

Paediatric enteral tube feeding

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Abstract

The benefits of good nutritional status on outcomes of children with chronic illness have been well established. However, many neurologically impaired or chronically ill children and young people struggle to meet their energy requirements orally. In such cases an enteral feeding device inserted directly into the stomach and/or jejunum may be necessary for temporary or long term nutritional support. The decision to recommend a child for long term tube feeding is complex and needs to be balanced against the potential risks, and should involve multi-disciplinary input. We aim to review the current evidence for gastrostomy placement in order to clarify indications for referral for tube insertion, device selection, complications and their management.

Keywords community care; enteral feeding; gastrojejunal tube; gastrostomy; jejunostomy; PEG

Introduction

The enteral tract should be used for nutritional support whenever possible due to the benefits of enteral feeding and the detrimental effects of parental nutrition (PN). Long term PN carries multiple disadvantages including higher cost, reduced availability, reduced gut stimulation, increased risk of bacteria translocation from the bowel, deranged liver function, and the risks of long term central venous catheterisation. At the long term follow-up of 36 home PN patients 82% experienced problems relating to the catheter, 50% had both mechanical problems and sepsis which caused a mean of 2.75 central lines to be inserted per patient. Where oral feeding is not possible, unsafe or inadequate

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for the metabolic demand, a variety of enteral tube feeding options is available.

The increasing prevalence of children surviving with severe chronic illness and neuro-disability and the overwhelming evidence for the benefits of good nutrition are increasing the demand for enteral tube feeding. There are a number of factors which influence the choice of route to use, mode of insertion and the long term care. These provide a challenge for health professionals and more importantly the families involved. The community nursing team who usually provides the long term care of these children should be involved with the process before and after the insertion.

Indications

Up to 40–70% of children with chronic illness are estimated to have feeding issues. Gastric feeding via a naso-gastric (NG) tube is usually the initial approach when the oral route is not suitable. However it carries significant logistical issues and risks as a long term solution. NG tube feeding is commonly used in inpatient or neonatal practice with up to 24% of neonates having one. NG tubes can be easily pulled out especially by babies. Frequent NG tube placement carries risks of misplacement, commonly into the lung or mediastinum. Oesophageal and gastric perforation in low weight babies (<750 g) are observed in up to 4% of cases. In older children a rare but life threatening complication of NG tube insertion is spasm of the cricoarytenoids causing airway compromise. Rigid tubes can cause erosions and bleeding both at the tip, but also as they pass through the nose causing epistaxis and sinusitis. The NG tube can also stimulate the naso-oro-pharynx thereby causing transient lower oesophageal sphincter relaxation (TLESR) which can increase gastro-oesophageal reflux (GOR) to a varying degree. In the short term these risks are relatively small justifying the common usage of NG tubes but in the long term and with inevitable repeated insertions these risks increase.

Gastrostomy insertion is indicated in patients with faltering growth who have oral nutritional intake that is failing to meet their metabolic need which is not expected to resolve in within months. Indications for surgically or radiologically inserted enteral tubes include:

- Physical impediment to oral nutrition
- Clinically unsafe swallow (e.g. neurological disability)
- Congenital malformations
- Foregut dysmotility (including GOR)
- Injury (e.g. head trauma or caustic oesophageal injury)
- Need for unpalatable feeds or medications
- Conditions with high metabolic demands, such as chronic renal failure, congenital heart disease, chronic lung disease including cystic fibrosis, short gut syndrome, and metabolic conditions

A multidisciplinary team (MDT) approach is useful to assess reasons for poor/unsafe oral feeding, the likely time-scale and should enteral tube feeding is required, the most suitable device and technique to be used based on other co-morbidities and psychosocial factors.

The enteral tube feeding method and procedure to be used should take into account the anatomy and existing conditions, such as scoliosis, microgastria, hepatosplenomegaly, ascites, and

previous abdominal surgery including the presence of a ventriculo-peritoneal shunt.

Insertion methods and preparation

The insertion methods commonly used are summarized in Table 1. They are determined by:

- the anatomical site where the feeds are to be delivered
 - gastric or
 - post-pyloric (usually jejunal)
 - or both
- the access route
 - oral/nasal route – i.e. NG tube or nasojejunal tube
 - abdominal – which can be direct or indirect as in gastro-jejunal (transpyloric)
- the general insertion technique
 - open surgery (laparotomy)
 - laparoscopic
 - endoscopic
 - fluoroscopic

(on its own and/or combination of two or more techniques)

NG tubes are usually inserted by a nurse or a trained carer. The other more invasive techniques are carried out by a paediatric surgeon, gastroenterologist or interventional radiologist depending on the expertise and preference at the paediatric centre. The device used can be a tube or a skin level low-profile “button” device both of which may have an internal flange or a water-filled balloon to prevent dislodgement (Figure 1).

