

# CHAPTER 5

## GASTROINTESTINAL PROCEDURES

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Disorders of the abdomen are, in many ways, the essence of general surgery. The surgeon should have expertise in the anatomy of the abdomen and confidence in examination of the abdomen. Similarly, gastrointestinal procedures should be an integral part of the armamentarium of the general surgeon.

### **I. UPPER GASTROINTESTINAL PROCEDURES**

Indications for intubation of the upper gastrointestinal (GI) tract include evacuation of the stomach (and occasionally more distal gastrointestinal tract) of gases and fluids for diagnostic and/or therapeutic purposes, or to deliver nutrients and medications. Modern GI tubes have a rich history; they are the product of many years of modifications in material and design.

#### **A. NASOGASTRIC TUBES**

1. Indications:

- a. Acute gastric dilatation
- b. Gastric outlet obstruction
- c. Upper gastrointestinal bleeding
- d. Ileus
- e. Small bowel obstruction
- f. Enteral feeding

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2. Contraindications:

- a. Recent esophageal or gastric surgery
- b. Head trauma with possible basilar skull fracture

3. Anesthesia:

None or viscous lidocaine in the nose

4. Equipment:

- a. Levin or Salem sump tube
- b. Water-soluble lubricant

- c. Catheter-tip syringe (60 ml)
  - d. Cup of ice
  - e. Stethoscope
  - f. Cup of water with a straw
5. Positioning:  
Sitting or supine
6. Technique:
- a. Measure tube from mouth to earlobe and down to anterior abdomen so that last hole on tube is below the xiphoid process. This marks the distance that the tube should be inserted.
  - b. Some surgeons will place tip of tube in cup of ice to stiffen it or bend the tip downward to facilitate the tube's passage into the proximal esophagus.
  - c. Apply lubricant liberally to tube.
  - d. Ask patient to flex neck, and gently insert tube into a patent naris (see Figure 5.1).

**Fig. 5.1.**

- e. Advance tube into nasopharynx aiming posteriorly, asking the patient to swallow if possible.
  - f. Once the tube has been swallowed, confirm that the patient can speak clearly and breathe without difficulty, and gently advance tube to estimated length. If the patient is able, instruct him or her to drink water through a straw; while the patient swallows, gently advance the tube.
  - g. Confirm correct placement into the stomach by injecting approximately 20 ml of air with catheter-tip syringe while auscultating epigastric area. Return of a large volume of fluid through tube also confirms placement into stomach.
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- h. Carefully tape tube to the patient's nose, ensuring that pressure is not applied by tube against naris. Tube should be kept well lubricated to prevent erosion at naris. With the use of tape and a safety pin, the tube can be secured to the patient's gown.
  - i. Irrigate tube with 30 ml of normal saline every 4 hours. Salem sump tubes will also require the injection of 30 ml of air through the sump (blue) port every 4 hours to maintain proper functioning.
  - j. Constant low suction may be applied to Salem sump tubes, whereas Levin

tubes should have only low intermittent suction.

- k. Monitor gastric pH every 4–6 hours and correct with antacids for pH < 4.5.
- l. Monitor gastric residuals if tube is used for enteral feeding. Obtain a chest radiograph to confirm correct placement before using any tube for enteral feeding.
- m. The tube ideally should not be clamped because it stents

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open the lower esophagus, increasing the risk of aspiration if the patient's stomach should distend.

## 7. Complications and Management:

- a. Pharyngeal discomfort
  - Common due to the large caliber of these tubes.
  - Throat lozenges or sips of water may provide relief.
  - Avoid using aerosolized anesthetic for the pharynx because this may inhibit the gag reflex, interfering with the protective mechanism of the airway.
- b. Erosion of the naris
  - Prevented by keeping tube well lubricated and ensuring that tube is taped so that pressure is not applied against naris. Tube should always be lower than the nose and never taped to the forehead of the patient.
  - Frequent checking of the tube position at the naris can help prevent this problem.
- c. Sinusitis
  - Occurs with long-term use of nasogastric tubes.
  - Remove the tube and place in other naris.
  - Antibiotic therapy if needed.
- d. Nasotracheal intubation
  - Results in airway obstruction that is fairly easy to diagnose in the awake patient (cough, inability to speak).
  - Obtain a chest radiograph to confirm placement prior to use for enteral feeding.
- e. Gastritis
  - Usually manifests itself as mild, self-limited upper gastrointestinal bleeding.
  - Prophylaxis consists of maintaining gastric pH > 4.5 with antacids via

the tube, intravenous (IV) histamine<sub>2</sub> receptor blockers, and removal of tube as soon as possible.

f. Epistaxis

- Usually self-limited.
- If persists, remove the tube and assess location of bleed.
- Refer to Chapter 1 for treatment of anterior and posterior epistaxis.

## **B. OROGASTRIC TUBE**

1. Indications:

The indications for orogastric (OG) tubes are generally the same as for NG tubes. However, because they are generally not

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tolerated well by the awake patient, they are used in intubated patients and newborns. The OG tube is the preferred tube for decompressing the stomach in the head trauma patient with a potential basilar skull fracture.

