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Wolters Kluwer

Gastrostomy tubes: Complications and their management

AUTHOR: [Mark H DeLegge, MD, FACP, AGAF](#)**SECTION EDITORS:** [John R Saltzman, MD, FACP, FACC, FASGE, AGAF](#), [David Seres, MD](#)**DEPUTY EDITOR:** [Kristen M Robson, MD, MBA, FACP](#)

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INTRODUCTION

Gastrostomy tubes may be placed endoscopically, surgically, or radiologically. Many of the complications seen with the various placement techniques are similar with similar approaches to management.

This topic will review the management of complications related to gastrostomy tube placement, with a focus on percutaneous endoscopic gastrostomy tubes. The indications for gastrostomy tubes, the placement of gastrostomy tubes, the routine care of gastrostomy tubes, and the management of dysfunctioning gastrostomy tubes are discussed separately. (See "[Gastrostomy tubes: Uses, patient selection, and efficacy in adults](#)" and "[Gastrostomy tubes: Placement and routine care](#)".)

INCIDENCE OF COMPLICATIONS

Complications of gastrostomy tube placement may be minor (wound infection, minor bleeding) or major (necrotizing fasciitis, colocutaneous fistula). Most complications are minor. The reported rates of complications following percutaneous endoscopic gastrostomy (PEG) tube placement vary from 16 to 70 percent [1-5]. The variable frequency of complications observed in reports in part reflects differences in the definitions used and the populations under study. Most studies have suggested that complications are more likely to occur in older adults with

comorbid illnesses, particularly those with an infectious process or who have a history of aspiration [4].

Some of the studies looking at complications found the following:

- In one series, complications were described in 70 percent of 97 patients, of which 88 percent were considered to be minor, including tube dislodgement, peristomal wound leakage, and PEG wound infection [1].
- A much lower rate of complications was observed in another report of 314 patients, of whom 13 percent had minor and 3 percent had major complications, including gastric perforation, gastric bleeding, and hematoma development [2].
- In a prospective study with 484 patients, 85 patients (18 percent) died within two months of PEG tube placement [3]. Excluding those who died, complications including abdominal pain, peristomal infection, diarrhea, and leakage were seen in 39 percent of patients at two weeks and in 27 percent of patients at two months.
- In a study including 119 patients who underwent PEG tube placement, complications occurred during hospitalization in 27 percent of patients and the 30-day mortality rate was 10 percent [6]. The most common complication was tube dislodgement (14 percent of patients). Twelve of the complications (10 percent of patients) were classified as serious. None of the deaths was directly related to PEG tube placement. Indications for PEG tube placement included tumors (55 percent), neurologic disease (29 percent), and dementia (3 percent).
- In a study including 452 patients who underwent placement of either a PEG or a percutaneous radiologic gastrostomy with at least 30 days of follow-up, the overall complication rates were not significantly different between the two groups (27 versus 30 percent) [7].
- In a database study including over 33,000 gastrostomy tube placements, percutaneous radiology-guided gastrostomy placement was associated with higher rates of 30-day mortality, colon perforation, bleeding, and peritonitis compared with percutaneous endoscopic gastrostomy tube placement [8].

COMPLICATIONS THAT MAY OCCUR AT ANY TIME

Many of the complications associated with gastrostomy tube placement may be seen at any time following gastrostomy tube placement. These include infection, bleeding, peristomal

leakage, and inadvertent tube removal.

Tube dysfunction — The approach to patients with a dysfunctional gastrostomy tube is discussed separately. (See "[Gastrostomy tubes: Placement and routine care](#)", section on '[Managing dysfunctioning gastrostomy tubes](#)'.)

Infection — Most infections are minor, though severe infections such as peritonitis and necrotizing fasciitis can occur. Wound infection is more likely to occur when a gastrostomy has been placed through a contaminated procedure field or with poor technique, in debilitated patients, and those who did not receive antibiotic prophylaxis [9-11].

