

# *Airway Management and Equipment*



Anesthesiology



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## **Indications of intubation:**

- Resuscitation (CPR)
- Prevention of lung soiling
- Positive pressure ventilation (GA) - administering artificial respiration for a prolonged period, in case of inadequate spontaneous ventilation or respiratory paralysis.
- Pulmonary toilet - by clearing mucus and secretions from the airway, in case of impaired mucociliary clearance which is linked to poor lung function in a broad range of diseases and disabilities in order to prevent atelectasis and pulmonary infections.
- Patent airway (coma or near coma)
- Respiratory failure(CO2 retention )

## **Requirement of successful intubation:**

- 1-Normal roomy mandible
- 2-Normal T-M, A-O , and C-spine
- 3-Alignment of 3 axes or Assuming sniffing position

## **Airway Evaluation:**

- Take very seriously history of prior difficulty

(Review prior anesthetic records. Ask the patient about the problems prior to anesthesia such as jaw pain, hoarseness of voice ,dental injury etc. that may suggest difficult intubation, or If the patient was informed by the anesthetist that he was difficult to ventilate or intubate...)

- Examination:
  - LEMON OR MELON PHYSICAL SIGN**

- Look externally:
  - Look for any obvious anomaly
  - Morbid obesity(BMI)
  - Skull
  - Face
  - Jaw Movement
  - Mouth and teeth
  - Neck
  - Facial hair

(facial hair can mask other signs of a difficult airway- like short thyromental distance. This is why you need to physically touch your patient's neck when determining thyromental distance)

**Cass and James's 6 common anatomical anomaly:**

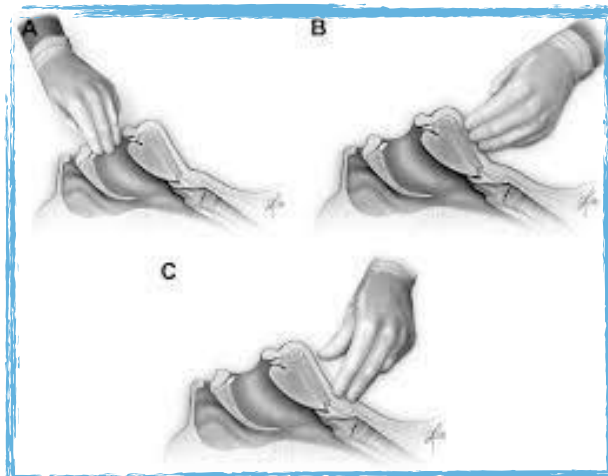
- Short muscular neck with full set of teeth
- **Receding jaw with an obtuse mandibular angle**
- **Protruding upper incisor**
- Poor mobility of the mandible
- Long and high arched palate
- Increased alveolar mental ridge distance requiring wide opening of the mandible for insertion of laryngoscope

**● Predictors of difficulty to intubate (OBESE):**

1. Obese (body mass index > 26 kg/m<sup>2</sup>)
2. Bearded
3. Elderly (older than 55 y)
4. The Snorers
5. Edentulous (Toothless)

