ENTERAL NUTRITION

Enteral nutrition (EN) is a process of providing essential macro- and micro-nutrients in liquid format via a feeding tube to people who cannot maintain sufficient oral intake to meet their nutritional needs.[1] This article provides an overview of EN feeds and administration and discusses common complications.

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Enteral nutrition therapy has been in existence since ancient Egypt, with significant advances being made during the 20th century.[2] The first post-pyloric tube placement occurred in 1910 and the first feed pump was used in 1930.[2] The introduction of commercial feeding formulas began in the 1950s, with many developments through the 1970s.[3]

Research on amino acids and metabolic pathways in 1943-1945 influenced the development of human nutrient requirements.[4] This allowed more targeted EN feed formulas to be produced.[2] Experimentation and research into methods to accurately access the gastrointestinal tract (GIT), the equipment, tubes and containers needed and understanding of the process of digestion and absorption, led to the production of a range of formulas to suit different individual requirements and for specific disease conditions.[2]

INDICATIONS FOR ENTERAL FEEDING

Now, in nutrition support, enteral feeding should be considered for malnourished patients or those at risk of malnutrition who have a functional gastrointestinal tract but are unable to maintain an adequate or safe oral intake.[5,6] Enteral nutrition is administered using the GIT, which is always the preferred route over parenteral nutrition (PN) as it is a more physiologically normal process and less risky. It promotes gut barrier integrity and reduces rates of infection and mortality.[1,5]

Other indications for EN include:

- Prolonged anorexia
- Severe protein-energy undernutrition
- Liver failure
- Inability to take oral feedings due to head or neck trauma
- Critical illnesses (eg, burns) causing metabolic stress
- Small-bowel adaptation after intestinal resection, or in disorders that may cause malabsorption such as Crohn's disease or cystic fibrosis[7,8]

Early post-pyloric feeding (duodenal or jejunal) is useful for those undergoing gastrointestinal surgery, as although gastric and colonic function is impaired postoperatively, small bowel function is often normal 6-12 hours after surgery.[5]

In severe pancreatitis, enteral feeding is known to promote the resolution of inflammation and reduce the incidence of infection.[5] Slow-rate enteral feeding may also be useful in conjunction with parenteral nutrition to help maintain gut function and reduce the risk of cholestasis in long-term PN.[5]

CONTRAINDICATIONS

EN is contraindicated in conditions where the GIT is non-functioning and/or obstructed, such as high-output GI fistulas, paralytic or prolonged ileus and mesenteric ischemia. These patients will require PN in order to meet nutritional needs.[5,8] Research on nutrition in critical

REFERENCES

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illness has shown that there is no difference in clinical outcomes in patients who are fed EN vs PN for short periods (five to seven days).[5,8]

EN is normally contraindicated in those who are at the end of life and/or do not wish to receive aggressive medical and nutritional interventions, for example, those who have advanced dementia or metastatic end-stage cancer. Research has demonstrated that EN treatment does not improve quality of life or mortality and would be burdensome in this patient group.[8]

ENTERAL FEEDING TUBES

Enteral feeding refers to oral, gastric or post-pyloric feeds, for example, nasogastric (NG), nasojejunal, orogastric, gastrostomy and jejunostomy tubes.[5,6,9] For short-term EN (<4 weeks) a soft small diameter nasogastric tube is placed or nasojejunal tube (the tube is longer to reach the small bowel) for post-pyloric feeding. Tubes are manufactured using silicone or polyurethane.

If a nasal injury or deformity is present making nasal placement difficult, an orogastric tube can be placed. This is normally in unconscious patients as orogastric tubes are difficult to tolerate.[5,7]

Long-term feeding tubes, including gastrostomy and jejunostomy tubes, are placed via an endoscopic procedure (PEG) or are radiologically placed (RIG). Open or laparoscopic techniques can be used if percutaneous and radiological placement is not possible. However, this carries more risk with a general anaesthetic.[7] The choice of tube depends on the length of time feeding is required, the underlying condition, the physician's capabilities and also the patient's preference.[7,10]

ENTERAL FEEDING ADMINISTRATION

Feeding can be administered by boluses or pump feeding. Bolusing involves administering a set volume of feed over a 15- to 60-minute period via a 60ml enteral syringe several times a day (eg, 200ml x six boluses a day). Pump feeding allows a continuous volume of feed to be administered throughout the day or night (eg, 50mls/hour for 20 hours).[5,11] The two methods can be combined as well.

