The Title of Chapter

Nasogastric intubation, inserting a nasogastric and Sengstaken-Blakemore tube for diagnostic, therapeutic and feeding reasons

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1. The goal of this chapter

Inserting a nasogastric tube is a common hospital ward and emergency room procedure. In this chapter the anatomical basis, indication, contraindication and technique of this procedure will be discussed. Furthermore we demonstrate the main point of Sengstaken Blackmore tube application. Furthermore the basic principles and general rules will be discussed.

2. Elements/Terms/Definitions

A nasogastric (diagnostic, therapeutic and feeding) tube: is a thin, plastic tube through the nose, past the throat, and down into the stomach, used for administering drugs, fluid etc. and can be used for feeding or gastric lavage.

Sengstaken-Blakemore tube: A variety of specialized nasogastric and orogastric tubes have been developed for use as devices to control bleeding esophageal varices inpatients with liver cirrhosis) with balloon tamponade. The Sengstaken-Blakemore (SB) tube is a triple-lumen, soft rubber tube with esophageal and gastric balloons.

3. Nasogastric intubation

The placement of a nasogastric tube is common used emergency medical technique in different medical ward, hospital surroundings (emergency medicine, internal medicine, gastroenterology, surgery, geriatric medicine etc.).

Indications of nasogastric intubation

Patients who are experiencing episodes of vomiting due to gastric distension should undergo nasogastric intubation, and indications for this procedure include diagnostic (eg. bleeding), and therapeutic gastric lavage (drug poisoning, ileus) and gastric decompression.

Contraindications of nasogastric intubation

1) Massive facial trauma or basilar skull fracture.
2) Esophageal injury.
3) Malformations: choanal atresia and esophageal atresia.
4) Esophageal stricture, Zenker's diverticulum.
5) Recent oropharyngeal, nasal, or gastric surgery; recent esophago-gastrostomy.
6) Previous gastrectomy.

§ The indication of gastric lavage in patients with poisoning when no contraindication and the patients who have ingested a potentially life-threatening amount of poison in whom the procedure can be performed within 60-120 minutes. Aspirin, alcohol, barbiturates, anticholinergic drugs are slowing the emptying the stomach, the opiates, atropine, antidepressant and phenitoin can decrease the bowel movement, so in such cases, gastric lavage should be carried out even after 8-12 hours after ingestion.
Equipment needed for nasogastric intubation
1) Gloves, goggles, and gown.
2) Emesis basin and protective sheets.
3) Nasogastric tube.
4) Lubricating Jelly.
5) Suction syringe, 30·ml, with catheter tip.
6) Suction tube and suction device.
7) Glass of water and a straw.
8) Adhesive tape.

Personnel required for nasogastric intubation.
One professional person can successfully perform this procedure unaided.

Patient preparation for nasogastric intubation
Written consent is not needed for this procedure, but it is essential that the operator explain to the patient that the introduction of the tube can cause unpleasant signs (nausea, cough, etc). The patient should also understand the need for neck flexion in order to prevent placement of the tube in the trachea.

Patient positioning for nasogastric intubation
The good cooperating, conscious patients should be in a comfortable, sitting position. Unconscious patients should be supine with the head slightly elevated.

Anatomy basis of nasogastric intubation
The nasogastric tube enters either nostril and traverses the floor of the nasal cavity into the nasopharynx. From there it courses into the oropharynx to the level of the larynx, where it can go either anteriorly into the trachea or posteriorly into the esophagus. If the patient swallows and maintains cervical flexion, the entrance to the trachea is closed and the tube can enter only the esophagus (Figure 17-1).