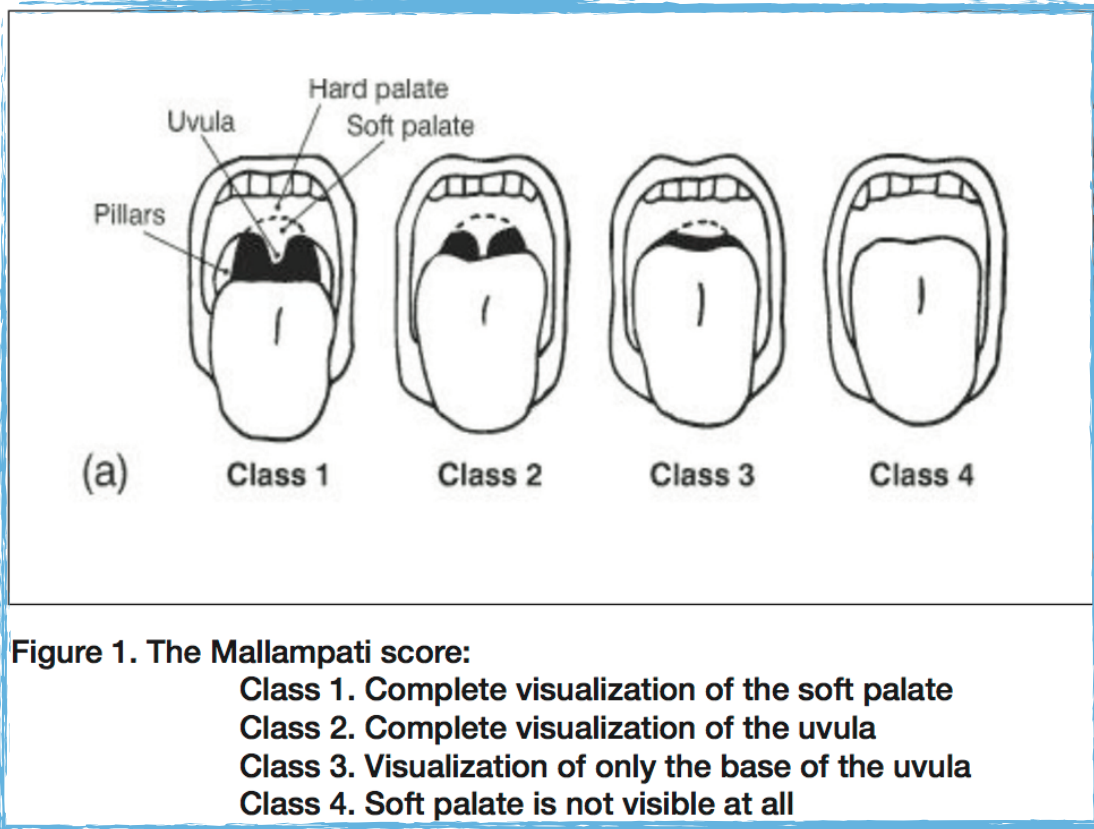
● Evaluate 3-3-2-1 rule:

The 3-3-2 rule holds that in patients with normal relative anatomy the following apply: **normal mouth opening is three** (of the patient's) fingerbreadths; a normal mandible dimension will likewise allow **three** fingerbreadths (about 7 cm, and if less than 6 cm = difficult airway) between the **mentum and the hyoid bone**; and the **notch of the thyroid cartilage** should be **two** fingerbreadths below the **hyoid bone** and **subluxation one finger.**



- **Mallampati score:**

To perform a Mallampati evaluation, with the patient seated, have the patient extend his neck, open his mouth fully, protrude his tongue, and say "ah." Visualize the airway, looking for the tongue, soft and hard palate, uvula, and tonsillar pillars.



- **Obstruction:**

Evaluation for stridor, foreign bodies, and other forms of sub- and supraglottic obstruction should be performed in every patient prior to laryngoscopy.

- **Neck mobility: (range >90)**

Patients with degenerative or rheumatoid arthritis may have limited neck motion, and this should be assessed to assure the ability to adequately extend the neck during laryngoscopy and intubation. Patients in whom traumatic cervical spine injury is suspected, and in whom the cervical spine has been immobilized by a cervical collar have limited neck mobility by definition. However this factor in isolation is typically not a significant hindrance to peroral direct laryngoscopy and intubation.

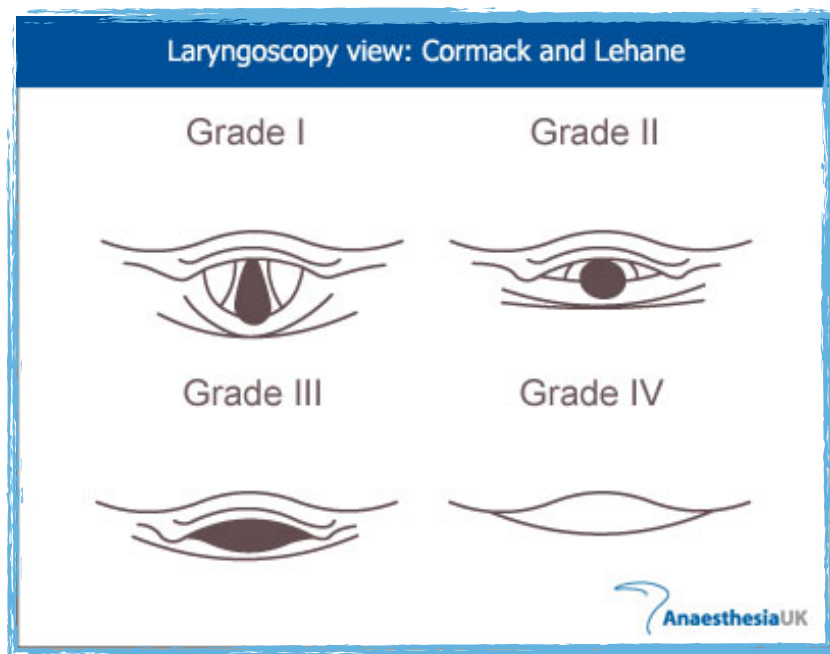
## ● Evaluation by Laryngoscopy:

