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Sengstaken-Blakemore Tube

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Overview

Balloon tamponade of bleeding esophageal varices was described as early as the 1930s. A double-balloon tamponade system originally developed by Sengstaken and Blakemore in 1950 has undergone relatively few changes to the current day.^[1, 2, 3] The 3 major components of a Sengstaken-Blakemore tube are a gastric balloon, an esophageal balloon, and a gastric suction port. The addition of an esophageal suction port to help prevent aspiration of esophageal contents resulted in what is called the Minnesota tube. Another nasogastric (NG) device with a single gastric balloon is most effective at terminating bleeding from gastric varices and is known as the Linton-Nachlas tube.^[4] The advent of endoscopy has reduced the use of balloon tamponade, but the use of such devices can still be temporizing or lifesaving, despite their potential for serious complications.^[5, 6, 7, 8]

See the images below.



Sengstaken-Blakemore tube. Image courtesy of Richard Treger, MD.



Linton-Nachlas tube. Image courtesy of Richard Treger, MD.

Indications

- Acute life-threatening bleeding from esophageal or gastric varices that does not respond to medical therapy (including endoscopic hemostasis and vasoconstrictor therapy)^[9, 10, 11]
- Acute life-threatening bleeding from esophageal or gastric varices when endoscopic hemostasis and vasoconstrictor therapy are unavailable

Contraindications

- Variceal bleeding stops or slows
- Recent surgery that involved the esophagogastric junction
- Known esophageal stricture

Anesthesia

- Topical anesthetic (spray and jelly) for oropharynx (For more information, see Anesthesia, Topical.)
- Intubation and sedation for most patients

Equipment

- Gastroesophageal balloon tamponade tube
- Y-tube connector or similar adapter (if not already part of the tamponade balloon ports): See the images below.



Y-tube connector. Image courtesy of Richard Treger, MD.



Lopez valve. Image courtesy of Richard Treger, MD.

• Traction device or setup (See the image below.)



Pulley device for traction. Image courtesy of Richard Treger, MD and Stanley Dea, MD.

• Manual manometer or sphygmomanometer (See the image below.)



Sphygmomanometer. Image courtesy of Richard Treger, MD.

• Vacuum suction device with suction tubing and connectors (See the image below.)



Vacuum suction device. Image courtesy of Richard Treger, MD.

- Tube clamps, 4
- Large (60 mL) irrigating syringe (catheter tip)
- Soft restraints
- Water-soluble lubricating jelly
- Scissors for emergency balloon decompression

Positioning

- Elevate the head of the bed to 45° and position the patient on the bed.
- The left lateral decubitus position is an acceptable alternative position.

Technique

The following instructions pertain to the Sengstaken-Blakemore and Minnesota tubes. The same principles apply to the Linton-Nachlas tube, even though it has only a single gastric balloon.

- Control of the patient is essential. Routine use of soft restraints and medications for sedation should be considered in most patients.
- The threshold to perform endotracheal intubation should be low, as the risk of regurgitation and aspiration is extremely high. To minimize this risk, perform nasogastric (NG) lavage and maximal stomach evacuation prior to the placement of an esophageal tamponade tube.
- Ensure that all the appropriate equipment is present. Ensure that the balloons on the tamponade tube are free of leaks (optimally, test this while balloons are submerged under water).
- (Optional step) If monitoring gastric balloon pressure, inflate the gastric balloon in increments (typically 100 mL) up to the maximum recommended volume (usually 500 mL) while the pressure is measured with the manometer. Note the pressure at each given volume. See the image below.



Setup for measuring gastric or esophageal balloon pressure. Image courtesy of Richard Treger, MD.

• (Optional step) If the NG tube is used, tie it along the course of the tube with silk sutures, with the tip of the NG tube 3-4 cm proximal to the esophageal balloon. This step is not required if the tube has esophageal aspiration ports (ie, Minnesota tube). See the image below.



NG tube tied along Sengstaken-Blakemore tube. Image courtesy of Richard Treger, MD.

- Position the patient appropriately and anesthetize the posterior pharynx and nostrils with a topical anesthetic.
- Suction all air from the gastric and esophageal balloons. See the image below.



Air being suctioned from gastric balloon using 60-mL syringe. Image courtesy of Richard Treger, MD.

• Clamp the balloon ports or insert the plastic plugs into the lumens (if provided with the tube). See the image below.



Plastic plug being inserted into lumen of balloon port. Image courtesy of Richard Treger, MD.

- Coat the balloons on the tube with water-soluble lubricating jelly.
- Pass the tube to at least the 50-cm mark. The tube can be passed through the nostrils or, preferably, through the mouth. The oral route is especially preferred in intubated patients. See the image below.



