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Review Article

Surgical feeding tube insertion, the literature review and the actual procedure

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ABSTRACT

Nutritional support through feeding tubes for patients who are unable to take oral feed has many advantages over parenteral nutrition. The feeding tubes can also be used for decompression in patients with bowel obstruction or gastroparesis and those requiring peri-operative nutritional support when oral intake is contraindicated or limited. Therefore, insertion of the feeding tube is currently one of the most commonly performed procedures. With the advances in intervention, most of the feeding tubes are inserted under endoscopic or fluoroscopic guidance. However, in some cases only the insertion of a surgical feeding tube is possible. This paper introduces the indications for inserting a surgical feeding tube formation. It also describes the surgical management of dislodgement and clogging of the tube, and enterocutaneous fistula among the possible complications.

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Keywords: Enteral nutrition; Gastrostomy; Jejunostomy

Introduction

Enteral nutrition has advantages over parental nutrition in patients who are unable to take oral feed.¹ Therefore, the insertion of a feeding tube for nutritional support has become a very commonly performed intervention. A systematic literature search in PubMed was performed in the English language, using combinations of the following terms: “surgical,” “gastrostomy,” “jejunostomy,” except “infant” and “children.” The reference list was checked for relevance to the surgical feeding tube.

The feeding tube may be inserted not only for enteral nutritional feeding but also for decompression in patients with bowel obstruction or gastroparesis and for peri-operative nutritional support when oral intake is contraindicated or limited.^{2–9} The surgeon determines the size, length, and shape of the tube, the position in which it is to be inserted, and whether a drug can be administered with food after a predefined interval.

Stamm and Witzel introduced surgical access in the 1890s, and the first percutaneous endoscopic gastrostomy (PEG) insertion of a feeding tube was performed in 1979.^{10–12} In recent times, due to the development of interventions, percutaneous feeding tube insertion under endoscopic or fluoroscopic guidance has replaced

most surgical feeding tube insertions.¹³ However, there are cases that require surgical feeding tubes. For example, a feeding tube is inserted during surgery in patients expected to have fasted for several days, or when insertion of a percutaneous feeding tube is not possible due to technical challenges. Moreover, there is no difference in the mortality and complications associated with a percutaneous surgical tube insertion compared to a surgical insertion;^{13–15} thus, this method can be useful in patients who cannot tolerate surgical intervention.¹⁶ However, surgical insertion of a feeding tube is an important procedure for the division of upper gastrointestinal surgery, trauma, and general surgery. This paper aims to review the literature about surgical feeding tube insertion and describes the actual procedure of insertion of the surgical feeding tube and the management of associated complications.

Indications

A feeding tube is indicated for all patients who cannot tolerate oral feeding but require nutritional support. Such patients include those with head and neck tumors, esophageal obstruction, and various neurological disorders, among others. Additionally, when decompression is required for bowel obstruction or gastroparesis

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requires, a feeding tube might be inserted.^{2–6,17,18}

Assessment of the Patient

It is first necessary to evaluate the period for which nutritional support through a feeding tube is required. For short-term tube feeding, a nasogastric tube or nasojejunal tube can be used; however, if the patient is likely to require enteral feeding for more than one month, it is better to perform a gastrostomy, due to the potential complications associated with the nasogastric tubes.¹⁹ Nasogastric tubes are mainly 8–12 Fr flexible tubes, small in size and can get easily stacked. therefore, proper management is required after tube feeding or oral drug administration through these tubes.

Another important consideration is the site of insertion of the feeding tube. It must be decided whether pre-pyloric feeding (gastrostomy) or post-pyloric enteral feeding (jejunostomy) is required. Gastrostomy is more similar to the physiological process of feeding and it is more convenient to place the tube than jejunostomy. Moreover, a gastrostomy tube can tolerate a large volume and higher osmotic load. However, gastrostomy has a risk of aspiration in patients with gastroesophageal reflux disease (GERD) or delayed gastric emptying. To prevent aspiration after performing gastrostomy, a fundoplication can be performed; however, no beneficial effect has been reported.^{20,21} Therefore, in a patient with a risk of GERD or delayed gastric emptying and a past history of recurrent aspiration, a post-pyloric feeding tube (gastrojejunal tube or feeding jejunostomy tube) must be considered.^{22,23} Besides, jejunostomy should be considered if an insertion through gastrostomy is impossible because of previous esophageal or gastric surgery, and if gastric emptying is difficult.

