Chapter 86: Gastrointestinal Procedures and Devices

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NASOGASTRIC ASPIRATION

Nasogastric (NG) aspiration is used to remove liquid contents from the stomach and decompress the stomach and small bowel. The need for NG aspiration often varies with the clinical presentation (Table 86-1). Gastric decompression is useful in small bowel obstruction, although some studies have shown that medical therapy with octreotide or somatostatin has allowed safe treatment of bowel obstruction associated with malignancy.1,2 NG aspiration and decompression are no longer considered routine for the treatment of adynamic ileus.3,4 Removal of liquid contents is useful in cases of GI bleeding, but not all patients with GI bleeding require NG aspiration.

TABLE 86-1
Selection of Patients for Nasogastric Aspiration

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Best Uses</th>
<th>Consider Withholding</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI bleeding with hematemesis</td>
<td>Rapid bleeding (large hematemesis, refractory hemodynamic instability)</td>
<td>Slow or mild bleeding (coffee grounds, blood-streaked emesis)</td>
</tr>
<tr>
<td>GI bleeding without hematemesis</td>
<td>Massive rectal bleeding with hemodynamic instability</td>
<td>Clinical picture suggests lower GI source (bright red blood per rectum, age &gt;50 y, blood urea nitrogen/creatinine &lt;30)5</td>
</tr>
<tr>
<td>Small bowel dilation</td>
<td>Small bowel obstruction</td>
<td>Ileus</td>
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</table>

In GI bleeding, a common and controversial situation for NG aspiration,6 aspiration of stomach contents can localize the source of bleeding, indicate the rate of bleeding, and clear the stomach for endoscopy. Patients with hematemesis virtually always have an upper GI source, and NG aspiration is helpful to assess the rate of
hemorrhage rather than identify the source. In significant upper GI bleeding, such as suggested by refractory hemodynamic instability or large quantities of bright red bloody emesis, the rate of bleeding can determine the success of medical interventions and the need for emergent endoscopy. When the clinical picture suggests a slower rate of bleeding, such as with coffee-ground emesis or blood-streaked emesis, the need for NG aspiration is less clear because less sensitive methods of assessing the rate of hemorrhage, such as observation of spontaneous bleeding, hemodynamic assessment, and serial hematocrit measurement, are often adequate.

In patients without hematemesis, NG aspiration lacks sensitivity to detect an upper GI source. Although it has been reported that 10% of patients with hematochezia have an upper GI source, many of these are from a duodenal source and are beyond the reach of the NG tube. Most patients with melena have an upper GI source and require upper endoscopy regardless of the results of NG aspiration. In severe, ongoing rectal bleeding with hemodynamic instability, NG aspiration is relatively useful because severe upper GI bleeding is generally easier to stop than severe lower GI bleeding.

The literature is riddled with case reports of bizarre mishaps resulting from the use of NG tubes, some of which are listed in Table 86-2. However, the rate of adverse effects has not been systematically addressed. The main morbidity from the procedure is probably related to pain, followed by epistaxis, both of which can be minimized by good technique.

### Table 86-2

**Complications of Placement of Nasogastric and Nasoenteric Tubes**

- Epistaxis
- Intracranial placement
- Bronchial placement
- Pharyngeal placement
- Esophageal obstruction or rupture
- Bronchial or alveolar perforation
- Pneumothorax
- Charcoal instillation into the lungs and pleural cavity
- Gastric or duodenal rupture
- Vocal cord paralysis
- Pneumomediastinum
- Laryngeal injuries
- Knotting (preventing removal)

The equipment required for NG tube insertion is listed in Table 86-3. The optimal positioning is with the patient seated upright with the neck slightly flexed. Topical application of anesthetic can reduce the pain of the procedure, and a vasoconstrictor can shrink the turbinates, creating a larger nasal opening, but use a
vasoconstrictor with caution in hypertensive patients. One option is to mix 4% lidocaine with oxymetazoline and instill this solution using a nasal atomizer. Nebulized lidocaine also provides effective analgesia. Although it is tempting to use viscous lidocaine on the tip of the tube instead of premedication, this maneuver does not allow time for the lidocaine to be effective. A right-handed operator may choose the right side or the side of patient preference. Premedication with IV metoclopramide, in adults, or lingual 24% sucrose, in infants, may also decrease pain.