Wound infection — Signs of a wound infection include increased erythema, tenderness, and a purulent exudate. Most infections will respond to a first-generation cephalosporin or a quinolone. Methicillin-resistant *Staphylococcus aureus* (MRSA) has emerged as an important cause of gastrostomy-site infections in some centers and may require different antibiotic treatment [12]. Fungal-related gastrostomy infectious complications occur, although much less commonly than bacterial infections. These include fungal peristomal cellulitis, candidal peritonitis, and intra-abdominal abscesses [13-16]. (See "[Antibiotic prophylaxis for gastrointestinal endoscopic procedures](#)" and "[Antimicrobial prophylaxis for prevention of surgical site infection in adults](#)".)

In patients with wound infections, culturing the site is generally not helpful. If the infection responds to antibiotics, the tube generally does not need to be removed. However, if signs of peritonitis (rebound tenderness) or necrotizing fasciitis (worsening edema and erythema, development of bullae) develop, the tube should be removed and additional therapy instituted. (See '[Necrotizing fasciitis](#)' below.)

Attempts have been made to decrease the risk of wound infection. Antibiotic prophylaxis (typically with a third-generation cephalosporin) at the time of the procedure has been shown to reduce wound infections. At least two studies found that nasopharyngeal decontamination of patients with MRSA, along with standard prophylactic antibiotics, significantly reduced the incidence of wound infections [17,18]. Another study found that administration of a third-generation cephalosporin intravenously and a povidone-iodine spray to the abdominal wall before percutaneous endoscopic gastrostomy (PEG) tube placement reduced wound infections compared with intravenous cephalosporin or povidone-iodine spray alone [19].

One study looked at prophylaxis with sulfamethoxazole and [trimethoprim](#) to prevent cellulitis [20]. A total of 234 patients were assigned to either a 20 mL solution of sulfamethoxazole 800 mg plus trimethoprim 160 mg given through the PEG tube immediately after placement or to [cefuroxime](#) 1.5 gm intravenously one hour before PEG tube placement. After 7 to 14 days of

follow-up, there was no significant difference in the rate of wound infections between the patients in the sulfamethoxazole-trimethoprim group compared with the patients who received cefuroxime (9 versus 12 percent).

Necrotizing fasciitis — Necrotizing fasciitis (necrosis of the fascia layers) is a rare complication of gastrostomy tube placement [21,22]. Patients with diabetes mellitus, wound infections, malnutrition, and a compromised immune system are at increased risk [23]. Signs of necrotizing fasciitis include edema, erythema, and development of bullae. If necrotizing fasciitis develops, immediate treatment with antibiotics and surgical debridement is required. (See "[Necrotizing soft tissue infections](#)".)

Traction and pressure on the gastrostomy wound can predispose to the development of necrotizing fasciitis. One study demonstrated that patients who had their gastrostomy tube external bolster set directly against the abdominal wall were more likely to develop wound infection, peristomal drainage, and fasciitis compared with patients whose external gastrostomy tube bolster was left 3 cm from the abdominal wall [24]. It was hypothesized that the distant placement of the external bumper prevented compression of the tissue in the gastrostomy tract, which in turn prevented wound breakdown [25].

Prevention of necrotizing fasciitis is imperative since treatment requires large surgical debridement, antibiotics, and extensive hospital support. It is important to allow the external bolster of the gastrostomy tube to "free-float" 1 to 2 cm from the abdominal wall after gastrostomy tube placement to prevent this complication. (See "[Gastrostomy tubes: Placement and routine care](#)", section on '[Proper placement of the external bolster](#)'.)

Bleeding — Hemorrhage following gastrostomy tube placement is rare. Most bleeding can be controlled by simple pressure over the abdominal wound. Endoscopy should be performed if the bleeding persists or if there is evidence of significant bleeding, such as a drop in hemoglobin, aspiration of frank blood from the stomach, melena, hematochezia, or hemodynamic instability.

Bleeding may originate from the gastrostomy tract, the gastric vasculature, or from gastric ulceration (often seen if the tube is apposed too tightly to the abdominal wall). Less common causes of bleeding include gastric artery perforation, superior mesenteric artery perforation, retroperitoneal hemorrhage, aortic perforation, esophageal ulceration, abdominal wall pseudoaneurysm, and gastric wall and rectus sheath hematomas [26-33].

