

Enteral nutrition

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Enteral nutrition (the delivery of nutrients into the gastrointestinal tract) should always be the preferred route of administration of nutrition where possible. Benefits of enteral nutrition include preservation of the gut mucosal barrier and immunity and prevention of gut atrophy. The use of enteral nutrition is also associated with reduced infection rates, better wound healing and a reduced length of stay compared with parenteral nutrition. Supplementary enteral nutrition can be in the form of oral supplements as well as via tube-feeding techniques such as feeding gastrostomies or jejunostomies and nasogastric or nasojejunal tubes. Enteral feeds contain variable nutrient formulations with respect to the content of energy, fat and nitrogen, as well as the osmolarity and nutrient complexity. In general, most feed formulations contain 1–2 kcal/mL and up to 0.6 g/mL protein. Oral supplements Many liquid oral supplements are commercially available, supplying around 200 kcal and 2 g of nitrogen per 200-mL carton. These can be used to increase daily caloric intakes in addition to that provided by diet alone, and are useful when weaning patients off tube-feeding regimens.

Nasogastric/ duodenal/jejunal tube
Whole food PPN TPN by mouth
Gastrostomy tube Jejunostomy
tube Figure 25.3 Routes available
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port. PPN, partial parenteral nutrition; TPN, total parenteral nutrition. (Redrawn with permission from Rick Tharp, rxkinetics.com.)

Patients who are unable to maintain adequate nutritional intake with oral supplements will need administration of enteral feed via tube feeding. This can be prepyloric either via a conventional nasogastric (Ryle's) tube or a fine-bore feeding tube inserted into the stomach or via a surgical or

endoscopically placed gastrostomy. Feed can also be delivered beyond the pylorus via a nasojejunal tube or surgical or endoscopic feeding jejunostomy. The enteral feeding regime is best planned and managed by a trained dietician as administration of enteral feed requires calculation of the patient's nutritional requirements to allow caloric requirements to be met but at a sufficiently gradual rate of increase to prevent the onset of refeeding syndrome in the chronically malnourished patient. The rate of feeding typically starts at 10–20 mL/h and can increase to approximately 75 mL/h if tolerated. Enteral feeding protocols should include aspiration of the tube, if of sufficiently wide calibre, to reduce the risk of nosocomial aspiration pneumonia by reducing or stopping the administration of enteral feed if aspirate volumes are high. Tube blockage is common and can be prevented by regular flushing with water daily. Specific agents such as chymotrypsin may be used to unblock a partially obstructed tube; however, guidewires should not be used because of the risk of perforation of the tube and thus damage to the lumen of the stomach or bowel. A radio-opaque nasogastric or Ryle's tube can be used for short-term feeding in the majority of patients and provides the advantage of also having a wide enough calibre to allow aspiration; however, the high-grade polyvinylchloride (PVC) material used can become brittle over time and thus should be changed every 2 weeks. For longer term feeding a fine-bore feeding tube (8–12Fr) may be preferable to minimise the risk of rhinitis, pharyngitis and gastric and oesophageal erosions. These tubes are also less likely to interfere with eating and drinking and are often better tolerated by patients. Techniques for establishment of tube feeding

Insertion of nasogastric and nasojejunal feeding tubes

Nasogastric tubes can usually be inserted in the ward setting; however, in patients in whom there may be any concerns regarding the oropharyngeal or oesophagogastric anatomy, endoscopic insertion under direct visualisation may be needed. Patients are positioned in a semirecumbent position and the distance between the xiphisternum and the tip of the nose measured. The tube is inserted into the chosen nostril and advanced gently to the 10-cm point. Patients are then encouraged to swallow and the tube simultaneously advanced down the oesophagus with successive swallows until the distance measured to the xiphisternum is reached. The position of the nasogastric tube will need to be checked before feed is administered, either by pH testing (pH <5 is considered safe) or with a chest radiograph to confirm that the tip of the nasogastric tube is below the diaphragm and well past the bronchial bifurcation. Fine-bore feeding tubes can be inserted in a manner similar to John Alfred Ryle, 1889–1950, Regius Professor of Medicine, University of Cambridge, Cambridge, and later Professor of Social Medicine, University of Oxford, Oxford, UK, introduced the Ryle's tube in 1921. insertion; this must be confirmed to have been removed after insertion of the tube (Figure 25.4)

Feed can also be delivered directly to the jejunum via either tube feeding or surgically created jejunostomies. The advantage of this is that it bypasses the stomach and can thus overcome problems of delayed gastric emptying without necessitating the use of total parenteral nutrition (TPN). Nasojejunal feeding can also be used in patients who are unable to have a gastrostomy as this is the least invasive form of nutrient delivery into the jejunum. The siting of nasojejunal tubes requires either endoscopic or radiological (fluoroscopic) guidance; therefore, unlike nasogastric tubes, these cannot be inserted in the typical ward setting. Abdominal radiographs can confirm the position of the nasojejunal tube if there is any concern regarding proximal migration or displacement (Figure 25.5).

