AIRWAY MANAGEMENT

Reading:
- Morgan and Mikhail – 309-340

Videos on web-site:
- Introduction to intubation
- Managing the airway

Optional

OBJECTIVES:
At the conclusion of this learning session the student will be able to:

1. Apply the Mallampati classification system to a preoperative airway assessment.

2. Discuss the importance of measuring the thyromental distance.

3. Demonstrate how to open a patient’s airway using the head tilt-chin lift maneuver.

4. Demonstrate how to maintain a patent airway using:
   a. a mask
   b. an oral airway
   c. a nasal airway

5. Explain the various components of applying a mask to the face and maintaining an effective seal.

6. List patient characteristics that could alert the nurse anesthetist that a potentially difficult intubation may exist.

7. Diagram the position of the oral, laryngeal and pharyngeal when a patient’s head is elevated and the neck is extended.

8. Discuss the components of a pre-intubation checklist.

9. Review the differences between the intraoral vs. extraoral technique of opening the mouth before intubation.
10. Identify the components of glottic opening which include:
   a. epiglottis
   b. vocal cords
   c. cuneiform cartilage
   d. corniculate cartilage
   e. arytenoid cartilage

11. Discuss the difference in anatomic positioning between using the Macintosh blade as compared to a Miller blade.

12. Inventory the potential complications during and after intubation.

13. Summarize the technique for performing a nasal intubation.

14. Identify areas on the chest and abdomen that one must listen to confirm proper placement of an endotracheal tube.

15. List six criteria that are used to confirm proper endotracheal tube placement.

16. Predict the proper depth of endotracheal tube insertion for adult patients.

17. List five criteria that must be met prior to extubation.

18. Discuss proper extubation procedure.

19. Summarize the procedure for proper cricoid pressure.

Revised/Updated August 2009
AIRWAY MANAGEMENT

Pre operative Airway Assessment:
1. Identifying indicators of difficult bag mask ventilation (BMV) = MOANS
2. Identifying risks for difficult intubation = LEMON

*THE ABILITY TO RECOGNIZE AND TREAT AIRWAY OBSTRUCTION, THEN VENTILATE WITH A BAG AND MASK IS MORE IMPORTANT THAN THE ABILITY TO INTUBATE.

◆ Assess For Airway Obstruction

OPENING THE AIRWAY - Head Tilt-Jaw Thrust (Triple Airway Maneuver)
Ventilating With a Bag and Mask (BMV)

- Check equipment

- Place in sniffing position and pull head into extension with your left hand.

- Place the apex of the triangular mask on the bridge of the nose and press firmly.

- Grasp each side of the mask with your hands and spread it as much as you can.
- As you spread the mask, reach down with your index fingers and pull the loose cheek tissue forward to bunch on either side of the mouth.

- Place your remaining fingers on the jaw and lift upward.
While maintaining the mask fit and patent airway with your left hand, squeeze the bag with your right hand.

Gastric distention and regurgitation

How do you know if there is air exchange?

1. 
2. 
3. 
4. 
5.

5 INDICATORS OF DIFFICULT BAG MASK VENTILATION

1. M=
2. O=
3. A=
4. N=
5. S=
What do you do if you cannot ventilate after performing the triple airway maneuver?
1.
2.
3.
4.

Oral Airways
- Advantages
- Disadvantages
- Insertion
Nasal Airway

♦ Advantages

♦ Disadvantages

♦ Insertion

If you have difficulty placing the nasal airway then:
1.
2.
RISKS FOR DIFFICULT INTUBATION

History
♦ Known previous difficult intubation
♦ Previous upper airway surgery
♦ Excessive snoring/sleep apnea
♦ Radiation
♦ Change in quality of voice
♦ Neck mass
♦ Arthritis

Patient Characteristics That Could Make Airway Management Difficult
♦
♦
♦
♦
♦
♦
♦
♦ Preoperative airway assessment

Mallampati Classification

Class I: soft palate, uvula, fauces, pillars visible
No difficulty

Class II: soft palate, uvula, fauces visible
No difficulty

Class III: soft palate, base of uvula visible
Moderate difficulty

Class IV: hard palate only visible
Severe difficulty
How would you assess Mallampati classification?