To decrease the risk of bleeding, it is recommended that patients have normal coagulation parameters at the time of gastrostomy tube placement. We hold antiplatelet agents (eg, [clopidogrel](#)) for five days prior to gastrostomy tube placement. We also instruct patients to hold

aspirin-containing products for 24 hours prior to gastrostomy placement. Selective serotonin reuptake inhibitors (SSRIs) may also increase the risk of bleeding [34], though there are no guidelines regarding whether to stop SSRIs prior to gastrostomy tube placement. Our practice is to hold SSRIs for three days prior to gastrostomy tube placement in patients with other risk factors for bleeding. (See "[Management of anticoagulants in patients undergoing endoscopic procedures](#)", section on 'Elective procedures' and "[Management of antiplatelet agents in patients undergoing endoscopic procedures](#)", section on 'P2Y12 receptor blockers'.)

While most bleeding can be controlled by simple pressure over the abdominal wound, if the bleeding appears to be coming from the gastrostomy tract and pressure does not work, the external bumper can be tightened against the abdominal wall to compress the gastrostomy tract. Compression should be released within 48 hours to avoid gastrostomy tract wound breakdown. Only rarely will surgical intervention be necessary for gastrostomy-associated bleeding complications.

Abnormal coagulation parameters should also be corrected prior to traction removal of gastrostomy tubes to prevent gastrostomy tract hemorrhage. However, gastrostomy tube replacement devices with a balloon tip can be placed and removed safely in patients with abnormal blood coagulation parameters, unless it is anticipated that the gastrostomy tract will require dilation prior to insertion of the replacement tube.

Peristomal leakage — Peristomal leakage usually occurs within the first few days after gastrostomy tube placement, though it may also be seen in patients with a mature gastrostomy tract. Treatment includes management of comorbidities, such as malnutrition and hyperglycemia, loosening of the external bolster, and local measures to address skin breakdown (such as powdered absorbing agents or a skin protectant such as a paste of [zinc oxide](#)).

Peristomal leakage is more likely to occur in malnourished patients and those with diabetes mellitus who may have poor tissue healing and are prone to wound breakdown. In addition, placement of the external bolster of the gastrostomy tube too tightly against the external abdominal wall may lead to poor tissue blood flow, wound breakdown, and peristomal leakage.

Placement of a larger size gastrostomy tube through the same gastrostomy tube tract will **not** solve the problem. Once the gastrostomy tube tract has started to leak, placing larger gastrostomy tubes through the same tract will serve only to further distend and distort the tract and will not promote tissue growth or healing.

If the gastrostomy tract has had time to mature (ie, up to four weeks after placement), the gastrostomy tube can be removed for 24 to 48 hours, permitting the tract to close slightly; a

replacement gastrostomy tube can then be placed through the same, partially closed tract [35]. However, as a note of caution, different tracts will close at different rates, and there is a chance that in some patients the tract may close in as few as 24 hours. Leaving a guidewire in place may help maintain tract patency until a replacement gastrostomy tube is inserted. This technique works well for patients with a gastrostomy tract that started to leak a month or more after initial insertion. It does not work as well for patients with early tract leakage since these patients are usually experiencing poor wound healing from comorbid disease processes.

In some patients with a mature gastrostomy tract and peristomal leakage, the gastrostomy tube will need to be fully removed, allowing the tract to close completely. Another gastrostomy tube can then be placed at a different location on the abdominal wall. In our experience, the new gastrostomy tube can be placed when there is at least 50 percent closure of the old gastrostomy tube tract, at which point the initiation of feedings will not have a significant impact on leakage or inhibition of tissue healing of the old gastrostomy tract.

Ulceration — Patients may develop ulcers related to the gastrostomy tube, either underneath the internal bolster or on the gastric wall. While this typically is seen in patients with longstanding gastrostomy tubes, it can be seen in patients with recently placed gastrostomy tubes, particularly if the external bolster is set such that the internal bolster is pulled tightly against the gastric wall. The ulcer often responds to loosening of the external bolster, which allows the internal gastrostomy tube bolster to be released from the gastric mucosa. In patients who have a rigid internal bolster, the gastrostomy should be exchanged for one with a flexible internal bolster to reduce the potential for future gastric ulceration. Of note, rigid bolsters cannot be pulled through the gastrostomy tract for removal and are typically removed endoscopically after cutting the gastrostomy tubing at the skin.

