding.

Phenytoin administration is affected because phenytoin binds to the enteral formula and forms a phenytoin– tube feeding complex that adheres to the wall of the feeding tube. Ciprofloxacin has also been shown to bind with tube feedings, reducing its absorption. Vitamin K, present in many enteral formulas, may make a patient more resistant to the effects of warfarin.(15)

Oral Diet Therapy

A general diet is designed to provide optimal nutrition to patients who do not require a therapeutic diet. A healthful diet contains a variety of foods that are low in fat and cholesterol and have a moderate salt content; an abundance of fruits, grains, and vegetables is ideal.

Clear Liquid Diets

Clear liquid diets supply fluid and energy in a form that creates a minimal amount of residue. They are meant to avoid a high osmolar delivery to the GI tract, which would result in fluid shifts and associated nausea and diarrhea. Clear liquid diets generally contain an abundance of carbohydrates but little protein or fat, and are thereby nutritionally inadequate to meet basic metabolic needs. There is but sparse evidence to suggest that a clear liquid diet is better tolerated than any other diet in the postoperative period. Early feeding after abdominal or thoracic surgery may reduce postoperative complications, hospital length of stay, and mortality, although vomiting may be increased.

Full Liquid Diets

Full liquid diets are indicated for patients who are unable to chew, swallow, or digest solids. They are largely milk-based and should not be used for lactose-intolerant patients. They contain a large amount of simple carbohydrates and should be used with caution in diabetic patients.

Soft Diets

Soft diets are designed for patients who cannot tolerate a regular diet, usually because of an oral, pharyngeal, or esophageal anatomic lesion (e.g., pharyngeal or esophageal cancer). Soft diets are often used in a progression from a liquid to solid diet. Soft diets are believed to reduce gas and nausea in postoperative patients, although there are no data supporting this concept. For patients with poor dentition, a soft diet can provide adequate calories, protein, and nutrients without having to rely on any significant mastication.

Fiber- and Residue-Restricted Diets

Fiber- and residue-restricted diets are used for patients with GI strictures and are presumed to reduce the risk of obstruction while prolonging transit time.

Carbohydrate intake is reduced, and well-cooked vegetables, refined cereals, and breads are used. Although these diets are commonly prescribed, no data support their use in the GI stricture patient population.

High-Fiber Diets

High-fiber diets include soluble and insoluble fibers, which have a wide range of metabolic and physiologic effects. They are used to reduce intraluminal colon pressures in patients with diverticulosis, although no data support this concept.

They may also be useful in diabetes by delaying glucose absorption, in cardiovascular disease by lowering serum cholesterol and serum triglyceride levels, and in preventing colon cancer. This diet emphasizes foods such as vegetables, fruits, legumes, and whole-grain breads and cereals.

Post-gastrectomy and Anti-dumping Diets

Nutritional therapy for dumping syndrome involves ingestion of small, frequent meals high in protein and fat to deliver a lower-osmolarity solution to the small intestine; simple sugars are also avoided to prevent rapid absorption. Fluid intake should be restricted and separated from solid food intake to avoid rapid gastric transit. High-pectin–containing foods (e.g., bananas, oranges) will slow gastric output.

Low-Fat Diets Low-fat diets are used to minimize diarrhea and steatorrhea associated with fat malabsorption, especially in patients with pancreatic or biliary dysfunction.

In patients who are to be on low-fat diets for prolonged periods, fat-soluble vitamins (A, D, E, K) must be supplemented.

Medium-chain triglycerides may be used to substitute for some long-chain triglycerides; they have 6- to 12-carbon fatty acid chains, high aqueous solubility, and do not require bile salts for absorption in the small intestine.223 Medium-chain triglycerides do not undergo chylomicron formation and are absorbed directly into the portal venous system.(16)

AIM OF THE STUDY

To compare the outcome of Early Enteral feeding vs Routine Delayed oral feeding after gastro intestinal surgeries.

0BJECTIVES

1. To study the impact of early feeding on duration of paralytic ileus and start of oral feeds following upper gastrointestinal surgery.

2. To study the rate of anastamotic leak after start of early enteral feeding

3. To study the rate of wound infection after starting early enteral feeding

4. To compare duration of hospital stay.

MATERIALS AND METHODOLOGY

STUDY CENTRE

The study was conducted in the General Surgery department of Govt Vellore Medical College&Hospital,Vellore after obtaining Institutional Ethics Committee approval.

STUDY PERIOD- May 2018 to July 2019

SOURCE OF DATA – All patients undergoing Gastro Intestinal Surgical procedure at Govt Vellore Medical College&Hospital.

SAMPLE SIZE-100 patients,50 in each group

Type of study: prospective, randomised, control study

50 patients included in this study are divided into two cohorts

1) Study Group-25

2) Control Group-25

PROTOCOL

- STUDY GROUP – will be fed with in 48 hours after enteric anastomosis and also from full anaesthesia recovery.

- CONTROL GROUP – will be fed 48-72 hours after or even more following enteric anastomosis depending upon return of the full peristaltic sounds.