Gastrostomy

Gastrostomy tubes are generally reserved for patients who require longer term feeding. The decision for insertion of these tubes is increasingly discussed in the multidisciplinary context because of the long-term physical, psychological and lifestyle implications. Gastrostomy insertion can be endoscopic (percutaneous endoscopic gastrostomy [PEG]), radiological (radiologically inserted gastrostomy [RIG]) or surgical (

Figure 25.6) . A PEG involves the insertion of the gastrostomy tube through the abdomen and stomach under vision via an endo - scope, avoiding a surgical incision and a general anaesthetic. The endoscopist is able to visualise a cannula entering the - -

Figure 25.4 A /f_i ne-bore feeding tube with its guidewire.

insu ffl ated stomach via the anterior abdominal wall, through which a guidewire is passed. Then either the gastrostomy tube can be inserted through the anterior abdominal wall over the guidewire or the guidewire can be pulled out via the mouth and the tube secured to the guidewire, pulled down into the stomach and then pulled out through the abdominal wall. The stomach wall is pulled up to the anterior abdominal wall and held in place by a cu ff , balloon or plastic bumper to minimise the risk of intraperitoneal leakage (Figure 25.7). A RIG is an option in patients who are unable to have a PEG because of di ffi culty with oesophageal intubation, compromised respiratory function or oropharyngeal anatomy distortion such as fr om head and neck cancers. A nasogastric tube is inserted to insu ffl ate the stomach and a cannula is inserted under radiographic guidance to facilitate insertion of the gastrostomy device, which is retained internally via a balloon or a pigtail. Contrast can be administered via the RIG to confirm the correct site of placement. A surgical gastrostomy may be necessary in patients who are unable to have either a PEG or a RIG, most commonly because of distorted intra-abdominal anatomy , usually from pr evious surgical intervention. This will require either a laparotomy or a laparoscopy with a small gastrostomy to allow insertion of the feeding tube, which can be held in place either by insu ffl ation of a balloon or by a plastic 'bumper'. The stomach wall is fixed to the anterior abdominal wall with sutures to minimise intraperitoneal leakage. Some gastrostomy devices also allow the fitting of jejunal extensions, thus allowing venting of stomach contents and simultaneous delivery of nutrients into the jejunum. Complications of a gastrostomy , regardless of the technique of placement, include perforation, bleeding and peritonitis. Localised sepsis around the insertion site is very common and may require systemic antibiotics. Gastrostomies that have been in place f or a long period are likely to develop a persistent gastric fistula on removal owing to epithelialisation of the tract, which may require surgical intervention for closure. Tube blockage may occur, as well as tube displacement. Nasojejunal tubes and jejunostomies Surgical jejunostomies are often created at the time of resection in patients undergoing major oesophagogastric surgery who are likely to have insu ffl icient oral intake in the immediate postoperative period. Jejunostomies require a general anaesthetic and either a laparotomy or a laparoscopy , facilitating the insertion of a feeding tube through the anterior abdominal wall into the pr oximal jejunum. The site of insertion in the jejunum is usually fixed to the anterior abdominal wall to further reduce the risk of leakage. A more recent development is the siting

Figure 25.5 Abdominal radiograph con /f_i rming that the position of

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punctured under image guidance and a guidewire inserted, over which the tract is dilated to allow a feeding jejunostomy tube to be passed. The position of the tube is confirmed with fluoroscopy and the tube anchored to the skin with sutures. Complications of jejunostomy insertion in the perioperative period include bleeding or tube displacement and leakage causing peritonitis. In the longer term, granulation tissue formation or localised sepsis at the site of insertion is common.

Complications of enteral feeding The complications of enteral feeding can be divided into three main groups and are outlined in Summary box 25.3 first group is that of complications related to the siting of tubes or creation of gastrostomies or jejunostomies, which have been covered individually in the sections above. The second group are gastrointestinal complications related to ongoing nutrient delivery . Enteral feeding is not appropriate in patients who are not likely to absorb the delivered nutrients. This includes patients who have an insufficient length of functioning intestine as well as patients with mechanical intestinal obstruction or paralytic ileus. These patients will require TPN as enteral nutrient delivery is likely to result in complications such as aspiration and failure to meet nutritional requirements. Enteral feeding can cause bloating and vomiting and is associated with diarrhoea in over 30% of patients, which can compromise nutritional uptake. The third group refers to the development of metabolic or biochemical complications, and thus the establishment of feeding should be monitored carefully as rapid increases in nutrient delivery in patients with chronic malnutrition can cause electrolyte disorders and refeeding syndrome (see Refeeding syndrome). Enteral nutrition

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Figure 25.4 A fine-bore feeding tube with its guidewire.

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Figure 25.5 Abdominal radiograph confirming that the position of the tip of a nasojejunal feeding tube is past the duodenojejunal flexure.

Figure 25.6 Percutaneous endoscopic gastrostomy tube, showing the external bumper and tube clamp

Adapter Tubing clamp

External bumper Skin Fat Muscle

Internal bumper Catheter tip

Stomach wall Figure 25.7 Cross-sectional appearance of a percutaneous endoscopic gastrostomy tube in situ , showing the abutment of the stom

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