Emergency Medical Retrieval Service (EMRS)

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Standard Operating Procedure

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Aims

- To ensure knowledge of correct clinical situations in which to use tube.
- To ensure knowledge of how to use tube effectively.
- To ensure patient safety in the aeromedical environment.

Background

Balloon tamponade of bleeding oesophageal 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. The 3 major components of a Sengstaken-Blakemore tube are a gastric balloon, an oesophageal balloon, and a gastric suction port. The addition of an oesophageal suction port to help prevent aspiration of oesophageal contents resulted in what is called the Minnesota tube. The advent of endoscopy has reduced the use of balloon tamponade, but the use of such devices can still be temporizing or lifesaving, particularly in the EMRS setting.

Application

EMRS Team Members
SAS Paramedics
Policy

The Oesophagogastric Tamponade Tube should be considered in the following situations:

- Acute life-threatening bleeding from oesophageal or gastric varices that does not respond to medical therapy (including endoscopic haemostasis and vasoconstrictor therapy).
- Acute life-threatening bleeding from oesophageal or gastric varices when endoscopic haemostasis and vasoconstrictor therapy are unavailable.

Blakemore/Sengstaken Tube

Designed for emergency control of bleeding oesophageal varices and as a diagnostic aid in determining the source and/or extent of haemorrhage into the stomach. Introduced orally or through nasal passage. Single-use, non-sterile. Not carried by EMRS but may already be in situ.

Minnesota Tube

Four-lumen, double-balloon design used in the treatment of bleeding oesophageal varices or simple oesophageal haemorrhaging. Elongated oesophageal balloon helps control bleeding. Third and fourth lumens facilitate suctioning above the oesophageal balloon and in the stomach. Single-use, non-sterile.
EMRS have Bard Minnesota tubes available. The tubes contain latex and should be stored at room temperature. These should be taken along with ancillary equipment to allow use – aneroid sphygmomanometer, 50ml bladder tipped syringe, 2 tongue depressors and 2 clamps with protected jaws. The equipment shall be in a bag with the tube. Instructions are packaged with the tube.

Aneroid sphygmomanometer with 50ml bladder tipped syringe and 2 clamps, and complete kit in bag.

**EMRS experience suggests that all patients should be intubated and ventilated prior to insertion of the Minnesota tube.**

This SOP describes two methods of use – either inflating the tube with **air** or **water**. Neither is a perfect solution for aeromedical transport, but represent pragmatic solutions depending on the situation presented.

**AIR Inflation**

- As recommended by tube manufacturer.
- Allows pressure to be monitored during inflation as a warning of oesophageal placement of the gastric balloon.
- **Requires low altitude transfer or King air cabin pressurized to sea level.**
- Requires constant monitoring of tube balloon pressure during flight.
- Upon ascent, atmospheric pressure reduction will make balloon enlarge. This may cause injury to the patient.
- Upon decent the balloon may decrease in size causing migration, loss of tamponade and patient injury if then inflated while gastric balloon has entered oesophagus.

**WATER Inflation**

- Outwith manufacturer’s directions for use.
- Does not allow pressure to be monitored during inflation as a warning of oesophageal placement of the gastric balloon. Risks oesophageal rupture.
- No “feel” of inflation pressure as fluid traveling down narrow tube to inflate balloon.
- Requires 200-250mls of **water** to fill balloon to same size as 500mls of air.
- Monitoring of tube balloon pressure not possible, therefore limiting to gastric balloon only.
• Effects of varying atmospheric pressure or altitude negligible as water incompressible.

**Testing & Preparation - AIR**

1. Assemble the equipment: Minnesota tube, Lubricating jelly, tie to secure tube, 2 tongue depressors to bridge mouth and secure tube, 50ml bladder tip syringe, 2 clamps, aneroid sphygmomanometer.

2. Connect the aneroid sphygmomanometer to the one of the lumens that leads to the gastric balloon.

3. Inflate stomach balloon with incrementally 100, 200, 300, 400 and 500ml of **air**, and immerse in water to test for leaks. For each volume of **air**, write down the pressure reading obtained.

4. Inflate oesophageal balloon and immerse in water to test for leaks.

5. Remove all **air** from “stomach” and “oesophageal” balloons and close “inflation” ports with the plugs. Place tube in ice water to stiffen the tube. In use, do not rely on the plugs alone – tube should be clamped as well.

**Placement – AIR inflation**

1. Intubate and ventilate patient.

2. Lubricate Minnesota tube and introduce through the mouth, beyond the 50cm mark, ensuring the tip of the tube is in the stomach. It is vital that the gastric balloon be in the stomach and not the oesophagus during inflation otherwise oesophageal rupture will result. The tube is radio-opaque. Gastric aspirate can be pH tested.

