

# Emergency Airway Workshop

McGill University Refresher Course  
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# Introduction

- Interest in airway
- Who should master this skill
- Practice, practice, practice
- Formal courses
- Teaching

# Disclaimers

- None



# Today's objectives

- Review indications
- Help you prepare for the next sick patient you have to intubate
- Re-familiarize yourself with the DL and VL techniques
- Review rescue airway equipment and procedures
- Share tips from top airway experts and teachers
- Help you know your limits and when to call for help

# Case

- An 85 year old man brought in by family following a mechanical fall and head trauma earlier today down a few steps. He is known for a fib and is anticoagulated. He was being triaged when he suddenly became unresponsive.
- He is brought into the crash room. On your arrival he is snoring and unresponsive to voice or pain stimulation. His GCS is a 6 (motor 4, eyes 1, vocal 1). He has a large gash on his forehead.
- Vitals : HR 94, BP 160/70, O2 sat of 91%, RR 14

# Manage

- Call for help!
- BLS manoeuvres : jaw thrust, head extension and lower neck flexion?
- Examine and remove any oral foreign body / secretions
- Standard ACLS
- **Treat reversible cause** Hypoglycemia, Narcotic overdose, Arrhythmia rhythm, Hypovolemia

# Indications

- Obtain / maintain
- Correct hypoxia / hypoventilation
- Protect
- Predict

# Indications

- Obtain / maintain : **Pathological airway obstruction**
  - Paradoxical breathing, indrawing between the ribs
  - Snoring (above larynx)
  - Stridor
  - Voice change
- Correct – Sepsis, Asthma, COPD, CHF
- Protect – Trauma, Tox
- Predict – Transfers



# First shot is the best shot

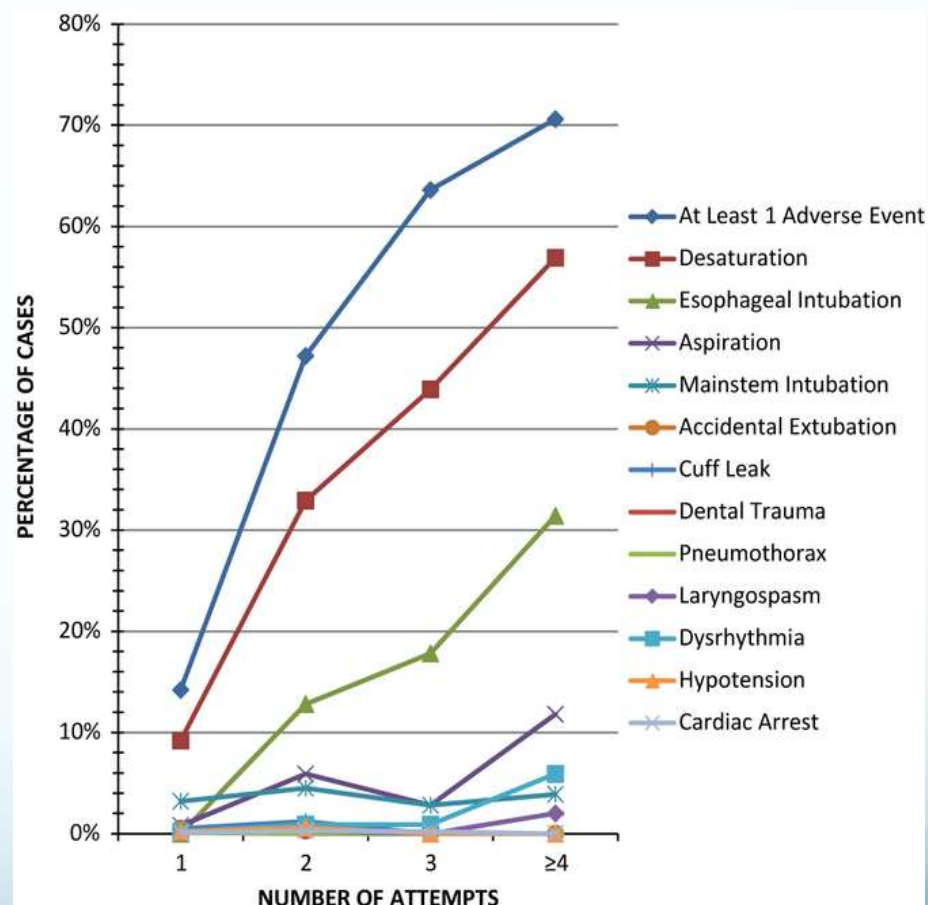
- The goal should be to achieve success in **the first attempt**
- We achieve first pass success 83% of the time<sup>1</sup>.
- We achieve it in less than 3 attempts 96% of the time in RSI group.
- But according to some studies, this complication rate increases with OR increase between 5-14 with more than 3 attempts<sup>2</sup>.
- Definitive airway sans **hypoxemic, hypotension, hypoventilation** on 1st attempt