TABLE 86-3

Equipment for Nasogastric Tube Insertion

- Absorbent pad (blue Chux®)
- Kidney basin
- Equipment for anesthesia and vasoconstriction
- Nebulizer or nasal atomizer
- Local anesthetic (4% lidocaine)
- Vasoconstrictor (oxymetazoline, phenylephrine)
- Water-soluble lubricant
- Cup of water with straw
- Nasogastric Salem sump tube—16 F
- Catheter-tip syringe
- Tubing connected to suction device, such as wall suction

Describing the procedure to the patient in advance and talking to the patient during the procedure minimize anxiety. Insert the lubricated tube into the selected nostril. Direct the tube posteriorly, not superiorly, and it should naturally bend inferiorly toward the glottis. Resistance is expected at the level of the glottis. At this point, have the patient take a drink of water, and advance the tube at the time of swallowing. This step minimizes the potential for false passage at the level of the glottis. Warming the distal tip of the tube will make it more pliable and may further decrease the pain of the procedure. Once the tube is past the glottis, quickly advance the tube and aspirate stomach contents. If the patient coughs during the procedure, stop and make sure that the patient can speak clearly. Failure to aspirate stomach contents should prompt visualization of the pharynx to ensure the tube is not coiled in the posterior pharynx. If the appearance of the gastric aspirate is inconclusive, its pH can be tested, or air can be insufflated during auscultation over the stomach (Table 86-4). A chest x-ray can also be obtained to confirm tube placement. If the NG tube is to remain in place, it can be taped to the patient’s nose and connected to low-intermittent suction.
Some situations make NG tube insertion more difficult, such as obstructed nares, lack of patient cooperation, or endotracheal intubation. In patients with obstructed nares, the orogastric route may be used, although this is often less comfortable than the NG route. In obtunded patients with a poor gag reflex, endotracheal intubation may prevent aspiration. In patients with endotracheal intubation, flexing the neck or cooling the tube in ice water to stiffen it may facilitate passage.

ANOSCOPY

Anoscopy can identify an anorectal cause of bleeding in patients with hematochezia. Although an uncomforTable test, it is safe if performed properly. Contraindications include rectal foreign bodies and suspected rectal perforation. Anoscopy requires only an anoscope (a hollow plastic tube with a blunt obturator), lubricant, 4 x 4 gauze pads, blue absorbent pads (Chux®), and a light source. Because both hands contact contaminated areas during anoscopy, an assistant can hold a hand-held light source, or the operator can use a forehead-mounted light.

Usually, the lateral decubitus position is least uncomfortable, although the knee-chest position is an alternative. The equipment can be assembled onto the blue absorbent pad on the bed. After a careful external visual inspection of the anus with retraction of the buttocks, the generously lubricated anoscope is gently inserted into the anus. Step-by-step verbal communication is essential. If resistance or pain is encountered, slowing the rate of insertion or redirecting can allow more comfortable passage. After insertion is completed, remove the obturator, obtain stool from the tip, and perform guaiac testing. Then peer through the anoscope as it is withdrawn, looking for potential sources of bleeding. Internal hemorrhoids are common sources of anorectal bleeding that are visible through the anoscope. After the procedure, the patient or operator may wipe off the lubricant with gauze and dispose of it in the blue absorbent pad.

OROGASTRIC LAVAGE
Orogastric lavage is used to remove pills and fragments from the stomach. It is only appropriate for patients presenting well within 1 hour after a potentially lethal ingestion.\(^\text{14}\) Because an NG tube is too small to retrieve pill fragments, gastric lavage for solids is done orally with a large-bore tube. Gagging and vomiting during the procedure are common, and aspiration is a significant risk, particularly when airway protection is in doubt. Many other complications are possible, including tube misplacement into the bronchi, pharyngeal injury, and viscus perforation. Endotracheal intubation before this procedure can minimize these risks when a patient is or may become obtunded.

Equipment for the procedure includes a large-bore tube, such as the Ewald tube\(^\circ\) or the Tum-E-Vac\(^\circ\) (Ethox Corp, Buffalo, NY); lubricant; suction; emesis basin; blue absorbent pad; a catheter-tip syringe; irrigation fluid; and a bite block or oral airway to prevent patients from biting down on the tube. Patient positioning, tube advancement, and confirmation of placement are similar to NG tube insertion, but be especially sure to aim the proximal end away from others. After inserting a bite block in uncooperative patients, insert the gastric tube to the level of the glottis, and encourage the patient to swallow. Then pass the tube quickly into the stomach. Coughing or airflow from the tube raises concern for tracheal malpositioning. Have the patient vocalize to exclude tracheal placement. After suction and irrigation of gastric contents, charcoal and sorbitol can be instilled before withdrawal of the tube.