The choice of administration regimen is based on tolerance of EN, patient preference and safety.[12] There is no evidence that bolus feeding increases the risk of diarrhoea, bloating or aspiration compared with continuous feeding.[12]

ENTERAL FEEDS

The dietitian will assess the patient and advise on the type of feed and feeding regimen required. This is based on nutritional needs, clinical condition, feeding modality and risk of complications, and also ensures appropriate EN is given safely.[1,7] Standard enteral feeds contain carbohydrate, protein, fat, water, electrolytes, micronutrients (vitamins and trace elements) and can be with or without fibre as required by the patient.[1,7]

Enteral formulas vary in energy content from 1.0-2.0kcal/ml and the majority comes from carbohydrates.[13] Standard/polymeric formulas provide 30-60% of energy from carbohydrates.[13] Most enteral feeds contain protein derived from cow's milk or soya.[14] Enteral feeds have been designed to have differing macronutrient and micronutrient contents based on specific disease state requirements, for example, high protein for wound healing.[13]

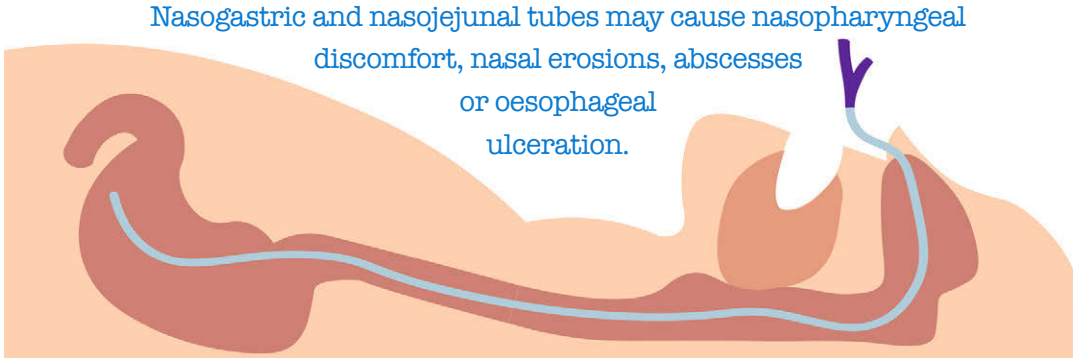
Elemental feeds required for malabsorption conditions such as inflammatory bowel disease and pancreatic insufficiency contain protein hydrolysates or free amino acids, which are more easily absorbed by the GIT.[14] Some enteral feeds contain glutamine, arginine and essential omega-3 fatty acids, which have been shown to modulate immune function, and decrease infectious complications and length of hospital stay in surgical and some critically ill patients. However, further research is ongoing in this area.[5,7]

ENTERAL FEEDING COMPLICATIONS

There are two main categories of complications with EN: problems occurring due to tube placement or from the feeding process.

Tube complications

Nasogastric and nasojejunal tubes may cause nasopharyngeal discomfort, nasal erosions, abscesses or oesophageal ulceration. Although uncommon, acute complications, such as pharyngeal and oesophageal perforation, can occur.[5] Risk of accidental bronchial insertion and/or migration is a serious complication. Tube position should be checked before administering water, feed or drugs through the tube. This is done through the stomach aspirate and testing the acidity on CE-marked pH indicator paper. A pH of <5.5 indicates gastric positioning.[5,7]



Most percutaneous gastrostomy or jejunostomy tube complications are related to the procedures for insertion such as bowel and abdominal wall perforation or intraperitoneal bleeding. Post-insertion complications include infections, peritonitis, peristomal leaks, tube dislodgement and gastrocolic fistula formation.[5,7] All feeding tubes should be flushed with water before and after use, as they can become blocked. If blockages occur, they can sometimes be removed by flushing with warm water or by an enzyme solution (such as Pancrex). If this is not effective the tube then needs to be replaced.[5]

Feeding complications

Common side effects of EN include gastro-oesophageal reflux and aspiration (which is more common in those with impaired consciousness), poor gag reflex and when fed in the supine position.[5,15] It is recommended patients are propped up by at least 30 degrees whilst feeding and are left in that position for a further 30 minutes to minimise aspiration risk.[15] The feeding regimen may be altered to reduce the volume or use of prokinetics for gastric motility.[5] Other gastrointestinal symptoms such as abdominal bloating, cramps, nausea, diarrhoea and constipation are also common. Again, the feed regimen can be altered by trying an alternative feed or other medications.[5,15]

If the patient has had a prolonged period of low energy intake, refeeding syndrome may occur due to the large increase in circulating insulin in response to carbohydrates. This can lead to biochemical abnormalities (low phosphate, potassium and magnesium), which can be dangerous.[5,16] Initiation of EN should be closely monitored including the physical observations and biochemical parameters.[16]

ETHICS IN ENTERAL FEEDING

Attitudes towards EN being initiated in those with terminal and life-limiting diseases have changed over the last 20 years. Enteral feeding in these patients is now considered inappropriate, as in most cases it is too late to offer any adequate clinical benefits and may reduce quality of life and prolong suffering.[17]

EN is a medical treatment and informed consent should be obtained from those with intact mental capacity before initiation. If the patient lacks mental capacity, a multidisciplinary team decision should be made with full consultation with the family, carers and advocates.[17] It is advised that these decisions are made in advance where possible and documented in the patient's care record should capacity be lost at a later stage.[18]

CONCLUSION

EN has many advantages over PN, including safety, effectiveness, decreased risk of infection, decreased cost, prevention of gut atrophy and preservation of the gut barrier.[5] EN is a relatively safe and common medical treatment and is best managed by the interprofessional team involved in the care of patients and with robust planning, monitoring and management of complications. Furthermore, any institution using artificial nutrition must follow strict protocols and procedures for its use to minimise complications.[6]