<sup>1</sup> Walls RM, Brown CA 3rd, Bair AE, et al. NEAR II Investigators. Emergency airway management: a multi-center report of 8937 emergency department intubations. *Journal of Emergency Medicine* 2011;41(4):347-354.

<sup>2</sup> Michael M Bernhard. The First Shot Is Often the Best Shot: First-Pass Intubation Success in Emergency Airway Management. *Anesthesia and Analgesia*. 2015 121(5)

# Advocating for first pass

- One or more AEs occurred in 14.2% (95% CI = 12.4% to 16.2%) of cases in the first attempt group versus in 53.1% (95% CI = 48.6% to 57.6%) of cases in the multiple attempts group



# Preparing

- **Yourself** : Deep breath, Wear protection, get out your checklist!
- **Patient** :
  - AMPLE history, history of anesthesia or airway issues, examine the airway, monitor, oxygen, positioning, 2 large bore IVs, estimate weight,
  - Perform a laryngeal handshake and consider marking your landmarks location with a sharpie
- **Meds** : induction medications and post-intubation sedation.
- **Team** : verbalizing **plan** and **rescue airway strategy**, assign roles, call for help
- **Equipment** : on a table!

# Preparing

- “There is no such thing as the easy airway.”
- **Difficult airway predictors** not well validated, but as a general rule call for help if it's an upper. In ED setting, we don't always have time to assess for them
- **LEMON** mnemonic

L = Look externally (burns, trauma, infection, radiotherapy, craniofacial syndrome)