Illustration of placement of Sengstaken-Blakemore tube. Image courtesy of CR Bard, Inc.

- Apply suction to the gastric and esophageal aspiration ports.
- (Optional step) If monitoring gastric balloon pressure, remove the tube clamps (or plastic plugs, if used) from the gastric balloon inflation ports. Introduce increments of <u>air</u> (usually 100 mL) through the gastric balloon inflation port while the pressure is again measured with the manometer. If, at any given increment, the gastric balloon pressure is 15 mm Hg greater than readings previously obtained during testing (ie, before intubation), then deflate the balloon, as it may be located in the esophagus.
- When the gastric balloon is correctly positioned in the stomach, inflate the balloon with the full recommended volume of <u>air</u> (usually <u>450-500</u> mL) and then clamp the air inlet and pressure-monitoring outlet. Check proper placement by irrigating the gastric aspiration port with water while auscultating over the stomach. If correct tube placement is at all uncertain or if time permits, obtain a portable chest radiograph.
- Pull the tube back gently until resistance is felt against the diaphragm.
- Secure the proximal end of the tube using a traction device. A pulley device can be used to maintain the desired 0.45-0.91 kg (1-2 lb) of traction. A 500-mL bag of intravenous fluid can serve as a convenient initial weight. Alternatively, tubes can be secured with tape to the mouth guard of a football helmet. A foam rubber cuff, which is generally included in the package with the tube itself, can be used to maintain traction against the nose if the tube has been inserted through the nostrils. See the image below.



Pulley device for traction. Image courtesy of Richard Treger, MD and Stanley Dea, MD.

 If bleeding persists from the gastric aspiration port (or from the esophageal aspiration port on a 4-lumen tube), inflate the esophageal balloon to the lowest pressure needed to stop bleeding (usually 30-45 mm Hg), and then clamp the port for the esophageal balloon. Check the balloon pressure periodically. See the image below.



Illustration of setup for inflating and measuring pressure in esophageal balloon. Image courtesy of CR Bard, Inc.

- If bleeding persists from the gastric aspiration port after inflation of the gastric and esophageal balloons, increase the external traction on the tube (maximum of 1.1 kg [2.5 lb]). In this case, the bleeding typically originates from a gastric rather than an esophageal varix.
- Confirm correct tube position by immediate portable radiograph.
- After bleeding has been controlled, reduce the pressure in the esophageal balloon by 5 mm Hg every 3 hours until 25 mm Hg is reached without bleeding; this pressure is generally maintained for the next 12-24 hours. If bleeding is controlled, deflate the esophageal balloon for 5 minutes every 6 hours to help prevent esophageal necrosis.
- Once satisfactorily positioned, the tube is generally left in place for 24 hours. If bleeding recurs, the gastric balloon and, if necessary, the esophageal balloon may be reinflated for an additional 24 hours. However, given the high mortality among patients who rebleed, consider alternatives such as sclerotherapy and transjugular intrahepatic portacaval shunt (TIPS).

Pearls

- In most cases, the esophageal balloon is not inflated during the initial placement of the tube. <u>Never</u> inflate the <u>esophageal</u> balloon <u>before</u> the <u>gastric</u> balloon.
- Keep a pair of <u>scissors</u> near the patient at all times in case the balloons migrate superiorly and obstruct the airway. The <u>whole tube</u> can be <u>cut</u> and <u>removed</u>.
- Direct pressure from the tube can cause mucosal ulceration. Perform frequent examinations to ensure that the tube is not placing excessive force on any given surface.
- Generally, the esophageal tamponade tube is a temporizing measure and should not be left in place for more than 24 hours.

Complications

- Aspiration:^[10] This is probably the most frequent major complication. The greatest risk of aspiration occurs during insertion. The risk of aspiration can be minimized by evacuating the stomach prior to tube placement and maintaining a low threshold for endotracheal intubation.^[12]
- Asphyxiation:^[13, 14] This complication is caused by proximal migration of the tube and can be prevented with endotracheal intubation. If tube migration results in airway obstruction, cutting across all the tube lumens just distal to the points of bifurcation allows immediate extraction of the entire tube.

- Esophageal <u>perforation</u> or rupture:^[15] This can occur with inflation of a gastric balloon that is inadvertently placed in the esophagus or can be secondary to esophageal mucosal necrosis that results from excessive or prolonged inflation of the esophageal balloon.
- Minor complications include the following:
 - Pain
 - Pharyngeal and gastroesophageal erosions and ulcers caused by local pressure effects
 - Pressure necrosis of the nose, lips, and tongue
 - Hiccups

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