-Simple easy test,correlates with what is seen during laryngoscopy or Cormack-Lehane grades, but ...

1-moderate sensitivity and specificity(12% false +ve)

2-Inter observer variation

3-Phonation increases false negative view



## **Laryngoscopic views**

The laryngoscopic views seen on intubation are often recorded by the anaesthetist and have been graded by Cormack and Lehane.

- Grade I: full view of glottis
- Grade II: only posterior commissure visible
- Grade III: only tip of epiglottis visible
- Grade IV: no glottic structure visible.

● **Wilson's Score:**

Table 1: Wilson's difficult intubation score		
<i>Risk factors</i>	<i>Levels</i>	
Weight	0	< 90 kg
	1	90-110 kg
	2	> 110 kg
Head and neck Movement	0	Above 90°
	1	About 90° (i.e. ± 10°)
	2	Below 80°
Jaw movement	0	IG > 5 cm or Slux > 0
	1	IG < 5 cm and Slux = 0
	2	IG < 5 cm and Slux < 0
Receding Mandible	0	Normal
	1	Moderate
	2	Severe
Buck teeth	0	Normal
	1	Moderate
	2	Severe

● **Difficult Airway Intubation:**

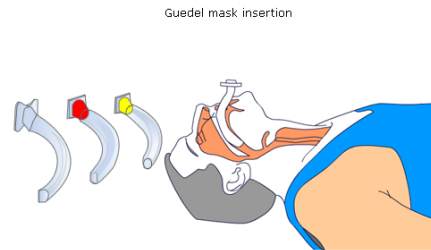
<p><b>Box</b> Medical features of difficult airway intubation</p> <ul style="list-style-type: none"> <li>• Congenital: rare</li> <li>• Acquired <ul style="list-style-type: none"> <li>– traumatic: fractures of mandible and cervical spine</li> <li>– infection: epiglottitis, dental or facial abscess</li> <li>– endocrine: thyroid enlargement, acromegaly, obesity</li> <li>– neoplasia: tongue, neck, mouth, radiotherapy</li> <li>– inflammatory: ankylosing spondylitis, rheumatoid arthritis</li> <li>– pregnancy</li> </ul> </li> </ul>
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● **Methods of Airway Control:**