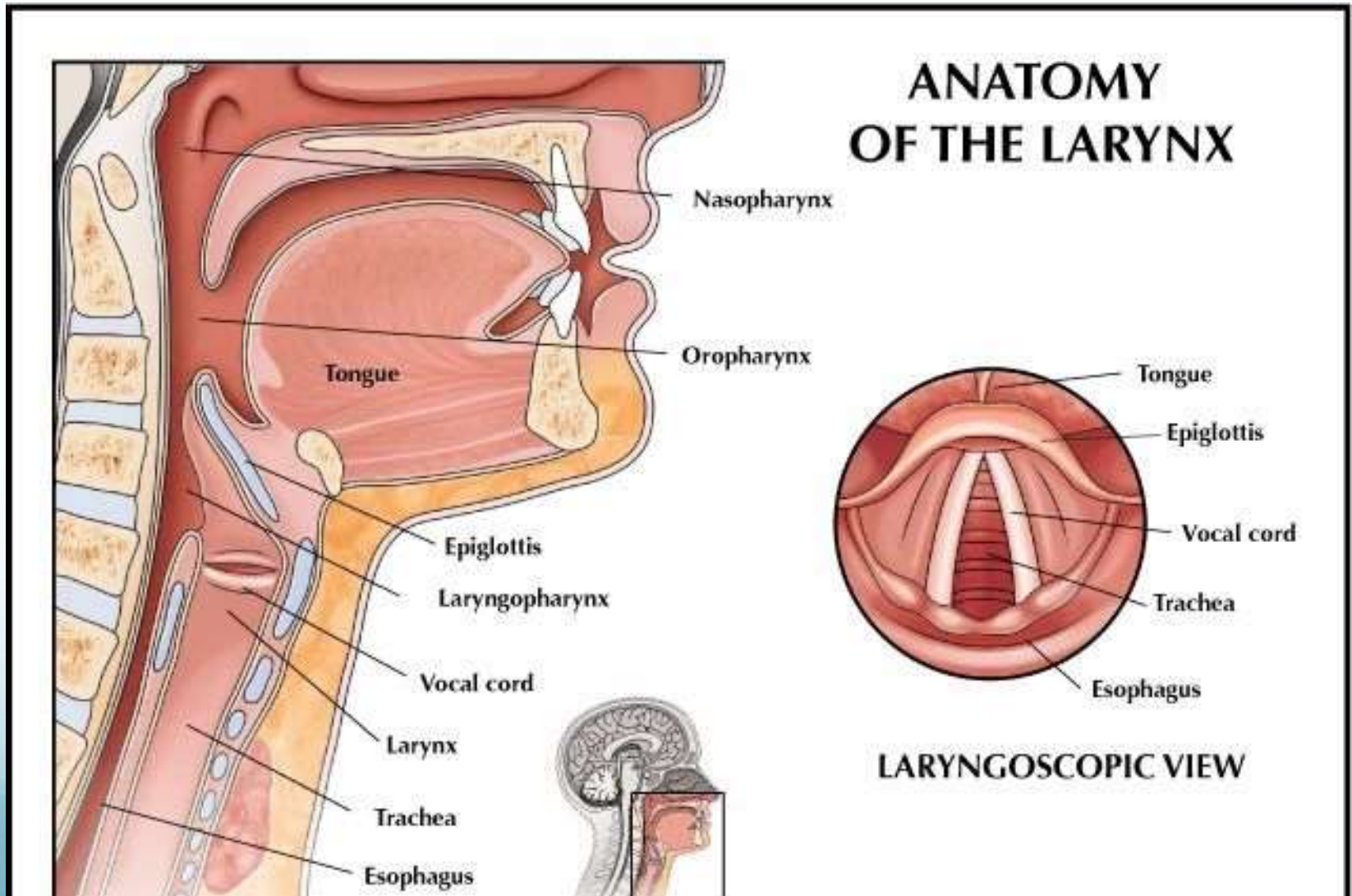
E = Evaluate 3-3-2

M = Mallampati I-IV

O = Obese / Pregnant

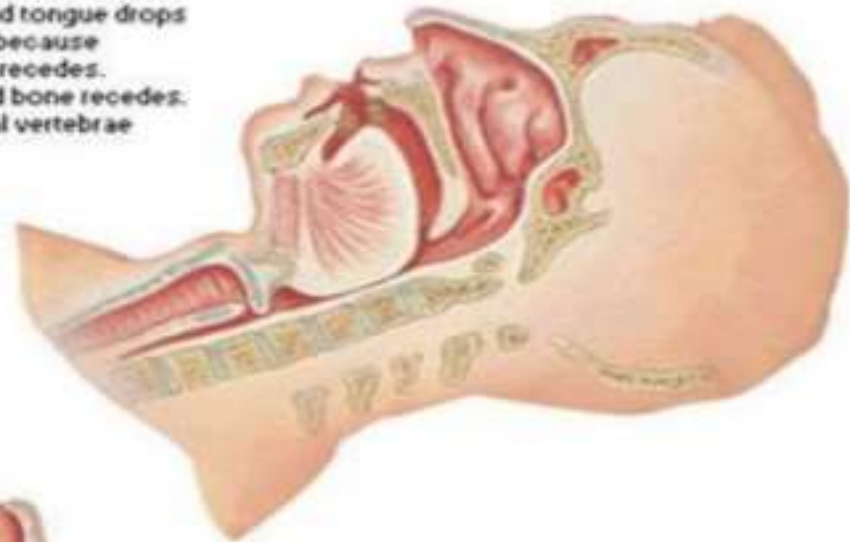
N = No teeth

# Anatomy



# Anatomy

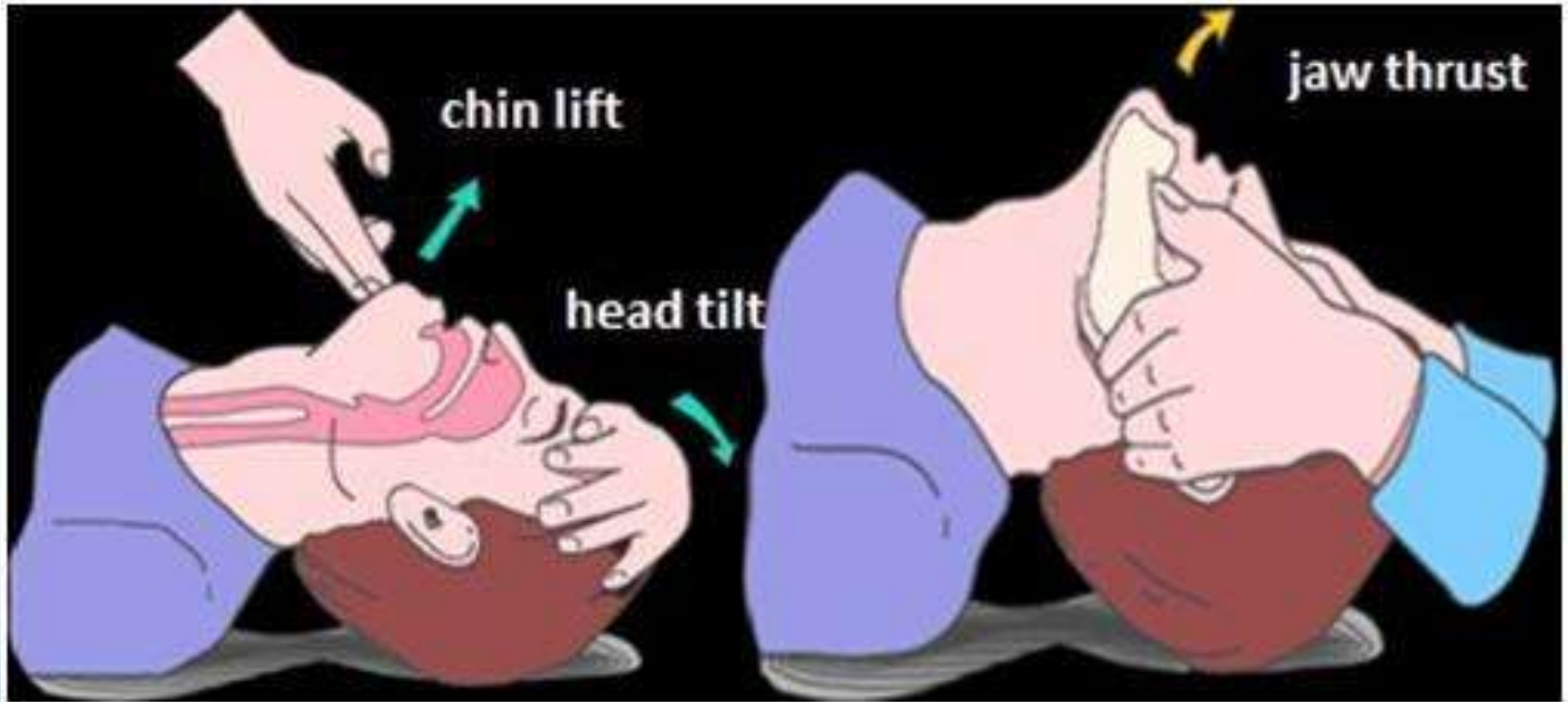
**Obstruction.** With head flexed, flaccid tongue drops back against posterior pharyngeal wall because mandible (to which tongue is