- a. Acute gastric dilatation
- b. Gastric outlet obstruction
- c. Upper gastrointestinal bleeding
- d. Ileus
- e. Small bowel obstruction
- f. Enteral feeding

2. Contraindications:

Recent esophageal or gastric surgery

3. Anesthesia:

None

4. Equipment:

- a. Levin or Salem sump tube
- b. Water-soluble lubricant
- c. Catheter-tip syringe (60 ml)
- d. Stethoscope

5. Positioning:

## Supine

## 6. Technique:

- a. Measure tube from mouth to earlobe and down to anterior abdomen so that last hole on tube is below the xiphoid process. This marks the distance the tube should be inserted.
- b. Apply lubricant liberally to tube.
- c. Because the patients in whom OG tubes are used are generally unable to cooperate, the tube should be placed into the mouth, directed posteriorly, until the tip begins to pass downward into the esophagus.
- d. Advance the tube slowly and steadily. If any resistance is encountered, stop and withdraw the tube completely. Repeat step c.
- e. If the tube advances easily, with little resistance, continue until the premeasured distance is reached. Resistance, gagging,  
fogginess of the tube, or hypoxia suggests errant placement of the tube into the trachea.
- f. Confirm correct placement into stomach by injecting 20 ml of air with the catheter-tip syringe while auscultating over the epigastric area. Correct placement is also confirmed by aspiration of a large volume of fluid.
- g. Irrigate tube with 15–20 ml of saline every 4 hours. Salem sump tubes will require injection of 15–20 ml of air through the sump (blue) port every 4 hours to maintain proper functioning.
- h. Constant low suction may be applied to Salem sump tubes, whereas Levin tubes should have only low intermittent suction.
- i. Monitor gastric residuals if tube is used for enteral feeding. Obtain a chest radiograph to confirm placement before using for enteral feeding.
- j. Monitor gastric pH every 4–6 hours and correct with antacids for pH < 4.5.

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## 7. Complications and Management:

- a. Pharyngeal discomfort and gagging are a problem with OG tubes when they are placed in awake and alert patients, and essentially eliminates their use in such patients except in conjunction with an oral endotracheal tube.
- b. Tracheal intubation
  - Correct placement in the esophagus is usually evident by the ease of advancement of the tube. Any resistance suggests tracheal intubation or coiling within the posterior pharynx.
  - Obtain a chest radiograph to confirm placement prior to use for enteral feeding.

c. Gastritis

- Usually manifests itself as mild, self-limited upper gastrointestinal bleeding.
- Prophylaxis consists of maintaining gastric pH > 4.5 with antacids via the tube, IV histamine<sub>2</sub> receptor blockers, and removal of tube as soon as possible.

## ***C. NASODUODENAL TUBE***

1. Indications:

Enteral feeding

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2. Contraindications:

Recent esophageal or gastric surgery

3. Anesthesia:

None or viscous lidocaine in the nose

4. Equipment:

- a. Tip-weighted, small-caliber tube
- b. Guide wire
- c. Water-soluble lubricant
- d. Cup of water with a straw
- e. Stethoscope
- f. Catheter-tip syringe

5. Positioning:

Sitting or supine

6. Technique:

- a. Measure tube length from mouth to earlobe and down to anterior abdomen so that tip is 6 cm below xiphoid process.
- b. Most duodenal tube tips are self-lubricating when moistened with water. If not, apply water-soluble lubricant to the tip of the tube.
- c. Ask patient to flex neck, and gently insert the tube containing the guide wire into a patent naris.
- d. Advance tube into pharynx aiming posteriorly, asking the patient to swallow if

possible.

- e. Once the tube has been swallowed, confirm that the patient can speak clearly and breathe without difficulty, and gently advance tube to estimated length. If the patient is able, instruct him or her to drink water through a straw, and while the patient swallows, gently advance the tube.
- f. Confirm correct placement into stomach by injecting approximately 20 ml of air with catheter-tip syringe while auscultating the epigastric area.
- g. Remove the guide wire and ask the patient to lie in a right decubitus position for 1–2 hours. An abdominal radiograph at this point will confirm transpyloric tube position or that the tube is coiled in the stomach; if coiled, withdraw tube for

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some distance and repeat this step. The tube should not be fixed to the nose.

- h. The patient should first lie in a supine position for 1–2 hours and then in a left decubitus position for 1–2 hours to facilitate passage of the tube through the C-loop of the duodenum.
- i. At this point, position of the tube should be confirmed by radiograph. If the tube has not passed beyond the stomach by this time, then upper endoscopy or fluoroscopy may be necessary to advance the tube into the duodenum.