The method of nasogastric intubation
1) Don gloves, goggles, and gown.
2) Measure the distance from the patient's ear to the umbilicus to determine the approximate length of tubing necessary for this procedure (Figure 17-2).
3) Lubricate the end of the tube with lidocaine jelly lubricant.
4) Have the patient hold the water and straw to the patient's mouth.
5) Insert the tube into one of the nostrils and advance straight back along the floor of the nasopharynx until resistance is met (the patient will usually let you know when this happens). Using gentle pressure and pushing straight back at a right angle to the long axis of the head, advance the tube posteriorly through the nasopharynx. Have the patient take a small sip of water through the straw and hold it in the mouth. Tell the patient to swallow. While he or she is swallowing, advance the tube into the esophagus (Figure 17-3). If this is successful, the patient will experience a mild gag. If not, and the tube slips into the trachea, violent coughing and gagging will occur. Withdraw the tube and attempt insertion a second time. For a clue to the position of the tube, listen at its open end; if air exchange is heard, the tube is improperly placed.
6) When the tube is in the esophagus, advance it into the stomach.
7) Once the nasogastric tube is in the stomach, withdraw some gastric succus.
8) Then inject air down the tube while listening over the left upper quadrant for the sound of air leaving the tube and bubbling in the stomach (Figure 17-4). If no sound is heard, reposition the tube and inject more air. If these two attempts are unsuccessful, check for the presence of respiratory gas exchange in the tube, make sure that the tube is not curled in the patient’s mouth and obtain a chest x-ray to check the tube's position.

9) Secure the tube to the nose with tape and benzoin, making sure that the tube does not exert pressure on the nostril (Figure 17-5).

Gastric lavage in patients with poisoning
Contrary to procedure described above for the nasogastric tube, for gastric lavage we use larger tube (36F-42 F). Usually we use 10 to 20 liters lukewarm water for gastric lavage, and it is carried out until the washing liquid drug residues found. The optimal postures of the stomach lavage are the Trendelenburg position, or right lateral position. However, the procedure can be performed in a sitting position and supine as well.

Figure 17-1. The course of nasogastric tube in the pharynx
Figure 17-2. Estimation of the nasogastric tube’s length

Figure 17-3. The technique of nasogastric intubation
Possible complications of nasogastric intubation

1) Gastric erosion with hemorrhage.
2) Mucosa erosion, necrosis of the nasal mucosa.
3) Aspiration and aspiration pneumonia.

Patient follow-up after nasogastric intubation

1) Make sure the nasogastric tube is functioning properly.
2) Periodically verify that there is no necrosis of the nostril.
Nasogastric feeding tube insertion
The basic feeding tube consists of a silastic or polyurethane tube with a weighted distal tip and a stylet guidewire that is inserted into the tube prior to insertion to stiffen it and facilitate passage into the stomach (Figure 17-6).

Figure 17- 6 Characteristics of nasogastric feeding tube

Indication of nasogastric feeding tube insertion
Nasogastric feeding tubes are used to provide enteral nutritional support.

Contraindications of nasogastric feeding tube insertion
Patient's inability to tolerate liquid nasogastric feeding because of regurgitation and possible aspiration, but otherwise is similar to the procedure described above for the nasogastric tube insertion.

Equipment needed of nasogastric feeding tube. Similar to the procedure described above for the nasogastric intubation, but three additional equipments are needed.
   1) Because of the feeding tubes are rather soft, a supporting guidewire stylet is necessary.
   2) Intravenous tubing and appropriate bag or bottle to hold the liquid feeding solution.
   3) Food coloring to add to the feeding solution.

Personnel required for nasogastric feeding tube intubation
One professional person can successfully perform this procedure unaided.

Patient preparation for nasogastric feeding tube intubation
Similar to the procedure described above for the nasogastric intubation.

Patient positioning for nasogastric feeding tube intubation
Similar to the procedure described above for the nasogastric intubation.
Anatomical knowledge of nasogastric feeding tube intubation
Similar to the procedure described above for the nasogastric intubation.

Procedure of nasogastric feeding tube intubation
Similar to the procedure described above for the nasogastric intubation, only one additional equipment using important: because of the feeding tubes are rather soft, a supporting guidewire stylet is necessary. Once the tube position has been confirmed by a radiograph, remove the stylet guidewire (Figure 17-7).
Never reinsert a guidewire into a feeding tube after it has been placed into a patient. This may result in the passage of the guidewire through the wall of the tube and subsequent gastrointestinal perforation.