Ulceration of the contralateral gastric wall from the site of the gastrostomy tube can occur with balloon gastrostomy replacement tubes. In some of these tubes, the tip of the gastrostomy tube may extend out from the inflated balloon and act as a mechanical irritant. The balloon gastrostomy tube should be removed and replaced with a non-balloon replacement gastrostomy tube or a replacement gastrostomy tube in which the gastrostomy tube tip is contained within the inflated balloon [36]. (See "[Gastrostomy tubes: Placement and routine care](#)", section on '[Replacement tubes](#)'.)

Gastric outlet obstruction — Gastrostomy tubes can migrate forward into the duodenum and cause gastric outlet obstruction [37]. This occurs if the external bolster on the gastrostomy tube is allowed to migrate away from the abdominal wall, allowing the gastrostomy tube to slide forward through the gastrostomy tract and into the duodenum. A similar problem has been reported with balloon gastrostomy tubes, where the inflated balloon is allowed to migrate

through the pylorus, resulting in an obstruction [38]. This complication can be avoided by making sure the external bolster is appropriately positioned. (See "[Gastric outlet obstruction in adults](#)" and "[Gastrostomy tubes: Placement and routine care](#)", section on 'Proper placement of the external bolster'.)

Small bowel obstruction caused by gastrostomy tube placement has also been reported [39].

Inadvertent gastrostomy tube removal — Gastrostomy tubes may be inadvertently removed if traction is placed on the tube. Inadvertent gastrostomy tube removal is a common complication, usually occurring in combative or confused patients who pull on the tube. Many gastrostomy tubes are designed to be externally removed with 10 to 14 pounds of external pull pressure. If the gastrostomy tract has had time to mature (eg, is at least four weeks old), a replacement tube or a Foley catheter may be placed through the gastrostomy tract. The tract will begin closing within 24 hours (in some cases within four to eight hours), so placement of a replacement tube should not be delayed. (See "[Gastrostomy tubes: Placement and routine care](#)", section on 'Replacement tubes'.)

Gastrostomy tubes that are inadvertently removed within the first four weeks of gastrostomy tube placement should **not** be replaced blindly at the bedside. Because the gastrostomy tract may not have matured adequately, the gastric wall and the abdominal wall may have separated. Thus, blind replacement of the gastrostomy tube at the bedside may result in its placement in the peritoneal cavity instead of the stomach.

If the gastrostomy tube is removed early (prior to four weeks after initial placement), the gastrostomy tract should be allowed a few days to heal, and then a new gastrostomy can be placed at a different site. Alternatively, there are reports of successful endoscopic gastrostomy tube replacement through the original gastrostomy site [40]. (See "[Gastrostomy tubes: Placement and routine care](#)", section on 'Replacement tubes'.)

Regardless of the approach to gastrostomy tube replacement, patients who have early inadvertent removal should be treated with intravenous antibiotics and monitored for signs of peritonitis, which would require surgical intervention. The antibiotics used are the same as are used in patients with upper gastrointestinal tract perforations due to other causes. If signs of peritonitis do not develop, the antibiotics can be discontinued after seven days.

If there is ever a concern about the possibility of a replacement gastrostomy tube being positioned within the peritoneal cavity, a water-soluble contrast study through the gastrostomy tube should be obtained to confirm proper position prior to the initiation of feedings.

Leakage of gastric contents or tube feeds into the peritoneal cavity — Peritonitis has been reported from leakage of gastric contents from the gastrostomy site into the peritoneal cavity with the gastrostomy tube in situ [41]. If the contents include tube feeding formula, a combination of a chemical and bacterial peritonitis may develop [2]. It is hypothesized that peritonitis develops when the introducer needle enters the stomach tangentially rather than directly through the abdominal wall, leading to a long laceration along the greater curvature, which allows for escape of gastric contents. If peritonitis develops, tube feeds should be stopped and antibiotics should be started. Abdominal imaging should be performed to look for evidence of a perforation, and surgical consultation should be obtained. In addition, the patient should be evaluated for a wound infection, as this is a more common cause of peritonitis. (See ['Wound infection'](#) above.)