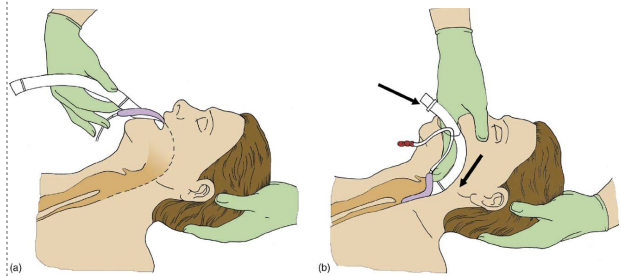
**1. Facemask**



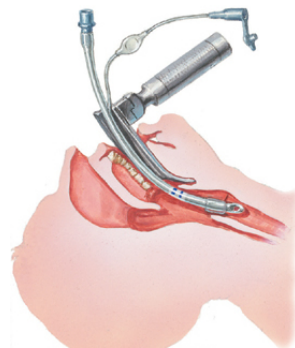
**2. Guedel Airway**



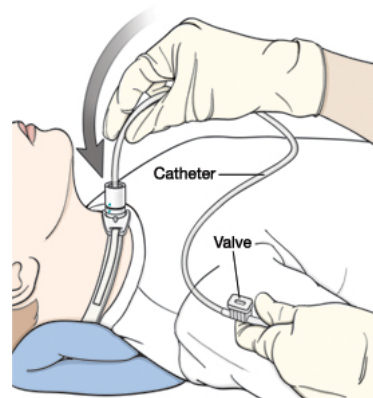
**3. Laryngeal Mask**



**4. Endotracheal Tube**



**5. Tracheostomy**



## ● How to Confirm Tube Position?

1. Direct visualization of ETT between cords
2. Indirect visualization using the Bronchoscopy
3. Continuous trace of capnography
4. Three point auscultation (with a properly positioned tracheal tube, equal bilateral breath sounds will be heard upon listening to the chest with a stethoscope, and no sound upon listening to the area over the stomach.)
5. Esophageal detector device (a disposable tool used to verify proper endotracheal tube placement by utilizing the anatomical differences between the trachea and esophagus. Because the trachea has cartilaginous rings, it is a rigid structure. As vacuum is applied the device will refill easily if the ET tube is in the trachea. If the ET tube is in the esophagus, the device will not retract because the esophagus will have collapsed against the distal end of the ET tube)

Other; as bilateral chest movement, mist in the tube (a small amount of water vapor will also be evident within the lumen of the tube with each exhalation and there will be no gastric contents in the tracheal tube at any time), CXR...

## ● Rapid Sequence Induction:

RSI is the preferred method of endotracheal intubation in the emergency department (ED) because it results in rapid unconsciousness (induction) and neuromuscular blockade (paralysis). This is important in patients who have not fasted and are at much greater risk for vomiting and aspiration.



- **RSI Technique:**

- 1. Preoxygenation**

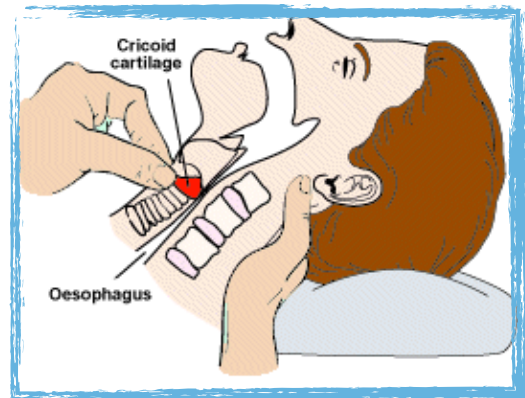
Administer 100% oxygen via a nonrebreather mask for 3 minutes. Studies have shown this can prevent apnea-induced desaturation for 3-5 minutes by increasing O<sub>2</sub> reservoir in the lung.

- 2. IV induction with Suxamethonium chloride**

Rapidly-acting induction agent to produce loss of consciousness and neuromuscular blocking agent immediately after the induction agent.

- 3. Cricoid Pressure**

Used to either prevent regurgitation, or to assist with visualisation of the glottis by a practitioner attempting intubation.



- 4. Intubate, inflate the cuff, and confirm the tube position.**

- 5. Release cricoid pressure and fix the tube.**

- **Complications of Intubation:**

- 1-Inadequate ventilation.

- 2-Esophageal intubation.

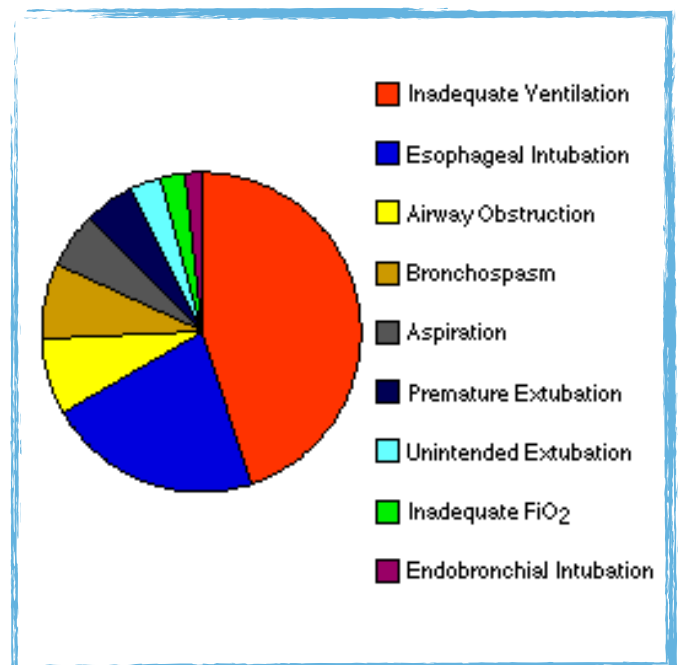
- 3-Airway obstruction.