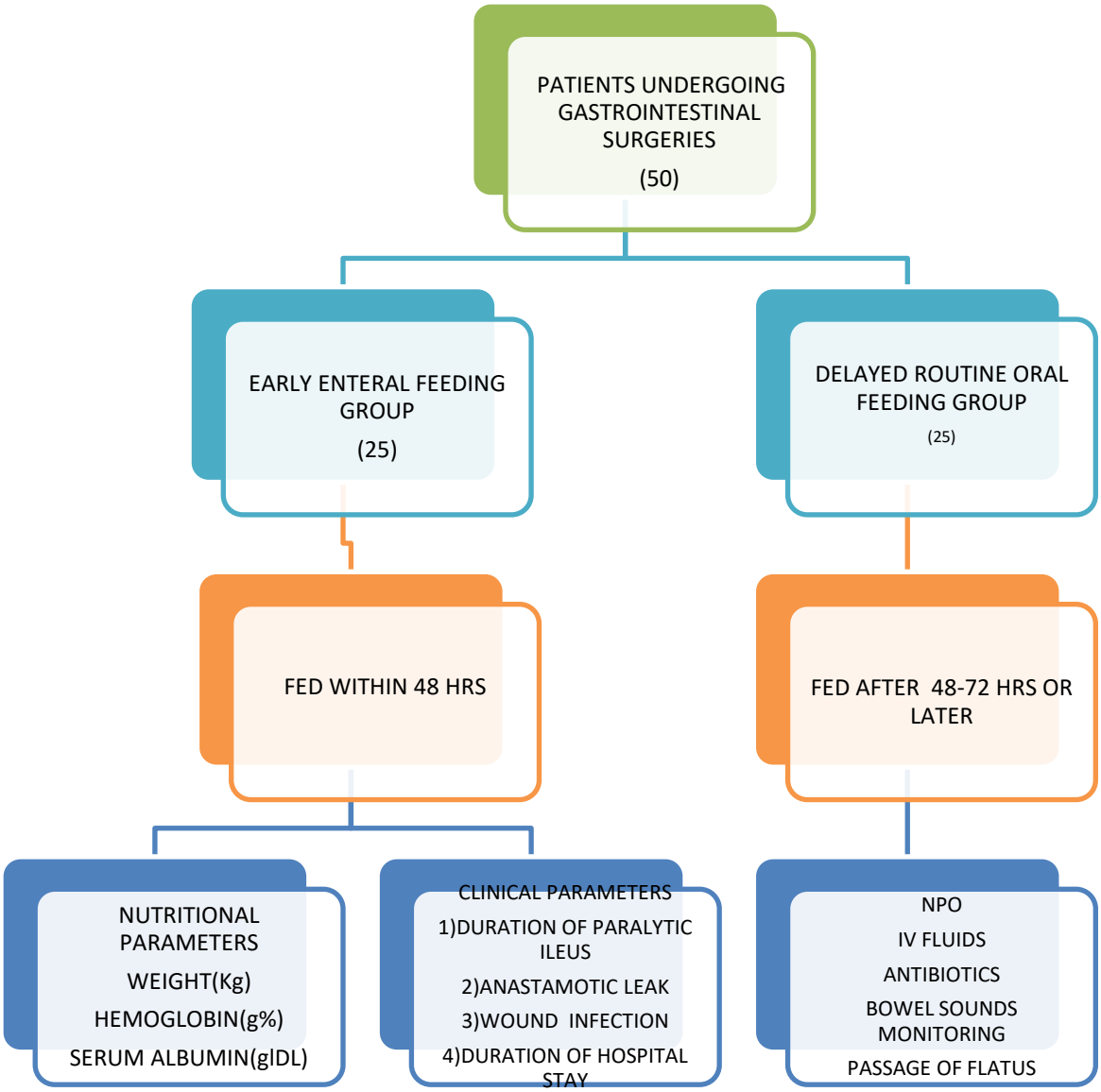
INCLUSION CRITERIA

- Age between 20 and 60 years.
- Both sex.
- Patients who undergoes bowel resection and anastomosis
  Or primary repair with traumatic or non traumatic intestinal perforation.
- Patients consented for inclusion in the study.

EXCLUSION CRITERIA

- Age <20 AND > 60yrs .
- Patients with following co-morbid medical conditions-cardiac/renal/hepatic dysfunction**.**
- Patients undergoing gastrointestinal surgeries other than those mentioned in the inclusion criteria.
- Previous history of gastrointestinal surgery or peritonitis.

Protocol for study :



Monitor the patient for side effects

- **Look for the following**

  1)Abdominal cramps

  2)Abdominal distension

  3)Ileus

  4)Diarrhoea(3or more stools per day)

  If any of above symptoms persists ,temporarily enteral feeding is stopped and patient observed.

  Nutritional parameters monitored are

- Weight(Kg)
- Haemoglobin (g%)
- Serum albumin (g/dl)
- These three parameters are monitored

  a) pre operatively

  b) post operatively day1

  c) post operatively day **7**

CLINICAL PARAMETERS

1)Duration of paralytic ileus

2)Anastamotic leak

3)Wound infection

4)Duration of hospital stay.

Relevant clinical parameters are checked for three times per day.

All patients are given post operative antibiotics(combination of a third generation cephalosporin and metronidazole).

No oral/intravenous/ rectal agents to stimulate bowel motility are given.

Protocol for patients in control group

- Routine management by nil per oral, intravenous fluids, antibiotics and frequent clinical monitoring for passage of flatus and bowel sounds.
- Oral feeds are started once the patient is deemed fit clinically for feeding

STATISTICAL ANALYSIS AND RESULTS

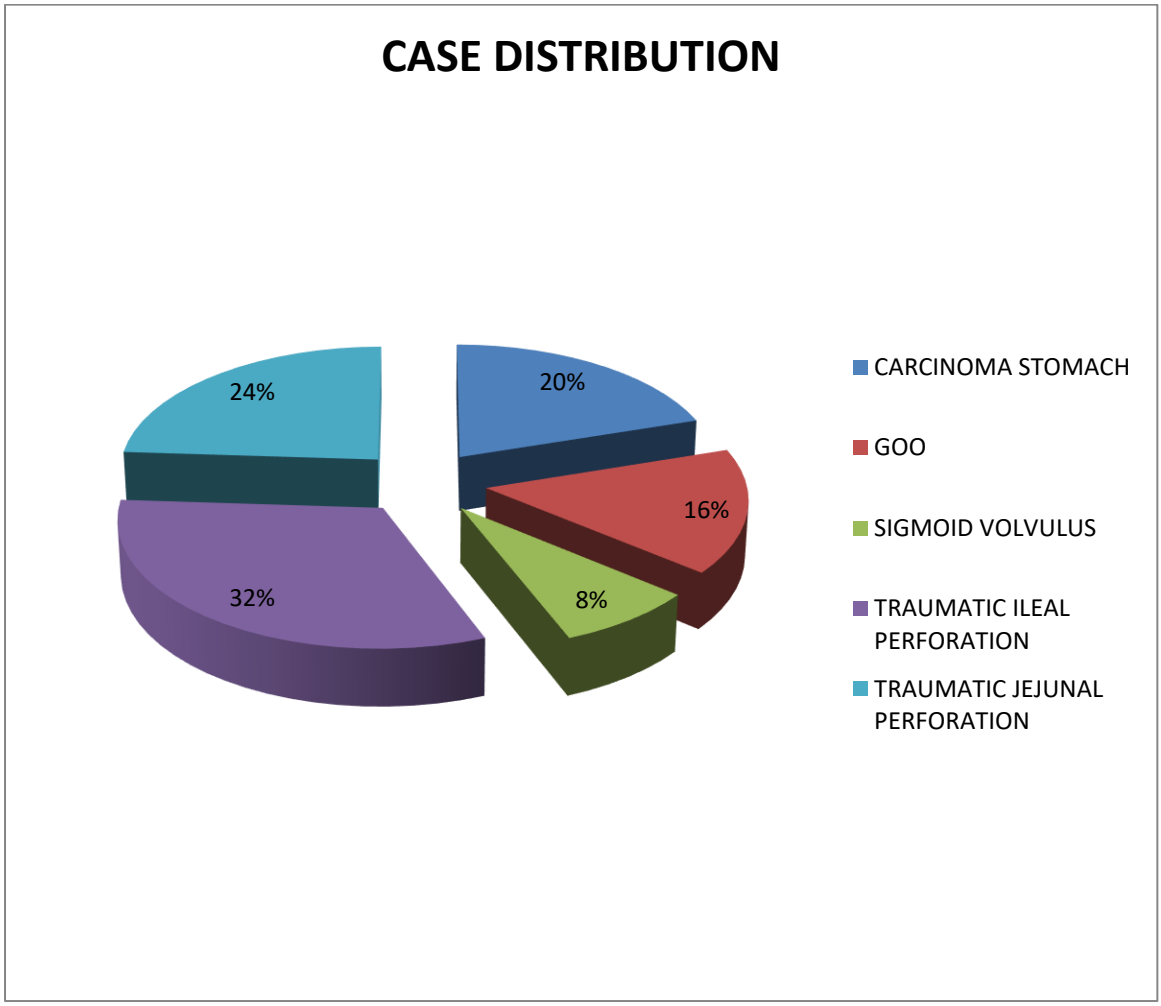
Total number of patients-50

Cases-25

Control-25

CASES	CONTROLS
CARCINOMA STOMACH 5(20%)	CARCINOMA STOMACH 5 (20%)
SIGMOID VOLVULUS 2(8%)	SIGMOID VOLVULUS 2(8%)
GOO 4(16%)	GOO 4(16%)
TRAUMATIC ILEAL PERFORATION 8 (32%)	TRAUMATIC ILEAL PERFORATION 8 (32%)
TRAUMATIC JEJUNAL PERFORATION 6 (24%)	TRAUMATIC JEJUNAL PERFORATION 6 (24%)

cases and controls were taken equally on both sides.