#### 7. Complications and Management:

- a. Epistaxis
  - Usually self-limited.
  - If persistent, remove the tube and assess location of bleed.
  - Refer to Chapter 1 for treatment of anterior and posterior epistaxis.
- b. Intestinal perforation
  - Presents usually as free air on chest radiograph.
  - Caused by inserting guide wire back through lumen of tube while it is in place. This should never be done.
- c. Obstruction of lumen (see section F below)

### ***D. LONG INTESTINAL TUBE***

#### 1. Indications:

Early partial small bowel obstruction

#### 2. Contraindications:

- a. Uncooperative patient
- b. Indication for operative intervention (i.e., small bowel ischemia)

3. Anesthesia:

None or viscous lidocaine in the nose

4. Equipment:

- a. Long intestinal tube
- b. Water-soluble lubricant

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- c. Saline
- d. 5-ml syringe, 22-gauge needle

5. Positioning:

Sitting up initially, then variable position as described below

6. Technique:

- a. Using needle and syringe, inject 5 ml of saline into the balloon at the end of the tube (see Figure 5.2).



**Fig. 5.2.**

- b. With the patient in an upright sitting position, roll up the balloon, apply a liberal amount of lubricant, and insert balloon into a patent naris.
- c. Carefully manipulate the tube such that the balloon falls into the nasopharynx without obstructing the airway.
- d. Instruct the patient to swallow the balloon as it is lowered slowly into the pharynx as though it were a bolus of food. Passage of the balloon in the patient who cannot swallow may be difficult. Often the balloon will advance along with the tube.
- e. After balloon has been swallowed, confirm that the patient can speak clearly and breathe easily, then advance it slowly

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into the stomach by instructing the patient to continue swallowing.

- f. Insert the tube to the point at which the D mark is at the nose, and have the patient lie in a right decubitus position for 1–2 hours. The tube should not be fixed to the nose. Low intermittent suction may be applied.
- g. Obtain an abdominal radiograph to confirm the presence of the tip in the duodenum or that the tube is coiled in the stomach and may need to be



withdrawn for some distance.

- h. The patient should then be placed supine for 1–2 hours, then next in a left decubitus position for 1–2 additional hours to facilitate passage of the tube through the C-loop of the duodenum.
  - i. At this point, position of the tube should be confirmed again by abdominal radiograph. If the tube has not passed beyond the stomach by this time, placement of the tip through the pylorus by flexible upper endoscopy or under fluoroscopy may be necessary.
  - j. Once the tube is in the duodenum, it can be advanced 2–3 cm every 15 minutes.
  - k. Once the tube is no longer needed, removal should proceed slowly over several hours to prevent intussusception (withdraw tube 3–5 cm every 10–15 minutes).
7. Complications and Management:
- a. Airway obstruction
    - The balloon may occlude the upper airway during initial placement.
    - Withdraw the tube immediately.
  - b. Epistaxis
    - Usually self-limited.
    - If it persists, remove the tube and assess location of bleed.
    - Refer to Chapter 1 for treatment of anterior and posterior epistaxis.
  - c. Intussusception of small intestine during removal
    - Best avoided by withdrawing tube 3–5 cm every 10–15 minutes.

## ***E. SENGSTAKEN-BLAKEMORE TUBE***

The Sengstaken-Blakemore (SB) tube is an emergently placed tube that temporarily stops life-threatening hemorrhage from

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gastroesophageal varices. It is only a temporizing therapy before definitive operative, endoscopic, or transjugular intrahepatic portosystemic shunt procedure.

### 1. Indications:

Exsanguinating hemorrhage from gastroesophageal varices

### 2. Contraindications:

None

3. Anesthesia:

None or viscous lidocaine in the nose

4. Equipment:

- a. SB tube
- b. Catheter-tip 60-ml syringe
- c. Hemostat clamps (two)
- d. Pressure manometer
- e. Levine or Salem sump NG tube
- f. Water-soluble lubricant
- g. Scissors

5. Positioning:

Supine or lateral decubitus

6. Technique:

- a. Because potentially lethal complications can occur with the use of the SB tube, patients should be in a monitored setting, such as the intensive care unit, staffed by personnel experienced with the use of this device.
  - b. Control of the airway by endotracheal intubation is strongly advised to minimize the risk of aspiration.
  - c. Pass a large NG tube (see section I A) or OG tube (see section I B) to empty the stomach of blood, and then remove the tube.
  - d. Inflate both esophageal and gastric balloons of the SB tube with air to test for leaks, then deflate.
  - e. Apply lubricant liberally to the tube.
  - f. Ask patient to flex neck, and gently insert tube into a patent naris.
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- g. Advance tube into pharynx, aiming posteriorly and asking the patient to swallow if possible.
  - h. Once the tube has been swallowed, confirm that the patient can speak clearly and breathe without difficulty (if not intubated), and gently advance tube to approximately 45 cm.
  - i. Apply low intermittent suction to the gastric aspiration port. Return of blood should confirm placement in the stomach. Otherwise inject 20 ml of air with the catheter-tip syringe while auscultating epigastric area (see Figure 5.3).

A rectangular box with a thin black border containing the text "Fig. 5.3." in a bold, sans-serif font.