Figure 17-7. Remove the guidewire after confirmation by radiograph of proper position of distal tip of the tube

Possible complications of nasogastric feeding tube intubation
Similar to the procedure described above for the nasogastric intubation, gastric erosion, hemorrhage, erosion or necrosis of the nasal mucosa or skin, aspiration pneumonia, etc.

Patient follow-up of patients with nasogastric feeding tube
1) Careful attention should be paid to tube position. Ideally, the distal tip of the feeding tube should be in the proximal duodenum or at least in the distal stomach.
2) The small feeding tube should be cleansed with irrigating solution if feedings are stopped.
Sengstaken-Blakemore tube insertion
A variety of specialized nasogastric and orogastric plastic tubes have been developed for use as devices to control bleeding esophageal varices with balloon tamponade. The 3 lumen 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. The Minnesota tube has an additional fourth lumen for aspiration of esophageal secretions (Figure 17-8).

Figure 17-8. Sengstaken-Blakemore and Minnesota tube

These two tubes effectively control hemorrhage from esophageal varices by increasing intraluminal pressure in the gastric cardia and lower third of the esophagus above the perfusion pressure of the submucosal venous plexus. This is accomplished by inflation of the gastric balloon followed, if necessary, by inflation of the esophageal balloon until no further bleeding is detected.

Indications of insertion of Sengstaken-Blakemore tube
1) Uncontrollable hemorrhage from presumed esophageal varices with impending shock.
2) Continued hemorrhage, with or without hemodynamic compromise, from esophageal varices after sclerotherapy.

Contraindications of insertion of Sengstaken-Blakemore tube
1) Ability to control variceal hemorrhage by another method, such as emergent sclerotherapy.
2) Lack of appropriate monitoring after insertion of the tube in an intensive care unit.
3) Inability to protect the patient's airway.

Equipment needed for insertion of Sengstaken-Blakemore tube
1) Goggles, gloves, gown, and protective sheets.
2) Sengstaken-Blakemore tube.
3) Suction probe.
4) Wall suction or portable suction.
5) Mercury manometer or aneroid pressure gauge.
6) Y connector or three-way stopcock.
7) Three rubber-clad clamps.
8) Lubricating jelly (preferably with lidocaine).
9) Lidocaine spray, 10%.
10) Glass of water and a straw.
11) Manometer’ grade rubber tubing, 2-3 feet.
12) Irrigating syringe 50·ml; water basin.
13) Tongue depressors and gauze pads to secure the tube.

**Personnel required for insertion of Sengstaken-Blakemore tube**

Two people are needed to insert this tube. This procedure should be performed by an experienced gastroenterologist, or other specialists (intensive therapist or emergency medicine specialist).

**Patient preparation for insertion of Sengstaken-Blakemore tube**

Explain the reason for the procedure to facilitate patient cooperation and informed consent is required. Consent is implied if the tube is utilized in a serious clinical state (eg, exsanguinations esophageal hemorrhage).

**Patient positioning for insertion of Sengstaken-Blakemore tube**

The patient should be supine, with the heard of the bed elevated 30-45 degrees, and in a location where he or she will be intensively monitored.

**Figure 17-9. Anatomy of oesophago-gastric junction with oesophageal and gastric varices.**

**Anatomy knowledge for insertion of Sengstaken-Blakemore tube**

Esophageal varices occur from increased portal venous pressure. Resulting in increased portal venous pressure, blood will find its way into the systemic venous circulation via other portal-systemic shunts. One such shunt is through the cardio esophageal venous plexus (Figure 17-
When veins in this plexus become distended with increasing flow of portal venous blood, they are prone to erosion in the distal esophagus. The mucosa over the distended veins becomes thinner, and irritation by gastric acid or mechanical irritation can rupture the thin-walled veins, causing hemorrhage.