**ESOPHAGEAL BALLOON (SENGSTAKEN-BLAKEMORE) TAMPONADE**

The Sengstaken-Blakemore tube is designed to tamponade bleeding from esophageal varices (Figure 86-1). With the increasing availability of endoscopy and success of medical therapy with octreotide, somatostatin, and vasopressin, its use has declined. Nevertheless, it still has a role in cases in which endoscopy is unavailable or hemorrhage is refractory to endoscopic techniques. It is only useful in patients with esophageal varices that are known or suspected from the clinical picture, such as in patients with severe hematemesis and signs of cirrhosis. The procedure frequently provokes emesis, and aspiration can be minimized by endotracheal intubation. Other risks include gastric or esophageal rupture. Insert the tube orally after the same procedure described in the section "Orogastric Lavage." After confirming tube placement as described earlier, expand the distal balloon with water or normal saline and apply gentle traction to the tube. Because varices are often at the gastroesophageal junction, this often stops the bleeding. If not, expand the proximal balloon. To maintain traction, tape the proximal end of the tube to the face guard of a football or lacrosse helmet that the patient wears. The patient will not be able to swallow secretions with this in place, so proximal suction, whether from a proximal port in the device or an NG tube inserted proximally, will further minimize the risk of aspiration.

**FIGURE 86-1.**

A. Sengstaken-Blakemore tube. B. Insertion of Sengstaken-Blakemore tube.
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Once the tube is in place, maintain traction to the minimum amount necessary to stop the bleeding to minimize the risk of tissue ischemia. Maintain balloon tamponade until more definitive measures can be taken.

**PARACENTESIS**

In paracentesis, ascitic fluid is removed for diagnostic or therapeutic purposes. Patients with ascites and abdominal pain or other GI symptoms may have peritonitis, requiring diagnostic paracentesis. This may be true even if the abdominal pain is mild and unaccompanied by signs of systemic infection. Patients with respiratory compromise or severe pain due to tense ascites require therapeutic paracentesis, in which a large quantity of fluid is removed. Large-volume therapeutic paracentesis is a lengthy procedure associated with
complications such as hyponatremia, renal impairment, and encephalopathy, and many of these patients require other treatment. Therefore, it is generally best reserved for the admitting team or ED observation unit, except in rare cases in which pain or respiratory compromise cannot be controlled in the ED with medications or supplemental oxygen. Other risks of paracentesis in general, whether diagnostic or therapeutic, include bowel perforation, ascitic fluid leak, hemorrhage, and introduction of infection.

Equipment for diagnostic paracentesis includes sterile drapes (both fenestrated and nonfenestrated), sterilizing solution (povidone-iodine or chlorhexidine), gauze, assorted syringes (3, 10, or 30 mL), a small-bore (27-gauge or smaller) needle, three medium-bore (21-gauge) needles, local anesthetic (lidocaine), and containers for cell count and culture for the laboratory. If paracentesis is also to be therapeutic, a three-way stopcock, sterile tubing, and a source of suction—either vacuum bottles or a setup for wall suction—are necessary, and a large-bore needle or plastic catheter (18- or 16-gauge) will speed the procedure. Ultrasonography can confirm ascites and identify a target fluid collection to minimize the potential for bowel perforation (Figure 86-2). US guidance can also assist the operator in avoiding subcutaneous vessels dilated by portal hypertension, and it decreases the risk of bleeding.

FIGURE 86-2.
US view of a desirable puncture site for paracentesis (arrow).

If the patient has coagulopathy or thrombocytopenia, correct deficiencies before paracentesis. Place the patient in a comfortabe supine position, and cleanse and steriley prepare the site of expected needle insertion. The left lower quadrant is generally a good area because this minimizes the potential for liver injury, but the right lower quadrant may also be used if the left lower quadrant has distorted anatomy, such as with prior scarring or ostomy surgery (Figure 86-3). Anesthetize the skin over the target area by raising a wheal, and then switch to a larger-bore needle to infiltrate to the level of the peritoneum. A Z-track technique, in which traction on the skin is used to create a displaced track to the peritoneum, can minimize the potential for infection and persistent leakage. At a depth expected to be near the peritoneum, apply
suction to the syringe and infiltrate lidocaine while advancing until peritoneal fluid is aspirated. Once the fluid is aspirated, change the syringe with the needle still in place, and then aspirate at least 50 cc of fluid into the fresh syringe for laboratory analysis. In therapeutic paracentesis, attach tubing to the needle, catheter, or stopcock, and connect to suction. Even if the goal is diagnosis, up to 1 L is unlikely to cause complications and may provide significant symptomatic relief. Then withdraw the needle or catheter and cover the insertion site with a dressing. A purse-string suture can be placed to minimize leakage. Recheck the patient in 30 minutes to identify persistent leakage or an increase in symptoms to suggest a complication. Patients with large-volume paracentesis should be monitored for hypotension for several hours after the procedure. Cover the puncture site with a dry dressing for 48 hours.