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- j. Slowly inject 100 ml of air into the gastric balloon and then clamp the balloon port to prevent air leakage. Stop inflating the balloon immediately if the patient complains of pain because this could indicate that the balloon is in the esophagus. If this is the case, deflate the gastric balloon, advance the tube an additional 10 cm, and repeat the injection of air.
  - k. With the gastric balloon inflated, slowly withdraw the tube until resistance is met at the gastroesophageal junction. Anchor the tube to the patient's nose under minimal tension with padding.
  - l. Obtain a chest radiograph to confirm correct gastric balloon positioning.
  - m. Add an additional 150 ml of air to the gastric balloon and reapply the clamp.
  - n. Irrigate the gastric port with saline. If no further gastric bleeding is found, leave the esophageal balloon deflated.
  - o. If bleeding persists, connect the esophageal balloon port to the pressure manometer and inflate the esophageal balloon to 25–45 mm Hg.
  - p. Transiently deflate the esophageal balloon every 4 hours to check for further bleeding (by aspirating through the gastric port) and to prevent ischemic necrosis of the esophageal mucosa.
  - q. Apply low intermittent suction to both the gastric and esophageal aspiration tubes.
  - r. After 24 hours without evidence of bleeding, deflate the esophageal and gastric balloons.
  - s. The SB tube can be removed after an additional 24 hours without evidence of bleeding.
7. Complications and Management:
- a. Esophageal perforation
    - Can result from intraesophageal inflation of the gastric balloon.
    - Deflate the gastric balloon and remove the SB tube.
    - Emergent surgical consult for operative therapy.
  - b. Aspiration
    - Prevented by endotracheal intubation
    - Supportive therapy (oxygen, pulmonary toilet)

- Antibiotics as indicated

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c. Rebleeding

- Reinsert SB tube
- Transjugular intrahepatic portosystemic shunt, endoscopy, or definitive surgery

## **F. FEEDING TUBE TROUBLESHOOTING**

Feeding tubes in either the stomach or the jejunum are frequently used in patients who cannot eat. They can be placed through open techniques, laparoscopically and endoscopically, but when they malfunction, a surgeon is usually called. It is critical that after manipulation of a feeding tube, its position within the lumen of the gut be verified either by aspiration of intestinal contents or by a contrast study through the tube. Failure to do so can cause tube feeds to be injected directly into the peritoneal cavity, which is life threatening.

### 1. Obstruction of Lumen

- Prevented by flushing of tube with water or saline at regular intervals.
- Avoid giving medications that are not easily liquefied through a feeding tube.
- Clearing of obstruction should be attempted with saline or carbonated liquids using a 1-ml (tuberculin-type) syringe. A difficult clog can sometimes be broken up by injecting a carbonated beverage and capping the tube, and repeating this multiple times over the course of a day.
- A guide wire can be used to break up inspissated tube feeds, but it must be used with extreme caution. It should be measured against the length of the feeding tube and not inserted more than 2–3 cm beyond the skin to prevent perforation of the bowel.
- Crushed pancrease has been used to break up obstructing tube feeds.

### 2. Reinsertion of Feeding Tubes

- Accidental removal is prevented by frequent inspection of the feeding tube to ensure that it is well secured.
- Once a feeding tube has been in place for at least 2 weeks, if it falls out, reinsertion can usually be accomplished by passing a Foley catheter or MIC gastrostomy tube through the

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previous wound and into the stomach or jejunum. This should be done as soon as possible to prevent the tract from closing.

- c. In the stomach, the balloon can be fully inflated. In the jejunum, the balloon should be inflated with no more than 2–3 ml of saline to prevent intraluminal obstruction.
  - d. A feeding tube that has been out for some time can often be replaced by interventional radiology. Insert a needle through the old site and place the feeding tube using the Seldinger technique under fluoroscopy.
  - e. Placement must be confirmed radiographically.
3. Changing Feeding Tubes
    - a. After approximately 1 month, the feeding tube tract is so well developed that the tube can be changed without fear of losing the tract.
    - b. Feeding tubes can be changed simply by deflating the balloon, removing the tube, and replacing with a new tube.
    - c. PEG tubes have a disc-like button in the stomach that can be difficult to extract through the skin wound. In these cases, the percutaneous endoscopic gastrostomy PEG tube should be changed or removed endoscopically.
  4. Removing Feeding Tubes
    - a. Feeding tubes should be left in place at least 2 weeks to ensure that the bowel has “healed” to the abdominal wall so that there is no intra-abdominal leak after removing a feeding tube.
    - b. The enterocutaneous fistula resulting from the feeding tube tract usually closes over time with conservative therapy.

## II. LOWER GASTROINTESTINAL PROCEDURES

The anus and rectum are readily examined at the bedside using a number of straightforward techniques. Likewise, many lesions of the anorectal region are easily dealt with in the awake patient without the need for general anesthesia or operating room equipment. Although usually considered minor procedures, the direct benefit to the patient is often immense.