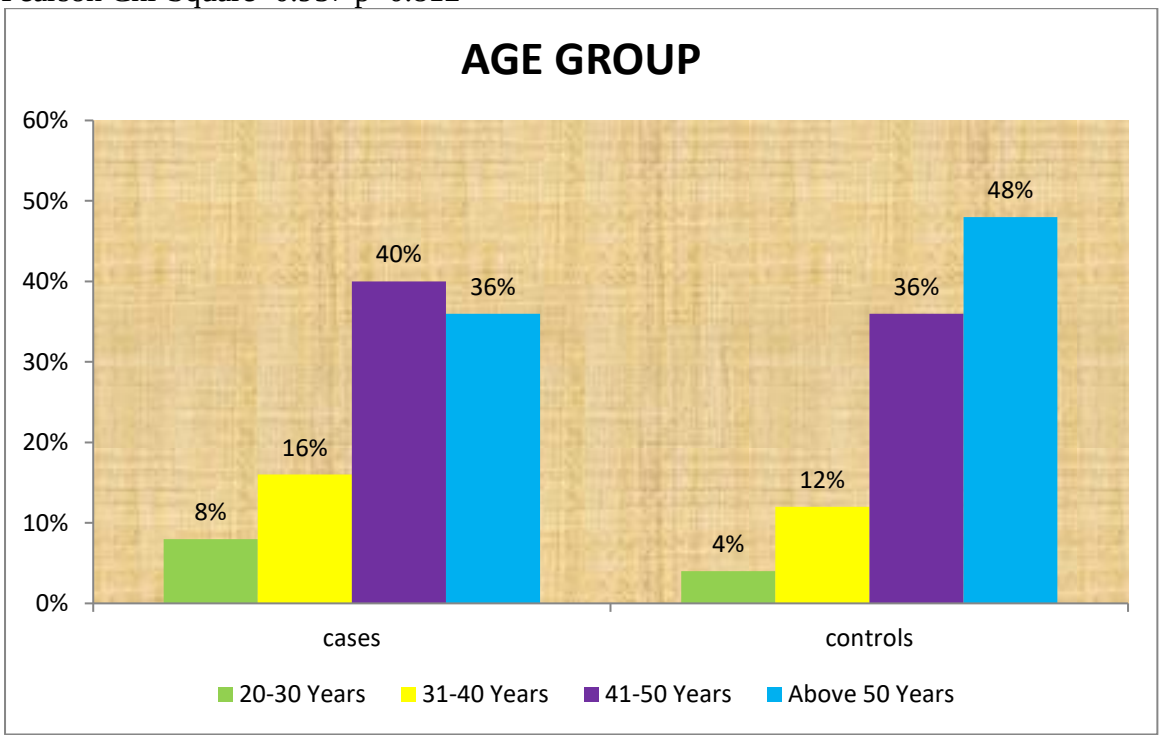

CASE DISTRIBUTION
20%
16%
8%
32%
24%
CARCINOMA STOMACH
GOO
SIGMOID VOLVULUS
TRAUMATIC ILEAL PERFORATION
TRAUMATIC JEJUNAL PERFORATION

STATISTICAL ANALYSIS

Crosstab

			Group		Total
			Cases	Controls	
age_group	20-30 Years	Count	2	1	3
		% within group	8.0%	4.0%	6.0%
	31-40 Years	Count	4	3	7
		% within group	16.0%	12.0%	14.0%
	41-50 Years	Count	10	9	19
		% within group	40.0%	36.0%	38.0%
	Above 50 Years	Count	9	12	21
		% within group	36.0%	48.0%	42.0%
Total		Count	25	25	50
		% within group	100.0%	100.0%	100.0%

Pearson Chi-Square=0.957 p=0.812



Age group distribution in cases and controls were

(20-30)years-8%among cases and 4% in controls

(31-40)years-16% in cases and 12% in controls

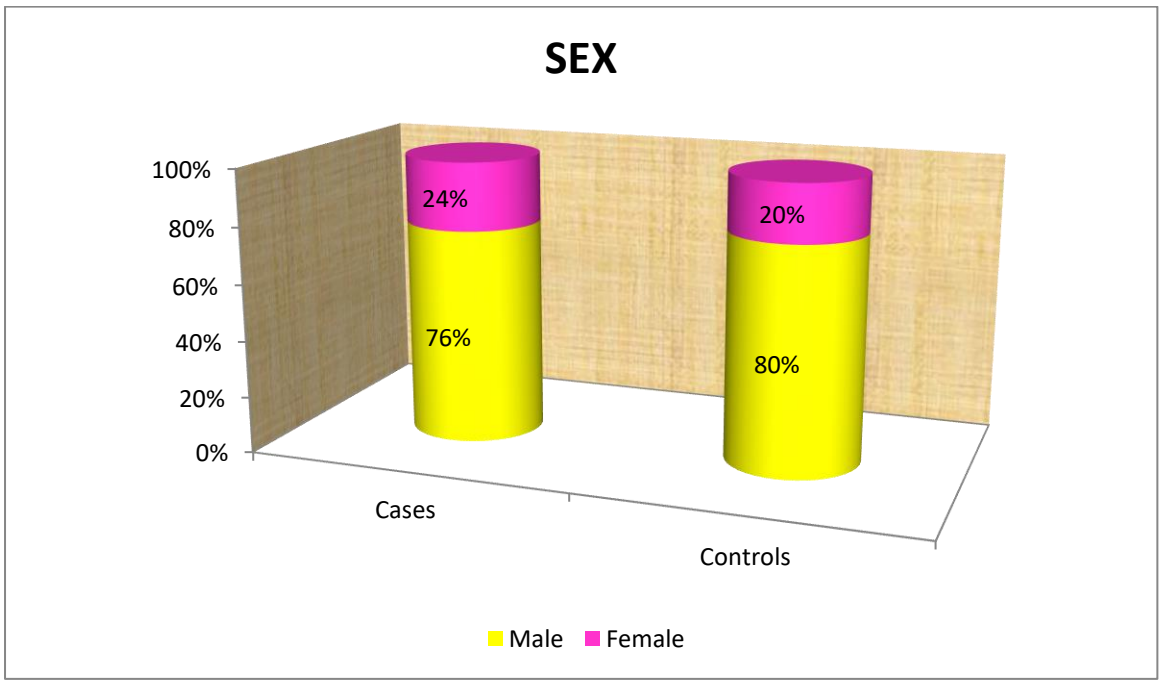
(41-50)years-40% in cases and 36% in controls

(51-60)years-36% in cases and 48% in controls

SEX DISTRIBUTION

			group		Total
			Cases	Controls	
Sex	Male	Count	19	20	39
		% within group	76.0%	80.0%	78.0%
	Female	Count	6	5	11
		% within group	24.0%	20.0%	22.0%
Total		Count	25	25	50
		% within group	100.0%	100.0%	100.0%

Pearson Chi-Square=0.117 p=0.733



The total number of patients was 50(study cases-25 and control-25).