attached) recedes. Epiglottis also falls back because hyoid bone recedes. Pharynx narrowed by flexion of cervical vertebrae



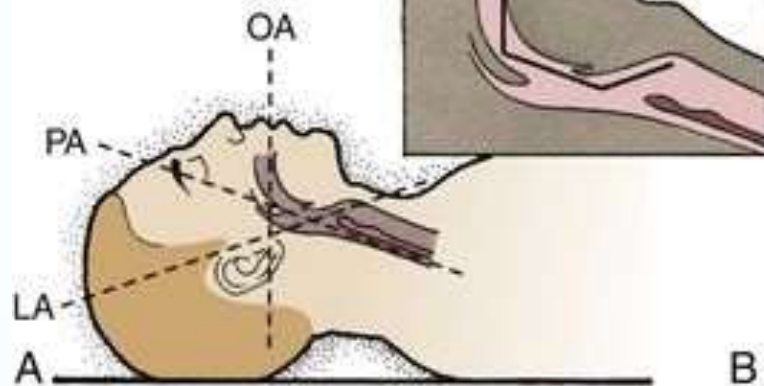
**Patency.** With head extended (head-tilt maneuver), mandible usually moves forward (or is actively pushed forward with jaw-thrust maneuver); tongue thus drawn forward. Epiglottis also pulled anteriorly by