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### A. ANOSCOPY

1. Indications:
  - a. Anal lesions (fistulas, tumors, etc.)
  - b. Rectal bleeding
  - c. Rectal pain

- d. Banding or injection of hemorrhoids
2. Contraindications:
  - a. Anal stricture
  - b. Acute perirectal abscess
  - c. Acutely thrombosed hemorrhoid
3. Anesthesia:

None
4. Equipment:
  - a. Clear polyethylene anoscope
  - b. Water-soluble lubricant
  - c. Directed light source or head-light
5. Positioning:

Lateral decubitus position or lithotomy position
6. Technique:
  - a. Examine anus by gently spreading anoderm and performing digital rectal examination.
  - b. Insert the anoscope slowly, using a liberal amount of lubricant and with the obturator in place, until the flange at the base rests on perianal skin.
  - c. Remove the obturator, and while withdrawing the anoscope, examine the anal mucosa in a systematic manner.
  - d. Repeat the procedure as needed to ensure full inspection of the anal canal.
7. Complications and Management:
  - a. Fissure
    - Anal or perianal tears may occur and usually respond to conservative measures.
  - b. Bleeding
    - Unusual, but may occur especially in the setting of large internal hemorrhoids; usually self-limited.

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## ***B. RIGID SIGMOIDOSCOPY***

1. Indications:
  - a. Rectal bleeding
  - b. Lower abdominal and pelvic trauma
  - c. Extraction of foreign bodies
  - d. Stool cultures
  - e. Evaluation and biopsy of ileoanal pouch
2. Contraindications:
  - a. Anal stricture
  - b. Acute perirectal abscess
  - c. Acutely thrombosed hemorrhoids
3. Anesthesia:

None
4. Equipment:
  - a. Rigid sigmoidoscope and obturator
  - b. Light source
  - c. Suction apparatus
  - d. Insufflating bulb
  - e. Water-soluble lubricant
  - f. Long cotton-tipped swabs
  - g. Biopsy forceps, if desired
5. Positioning:

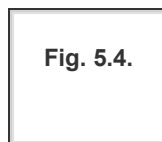
Lateral decubitus, lithotomy, or prone jackknife
6. Technique:
  - a. Administer tap water or saline enema before procedure to empty distal colon of feces.
  - b. Perform a digital rectal examination to assess for masses.
  - c. Assemble sigmoidoscope by placing the obturator through  

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the scope. Check light source and suction. Lubricate the scope thoroughly with water-soluble lubricant.
  - d. Gently insert the sigmoidoscope through the anus to 5 cm, remove the obturator, and attach the light source.

- e. Judiciously insufflate air to visualize the lumen, using the minimum amount of air necessary to see.
- f. Slowly advance the sigmoidoscope as a unit to visualize the rectum. Air will leak during the procedure, and intermittent insufflation will be necessary.
- g. The lumen of the sigmoid will be posterior toward the sacrum and then gently curving to the patient's left. To minimize the risk of perforation, advance the sigmoidoscope only when the lumen is clearly visualized.
- h. If stool is obstructing the view, use the cotton-tipped swabs to clear the lumen.
- i. Advance the sigmoidoscope under direct vision as far as tolerated by the patient (most rigid scopes are 20 cm long) (see Figure 5.4).



- j. To biopsy a mass or polyp, advance the scope until part of the mass is within the barrel of the scope. Insert the biopsy forceps

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into the barrel, and grasp a specimen of tissue. If needed, silver nitrate sticks may be used to achieve hemostasis.

- k. Systematically inspect the mucosa while withdrawing the instrument slowly.

#### 7. Complications and Management:

##### a. Bleeding

- Usually self-limited, but may occur after biopsy.
- Rarely will require treatment, but if bleeding is hemodynamically significant, then resuscitate and consider endoscopic treatment.

##### b. Perforation

- Manifested by abdominal pain, distention, and loss of hepatic dullness to percussion.
- Obtain upright chest radiograph; free air under the diaphragm confirms the diagnosis.
- IV fluids, IV antibiotics, urgent operative management.

## ***C. EXCISION OF THROMBOSED EXTERNAL HEMORRHOID***

### 1. Indications:



Painful thrombosed external hemorrhoid

2. Contraindications:

- a. Coagulopathy (PT or PTT  $>1.3\times$  control)
- b. Thrombocytopenia (platelet count  $< 50,000/\text{mm}^3$ )
- c. Nonthrombosed prolapsed hemorrhoid

3. Anesthesia:

1% lidocaine (mixing lidocaine with 1/100,000 epinephrine may reduce bleeding)

4. Equipment:

- a. Scalpel handle and #15 blade
- b. Sterile prep solution
- c. 25-gauge needle and syringe
- d. Forceps
- e. Small clamps
- f. Vaseline or Xeroform gauze

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5. Positioning:

Lateral decubitus or lithotomy

6. Technique:

- a. Prep and drape the anal area with sterile prep solution.
- b. Identify the thrombosed external hemorrhoid. By definition, it lies exterior to the dentate line, and it is firm and tender (see Figure 5.5).



**Fig. 5.5.**

- c. Perform a field block of the hemorrhoid by infiltrating the surrounding skin and soft tissues with lidocaine using a 25-gauge needle.
- d. Using a scalpel, make an elliptical incision over the thrombosed hemorrhoid (see Figure 5.6).



**Fig. 5.6.**

- e. Using the forceps to hold one side of the incision, enucleate the clot within the hemorrhoid with the aid of a clamp. Apply a Vaseline gauze or Xeroform dressing.
- f. The patient should be instructed to do sitz baths three times a day and after each bowel movement.