**Procedure for insertion of Sengstaken-Blakemore tube**

1. Prepare all needed equipment.
2. Test the balloons for air leaks and lubricate the lower end of the balloons with jelly. Evacuate all air from the balloons.
3. Wash hands and don gloves, goggles, and gown. Put the protective sheets in place.
4. If the patient is conscious coat the nasopharynx with Lidocaine spray and wait two to three minutes. Pass the tube through the mouth or one nostril with steady pressure until the tip of the tube is into the posterior pharynx.
5. While the patient swallows some water, advance the tube inferiorly into the esophagus (*Figure 14-10*). Advance the tube to the hub (the gastric balloon will be in the patient's stomach at this point).
6. Fill the irrigating syringe with air and listen over the patient's stomach with a stethoscope while pushing the air down the gastric aspiration port. A gurgling sound should be heard in the stomach as a result of air escaping from the tube (*Figure 17-11*). If no air is heard, withdraw the tube and insert again. Do not inflate either balloon until the tube is known to be in the stomach. Inflation of the gastric balloon in the esophagus has resulted in fatal esophageal perforation.
7. After confirming the position of the tube in the stomach, inflate the gastric balloon with 50 mL of air and clamp the gastric balloon port with two rubber-clad clamps.
8. Pull back on the tube until resistance of the balloon against the stomach cardia is felt, and secure the tube by taping a cuff of sponge rubber to the tube just distal to the patient's mouth or nostril (*Figure 17-12*). Allow enough tension to almost lift the patient's head off the bed. Almost all variceal bleeds can be controlled with the use of the gastric balloon alone. Rarely is it necessary to inflate the esophageal balloon as well.
9. Construct a pressure reading device by connecting the esophageal port to a Y connector or three way stopcocks. Use a segment of the rubber hose if needed. Connect a manometer or aneroid pressure gauge to one port of the Y connector or three-way Stop cock and an inflating bulb or the 50mL syringe to the other.
10. Inflate the esophageal balloon to 35-40 mm Hg of pressure with a sphygmomanometer (*Figure 17-13*).
11. Aspirate through the gastric aspiration port of the tube and evacuate the stomach of all blood and water. Irrigate the stomach, if needed, to completely evacuate all contents.
12. Continue to lavage the stomach for 30 minutes and check for bright red bleeding. If bleeding continues, increase the esophageal balloon pressures to 45 mm Hg. While increasing the balloon pressure by increments of 2 mm Hg, continue to lavage the stomach to determine the exact pressure at which bleeding is controlled.
13. Record the pressure in the esophageal balloon.
14. Obtain a chest x-ray and abdominal film immediately to check for proper placement of the tube. Secure the tube to the face with tongue depressors placed against the nostril or mouth. (*Figure 17-14*).
15) If using a Sengstaken-Blakemore tube, pass a standard nasogastric sump tube down the esophagus to evacuate all secretions that collect above the esophageal balloon.

16) Check pressure in the esophageal balloon every hour so that air leaks in the balloon can be quickly detected before bleeding recurs. The gastric contents and esophageal contents above the balloon should be checked and irrigated to make sure that no bleeding goes undetected. In all cases, the esophageal balloon should be deflated within 24 hours to prevent ischemic necrosis of the distal esophagus.

Figure 17-10. Insertion of a Sengstaken-Blakemore tube into the stomach
Figure 17- 11. Injection of air into the stomach during auscultation to verify tube position.
Figure 17-12. Placement of tension on the tube after the inflation of the gastric balloon
Figure 17-13. Inflation of esophageal balloon
Figure 17-14. The Sengstaken-Blakemore tube secured with tongue depressors
**Figure 17-15. Cutting of tube with a pair of scissors to rapidly deflate the balloon**

Possible complications of insertion of Sengstaken-Blakemore tube

1) Vomiting and aspiration during insertion.
2) Obstruction of the airway. In this case, immediately cut the tube to deflate all balloons simultaneously and withdraw the tube (Figure 17-15).