The third consideration is the approach. Although most patients can undergo an interventional (endoscopic or fluoroscopic) approach, intervention relative to contra-indication cases may consider surgical feeding tube insertion. For example, coagulopathy, ascites, peritoneal dialysis, colonic interposition, and enlarged liver are relative contra-indications for the interventional approach, and caution is necessary.^{24,25} In such cases, a surgical approach can be considered. Moreover, the surgical approach overcomes some of the contra-indications of endoscopic or fluoroscopic approach, such as difficulty in the safe passage of an

endoscope into the stomach, previous gastric surgery, portal hypertension, and presence of gastric varices. If a feeding tube insertion is necessary for a high-risk patient under general anesthesia, a surgical approach under local anesthesia can be considered if there are no severe adhesions from previous surgery. In addition, if a feeding tube is indicated during gastrointestinal surgery, it should be inserted prior to surgery.

Surgical Technique

Feeding jejunostomy

Bush first performed a feeding jejunostomy in 1858 in patients with inoperable gastric cancer.²⁶ In 1891, Witzel created a serosal tunnel to prevent extravasation and a serosal tunnel with a perpendicular lambert suture to prevent bowel obstruction and volvulus. This is currently the most commonly used method.²⁷ The needle catheter technique was proposed by Delany et al²⁸ in 1973, and many modifications to this technique have been made. Since the 1990s, there have been many modified laparoscopic jejunostomy techniques; however, the principle has not changed significantly. Nevertheless, when the Witzel procedure is performed, it is impossible to replace the feeding tube without using a guidewire, and it is not possible to replace it at the bedside if the feeding tube is removed. In addition, to prevent small bowel rotation, the distal end of the jejunostomy may be fixed, depending on the surgeon's experience.

First, a 5 cm abdominal incision is performed in the midline (Fig. 1A). The Treiz ligament is located, and a small incision is made to insert the feeding tube at the antimesenteric border of the jejunal loop (Fig. 1B). A diamond-shaped purse-string suture is performed using an absorbable material (Fig. 1C), the feeding tube is inserted through the skin incision and directed towards the distal jejunum. If the jejunum collapses and it is difficult to insert the feeding tube, pushing in a small amount of air might be helpful. After tying the purse-string suture (Fig. 1D), a seromuscular suture around the feeding tube insertion site is performed (Fig. 1E), and it is fixed to the abdominal wall (Fig. 1F). This process is similar to gastropexy. However, it is necessary to fix the small bowel, considering its shape and orientation, and to avoid kinking of the small bowel later. The seromuscular suture is carefully

Fig. 1. Feeding jejunostomy and gastrostomy. (A) Upper abdominal small incision. (B) Jejunostomy at the antimesenteric border of the jejunal loop. (C) Diamond-shaped purse-string suture around the jejunostomy site. (D) Feeding tube fixation by tying the purse-string suture. (E) Seromuscular suture around the feeding tube insertion site. (F) Fixation between small bowel and abdominal wall. (G) Tying the seromuscular suture from the inner point. (H) Purse-string suture around the gastrostomy site at stomach lower body, greater curvature side. (I) Seromuscular suture at gastrostomy site before ballooning. (J) Wound closure.

tied from the inner point (Fig. 1G). This makes repair easy if the suture breaks while tying. Ballooning is not required because it can cause obstruction of the narrow small bowels, leading to bile reflux. In patients scheduled for elective surgery, the small bowel incision site should be determined in consideration of future surgery.

Feeding gastrostomy

Gastrostomy allows physiological feeding and is one of the most preferred pre-pyloric feeding tubes. It can also be used for gastric decompression and drainage in patients with gastric outlet obstruction, in whom bypass gastrojejunostomy cannot be performed due to peritoneal carcinomatosis. Since Verneuil performed the first gastrostomy in 1876,²⁹ in most cases gastric tube insertion has been replaced by PEG in the clinical setting.¹⁵ However, a surgical gastrostomy is required if PEG is not possible because the stomach and abdominal wall are still not abutted by the peri-gastric organ.