Among them the male and female distribution was 19(76%) and 6(24%) in the study cases respectively and 20(80%) and 9(20%) in the control group respectively.

ANASTAMOTIC LEAK

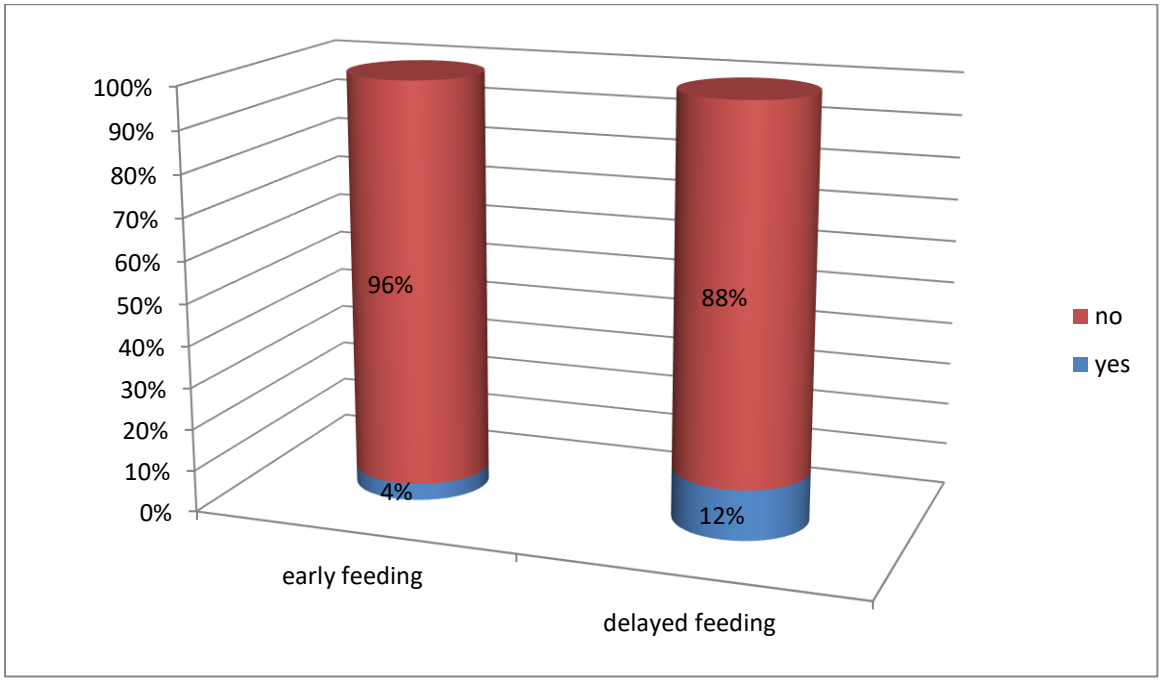
			group	
			Cases	Controls
anastamotic_leak	No	Count	24	22
		% within group	96%	88%
	Yes	Count	1	3
		% within group	4%	12%
Total		Count	25	25
		% within group	100.0%	100.0%

Odds Ratio=0.305

Pearson Chi-Square=1.087

p value=0.29 not significant.

ANASTAMOTIC LEAK



Anastamotic leak was 1(4%) in early feeding group and 3(12%) in delayed feeding group

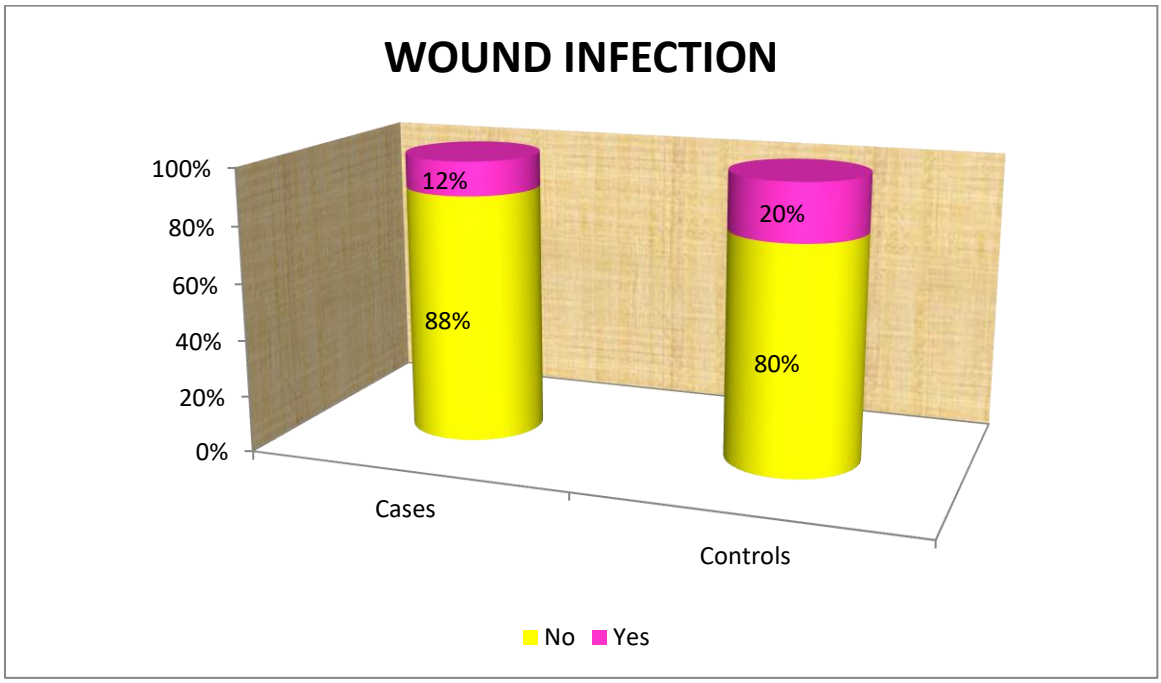
p value is 0.29 statistically not significant.