- 4-Bronchospasm.

- 5-Aspiration.

- 6- Trauma.

- 7-Stress response.



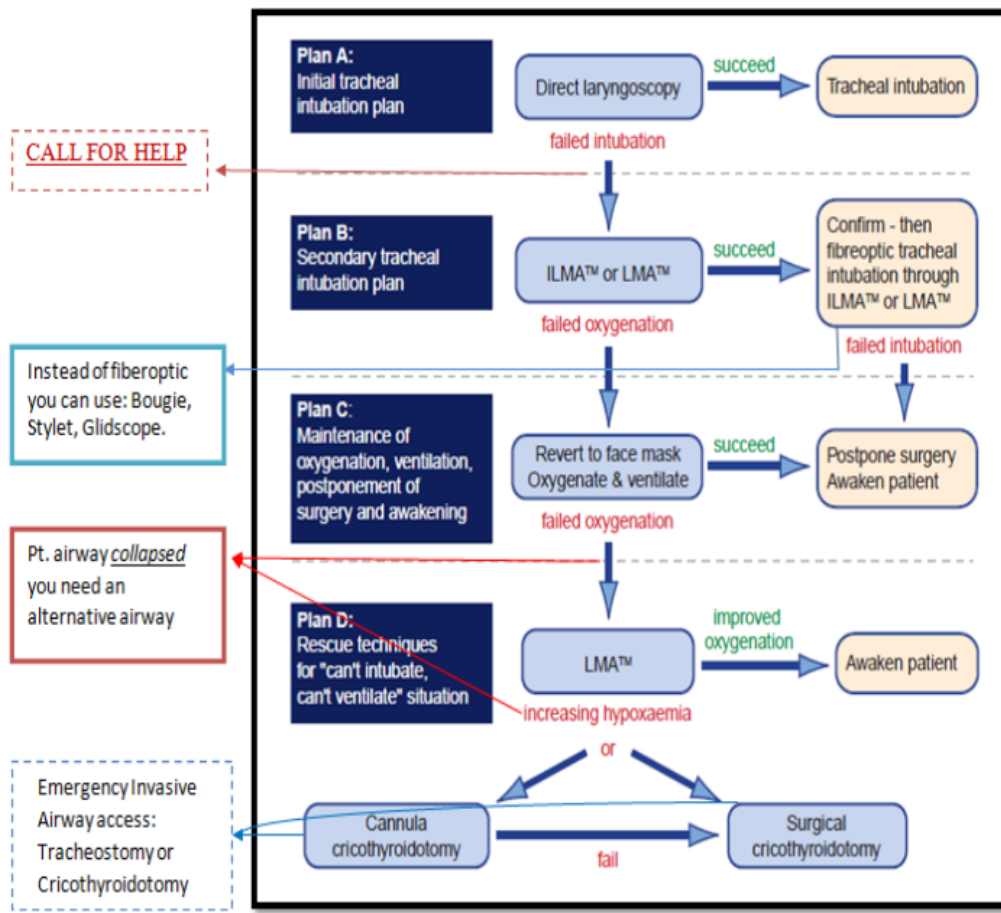
## ● Failed Intubation Management:

**Box** Initial course of action for failed intubation

- 1 Plan a course of management before starting anaesthesia
- 2 Call for *HELP*
- 3 Maintain airway
- 4 Ventilate with 100% oxygen
- 5 Maintain cricoid pressure (if part of anaesthetic technique)
- 6 Avoid persistent attempts to intubate if patient is hypoxic
- 7 Avoid further doses of muscle relaxants unless you are absolutely sure of airway control and ventilation

**Box** Subsequent decisions for consideration after failed intubation

- 1 Awaken patient or continue anaesthetic until senior help arrives
- 2 Summon experienced help – intubate under general or local anaesthesia: laryngeal mask (intubation through mask), fibre-optic intubation, blind nasal intubation
- 3 Last resorts include retrograde intubation, transtracheal jet ventilation, cricothyrotomy
- 4 Make elective tracheostomy
- 5 Perform surgery under regional anaesthesia