It can be performed through a laparoscopic or open approach. If the risk of administering general anesthesia is high, minimally invasive surgery under local anesthesia can be performed. Gastrostomy should be at an adequate distance from the lower costal margin; especially in lean patients, the external bolster should be in an adequate flat plane with respect to the skin of the abdominal wall to reduce the risk of leakage. Tubes that are too narrow have a high risk of clogging, and too wide tubes are difficult to manage if leakage occurs in the future. Usually, the site of insertion of the feeding tube is the anterior wall of the lower body of the stomach and the greater curvature; however, if a gastric surgery is planned in the future, it can be adjusted in consideration of the same.

The stomach wall is incised to insert the feeding tube, and an absorbable purse-string suture is performed around it (Fig. 1H). Next, before ballooning, a non-absorbable suture is performed to prepare for gastropexy. This procedure prevents an injury due to the balloon. Ballooning is then performed, and the balloon is pulled to maintain an appropriate distance from the stomach wall, and a purse-string suture is performed for fixation. This prevents accidental dislodgment of tube before the tract is formed due to balloon damage and prevents leakage into the peritoneum. If the purse-string suture is tied appropriately, the skin tagging suture will not be required. Next, gastropexy is performed so that there is no empty space between the abdominal wall and the gastrotomy site (Fig. 1I). The outer bolster is placed appropriately and water is used to perform the passage and leakage tests. If no problems are noticed during the test, the incision is closed (Fig. 1J).

Management of Complications

The complications of surgical insertion of the feeding tube

are not significantly different from those caused by percutaneous feeding tube insertion.¹³⁻¹⁵ Therefore, the corresponding management is also similar. The most common complications associated with a surgical feeding tube are clogging, dislodgement, and wound infection.¹⁵ Stoma leakage and gastrocutaneous fistula are also common. If the fistula track is adequately formed after insertion of the surgical feeding tube, the tube can be easily replaced at the bedside; hence, this should be considered when managing the complications.

Dislodgement

Late dislodgement that occurs after the tract was formed is not difficult to manage. In case of late dislodgement, the tube can be easily changed at the bedside. However, in the case of early dislodgement, blind reinsertion is not recommended as it might be accompanied by bowel wall injury due to the purse-string suture. If signs of peritonitis or sepsis are seen, immediate re-operation is required.

Clogging

In cases with delayed clogging, the tube should be changed. At this time, it should be ensured that the size of the tube which will be inserted after clogging is not too small, and the adjustment and management of medication through the tube should be evaluated. If necessary, it should be replaced with a larger diameter size tube. If tube change is not possible in cases with early clogging, unclogging can be attempted by warm saline flushing; however, if it fails, parenteral nutritional support is recommended until the change is possible.

Stoma leakage

The size of the fistula can increase due to various reasons such as the feeding tube not being fixed well to the abdominal wall, the fistula tract widening due to the oblique pressure, and the fistula receiving a burn injury caused by the bovie during skin incision, causing delayed healing, and leakage might develop. Depending on each case, the tube should be replaced with a larger diameter-sized tube, or the tube should be removed for 24 to 48 hours so that the fistula tract can become narrower, and a tube of the same size should be re-inserted. In this case, it is helpful to mount a narrow lumen catheter to prevent the fistula tract from being completely blocked, and appropriate steps to prevent skin irritation due to leakage from the stoma should be taken. If a narrow lumen balloon catheter is mounted, ballooning and pulling can be fixed to minimize leakage while waiting.

Fig. 2. (A) Enterocutaneous fistula. (B) Extensive incision around the fistula. (C) Epithelized fistulectomy. (D) Layer by layer suture including bowel wall. (E) Wound closure.

Enterocutaneous fistula

After removal of the feeding tube, it requires 3 to 7 days for the tract to close. If the fistula does not close after more than one week, additional management is required. Proton pump inhibitors, prokinetic agents, silver nitrate, or zinc oxide can be used. Endoscopic closure of the tract can be attempted. Finally, removal of a surgical fistula and closure of an open fistula is required. To remove the fistula tract under local anesthesia, an incision more extensive than the fistula is performed, and an epithelialized fistulectomy is completed. When the bowel wall is identified, primary closure is performed on the bowel wall, and the fascia and skin are closed layer by layer (Fig. 2).

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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