Patient follow-up after using of Sengstaken-Blakemore tube

1) Check the amount and character of gastric and esophageal contents and make certain to remove all gastric and esophageal secretions completely.
2) Ensure that the patient receives adequate sedation which is essential to reduce gagging and decrease the possibility of regurgitation of the tube and balloons.
3) Obtain a portable x-ray at least once a day to verify the position of the gastric balloon.
4) Before removing the tube, deflate all balloons. The best way to ensure that all air is out of the balloons is to cut the tube in half before withdrawing it from the esophagus.
4. Self assessment questions / answers

Question: What type of gastrointestinal intubation do you know?
Answer: 1) Diagnostic nasogastric intubation  
2) Therapeutic nasogastric intubation  
3) Nasogastric feeding tube  
4) Sengstaken-Blakemore tube

Question: What are the indications for nasogastric intubation?
Answer: Patients with episodes of vomiting due to gastric distension should undergo nasogastric intubation. Indications for this procedure include diagnostic (e.g. bleeding), and therapeutic gastric lavage and gastric decompression.

Question: What are the indications for nasogastric feeding tube?
Answer: Nasogastric feeding tubes are used to provide enteral nutritional support for a patient who possesses a functional alimentary tract but is unable to eat.

Question: What are the indications for Sengstaken-Blakemore tube?
Answer: 1) Uncontrollable hemorrhage from presumed esophageal varices.  
2) Continued bleeding, with or without hemodynamic compromise, from esophageal varices after sclerotherapy.

Question: List the possible complications of nasogastric feeding tube insertion.
Answer:  
- Gastric erosion with bleeding.  
- Nasal mucosa erosion, and erosion or necrosis of nasal skin.  
- Aspiration pneumonia.  
- Sinusitis.  
- Misplace of the nasogastric tube.
5. Case reports

**Case 1**
A 44-year-old patient with alcoholic liver cirrhosis and chronic renal disease combined with respiratory insufficiency was admitted to hospital because of huge amount of hematemesis with circulatory shock.
Question:
Which type of tube would stabilize the situation?
Answer:
The Sengstaken-Blakemore tube.

**Case 2**
A 93-year-old man was admitted to intensive care unit because of respiratory insufficiency due to pneumonia. He is on prolonged mechanical ventilation.
Question:
What type of tube must be inserted?
Answer:
Nasogastric feeding tube.

**Case 3**
A 24-year-old women 3 hours prior to admission ate poisonous mushrooms (Amanita phalloides).
Question:
What type of tube will be inserted?
Answer:
Insertion of wide nasogastric tube for gastric lavage.

**Case 4**
A 65-year-old man suffered esophageal injury because of thoracic trauma.
Question:
How to insert the nasogastric feeding tube?
Answer:
Insertion of nasogastric feeding tube is contraindicated.

**Case 5**
During the insertion of a Sengstaken-Blakemore tube dyspnoe developed in a 60-year-old male patients, and clinical signs of airway obstruction occurred.
Question:
What to do?
Answer:
Immediately cut the tube with a pair of scissors, deflate the balloons simultaneously and withdraw the tube.
6. **Suggested readings**

References:
- Hendrickson RG, Kusin S. Gastrointestinal decontamination of poisoned adults.

7. **Requirements - Nasogastric intubation. Inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons**

The instructor’s role
- The practice is designed for students to perform nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons techniques several times in their own hands.
- The instructor should expect from students the theoretical knowledge for practice. The practice does not serve the transfer of theoretical knowledge.

Specific tasks
- Description of equipment need for nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons
- Description of personnel requirements for nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons
- Demonstration of the method of nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons
- Demonstration of method of nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons
- Supervision of the nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons carried out by students and correction of failures.
- Reviewing the video recording made of the practice with students, and the analysis of each case.

The student’s role
- The student should prepare for the practice according to the best of his knowledge.
- The practice serves testing and exercise of the nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons on phantom device.