**Thyromental Distance Measurement**

- Measurement from the lower border of the mandible to the thyroid notch with the neck fully extended.
- Measurements of less than ______ cm or three finger breaths can indicate a potentially difficult airway.
- Assess mobility of larynx.
Temporomandibular Joint Mobility

◆ Three finger breaths opening is adequate
◆ Assess for TMJ click
◆ Mandibular glide

Atlanto-Occipital Joint Extension

◆ Touch chin to chest
◆ Extend head

IDENTIFYING RISKS FOR DIFFICULT INTUBATION

1. L=
2. E=
3. M=
4. O=
5. N=

Why is it vital to perform an airway assessment on every patient having anesthesia?
Preoperative Airway Assessment

<table>
<thead>
<tr>
<th></th>
<th>Long Incisors</th>
<th>Less room for blade in mouth</th>
<th>Test of TMJ function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of upper incisors</td>
<td>Long Incisors</td>
<td>Less room for blade in mouth</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Voluntary protrusion of mandibular teeth anterior to the maxillary teeth</td>
<td>Anterior protrusion of the mandibular teeth relative to the maxillary teeth</td>
<td>Ability to open mouth and insert blade</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Interincisor distance</td>
<td>Greater than 3 cm</td>
<td>Ability to open mouth and insert blade</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Oropharyngeal classification (Mallampati Classification)</td>
<td>Class I and II</td>
<td>I and II-Tongue small in relation to oral cavity</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td></td>
<td>Class III and IV</td>
<td>III and IV-Tongue large in relation to oral cavity</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Narrowsness of palate</td>
<td>With greater narrowing</td>
<td>Decreased oropharyngeal volume and room for the blade and ETT</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Thyromental distance</td>
<td>Greater than 6 cm or greater than three finger breadths</td>
<td>Larynx is relatively posterior to upper airway structures</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Length of neck</td>
<td>Subjective</td>
<td>Decreased ability to align the upper airway axes</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Thickness of neck</td>
<td>Subjective</td>
<td>Decreased ability to align the upper airway axes</td>
<td>Test of TMJ function</td>
</tr>
<tr>
<td>Range of motion of head and neck</td>
<td>Neck flexion to chest 35° Head extended on neck 80°</td>
<td>Ability to achieve a proper sniffing position</td>
<td>Test of TMJ function</td>
</tr>
</tbody>
</table>

GOT TEETH?

- Chipped
- Broken
- Loose
- Dentures
- Overbite
- Braces/Retainers
- Tongue rings
Cricoid Pressure

- Is performed in the following situations:
  9 All emergency surgery
  9 Obese patients
  9 History of gastric acid reflux
  9 Diabetics
  9 Pregnant patients
  9 Optimal external laryngeal manipulation (OELM)
  9 Any other patients that are high risk for gastric aspiration.
  9 Current controversies regarding cricoid pressure
◆ Procedure

Sellick’s Manoeuvre, applying cricoid pressure
- Thumb and index finger apply cricoid pressure
- Adam’s apple
- Thyroid cartilage
- Cricoid cartilage
- Trachea

◆ Contraindications to application of cricoid pressure

f
f
f
INTUBATION

THE ABILITY TO RECOGNIZE AND TREAT AIRWAY OBSTRUCTION, THEN VENTILATE WITH A BAG AND MASK IS MORE IMPORTANT THAN THE ABILITY TO INTUBATE

Pre-Intubation Checklist
◆ Anesthesia machine check
◆ Anesthetic drugs
◆ Laryngoscope and several different blades
◆ Endotracheal tubes and stylets
◆ Oral airways
◆ Suction
◆ Ambu bag
◆ Preoperative airway assessment

Head Position- Aligning the Axes of the Upper Airway

![Diagram of upper airway axes](image-url)
- The axes must be aligned in to make a straight path from the incisors to the larynx.
- The three axes are:
  1.
  2.
  3.

**Sniffing Position**

Head and neck position and the axes of the head and neck upper airway

Which picture best demonstrates correct sniffing position?
Obesity:

THE ‘SNIFF’ POSITION IN THE OBESE PATIENT

Just Head on Pillow

THE ‘SNIFF’ POSITION IN THE OBESE PATIENT

Scapula, Shoulder, Nape of Neck and Head Support Results in the ‘Sniff’ Position
What is it about these obese patients that may make ventilation and intubation difficult?

Why will desaturation occur rapidly in obese patients?
Could she be difficult to ventilate/intubate?