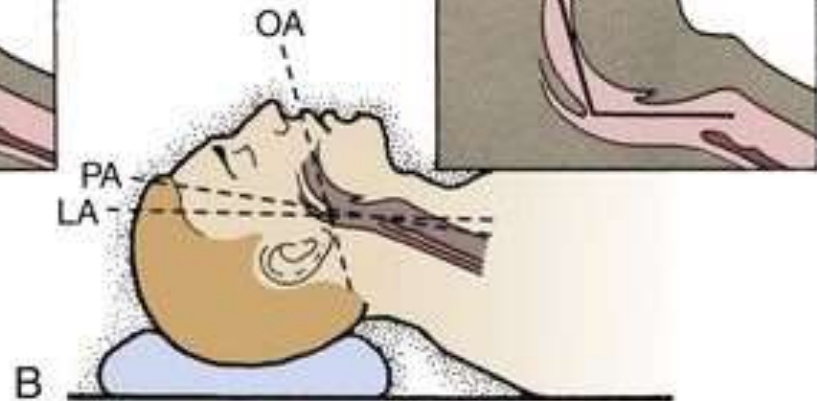
# Positioning



Head on bed,  
neutral position



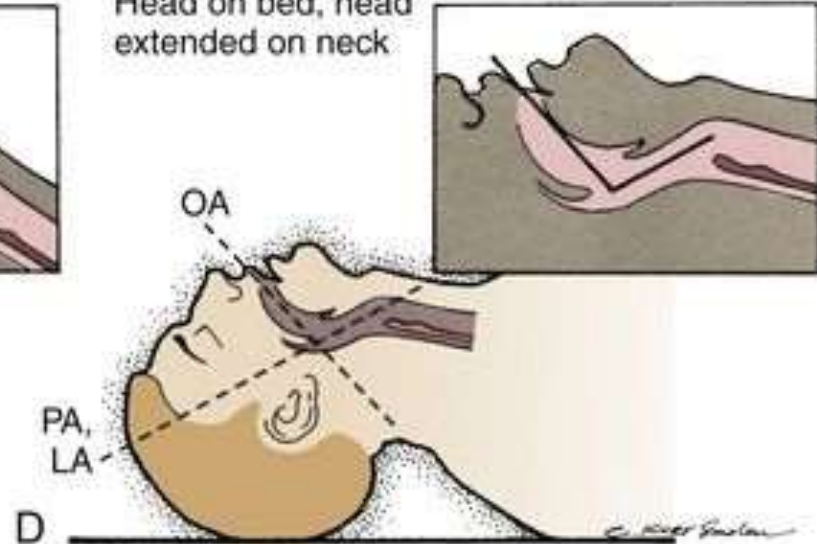
Head elevated on  
pad, neutral position



Head elevated on pad,  
head extended on neck  
(sniff position)