Introduction of tube feeds into the peritoneal cavity has also been described following routine removal of "traction removable" PEG tubes [42]. If the balloon replacement tube is inadvertently placed within the peritoneal cavity, peritonitis can develop when tube feeds are resumed. If there is any concern about the tube tip position following balloon replacement tube positioning, a contrast radiograph study through the PEG tube should be obtained.

EARLY COMPLICATIONS OF ENDOSCOPIC GASTROSTOMY TUBE PLACEMENT

Some complications are seen immediately following percutaneous endoscopic gastrostomy (PEG) tube placement. These include pneumoperitoneum, ileus, perforation of the esophagus or stomach (at a site other than the gastrostomy), or damage to other intra-abdominal organs, such as the liver or colon.

Pneumoperitoneum — Pneumoperitoneum is common following PEG tube placement [43]. Its etiology is thought to be secondary to the insufflation of air associated with the endoscopic procedure and needle puncture of the gastric wall. In the absence of peritonitis, it has no consequence, does not require treatment, and should **not** preclude feedings. However, pneumoperitoneum may be the result of damage to structures such as the colon, and may cause confusion for clinicians in those patients where clinical features raise concern about a ruptured viscus. In these settings, a radiologic study using water-soluble contrast should be obtained to confirm the position of the PEG tube within the stomach and to exclude a leak. A contrast computed tomography (CT) scan of the abdomen is also beneficial in deciding if a pneumoperitoneum is associated with damage to any contiguous abdominal structure [44].

Subcutaneous air has also been described after PEG tube placement. It occurs from air being introduced between the cutaneous and subcutaneous tissues [45]. In the absence of other

findings, it is inconsequential and should not preclude feeding [45]. Pneumomediastinum without perforation of a viscus structure has been described following PEG placement [46]. The etiology remains unknown.

Ileus — Some patients develop nausea and vomiting after PEG tube placement, which may be due to transient gastroparesis. In rare patients, an ileus develops, which is a complication that may be more likely in patients with significant pneumoperitoneum [47]. These patients can be identified by the presence of post-procedure abdominal distention, vomiting, and absence of bowel sounds. After a gastric or duodenal perforation has been excluded, patients who develop an ileus should be treated with bowel rest and, if necessary, gastric decompression. Feedings should not be resumed until the ileus has resolved.

Esophageal and gastric perforation — Gastric and esophageal perforations are known complications of upper endoscopy, but they are rare. (See "[Overview of upper gastrointestinal endoscopy \(esophagogastroduodenoscopy\)](#)", section on 'Complications'.)

Other early complications — Other early complications include:

- Small bowel obstruction from a small bowel wall hematoma following gastrostomy tube placement. In a case report, a hematoma developed on a jejunal loop of bowel near the stomach following PEG tube placement. An operative procedure allowed evacuation of the hematoma and resolution of the small bowel obstruction [48].
- Transhepatic placement of a gastrostomy tube. In one report, a PEG tube malfunctioned and was replaced with a balloon gastrostomy tube 2.5 years after initial placement [49]. The replacement tube was difficult to push back through the gastrostomy site. A contrast study showed that the balloon gastrostomy tube was inflated within the liver. Contrast from the tube entered the portal venous system. A fistula tract had developed between the liver and the stomach. Subsequent surgical exploration allowed the tube to be removed safely with resection of the gastrohepatic fistula tract, argon plasma coagulation (APC) of the liver bed to prevent bleeding, and replacement of the gastrostomy with a Stamm gastrostomy. Two additional reports of transhepatic PEG tube placement resulted in very different outcomes. One case required emergency surgery and repair of the liver laceration [50]. The second case resulted in the PEG tube being left in place for three months, at which time the tube was removed endoscopically [51].
- Damage to other intra-abdominal organs, such as the colon [52].
- Sigmoid volvulus from a PEG tube that had been placed through the colonic mesentery with subsequent rotation of the mesentery around the tube [53].