WOUND INFECTION

			Cases	Controls
wound_infection	No	Count	23	22
		% within group	92%	88%
	Yes	Count	2	3
		% within group	8%	12%
Total		Count	25	25
		% within group	100.0%	100.0%

Pearson Chi-Square=0.59 p=0.44

ODDS RATIO=0.54

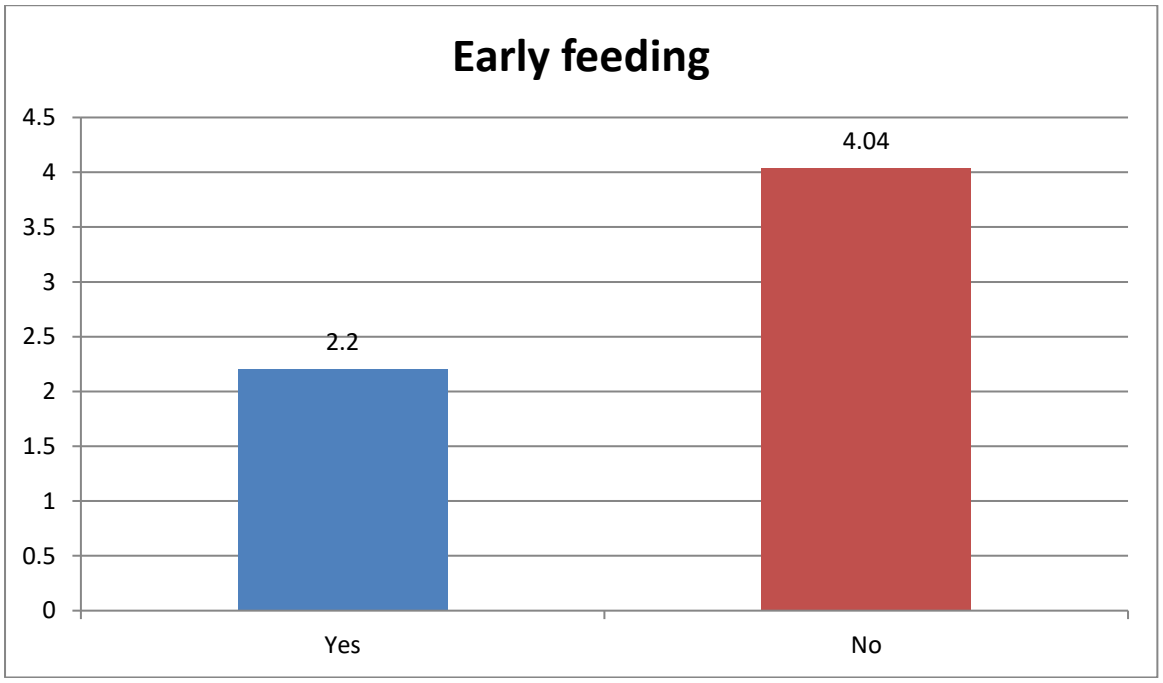


Patients started on early enteral feeding showed a significantly lesser rate of Wound infection as 3(12%) among the 25 cases developed infection. Whereas in the control group were late feeding 5(20%) of the patients developed infection of the surgical site. This difference is statistically not significant as the p value is 0.44, but it implies that early feeding group has only half the risk of wound infection when compared to delayed feeding group.

DURATION OF PARALYTIC ILEUS

	Group	N	Mean	Std. Deviation	Std. Error Mean	T value
DURATION OF ILEUS	Early feeding	25	2.2000	.40825	.08165	8.100**
	Delayed feeding	25	4.0400	1.05987	.21197	