Head on bed, head  
extended on neck



*© 2002 Saunders*

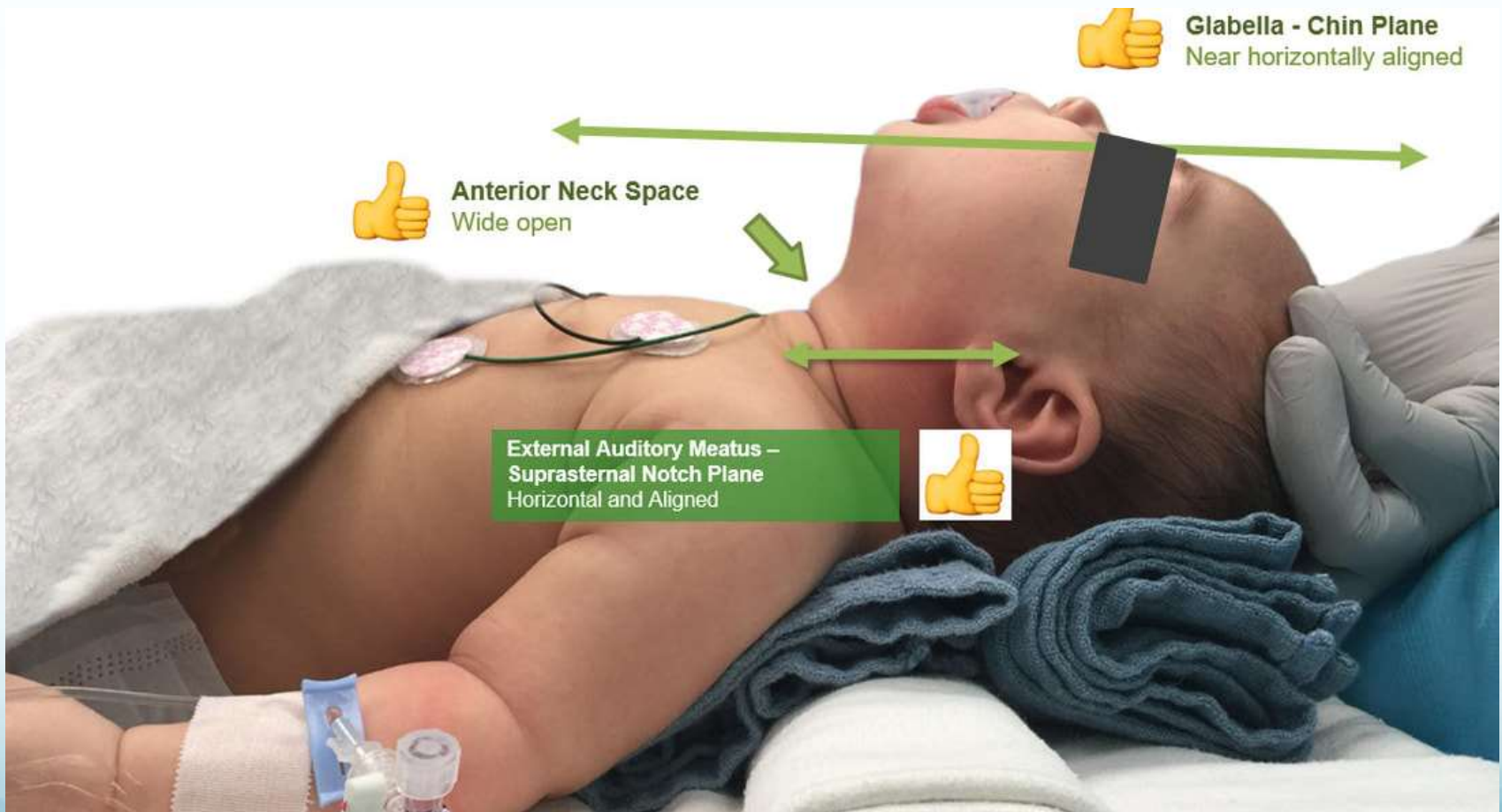


# Ramped vs Sniffing position

The ramped position did not improve oxygenation during endotracheal intubation of critically ill adults compared with the sniffing position. The ramped position may worsen glottic view and increase the number of laryngoscopy attempts required for successful intubation.



# Pediatric sniffing position



# C-spine immobilization

- Change to manual inline stabilization
- Remove c-collar and assign one person to this task
- Hands positioned over ears on either side.
- No limiting of the ROM of the mandible
- No traction

# Maxillofacial trauma

- If the patient is stable, consider imaging or OR intubation
- Always prepare double set-up if immediate RSI is indicated DL / VL and FONAs.
- An awake approach should be considered, but it requires time
- Management of aggressive bleeding should be anticipated.
- Allow patients to assume a position of comfort when safe to do so.

# Laryngeotracheal trauma

- Decompensation in the patient with a traumatized airway may be rapid and catastrophic.
- PPV should be avoided if possible.
- An awake approach with appropriate topicalization is the preferred approach.
- If an RSI is chosen, a double set-up with a FONA plan for accessing the trachea based on the level of the airway breach.
- ETT placement should ideally be performed with visualization of the airway using a flexible intubating endoscope (FIE).