- Pancreatitis from a PEG tube that migrated distally and resulted in occlusion of the ampulla by the internal bolster (a balloon) [54].

LATE COMPLICATIONS OF GASTROSTOMY TUBE PLACEMENT

Late complications occur after the gastrostomy tract has matured. They include deterioration of the gastrostomy site, buried bumper syndrome, and colocutaneous fistula formation.

Deterioration of the gastrostomy site — Deterioration of the mature gastrostomy site is a common problem. It may result in skin maceration, leakage, enlarging tract diameter, or complete breakdown of the tissue at the gastrostomy site. Normally, the site should be dry with minimal exudate. Since the tendency is for the gastrostomy tract to close down around the tube, an enlarging opening around the tube suggests tissue breakdown. Breakdown can then lead to other complications such as infection, leakage, buried bumper syndrome, and bleeding. (See '[Infection](#)' above and '[Bleeding](#)' above and '[Peristomal leakage](#)' above and '[Buried bumper syndrome](#)' below.)

Prevention and treatment include ensuring the external bolster is appropriately positioned and maintaining a clean and dry gastrostomy site. Any complications that develop will also require specific treatment (eg, antibiotics for a wound infection). (See "[Gastrostomy tubes: Placement and routine care](#)", section on '[Proper placement of the external bolster](#)' and "[Gastrostomy tubes: Placement and routine care](#)", section on '[Routine care](#)'.)

Buried bumper syndrome — Buried bumper syndrome is a long-term consequence of tight apposition of the external bolster of the gastrostomy tube against the abdominal wall [55]. The internal bolster of the gastrostomy tube slowly erodes into the gastric wall as tension is created on the gastrostomy tube tract, which ultimately causes pain and the inability to infuse feedings. The diagnosis can be confirmed on endoscopy, which will demonstrate the internal bumper buried within the gastric mucosa.

The treatment of buried bumper syndrome depends upon the type of gastrostomy tube [56]. If the internal bolster is collapsible, as it is on externally removable gastrostomy tubes, the gastrostomy tube can be removed by simple external traction. In a modification of this technique, the gastrostomy tube can be cut short and a guidewire passed through the stump into the gastric cavity [56]. The guidewire is snared endoscopically and pulled out of the oral cavity and attached to a new gastrostomy tube. The guidewire at the abdominal surface is pulled, pulling the new gastrostomy tube into the gastric cavity. The dilating portion of the new gastrostomy engages the buried bumper on the old gastrostomy. As the new gastrostomy tube

is pulled through the abdominal wall, the old gastrostomy tube is pushed out of the abdominal wall and removed.

However, if the internal bumper on the gastrostomy tube is rigid, the gastrostomy tube may have to be removed by gastrostomy wound tract cut-down or the push-pull T-technique [57]. The push-pull T-technique requires the gastrostomy tube to be cut 3 cm from the abdominal wall. An endoscope is introduced into the stomach, and a snare is passed through the scope and through the gastrostomy tube opening in the gastric wall. Once the snare is protruding externally through the gastrostomy tube, an additional short piece of gastrostomy tube is cut from the excess gastrostomy tubing. The snare is opened, and this short piece of tubing is grasped and pulled back against the gastrostomy tube, creating a T-shape. A Kelly clamp is placed across the T-shape. The endoscopist slowly removes the endoscope, snare, and gastrostomy tube orally as a second operator pushes the Kelly clamp and gastrostomy tube into the gastric lumen. This combined procedure frees the internal bumper from the gastric wall. Once the gastrostomy tube is removed, a new gastrostomy tube can be placed through the existing gastrostomy tract using direct endoscopic visualization. A standard gastrostomy tube placement technique should be used to permit the gastrostomy tube dilator to re-expand the partially closed gastrostomy tube tract. (See "[Gastrostomy tubes: Placement and routine care](#)", section on '[Endoscopic placement](#)'.)

Other reported techniques for managing buried bumper syndrome include use of a needle-knife or papillotome to incise the gastric mucosa to reach the internal bolster [41]. For some patients, surgical removal of the gastrostomy tube is required.