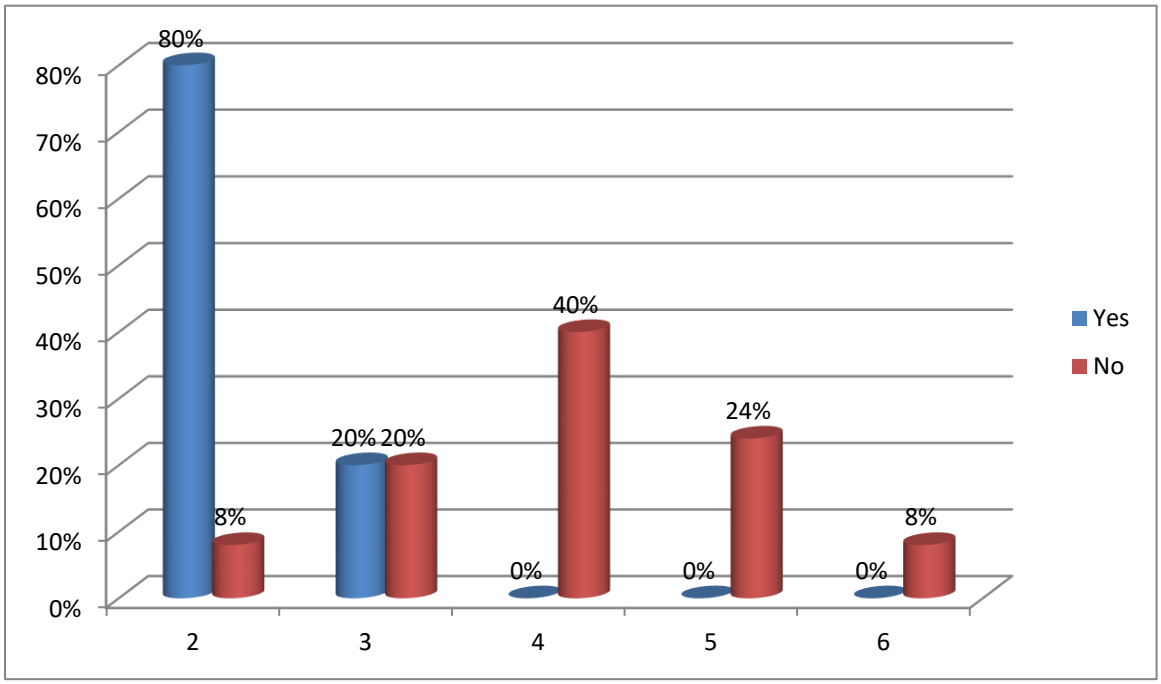
**p<0.001



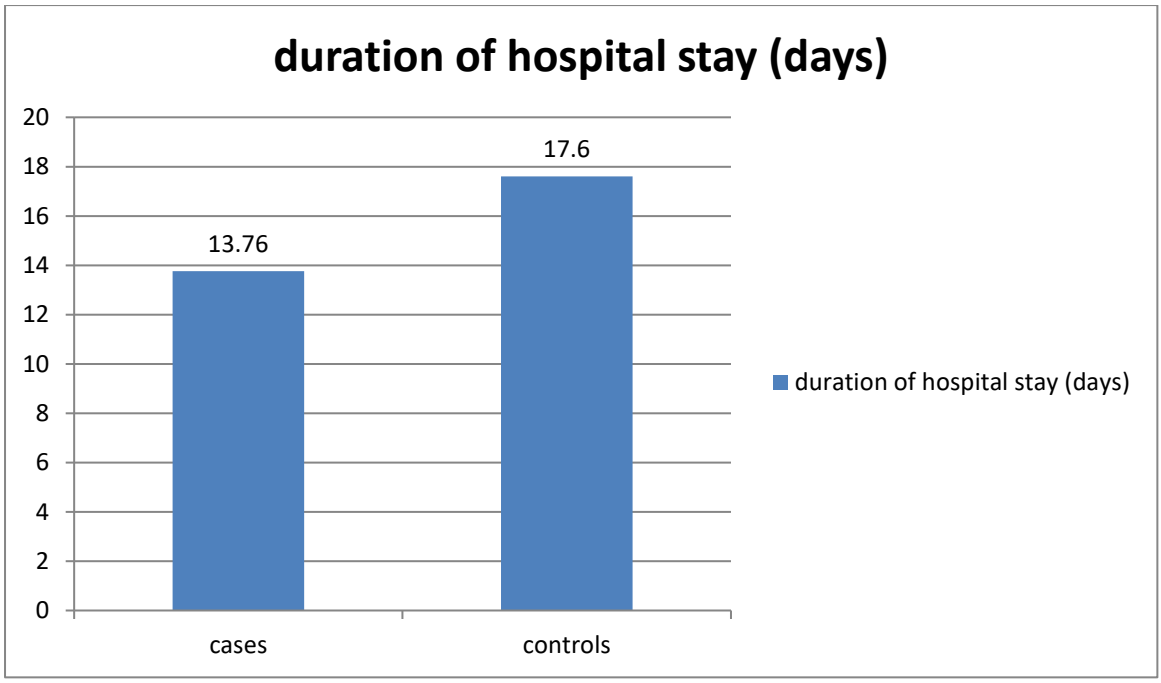
The mean number of days of paralytic ileus among the cases started on early feeding in the study group was 2.2 days while it was 4.04days among the cases started on the late feeding in the control group.since the p value is <0.001 the difference is statistically significant.

DURATION OF ILEUS * group Crosstabulation					
			Group		Total
			arly feeding	no	
DURATION OF ILEUS	2.00	Count	20	2	22
		% within group	80.0%	8.0%	44.0%
	3.00	Count	5	5	10
		% within group	20.0%	20.0%	20.0%
	4.00	Count	0	10	10
		% within group	0.0%	40.0%	20.0%
	5.00	Count	0	6	6
		% within group	0.0%	24.0%	12.0%
	6.00	Count	0	2	2
		% within group	0.0%	8.0%	4.0%
Total		Count	25	25	50
		% within group	100.0%	100.0%	100.0%

Pearson chi square =32.727** p<0.001



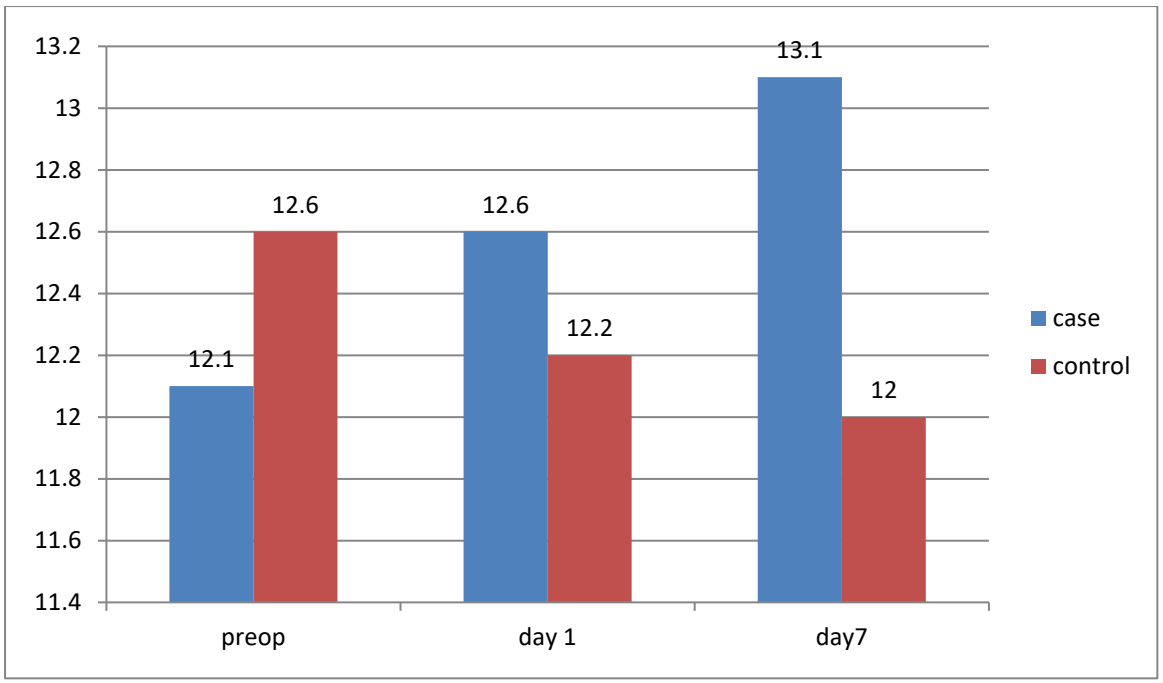
DURATION OF HOSPITAL STAY



	group	N	Mean	Std. Deviation	Std. Error Mean	Tvalue	Pvalue
duration_of_hospital_staydays	Cases	25	13.76	2.50466	0.50093	-5.27	p<0.001
	Controls	25	17.6	2.64575	0.52915		

The average number of days of stay in the hospital among the patients initiated on early feeding was 13.76 days. The same among the patients in the control group was 17.6 days. Since the p value was <0.001 the difference is statistically significant.

COMPARISON OF HAEMOGLOBIN (g%)



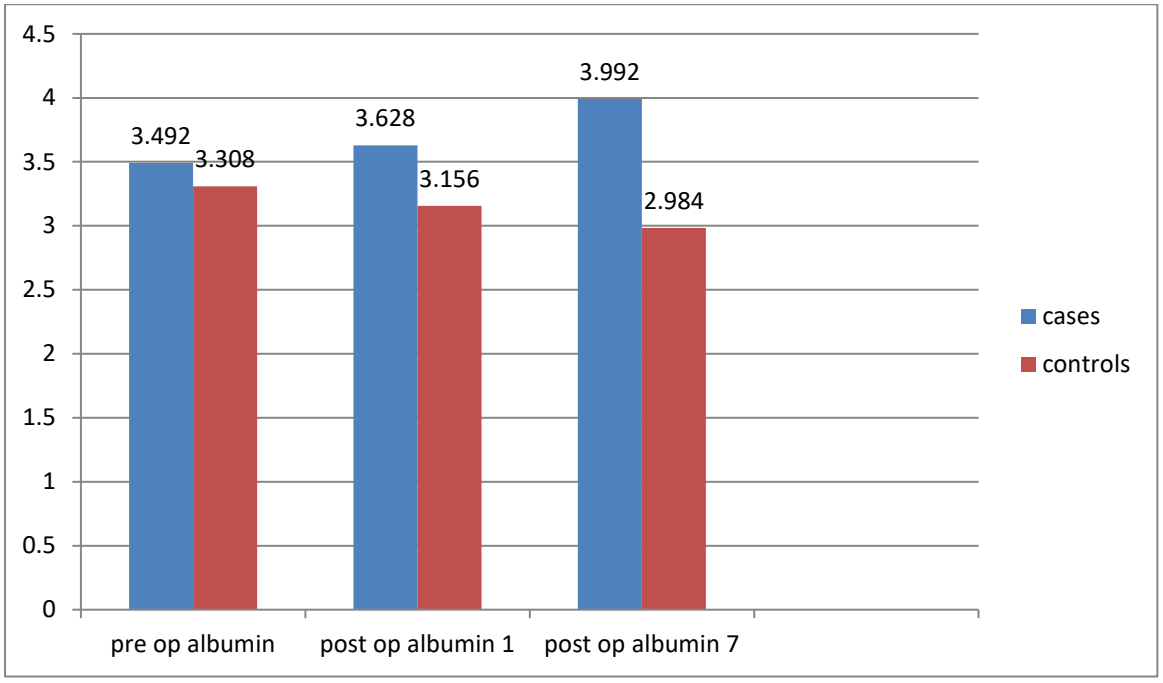
	Group	N	Mean	Std. Deviation	Std. Error Mean	tvalue	Pvalue
pre__op_hb_g	Cases	25	12.1	1.27316	0.25463	-1.098	0.278
	Controls	25	12.6	1.59452	0.3189		
post_op_hb_day_1	Cases	25	12.6	1.14865	0.22973	0.819	0.417
	Controls	25	12.2	1.72812	0.34562		
post_op_hb_day_7	Cases	25	13.1	1.54377	0.30875	2.359	0.022
	controls	25	12	1.82527	0.36505		