Specific tasks:
- Carry out the nasogastric intubation, inserting a nasogastric and Sengstaken-Balckemore tube for diagnostic, therapeutic and feeding reasons several times on phantom device
Reviewing the video recording made of the practice with the instructor, analysis of each cases. It is recommended to carry out all the techniques several times to acquire necessary experience.

8. **Knowledge tests**

Simple choice true/false
Encircle the T or F if the statement is true or false

1. I H Two professional persons are need to perform a successful insertion of a nasogastric tube.
2. I H Nasogastric tube insertion is indicated in patients who have gastric distension or a therapeutic and/or diagnostic gastric emptying is required.
3. I H Contraindications of nasogastric intubation are: massive facial trauma, esophageal atresia, stricture after oropharyngeal, nasal, or gastric surgery; recent esophageal, nasal or gastric surgery.
4. I H Lubricant gel is not requires in nasogastric tube insertion.

5. Choose the contraindications of nasogastric intubation (4/7)
   1) **Massive facial trauma.**
   2) **Esophageal injury.**
   3) **Malformations: choanal atresia and esophageal atresia.**
   4) **Esophageal stricture, Zenker's diverticulum.**
   5) Lack of patient’s monitoring after tube insertion.
   6) If we can not protect the patient's airway
   7) EKG abnormalities.

6. List the possible complications of the nasogastric tube insertion (7/7)
   1) Gastric erosion with bleeding.
   2) Nasal mucosa erosion.
   3) Aspiration pneumonia.
   4) Sinusitis.
   5) Mediastinitis.
   6) Pneumonia.
   7) Peritonitis.

**Simple choice**
**Underline the true answer**

7. What size syringe is needed for removing of gastric secretion via nasogastric tube? (simple choice):
   - 0.2-0.5 ml
   - 1 ml
   - 5-10 ml
8. Complications of nasogastric intubation are (except one)
   1) Gastric erosion.
   2) Mucosa erosion.
   3) Duodenal ulcer.
   4) Necrosis of the nasal mucosa.
   5) Aspiration pneumonia.

9. Put the following activities in chronological order by entering the number:
   1) Then inject air down the tube while listening over the left upper quadrant for
      the sound of air leaving the tube and bubbling in the stomach (7)
   2) Lubricate the end of the tube with lidocaine jelly lubricant. (4)
   3) If no sound is heard, replace the tube and inject more air. (8)
   4) Put the protective sheets in place. (2)
   5) Secure the tube to the nose with tape (9).
   6) Don gloves, goggles, and gown. (1)
   7) Pass the tube through one nostril with steady pressure until the tip of the tube
      is into the posterior pharynx. (6)
   8) Measure the distance from the patient's ear to the umbilicus to determine the
      approximate length of tubing necessary for this procedure (3).
   9) Have the patient hold the water and straw to the patient's mouth (5).

10. Match the letters with the appropriate numbers
    A. Nausea          1. Nose
    B. Contraindication 2. Esophageal stricture
    C. Adhesive tape 3. 50-100 ml
    D. Gastric emptying 4. Vagal reaction
    E. Suction syringe 5. Nasogastric tube
    Key: A4, B2, C1, D5, E3

Relationship-Analysis Questions Statements and Justification

11. Lubricating gel suction and syringe are always needed to insert a nasogastric tube,
    because they facilitate the effectiveness of operations. (A)
12. Patients vomiting due to gastric distension are candidates for gastric a tube insertion
    because the full stomach can cause bleeding. (C).
13. Nasogastric tube insertion is a common bedside procedure in the every-day-clinical
    practice; however, complications may occur during insertion of the tube. (B).
14. In emergency settings we don’t insert gastric tube, rather the surgical intervention is
    justified (E).
15. One professional person can not successfully perform the nasogastric tube insertion
    unaided, and inserting a nasogastric tube is a common hospital ward and emergency room
    procedure. (D)
9. References:

Chesnutt MS, Dewar TN, Locksley RM: Office and bedside procedures. Appleton & Lange, 1992 (page 244-258).