Prevention of the buried bumper syndrome requires good care and patient instruction. As mentioned above, the external bolster of the gastrostomy tube should be left 1 to 2 cm from the abdominal wall. Gauze pads should be placed over the external bolster, **not** underneath, which would create pressure on the gastrostomy tube tract wound. In addition, the gastrostomy tube itself should be pushed forward into the wound slightly and rotated during daily care. This will ensure that the internal bumper does not become buried into the gastric mucosa. After rotation, the gastrostomy should be placed back into its original position.

Colocutaneous fistula — A colocutaneous fistula is a rare complication associated with percutaneous gastrostomy tube placement [58]. It occurs as a result of interposition of bowel, usually the splenic flexure, between the anterior abdominal wall and the gastric wall. The gastrostomy tube is placed directly through the bowel into the stomach. Patients in whom this complication has occurred are often asymptomatic, except for transient fever or ileus. This complication can often be treated by removing the gastrostomy tube and allowing the fistula to close [59]. However, surgery is sometimes necessary to correct the internal gastric-bowel fistula.

The problem is usually discovered months after initial gastrostomy tube placement when the original gastrostomy tube is removed for gastrostomy tube replacement. As the replacement gastrostomy tube is passed blindly at the bedside, it is pushed through the gastrostomy tract opening in the abdominal wall and into the colon but cannot find its way back into the stomach. Once the tube feedings are restarted, the patient develops diarrhea from colonic tube feedings and dehydration from not receiving fluids or nutrition.

Prevention of this complication is related to the initial gastrostomy tube placement procedure. For endoscopic placement, relying on the combination of transillumination and finger palpation of the abdominal wall in choosing an appropriate gastrostomy tube site, rather than one of these techniques alone, will increase the safety of gastrostomy tube insertion. (See ["Gastrostomy tubes: Placement and routine care", section on 'Endoscopic placement'](#).)

Persistent gastric fistula following gastrostomy tube removal — A gastrostomy tube may be removed permanently in patients who recover from their original disease process. As a general rule, the gastrostomy tract closes within 24 to 72 hours of gastrostomy tube removal, but on occasion a fistula persists.

There is no established method for treating the fistulas. Our center uses the technique of fistula tract lining disruption with either a brush or electrocautery with subsequent gastric mucosal endoclippping [60]. Treatments that have been used in small series often include disrupting the epithelial surface within the tract to allow for healing and closure. In a series of four patients with peristomal leakage, circumferential argon plasma coagulation (APC) of the gastric mucosa surrounding the site (followed by endoscopic clipping the internal orifice in two patients) was used to encourage fistula tract closure [61].

A persistent gastrocutaneous percutaneous endoscopic gastrostomy (PEG) fistula (PGPF) has been described in 2 to 44 percent of children who underwent PEG tube placement [62]. The only factor that demonstrated any correlation with the development of PGPF in these pediatric populations was that the gastrostomy tube (the original tube or a replacement tube) was in place for greater than eight months. PGPF has also been reported in the adult literature, although no incidence data exist.

There are a number of case reports and small series documenting approaches to the closure of a PGPF. One series documented closure of a PGPF in 7 of 13 cases by the use of gastric acid suppression with a histamine antagonist and [silver nitrate](#) ablation of the gastrostomy tract lining to disrupt any epithelialization and to encourage tract closure. The same premise of gastrostomy tract lining disruption before using a number of closure techniques has been reported in other series [60,63,64]. There have also been some reports of PGPF closure using an

endoscopic clip closure technique alone without preprocedure fistula tract lining disruption [65].

PEG tract tumor seeding — Patients with proximal gastrointestinal (GI) tract cancers, such as head, neck, and esophageal cancers, are at risk of tumor seeding from the tumor site to the PEG tract by mechanical transfer [66-69]. During placement, the PEG tube can transfer tumor cells from the tumor to the gastric and abdominal walls. The use of an overtube across the proximal GI tract tumor site in theory should allow the PEG tube to be placed through the overtube without the risk of PEG tube tract seeding, though whether this approach is successful has not been studied. Overall, the risk of clinically significant seeding appears to be low.