# Case 2

- A 87 year old woman who suffers from a stroke and dementia history presents to ER with a history of vomiting and altered mental status.
- On arrival she is actively vomiting large amount of what looks like coffee grounds. She also appears very lethargic. They would like maximal care.
- She has an O2 sat of 92% on room air, a RR of 28, a BP of 87/60, a HR of 118 BPM, a temperature of 35.5

# Airway Contaminants

- Gross contamination with blood, vomitus, secretions will not only obstruct your view, but also lead to complications post intubation resulting from aspiration.
- Perform suction assisted laryngoscopy and airway decontamination or “SALAD” using Dr. Jim Du Canto’s technique

# SALAD technique description

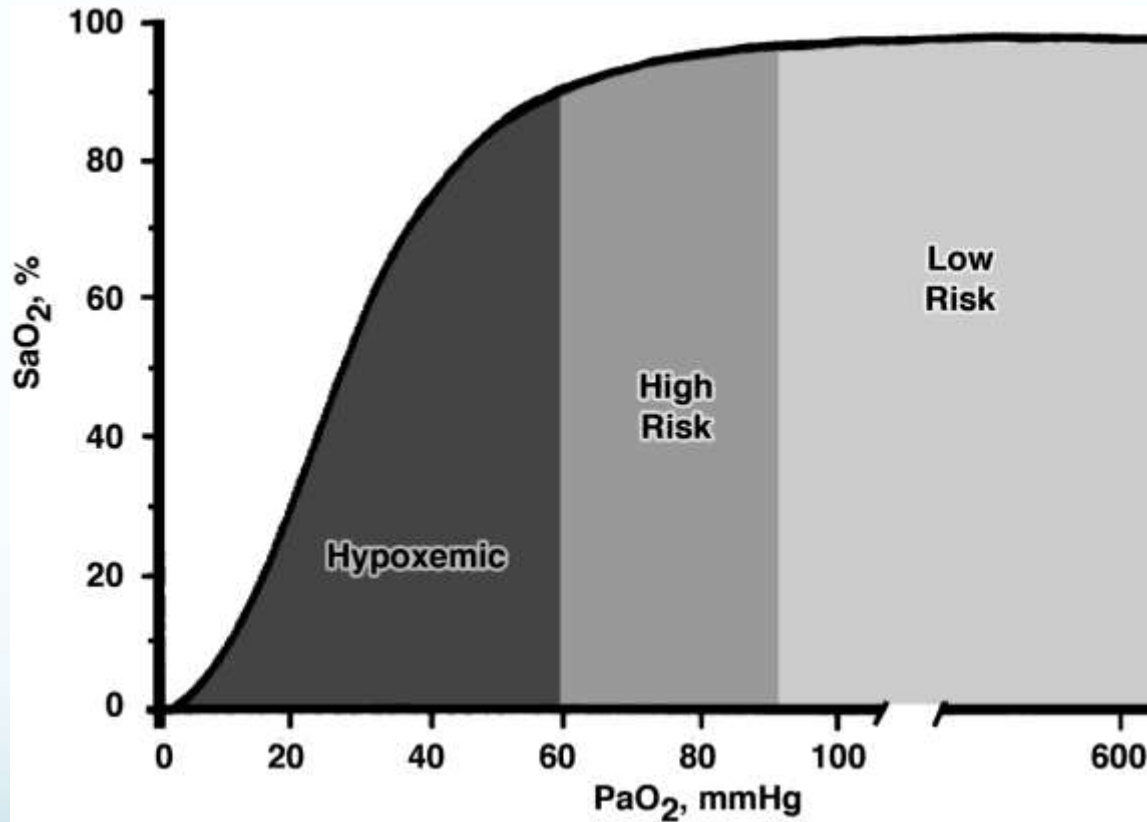
- **Oral decontamination** with Yankauer suction catheter
- **Insert laryngoscope** blade hugging the surface of the tongue (anteriorly) so as to avoid submerging the illumination/optics module in vomitus
- Use of the **rigid suction catheter** as a tongue **depressor/lifter** to permit the laryngoscope blade perfect position on the first attempt
- Continue to suction the hypopharynx, then insert the rigid suction catheter **into the proximal esophagus to serve as a continued drain of emesis**
- Repositioning of the suction catheter to the **left corner of the patient's mouth** facilitated by a slight withdrawal and reinsertion of the laryngoscope blade to permit this transit. The **laryngoscope blade will now effectively pin the suction catheter** in place with this manoeuvre.
- **Slight rotation of the laryngoscope blade leftward 30 degrees** to further open a channel for endotracheal tube passage through the pharynx and into the larynx.
- Inflation of the endotracheal tube cuff and **suctioning of the tracheal tube** and trachea prior to ventilation to avoid spreading any aspirated material