The mean pre operative haemoglobin among the cases in study group was

12.1g%. In post operative day 1 it was 12.6g% , but the levels increased to 13.1g% by post operative day7. But in the control group the meanpreoperative haemoglobin was 12.6g%, on post operative day 1 was 12.2g% and by post operative day7 was 12%.This is statistically not significant as the p valueis 0.022 in post operative day7.

COMPARISON OF SERUM ALBUMIN g/dl

preop_serum_albumingdl	Cases	25	3.492	0.37296	0.07459	1.816	0.076
	Controls	25	3.308	0.34269	0.06854		
post_op_albumin_day_1	Cases	25	3.628	0.46861	0.09372	3.935	p<0.001
	Controls	25	3.156	0.37425	0.07485		
post_op_albumin_day_7	Cases	25	3.992	0.66516	0.13303	6.167	p<0.001
	Controls	25	2.984	0.47494	0.09499		



The pre operative S.albumin levels among the patients started on early feeding were 3.492g/dl. On post operative day1 the same was 3.628g/dl and by post operative day7 it was 3.992 g/dl. Among the control cases the mean preoperative S.albumin levels was 3.308g/dl. On post operative day1 it was 3.156g/dl and by post operative day7 it was 2.984g/dl. This is statistically significant as the p value is <0.001 .

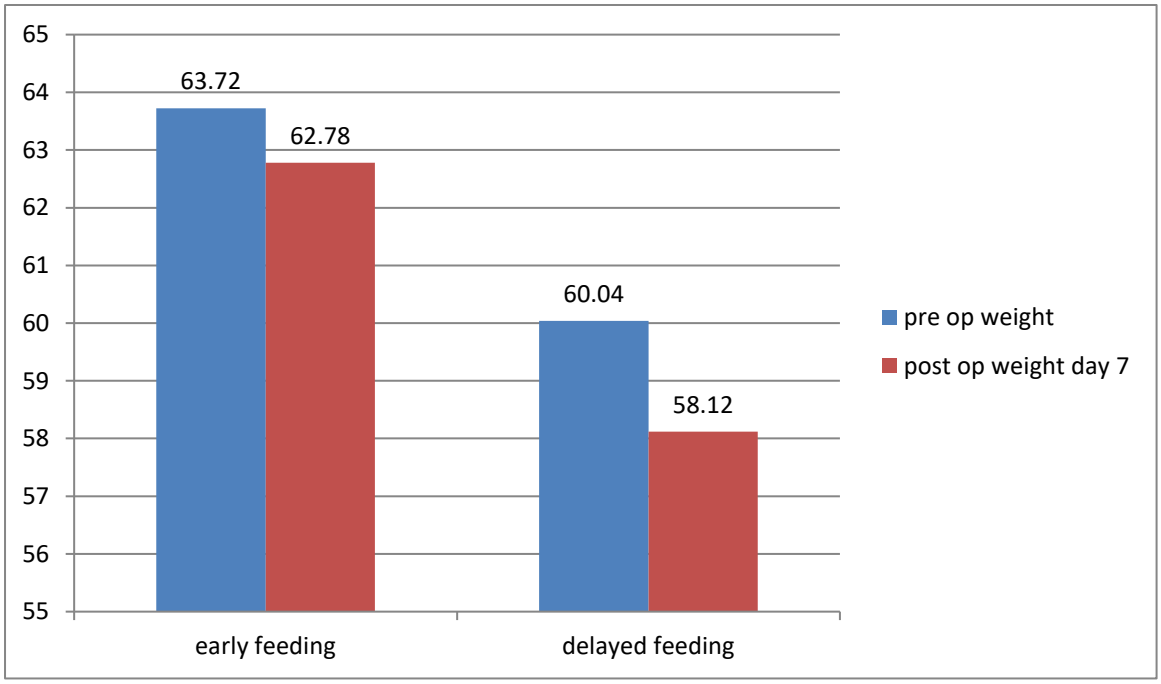
COMPARISON OF WEIGHT

Early feeding group	Pre op weight	25	63.72	11.51875	2.3512	0.2752	P=0.7842
	Day 7	25	62.78	11.63442	1.4024		

Mean difference was 0.92

Delayed feeding group	Pre op weight	25	60.04	6.8846	1.40532	0.9893	P=0.3274
	Day 7	25	58.12	6.5563	1.3383		

Mean difference was 1.92



The mean weight of the study cases pre operatively was 63.72kg,

In post operative day 7 it was 62.78kg , While comparing the same parameter in

the patients of the control group, the mean pre operative weight was 60.04kg,it was reduced to

58.12kg by postoperative day7.p value not significant in both groups, but it implies that weight loss was lesser in early feeding group when compared to delayed feeding group in post operative day 7

DISCUSSION

The laboratory parameters compared in this study were Weight(kg)of the patient,

Haemoglobin levels(g%) and the S.albumin levels(g/dl). The pre operative values

were compared to the post operative values in Day1 and Day7.

The mean weight of the study cases pre operatively was 63.72kg, In post operative day 7 it was 62.78kg , While comparing the same parameter in the patients of the control group, the mean pre operative weight was 60.04kg,it was reduced to 58.12kg by postoperative day7.p value not significant in both groups, but it implies that weight loss was lesser in early feeding group when compared to delayed feeding group.

The mean pre operative haemoglobin among the cases in study group was 12.1g%. In post operative day 1 it was 12.6g% , but the levels increased to 13.1g% by post operative day7. But in the control group the mean preoperative haemoglobin was 12.6g%, on post operative day 1 was 12.2g% and by post operative day7 was 12%.This is statistically not significant as the p value is 0.022 in post operative day7. .