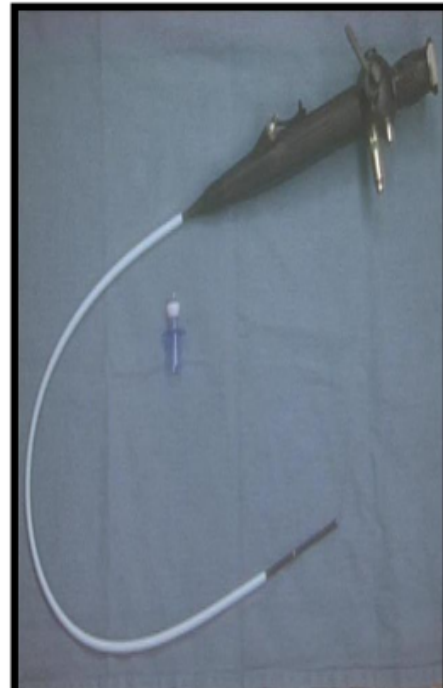
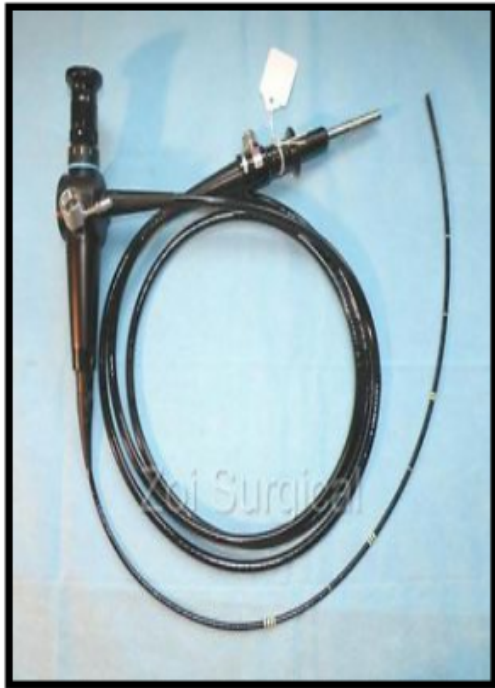


## ● Fiberoptic Laryngoscope Intubation:

### V. Fiberoptic laryngoscope intubation:

Fiberoptic endotracheal intubation is a useful technique in a number of situations. It can be used when the patient's neck cannot be manipulated, as when the cervical spine is not stable. It can also be used when it is not possible to visualize the vocal cords because a straight-line view cannot be established from the mouth to the larynx. Fiberoptic intubation can be performed either awake or under general anesthesia and it can be performed either as the initial management of a patient known to have a difficult airway, or as a backup technique after direct laryngoscopy has been unsuccessful.

It is usually done if there was any thyroid enlargement.



## ● Glidescope:

### **Glidescope:**

#### Indications:

- Patients with poor direct laryngoscopic view.
- Obese patients.
- Challenging airways (inability to view the vocal cords on direct view) due to anatomic variation or distortion.
- Small mouth opening (< 3 cm)
- Limited neck extension.
- Excessive secretions in the airway. (The GlideScope has an anti-fogging heat lamp to enable views in the presence of excess/bloody secretions)



### Contraindications:

- Absolute Contraindications: None.
- Relative Contraindications: may be overlooked in the true emergency situation because it is more important to resuscitate.
  - Limitations to mouth opening (< 3 cm)
  - Major trauma/fractures to the face (maxilla, mandible) or neck.
  - Neck abscess (retropharyngeal) can cause difficulty with tracheal intubation.
  - Neoplasm of the upper airway that may distort airway anatomy.
  - Nasal intubation required for surgical procedure (e.g., oral surgery)

- **Lighted Stylet:**

Endotracheal stylet with a light source at the tip. Very helpful in intubation aid, especially in difficult airways. The light can be seen from outside the patient helping guide the ET tube through the vocal cords.

- **Bougie:**

- Flexible device around 60 cm long.
- Used in Bougie-assisted Endotracheal Intubation.



← Lighted stylet

Intubation using bougie →