The threshold for performing anti-reflux surgery (e.g. Nissen fundoplication) for GOR symptoms at the time of gastrostomy creation varies between surgeons and centres. Many surgeons would manage expectantly unless a clear anatomical abnormality is present which is not going to resolve spontaneously, e.g. significant hiatus hernia. Indeed, for some NG tube fed patients, by removing the NG tube post-gastrostomy will reduce the oro-nasopharyngeal stimulation which in turn reduces transient lower oesophageal sphincter relaxation (TLESR), and hence the GOR may improve. On the other hand, altering the gastric anatomy (e.g. angle of His) by fixing the stomach anteriorly to the abdominal wall may worsen GOR necessitating further anti-reflux management.

We usually perform an upper gastro-intestinal contrast study to exclude malrotation, and hiatus hernia. The contrast study may also indicate the degree of delayed gastric emptying and GOR at the time of the study and can be used as a reference for future comparison. A pick up rate of 3.5–4.7% for other anatomical abnormalities, such as hiatus hernia or malrotation, have been reported and would alter the surgical management plan and counselling of the parents.

Percutaneous endoscopic gastrostomy (PEG)

The PEG insertion technique was introduced in 1980 and has remained the most commonly used method for creating a gastrostomy in children and adults. Its popularity has led to the term “PEG” being used synonymously with “enteral tube feeding” which is incorrect as “PEG” is only one of many techniques in achieving a gastrostomy, and indeed any enteral feeding tube. The internal and external components of a Corflo PEG are shown in Figures 2 and 3 (below).

Standard insertion technique

A flexible fibre-optic endoscope of appropriate size is used to visualise the gastric wall internally while a site is selected for insertion externally. A trocar is placed directly through the abdominal wall into the stomach under endoscopic vision. A distinct “finger indentation” as viewed endoscopically and gastric illumination in the epigastrium need to be clearly demonstrated to minimise risk in visceral injury. A guide-wire is passed through the trocar and retrieved internally by the endoscope which is then pulled out orally thus creating a continuous wire through the abdominal wall, stomach, oesophagus and the mouth. The PEG tube device (e.g. 12Fr Corflo or 9Fr Freka) is tied to the wire and pulled antegrade through the abdominal wall such that the PEG tube flange rests internally against the gastric mucosa. The flange has a thin soft or sponge filled silicone disc which prevents the tube from being removed accidentally. An external bolster is then fitted to complete the fixation of the stomach to the anterior abdominal wall. In the standard technique, the stomach is not sutured to the anterior abdominal wall. Adhesions will then form between the surfaces and mature to establish a more permanent approximation. The gastrostomy tract is lined by granulation tissue as it matures hence removal of the tube will cause spontaneous closure within 24–48 hours.

Variation of the standard technique

PEG insertion is a quick, relatively cheap, well tolerated procedure that leads to rapid patient recovery and is the method of choice for the majority of patients requiring a gastrostomy. In adults or older teenagers, it may possibly be carried out under sedation without general anaesthesia. However, the standard technique may not be appropriate for safe insertion without intra-abdominal visualisation, e.g. abnormal torso anatomy or adhesions. Some surgeons routinely use a laparoscope to provide additional views to reduce the risk of inadvertent visceral damage. There is some evidence to support this practice though careful patient selection may be the crucial factor.

Some surgeons place sutures to fix the stomach on the abdominal wall directly to improve security especially if the device is prematurely removed in the first few weeks. This is particularly so when a balloon device is inserted, e.g. in laparoscopic primary gastrostomy button insertion. The added advantage is that it potentially avoids further general anaesthesia to tube change as a balloon can be changed at the clinic without endoscopy. However this is associated with increased theatre time as well as potential morbidity associated with laparoscopic surgery including the need for CO₂ pneumoperitoneum which is particularly relevant in patients with limited cardio-respiratory reserves.

The traditional open gastrostomy as described by Stamm in 1894 is still commonly performed. This requires a limited laparotomy and is especially useful in very small infants, the presence of extensive adhesions or significant anatomical anomaly with may preclude oesophago-gastro-duodenoscopy (e.g. oesophageal atresia). Due to the relatively large size of the standard PEG tubes, usually an open or laparoscopic approach without endoscopy is used when the patient is less than 6 kg.

In centres with expertise in paediatric interventional radiology, percutaneous fluoroscopic gastrostomy insertion may also

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