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#### 7. Complications and Management:

##### a. Bleeding

- A small amount of dark bloody ooze is to be expected. Bright red bleeding indicates that the hemorrhoid is not thrombosed, and the incision should be stopped.
- Direct pressure or packing may be required to control bleeding.

##### b. Fissure

- Usually results from extending the incision beyond the hemorrhoid into anoderm.
- Treat conservatively with sitz baths and Anusol suppositories.
- Manage operatively if conservative treatment fails.

### ***D. REDUCTION OF RECTAL PROLAPSE***

#### 1. Indications:

- a. Prolapse of rectum (full-thickness)
- b. Mucosal prolapse of rectum (mucosa only)

#### 2. Contraindications:

- a. Infarction or gangrene of prolapsed segment
- b. Severe tenderness of prolapsed segment
- c. Extreme edema of prolapsed segment

#### 3. Anesthesia:

None

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#### 4. Equipment:

- a. Gloves
- b. Water-soluble lubricant

5. Positioning:

Decubitus or dorsal lithotomy

6. Technique:

- a. Don gloves and apply a liberal amount of water-soluble lubricant to the prolapsed segment.
- b. The concept is to apply steady, circumferential pressure on the prolapsed segment (to decrease edema) while simultaneously trying to reduce it. This is done by placing as many fingers of both hands as possible, oriented parallel to its longitudinal axis, around the segment and compressing it from all sides.
- c. Apply pressure firmly and steadily, with more pressure applied at the tip than at the base.
- d. Progress is typically slow and almost imperceptible. Be patient and squeeze for one to several minutes at a time, using plenty of lubricant.
- e. To prevent recurrence, the patient should be placed on stool softeners and should be instructed in the technique of manual self-reduction of prolapsed hemorrhoids, which may occur at each bowel movement.

7. Complications and Management:

Unsuccessful reduction

- May result in infarction of prolapsed segment
- Requires surgical management with excision of prolapsed portion

### III. ABDOMINAL PROCEDURES

These procedures are used to access the peritoneal cavity or to sample its contents. They are useful techniques that can provide diagnostic information or therapeutic benefit without the need for a major operative procedure.

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#### A. PARACENTESIS

1. Indications:

- a. Diagnostic studies
- b. Ascites
- c. Spontaneous bacterial peritonitis
- d. Therapeutic purposes
- e. Relief of respiratory compromise

- f. Relief of abdominal pain and discomfort
2. Contraindications:
    - a. Coagulopathy (PT or PTT > 1.3)
    - b. Thrombocytopenia (plt < 60,000)
    - c. Bowel obstruction
    - d. Pregnancy
    - e. Infected skin or soft tissue at entry site
  3. Anesthesia:

1% lidocaine
  4. Equipment:
    - a. Sterile prep solution
    - b. Sterile towels
    - c. Sterile gloves
    - d. 5-ml syringes, 20-ml syringes, 25-gauge and 22-gauge needles
    - e. 3-way stopcock, IV tubing
    - f. IV catheter (diagnostic: 20-gauge, therapeutic: 18-gauge) or long 16-gauge (CVP-type) catheter with 0.035-cm J wire
    - g. 500- to 1000-ml vacuum bottles and IV drip set (for therapeutic paracentesis)
  5. Positioning:

Supine

    - a. Preferred sites of entry to prevent bleeding from epigastric vessels (see Figure 5.7)

**Fig. 5.7.**

- Either lower quadrant (anterior iliac spine)
- Lateral to the rectus muscle and at the level of or just below the umbilicus
- Infraumbilically in the midline

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- b. The entry site should not be the site of a prior incision and should be free of gross contamination and infection.

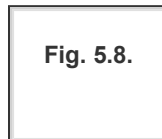
- c. The entry sites are percussed to confirm the presence of fluid and the absence of underlying bowel.
- d. The patient should empty his or her bladder prior to the procedure, and/or a Foley catheter should be placed to decrease the possibility of puncturing the bladder.

6. Technique—Diagnostic Sampling:

- a. Prepare site with sterile prep solution and drape with sterile towels.

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- b. Use 25-gauge needle to anesthetize skin and 22-gauge needle to anesthetize abdominal wall to peritoneum.
- c. Introduce IV catheter into the abdominal cavity, aspirating as it is advanced. The needle should traverse the abdominal wall at an oblique angle to prevent persistent leak of ascites from the puncture site (see Figure 5.8).



- d. When free flow of fluid occurs, the catheter should be advanced over the needle and the needle removed.

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- e. Draw 20–30 ml of fluid into a sterile syringe for diagnostic studies and culture.