The risk of PEG tract seeding with malignant cells was demonstrated in a prospective series that included 40 patients with oropharyngeal or esophageal cancer who underwent PEG tube placement using a pull-through technique [70]. Cytology using brushings obtained from the tubing and incision site after PEG tube placement demonstrated malignant cells in nine patients (23 percent). After three to six months of follow-up, brushings were again obtained from the tubing and incision site in 32 patients. Malignant cells were seen in three patients (9 percent of those with a second brushing), all of whom had esophageal squamous cell carcinoma, suggesting seeding of the tract during PEG tube placement. However, it should be kept in mind that the finding of malignant cells on brushings represents a surrogate endpoint, and whether patients are clinically affected (eg, develop clinically apparent abdominal wall tumors) is unclear. As a result, our practice is to inform patients of the risk of PEG tract seeding with malignant cells, but we do not alter our approach to feeding tube placement.

Other late complications — Other late complications of gastrostomy tube placement include gastric herniation and persistent abdominal wall pain.

Herniation of the stomach through a PEG tube site has been reported. In one report, a patient was noted to have a leaking PEG site one year following PEG tube insertion [71]. A bulge was noted at the PEG tube site on the abdominal wall when the patient coughed. A computed tomography (CT) scan demonstrated that a portion of the stomach had herniated through the PEG site. The PEG was removed, but the PEG tract remained open. Surgical repair of the fistula was suggested. However, the patient died of aspiration pneumonia prior to definitive surgical therapy.

Abdominal wall pain can occur and persist after gastrostomy tube placement. The work-up should include a full examination to rule out infection of the abdominal wall. This may include a CT scan to rule out an abdominal wall abscess. In some cases, the pain will be consistent with

neuropathic pain, in which case the remedy is often removal of the gastrostomy and insertion at a different site. Abdominal wall injection with an anesthetic agent may also be helpful.

COMPLICATIONS RELATED TO TUBE FEEDS

Complications related to the administration of tube feeds are discussed elsewhere. (See ["Nutrition support in critically ill patients: Enteral nutrition"](#), section on 'Monitoring'.)

SUMMARY AND RECOMMENDATIONS

- **Background** – Complications of gastrostomy tube placement may be minor (wound infection, minor bleeding) or major (necrotizing fasciitis, colocutaneous fistula). The reported rates of complications related to percutaneous endoscopic gastrostomy (PEG) tube placement vary from 16 to 70 percent. The majority of complications are minor. Complications appear to be more likely in older adults with comorbid illnesses, particularly those with an infectious process or who have a history of aspiration. (See ['Incidence of complications'](#) above.)
- **Placement of the external gastrostomy tube bolster** – One key to preventing complications is proper placement of the external gastrostomy tube bolster. The external gastrostomy tube bolster should be positioned such that 1 to 2 cm of in and out movement can be achieved. Loose apposition of the bolster to the abdominal wall does not result in peritoneal leakage since an early gastrostomy tube tract forms as a result of tissue edema and associated tissue secretions. If the tissue between the internal and external bolsters is compressed, it may lead to pressure necrosis and breakdown of the gastrostomy site. (See ["Gastrostomy tubes: Placement and routine care"](#), section on ['Proper placement of the external bolster'](#).)
- **Timing** – Many of the complications associated with gastrostomy tube placement may be seen at any time following gastrostomy tube placement. These include infection, bleeding, peristomal leakage, and inadvertent tube removal. (See ['Complications that may occur at any time'](#) above.)
 - Early complications – Some complications seen immediately following PEG tube placement include pneumoperitoneum, ileus, perforation of the esophagus or stomach (at a site other than the gastrostomy), or damage to other intra-abdominal organs, such as the liver or colon. (See ['Early complications of endoscopic gastrostomy tube placement'](#) above.)

- Late complications – Late complications occur after the gastrostomy tract has matured. They include deterioration of the gastrostomy site, buried bumper syndrome, and colocutaneous fistula formation. (See '[Late complications of gastrostomy tube placement](#)' above.)

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