FIGURE 86-3.
Sites for needle introduction in the left or right lower quadrant (x) for abdominal paracentesis.

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TRANSABDOMINAL FEEDING TUBES

Although the techniques for the initial placement of transabdominal feeding tubes (gastrostomy [G-tube], jejunostomy [J-tube], and gastrojejunostomy) are beyond the scope of emergency physicians, complications related to these tubes need to be recognized (Table 86-5). These tubes can be placed by a surgeon using open technique, by a gastroenterologist using endoscopic technique (percutaneous endoscopic gastrostomy), or by a radiologist with percutaneous techniques. The radiographic technique has been associated with fewer complications than has open or endoscopically assisted placement. 18
**Complications Seen with Transabdominal Feeding Tubes**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Initial Considerations</th>
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</thead>
<tbody>
<tr>
<td>Purulent drainage from stoma</td>
<td>Local care with hydrogen peroxide unless cellulitis is present.</td>
</tr>
<tr>
<td>Leakage from stoma</td>
<td>Carefully replace with larger tube.</td>
</tr>
<tr>
<td>Tube occlusion</td>
<td>Attempt irrigation; most often, just replace.</td>
</tr>
<tr>
<td>Dislodged tubes</td>
<td>Gently replace; confirm placement with x-rays.</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>High index of suspicion; consider needle aspiration.</td>
</tr>
<tr>
<td>Bacteremia</td>
<td>Consider as potential source in septic patient.</td>
</tr>
<tr>
<td>Bleeding from tract</td>
<td>If recently inserted, consider local injection, consult.</td>
</tr>
<tr>
<td>Bleeding from granuloma buildup</td>
<td>Local therapy with silver nitrate.</td>
</tr>
<tr>
<td>Infection of surrounding skin</td>
<td>Consultation, pull tube, IV antibiotics.</td>
</tr>
<tr>
<td>Necrotizing fasciitis</td>
<td>Consider MRI to help confirm; surgical debridement.</td>
</tr>
<tr>
<td>Peritonitis</td>
<td>Determine if fistula exists; consultation, IV antibiotics.</td>
</tr>
<tr>
<td>Pulmonary aspiration of feedings</td>
<td>Reduce flow rate, half-strength feeds, consider J-tube.</td>
</tr>
<tr>
<td>Vomiting or diarrhea</td>
<td>Reduce flow rate, half-strength feeds, stop feeds.</td>
</tr>
<tr>
<td>Gastroesophageal reflux</td>
<td>Reduce flow rate, half-strength feeds, consider J-tube.</td>
</tr>
<tr>
<td>Intestinal obstruction</td>
<td>Step feedings, NPO, admit, and observe.</td>
</tr>
<tr>
<td>Gastric outlet obstruction</td>
<td>Reposition tube.</td>
</tr>
<tr>
<td>Gastric volvulus</td>
<td>Surgical consult.</td>
</tr>
<tr>
<td>Gastric perforation</td>
<td>Surgical consult.</td>
</tr>
<tr>
<td>Esophageal perforation</td>
<td>Surgical consult.</td>
</tr>
</tbody>
</table>
### Complication | Initial Considerations
--- | ---
Colonic perforation | Surgical consult.
Colocutaneous fistula | Surgical consult.
Electrolyte abnormalities | Change feedings or increase free water.
GI bleeding | Endoscopy and therapy directed at cause.
Bolster buried in abdominal wall | Surgical consult.

Abbreviations: J-tube = jejunostomy tube; NPO = nothing by mouth.

Frequent minor complications are associated with the use of these tubes, including purulent drainage and leakage around the stomal site, clogging, dislodgement, and vomiting and diarrhea.

Drainage from the stomal site is a common finding and represents a foreign-body reaction due to the catheter. As long as there is no evidence of cellulitis or necrotizing fasciitis, local skin care with hydrogen peroxide and warm water usually will clear up the problem. If there is granuloma formation with localized bleeding from friable skin, local treatment with silver nitrate usually will help.