7. Technique—Therapeutic Drainage:

- a. Prepare site with sterile prep solution and drape with sterile towels.
- b. Use 25-gauge needle to anesthetize skin and 22-gauge needle to anesthetize abdominal wall to peritoneum.
- c. Introduce IV catheter into the abdominal cavity, aspirating as it is advanced. The needle should traverse the abdominal wall at an oblique angle to prevent persistent leak of ascites from the puncture site.
- d. When free flow of fluid occurs, the catheter should be advanced over the needle and the needle removed. Alternatively, a CVP-type catheter with extra side holes may be placed over a guide wire using the Seldinger technique.
- e. After insertion of the needle and aspiration of fluid, a J-tip guide wire is placed through the needle into the peritoneal space. The needle is removed, leaving the wire in place.
- f. A stiff plastic dilator is used to dilate the tract by placing it over the wire and into the abdomen. A #11-blade scalpel can be used to make a tiny nick at the entry site as well.

- g. The dilator is removed, the catheter is placed over the wire and into the abdomen, and the wire is removed.
- h. Draw 20–30 ml of fluid into a sterile syringe for diagnostic studies and culture.
- i. IV tubing is hooked to the catheter and to a vacuum bottle to remove a large volume of fluid.
- j. Should the catheter become occluded, careful manipulation of the catheter to re-establish flow may be undertaken. Alternatively, asking the patient to turn on his or her side and again onto his or her back may also help re-establish flow. However, the needle or guide wire should not be reintroduced because of the risk of bowel injury. If less than an adequate volume is withdrawn, the catheter should be removed and replaced, possibly at another entry site.

#### 8. Complications and Management:

##### a. Hypotension

- Can occur during or after procedure due to rapid mobilization of fluid from intravascular space or due to vasovagal response.

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- IV hydration can prevent and correct the hypotension in most cases.
- 5% albumin solution or other colloid-based fluid is often used for this purpose.

##### b. Bowel perforation

- Rarely recognized at time of procedure
- Can lead to infected ascites, peritonitis, and sepsis

##### c. Hemorrhage

- Rare, but can be caused by injury to mesentery or injury to inferior epigastric vessels.
- Usually self-limited. Avoided by entering abdomen lateral to rectus and by correcting coagulopathy.
- Hemodynamic instability requires laparotomy.

##### d. Persistent ascites leak

- Usually will seal in <2 weeks. Can result in peritonitis.
- Skin entry site may be sutured to minimize leak.

##### e. Bladder perforation

- Avoided by inserting Foley catheter prior to procedure.
- May require a period of bladder catheterization until sealed.

- Obtain urology consult.

## ***B. DIAGNOSTIC PERITONEAL LAVAGE***

### 1. Indications:

Blunt abdominal trauma, in the setting of an equivocal or unreliable abdominal examination (e.g., after head trauma or intoxication) in a patient with unexplained hypotension or blood loss. It is particularly useful in a patient who is too unstable to transport for computed tomography (CT) scan or when CT is not available.

### 2. Absolute Contraindications:

- a. Indication for laparotomy is already present
- b. Pregnancy

### 3. Relative Contraindications:

- a. Cirrhosis—Ascites can make the lavage fluid laboratory studies difficult to interpret.
- b. Morbid obesity—Makes diagnostic peritoneal lavage (DPL) technically more difficult.
- c. Prior abdominal surgery—Increases the risk of bowel injury during the procedure.
- d. Suspected retroperitoneal injury—DPL results are often false-negative.

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### 4. Anesthesia:

1% lidocaine with 1/100,000 epinephrine to decrease bleeding and false-positive results

### 5. Equipment:

- a. Sterile prep solution
- b. Sterile towels, sterile gloves, gown, mask, cap
- c. Syringes: 5 ml, 10 ml, 20 ml
- d. 25-gauge needle
- e. Peritoneal dialysis catheter
- f. IV tubing
- g. 1000-ml bag of normal saline or Ringer's lactate
- h. Scalpel handle and #10 and #11 (or #15) blades

- i. Surgical instruments: tissue forceps, hemostats, Allis clamps, retractors, suture

6. Positioning:

Supine. The stomach should be decompressed by an NG or an OG tube (OG if head trauma is present). The bladder should be drained by a Foley catheter.

7. Technique:

- a. Prepare the entire abdomen with sterile prep solution and drape with sterile towels.
- b. With a 25-gauge needle and lidocaine with epinephrine, anesthetize a site in the lower midline approximately one-third the distance from the umbilicus to the symphysis pubis (see Figure 5.9).

**Fig. 5.9.**

- c. Make a small incision down to the linea alba (the linea alba is midline in position and recognized by its decussating fibers and absence of muscle beneath it).
- d. Incise the fascia and peritoneum in the midline for a length of approximately 1 cm, grasping the edges of the fascia with hemostats or Allis clamps (see Figure 5.10).

**Fig. 5.10.**

- e. Introduce the dialysis catheter into the peritoneal cavity at

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an oblique angle aiming toward the cul-de-sac, and advance it carefully into the pelvis.

- f. Aspirate from the catheter with a syringe. Gross blood (5 ml or more) or gross enteric contents are indications for immediate laparotomy.
- g. If no gross blood or enteric contents are aspirated, instill 10 ml/kg of warmed saline or Ringer's lactate, up to 1000 ml, via the IV tubing. Drainage of dialysate into a chest tube or Foley catheter is also an indication for laparotomy.
- h. After waiting 5–10 minutes, allow the fluid to drain by gravity back into its original bag.