The pre operative S.albumin levels among the patients started on early feedingwere 3.492g/dl. On post operative day1 the same was 3.628g/dl and by postoperative day7 it was 3.992 g/dl. Among the control cases the mean preoperative S.albumin levels was 3.308g/dl. On post operative day1 it was 3.156g/dl and by post operative day7 it was 2.984g/dl. This is statistically significant as the p value is <0.001. This signifies the advantage to starting early enteral feeding in order to maintain the nutritional status of the post operative patient.

The mean number of days of paralytic ileus among the cases started on early feeding in the study group was 2.2 days while it was 4.04days among the cases started on the late feeding in the control group.since the p value is <0.001 the difference is statistically significant.

Wound infection as 3(12%) among the 25 cases developed infection. Whereas in the control group were late feeding 5(20%) of the patients developed infection of the surgical site. This difference is statistically not significant as the p value is 0.44.

The average number of days of stay in the hospital among the patients initiated on early feeding was 13.76 days. The same among the patients in the control group was 17.6 days. Since the p value was <0.001 the difference is statistically significant and adds to the list of advantages of early feeding.

Anastamotic leak was 1(4%) in early feeding group and 3(12%) in delayed feeding groupp value is 0.29 statistically not significant.

CONCLUSION

- Nutritional status of the patient clinically and biochemically is better in early feeding.
- Duration of paralytic ileus is lesser in early feeding.
- Rate of surgical site infections risk is very less in early feeding.
- Anastamotic leak rate relatively less among early feeding patients.
- Duration of hospital stay is lesser in early feeding.
- This study clearly shows the advantages of starting early enteral feedingin patients undergoing gastrointestinal surgeries over delayed enteral feeding.

BIBLIOGRAPHY

.1. Kolaček S. Enteral nutrition. World Rev Nutr Diet. 2013;108:86–90.

2. Enteral feeding: Indications, complications, and nursing care - American Nurse Today [Internet]. [cited 2019 Nov 2]. Available from: https://www.americannursetoday.com/enteral-feeding-indications-complications-and-nursing-care/

3. Bastow MD. Complications of enteral nutrition. Gut. 1986 Nov;27(Suppl 1):51–5.

4. Nasogastric Intubation: Background, Indications, Contraindications [Internet]. [cited 2019 Nov 2]. Available from: https://emedicine.medscape.com/article/80925-overview

5. Department of Surgery - Gastrostomy Tubes [Internet]. [cited 2019 Nov 2]. Available from: https://surgery.ucsf.edu/conditions--procedures/gastrostomy-tubes.aspx

6. Tapia J, Murguia R, Garcia G, de los Monteros PE, Oñate E. Jejunostomy: techniques, indications, and complications. World J Surg. 1999 Jun;23(6):596–602.

7. ASGE | Understanding Percutaneous Endoscopic Gastrostomy (PEG) [Internet]. [cited 2019 Nov 2]. Available from: https://www.asge.org/home/for-patients/patient-information/understanding-peg

8. Rp N, Vp J, Nr P, Sp H. Complications of PEG - Prevention and Management. Trop Gastroenterol. 2010 Jan 9;30(4):186–94.

9. Buried bumper syndrome: A complication of percutaneous endoscopic gastrostomy [Internet]. [cited 2019 Nov 2]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4716063/

10. Replacing Gastrostomy Tubes [Internet]. [cited 2019 Nov 2]. Available from: http://ccn.aacnjournals.org/content/33/5/75.full

11. Shike M, Latkany L. Direct percutaneous endoscopic jejunostomy. Gastrointest Endosc Clin N Am. 1998 Jul;8(3):569–80.

12. Faria GR, Taveira-Gomes A. Open gastrostomy by mini-laparotomy: a comparative study. Int J Surg Lond Engl. 2011;9(3):263–6.

13. TSUJIMOTO H, HIRAKI S, TAKAHATA R, NOMURA S, ITO N, KANEMATSU K, et al. Laparoscopic jejunostomy for obstructing upper gastrointestinal malignancies. Mol Clin Oncol. 2015 Nov;3(6):1307–10.

14. Percutaneous Fluoroscopic Gastrostomy Tube Placement in Patients With Head and Neck Cancer | Head and Neck Cancer | JAMA Otolaryngology–Head & Neck Surgery | JAMA Network [Internet]. [cited 2019 Nov 2]. Available from: https://jamanetwork.com/journals/jamaotolaryngology/fullarticle/221092

15. Types of Enteral Nutrition Formulas [Internet]. Physicans' Elemental Diet. [cited 2019 Nov 2]. Available from: http://elementaldiets.com/why-enteral-nutrition/types-of-enteral-formulas/

16. MacFie J, Woodcock NP, Palmer MD, Walker A, Townsend S, Mitchell CJ. Oral dietary supplements in pre- and postoperative surgical patients: a prospective and randomized clinical trial. Nutr Burbank Los Angel Cty Calif. 2000 Sep;16(9):723–8.

CONSENT FORM

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு :

ஆராய்ச்சி நிலையம் : பொது அறுவை சிகிச்சைத் துறை

பங்கு பெறுபவரின் பெயர் : வயது :

பங்கு பெறுபவரின் எண். :

பங்கு பெறுபவரது இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களைப் பெறவும் வாய்ப்பளிக்கப்பட்டது.	
நான் இவ்வாய்வின் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்தக் காரணத்தினாலோ எந்தக் கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகிக் கொள்ளலாம் என்று அறிந்து கொண்டேன்.	
இந்த ஆய்வு சம்மந்தமாகவோ, இதைச் சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும்போது இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளைப் பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.	
இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான முடிவுகளையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதைப் பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன்.	
இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்குக் கூறப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன், இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத நோய்க்குறி தென்பட்டாலோ உடனே அதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன்.	

பங்கேற்பவரின் கையொப்பம் .....இடம் ..... தேதி
கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம் ..... தேதி

ஆய்வாளரின் பெயர் .....

PROFORMA

1. NAME:

2. AGE:

3. SEX:

4. IP NO:

5. GROUP:STUDY/CONTROL

6. DIAGNOSIS:

7. SURGERY DONE:

8. LABORATORY VALUES:

	PRE OPERATIV	POST OPERATIVE DAY 1	POST OPERATIVE DAY 2
WEIGHT(kg)			
HAEMOGLOBIN(g%)			
S.ALBUMIN(g/dl)			

9.DURATION OF PARALYTIC ILEUS(DAYS):

10.TIME TAKEN TO START ORAL FEEDS(DAYS):

11.ANASTAMOTIC LEAK: YES/NO

12.SURIGAL SITE INFECTION: YES/NO

13.DURATION OF HOSPITAL STAY(DAYS):

14.GASTROINTESTINAL COMPLICAIONS TO FEEDS:

ABDOMINAL CRAMPS/VOMITTING/ABDOMINAL DISTENSION/DIARRHOEA/NO COMPLICATIONS.