Opening the Mouth for Laryngoscopy

Intraoral Technique
Extraoral Technique

Opening the Mouth for Laryngoscopy: Extraoral Technique

Laryngoscopy and Visualization

Conventional Laryngoscopy with a Curved Blade

Insert the laryngoscopy blade into the right side of the mouth.
Miller vs Macintosh Blade

Intubation sequence:

A. Insert the laryngoscope blade into the right side of the mouth.

B. Approach the base of the tongue and lift the blade forward at a 45° angle.

C. Engage the epiglottis and continue to lift the blade forward at a 45° angle.

D. Advance the laryngoscope blade toward the midline of the base of the tongue by rotating wrist.

Epiglottis

Place blade posterior to (beneath) the epiglottis.
Fig. 7-8. You can see the larynx because the teeth are missing, even though the mouth is not wide enough to pass the tube.
Lifting During Laryngoscopy

Fig. 7-7. Don't push on the teeth. Lift upward instead. Like tennis: keep the wrist stiff and the elbow straight.
Cormack and Lehane Grading System

<table>
<thead>
<tr>
<th>Cormack &amp; Lehane’s</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>353</td>
<td>70.6</td>
</tr>
<tr>
<td>Grade 2</td>
<td>108</td>
<td>21.6</td>
</tr>
<tr>
<td>Grade 3</td>
<td>39</td>
<td>7.8</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Placement of an Endotracheal Tube

The glottic opening is recognized by its triangular shape and white vocal cords.
Vocal cords

Corniculate cartilage

Vocal cords

False vocal cord

CORDS APART

CORDS ADJACENT
◆ The endotracheal tube cuff is advanced _____ cm past the vocal cords.
◆ After placement, the laryngoscope blade is removed from the mouth.
◆ The endotracheal tube cuff is inflated, and positive pressure ventilation is instituted.
Confirmation of Endotracheal Tube Placement

- DIRECT VISUALIZATION OF THE ETT BETWEEN THE CORDS
- PRESENCE OF END-TIDAL CARBON DIOXIDE
- OBSERVATION OF CHEST RISE AND FALL DURING VENTILATION
- AUSCULATATION FOR BREATH SOUNDS
- CONDENSATION ON THE ETT DURING EXHALATION
- RESERVOIR BAG COMPLIANCE AND REFILLING

Intubating the esophagus in most cases is not catastrophic. The catastrophe occurs if the esophageal intubation is not recognized.

Why isn’t decreased SaO2 used to initially confirm ETT placement?

- Depth of insertion
List signs that would alert you to the fact that the ETT is in the right mainstem bronchus?

List signs that alert you to the fact that the distal end of the ETT is above the vocal cords?

What are your first interventions if an intubated patient is desaturating?
1.
2.
3.
Listening to Breath Sounds

Can an endotracheal tube migrate? If so where is it most likely to migrate in an adult?
What is this?
Are patients prone to developing atelectasis during general anesthesia?

What can increase the potential for atelectasis?
Taping an Endotracheal Tube

Complications of Endotracheal Intubation and Ventilation

**Mechanical:**
1.
2.
3.
4.

**Physiologic:**
1.
2.
3.
4.
5.

**While Intubated:**
1.
2.
3.
4.
5.
6.
7.
8.
9.

**Upon Extubation:**
1.
2.
3.
4.
5.

Nasal Intubation

◆ Why perform a nasal intubation?

◆ Contraindications:
Procedure
Preoperative preparation

Complications
EXTUBATION CRITERIA

- Recovery of airway reflexes
- Responds to command
- Absence of hypoxia/hypercarbia
- Absence of cardiac instability
- Inspiratory capacity of 10-15 cc/kg
- Absence of gastric distention
- Spontaneous respiration
- Absence of residual neuromuscular blockade
- Verification of intact neuromuscular functioning

- Prior to extubation, all patient’s are to be preoxygenated with 100% oxygen
- Patient’s must be orally suctioned prior to extubation
- Suction endotracheal tube as needed

Extubation Procedure

1. Allow pressure to build to 30 cm H₂O (lung → TLC)
2. Deflate cuff
3. Pull tube simultaneously
4. First event postextubation is a forceful exhalation
REFERENCES


Dixon, B. Preoxygenation is more effective in the 25 degree head up position than in the supine position in severely obese patients: A randomized controlled study. *Anesthesiology*. 102(6), 2005, 1110-1115.


Lane, S., A prospective randomized controlled trial comparing the efficacy of preoxygenation in the 20 degrees head up vs supine position. *Anesthesia*, 60(11), 2005, 1064-1067.


Philippe, J., Difficult tracheal intubation is more common in obese than lean patients. Anesthesia & Analgesia. 97(2) 2003, 595-600.