- i. Send a sample of the fluid for cell count and amylase. Positive findings include a red blood cell count of  $>100,000/\text{mm}^3$ , a white blood cell count  $>500/\text{mm}^3$ , or amylase  $>175$ .
  - j. Note: Criteria for positive lavage findings may vary among individual trauma surgeons.
  - k. At the conclusion of the procedure, the catheter is removed and the fascia and skin are closed carefully using standard techniques (interrupted #1 Prolene, Vicryl, or PDS suture for fascia).
8. Complications and Management:
- a. Bladder injury
    - Preventable by inserting Foley catheter prior to procedure.
    - Treated by Foley catheter drainage for a period of several days.
  - b. Injury to bowel or other abdominal organ
    - Treated with nothing-by-mouth status, IV hydration, and IV antibiotics.
    - Bowel perforation with soilage requires laparotomy for repair.
  - c. Hemorrhage
    - Rarely life-threatening, but may lead to false-positive results, especially if source is skin or subcutaneous tissue.
    - Treated with nothing-by-mouth status, IV hydration, transfusion, and laparotomy if it persists.
  - d. Peritonitis
    - May be due to poor aseptic technique or bowel perforation.
    - Laparotomy may be necessary to rule out perforation.
  - e. Wound infection
    - A potential late complication. Incidence may be

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diminished by a dose of broad-spectrum IV antibiotics prior to procedure.

- Treated with antibiotics and by opening the wound and packing it.

### ***C. TENCKHOFF CATHETER INSERTION***

#### 1. Indications:

Short-term or chronic ambulatory peritoneal dialysis

## 2. Contraindications:

- a. Obliterated peritoneal space (prior surgery, infection, carcinomatosis)
- b. Ruptured diaphragm
- c. Respiratory insufficiency
- d. Presence of a large ventral or umbilical hernia

## 3. Anesthesia:

1% lidocaine (1/100,000 epinephrine may reduce bleeding)

## 4. Equipment:

- a. Surgical prep solution, sterile towels, sterile gloves
- b. Scalpel handle and #10 blade
- c. Tissue forceps
- d. Self-retaining retractor
- e. Double-cuff peritoneal dialysis catheter
- f. 3–0 absorbable suture on a taper-point curved needle
- g. 2–0 nylon suture on a curved cutting needle
- h. 25-gauge and 22-gauge needle
- i. 10-ml syringe

## 5. Positioning:

Supine. The stomach should be decompressed by an NG or an OG tube. The bladder should be drained by a Foley catheter.

## 6. Technique:

- a. Prepare the entire abdomen with sterile prep solution and drape with sterile towels.
- b. With a 25-gauge needle and lidocaine, anesthetize a site lateral
 

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 to the midline (over the rectus abdominus) approximately one-third the distance from the umbilicus to the symphysis pubis.
- c. Make a longitudinal incision approximately 5 cm in length down to the level of fascia.
- d. Anesthetize a tract for the creation of a subcutaneous tunnel, to a point 8–12 cm lateral to the incision, and make a small stab incision at this point (see Figure 5.11).

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**Fig. 5.11.**

- e. Tunnel the dialysis catheter such that the proximal cuff lies in a subcutaneous location and the distal cuff lies in the first incision (see Figure 5.12).



**Fig. 5.12.**

- f. Make an incision in the fascia and retract the rectus laterally, exposing the posterior fascia.
- g. Place a purse-string of 3–0 absorbable suture in the posterior fascia (see Figure 5.13).



**Fig. 5.13.**

- h. Under direct vision, carefully incise the posterior fascia and peritoneum in the center of the purse-string suture. Locally

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explore the peritoneal cavity to be certain that adhesions or viscera are not in the way.

- i. Carefully insert the catheter into the peritoneal cavity, aiming inferiorly and posteriorly, such that the distal cuff lies just anterior to the peritoneum. The catheter should feed easily and without resistance into the pelvis. Flush the catheter with heparinized saline (100 units/ml) and be certain of the lack of significant resistance (see Figure 5.14).



**Fig. 5.14.**

- j. Secure the catheter with the purse-string suture.
- k. Close the anterior fascia around the catheter such that the cuff lies within the muscle.
- l. The skin may be closed in the usual fashion.
- m. Secure the catheter where it exits the smaller incision with skin sutures.

- n. The function of the catheter should be tested by infusing 1 l of saline or Ringer's lactate and then allowing it to drain by gravity.
- o. Peritoneal dialysis can begin the same day, using small volumes (1 L).

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7. Complications and Management:

- a. Injury to intra-abdominal viscus
  - May occur in the setting of extensive adhesions or previous surgery
- b. Peritonitis
  - An ever-present risk that requires careful technique and surveillance
  - Treated with IV and/or intraperitoneal antibiotics
  - May occasionally require removal of catheter
- c. Catheter dysfunction
  - May be caused by ingrowth of tissue or adhesions to the catheter, and usually requires catheter removal.
  - If it is placed correctly deep in the pelvis, catheter is less likely to be occluded by omentum.

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