3. Suction gastric and oesophageal aspiration lumens to avoid regurgitation of gastric contents during inflation of gastric balloon.

4. Using the 50ml syringe, inflate gastric balloon with 100, 200, 300, 400 and 500ml of **AIR** (100ml incremental boluses). At each volume, measure the pressure. If at any point it is 15mmHG above the reading obtained during the test, **stop** – this
represents oesophageal inflation of the gastric balloon. Deflate and repass tube if this occurs.

5. Clamp the gastric balloon lumen.

6. Pull Minnesota tube back gently until firm resistance is felt at diaphragm / gastroesophageal junction. Secure the tube so that the position is maintained with minimal tension.

7. Lavage the stomach with normal saline solution. This should be continued through the gastric aspiration lumen until the aspirate is clear.

8. If oesophageal varices continue bleeding, inflate oesophageal balloon to 35 to 45 mm Hg. **Never inflate above 45 mmHg.** Connect the sphygmomanometer to the oesophageal balloon lumen.

9. The oesophageal balloon pressure should be maintained at lowest level that stops bleeding. Deflate for at least five minutes every six hours. Also deflate by 5 mmHg every 3 hours until a pressure of 25 mmHg is obtained without bleeding. Most varices will be stopped by a correctly applies gastric balloon and therefore the oesophageal balloon should not be used in these cases.

10. If further continuous bleeding occurs after oesophageal tamponade, this is likely from gastric varix and the tube can be subjected to gentle traction. This can cause mucosal ischemia in a few hours therefore should only be applied cautiously for short time intervals.

11. Keep scissors all the time at bedside.

12. If moving with sphygmomanometer connected, tape connections to secure.

13. Perform periodic gastric and oesophageal lavage with lukewarm water to assess for continuous bleeding.

14. **Transport should minimize pressure changes.** Fixed wing requires pressurization of the cabin to sea level, and helicopters should maintain low altitude. No data exists for a safe height. Balloon pressure should be monitored in flight, as should tube position to prevent migration. It is not recommended to have the oesophageal balloon inflated in flight as overinflation of it as the pressure changes is likely to cause injury. This is less of a consideration in a pressurized cabin.

15. Document pressure readings.
Testing & Preparation - Water

1. Assemble the equipment: Minnesotta tube, Lubricating jelly, tie to secure tube, 2 tongue depressors to bridge mouth and secure tube, 50ml bladder tip syringe, 2 clamps, aneroid sphygmomanometer.

2. Test with air. Inflate stomach balloon with incrementally 100, 200, 300, 400 and 500ml of air, and immerse in water to test for leaks. For each volume of air, write down the pressure reading obtained.

3. Inflaote oesophageal balloon and immerse in water to test for leaks.

4. Remove all air from “stomach” and “oesophageal” balloons and close “inflation” ports with the plugs. Place tube in ice water to stiffen the tube. In use, do not rely on the plugs alone – tube should be clamped as well.

Placement – WATER inflation of gastric balloon

1. Intubate and ventilate patient.

2. Lubricate Minnesota tube and introduce through the mouth, beyond the 50cm mark, ensuring the tip of the tube is in the stomach. It is vital that the gastric balloon be in the stomach and not the oesophagus during inflation otherwise oesophageal rupture will result. The tube is radio-opaque. Gastric aspirate can be pH tested.

3. Suction gastric and oesophageal aspiration lumens to avoid regurgitation of gastric contents during inflation of gastric balloon.

4. Inflate gastric/stomach balloon with 200 – 250mls of WATER.

5. Clamp gastric balloon lumen.

6. Pull Minnesota tube back gently until firm resistance is felt at diaphragm / gastroesophalgeal junction. Secure the tube so that the position is maintained with minimal tension.

7. Lavage the stomach with normal saline solution. This should be continued through the gastric aspiration lumen until the aspirate is clear.

8. If oesophageal varices continue bleeding, inflate oesophageal balloon with air. (As the oesophagous is more pressure sensitive, the pressure must be monitored. This necessitates air inflation. – See air inflation section points 8&9 for method and cautions.

9. If further continuous bleeding occurs after oesophageal tamponade, this is likely from gastric varix and the tube can be subjected to gentle traction. This can cause mucosal ischemia in a few hours therefore should only be applied cautiously for short time intervals.
10. Keep scissors all the time at bedside.

11. If moving with sphygmomanometer connected, tape connections to secure.

12. Perform periodic gastric and oesophageal lavage with lukewarm water to assess for continuous bleeding.

13. **It is not recommended to have the oesophageal balloon inflated in flight as overinflation of it as the pressure changes is likely to cause injury. This is less of a consideration in a pressurized cabin.**

14. **Do not attempt to measure pressure in water filled balloon – this will break the sphygmomanometer.**