Leakage of gastric contents can become a problem. This is managed by careful insertion of a larger tube. Care should be used not to force too large a tube into the stoma, because this can cause separation of the stomach wall from the abdominal wall.

Prevention is the best treatment for clogging of gastrostomy and jejunostomy tubes. Frequent flushing with water and careful crushing of pills usually can prevent this problem. Vomiting and diarrhea can be relieved by decreasing the amount of the feedings and/or diluting the feedings. To unclog the tube, instill warm water or carbonated beverage (cola is most often used) and let it remain for 20 minutes. Then attempt flushing.\(^{19}\) Alkalinized pancreatic enzymes (12,000 lipase units dissolved in 650 mL bicarbonate) have also proven effective in about 50% of cases.\(^{20}\)

**TUBE REPLACEMENT**

If the tube cannot be unclogged or if it has fallen out, replacement will be necessary. If the tube was placed by a surgeon or gastroenterologist and has not been replaced, it probably will have a bolster (also called a mushroom or bumper) holding the tube in place (Figure 86-4). This will prevent the tube from being removed. The bolster must be removed endoscopically, or the tube may be cut off and the bolster allowed to pass through the GI tract.\(^ {21}\) The latter technique is generally safe in adults, but passage in children has complications,\(^ {22}\) and tube removal should be done by the endoscopist or surgeon. Tube removal should be
do by the endoscopist or surgeon. Endoscopic removal in adults is advisable when there is suspected or potential obstructive disease of the GI tract, such as pyloric stenosis, intestinal pseudo-obstruction, and intestinal stricture (e.g., due to radiation, ischemia, or inflammatory bowel disease). If the tube is cut, an abdominal radiograph should be obtained 1 week later to confirm passage of the internal component. Most reported complications from a retained internal bolster have occurred when the bolster did not pass within 1 to 2 weeks. If the bolster or bumper becomes buried in the abdominal wall, consult with the endoscopist or surgeon who placed the device. Do not attempt removal by traction. Some specially designed tubes have internal bumpers that can be removed by external traction, but consultation with the endoscopist or surgeon who placed the device is necessary before any traction is applied to verify the type of tube and the appropriate method of removal (Figure 86-4).

FIGURE 86-4.
Percutaneous endoscopic gastrostomy tube (G-tube) with a mushroom bolster in place.

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If the tube has become dislodged or has fallen out, replace it as quickly as possible (within a few hours) to prevent closure of the tract. Most tracts mature after 2 to 3 weeks. Do not attempt to replace a tube with an immature tract. First determine, if possible, which type of tube is being used. If the tube is available, replacement with the same size is usually possible. If the tube is not available, it can be difficult to determine whether the tract is for a jejunostomy or gastrostomy tube. Location site on the abdominal wall is not helpful to differentiate the two. A tract for a gastrostomy tube is usually larger. Old records may be useful and should be obtained, if possible. After determining the type of tract and size of tube used previously, insert the tube using a water-soluble lubricant. If the size of the tube being replaced is not known, it is reasonable to start with a 16- or 18-F replacement gastrostomy tube or Foley catheter. The lubricated tube should pass easily into the stoma without additional equipment. If resistance is met, abandon the attempt. A smaller tube can be tried to keep the tract open. After replacing the tube, instill a 20- to 30-mL bolus of a water-soluble
contrast material (e.g., diatrizoate meglumine and diatrizoate sodium solution [Gastrografin]) through the tube, and obtain a supine abdominal x-ray within 1 to 2 minutes. The x-ray should demonstrate rugae of the stomach for a gastrostomy tube and flow into the small bowel for a jejunostomy tube. US can also be used to verify gastric placement. The tip of the tube can be visualized within the stomach, and confirmation of placement can be done by injecting 10 cc of normal saline into the tube and observing the fluid entering the stomach, using real-time US. Another way of determining placement is to withdraw gastric fluid and check pH to make sure it is acidic. If there is any question of improper placement, obtain immediate consultation.

A special caution regarding jejunostomy tubes should be noted. Jejunostomy tracts are smaller, and smaller tubes are used (8- to 14-F). These tubes usually are not sutured in place and frequently become dislodged. They can be replaced with catheters made specifically for jejunostomies or with Foley catheters. **If a Foley catheter is used to replace a lost jejunostomy catheter, the balloon should never be inflated** because it can cause a bowel obstruction or damage the jejunum. The tube is lubricated, inserted into the stoma, and advanced 20 cm. These tubes are easily replaced if the tract is mature; however, if resistance is met, referral to a radiologist for fluoroscopic placement using guidewires is recommended.

**REFERENCES**


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