# Prevent Hypoxemia

- Desaturation to below 70% puts patients at risk for dysrhythmia, hemodynamic decompensation, hypoxic brain injury, and death.
- **Recognize the risk of acute and rapid desaturation**
- **Low risk** : No lung pathology, no anemia, low metabolic demands
- **High risk** : Sepsis, CHF, Pneumonia, COPD, anemia, already hypoxemic

# Prevent Hypoxemia



# Preoxygenate

- **Goals : Prolonging safe apnea time (time to desat less than 90%)**
  - 1) to bring the patient's saturation as close to 100% as possible
  - 2) to denitrogenate the residual capacity of the lungs (maximizing oxygen storage in the lungs)
  - 3) to denitrogenate and maximally oxygenate the bloodstream.
- **Preoxygenate passively** with O<sub>2</sub> in someone with adequate drive
  - Nasal cannula NRFM, Venturi mask

# Preoxygenation

- Position : sitting up or in reverse Trendelenburg if the patient has c-spine immobilization.
- Patients with an **adequate respiratory drive** should receive preoxygenation for **3 minutes**
- **Cooperative patients** can be asked to take 8 vital-capacity breaths (maximal exhalation followed by maximal inhalation) to reduce the preoxygenation time to approximately **60 seconds**.

# Delayed Sequence Intubation

- Consider in the **delirious** for both preoxygenation and preparation
- Using dissociative dose of **ketamine 1-1.5mg/kg dose slow iv push**, with increment doses 0.5mg/kg
- Followed by NRFM or NPPV
- Consider NG tube insertion in some cases
- Paralytic added afterwards
- 91% of the patients in this study achieved sats above 93%
- Out of 64 patients, 2 weren't intubated at all, just received NPPV (asthmatics)

# Preoxygenation

- **Preoxygenate** and **Ventilate actively** with O<sub>2</sub> for patients who **remain hypoxic** remaining below 93-95% or with **inadequate drive**
- NPPV (consider in the CHF or COPD patient with elements of type 2 respiratory failure)
- BMV mask +/- oral or nasopharyngeal airway

# Prevent and Maintain O<sub>2</sub>

- **Apneic oxygenation** with nasal prongs to prolong safe apnea time up to 8 fold
- 15L will provide 100% FiO<sub>2</sub> in the pharynx
- Alveoli continue to take up oxygen even without breathing movements.
- 100% saturation can be maintained this way for up to 100 min!
- Hypercapnea and severe acidosis will eventually ensue in a hypoventilatory state

# BMV use during apnea

- Two goals : ventilate and oxygenate
- In the first minute of apnea PaCO<sub>2</sub> will increase 8-16mm, and then about 3mm /min. Which sounds negligible...
- **EXCEPT**
  - In the profoundly acidotic patient (ASA toxicity)
  - Increased intra-cranial pressure (cerebral vasodilation)
- Oxygen delivery and alveoli recruitment
- If a bag-valve-mask device is used during the onset of muscular relaxation, a PEEP valve will provide sustained alveolar distention.



# BMV technique

- C-E technique to achieve adequate seal
- Look for chest expansion, improving O2 sat and color and lack of abdominal distension
- Listen for a “hissing” sound when air escapes
- Feel for compliance of the bag that is reduced due to obstruction or sometimes in bronchospasm / pneumothorax
- Do not overbag so as not to induce gastric insufflation, hypercapnia, breath stacking, hyperventilation
- Cricoid pressure ?
- Laryngospasm : PPV will usually correct

# Oral airways

- DO use Adjunct to BVM in the unconscious patient
- DON'T use one that is too big = cause laryngospasm or obstruction
- DON'T use one that is too small = not effective
- DO use both insertion technique : inverted or straight
- DO: r/o foreign body prior
- DON'T insert in the awake patient (gag, vomit, aspirate, laryngospasm)

As a general rule

- Adult F = 8 cm
- Adult M = 9-10cm



# Nasal airway

- DO in trismus when OPA not usable
- DO lubricate
- DO advance perpendicular to the face
- DON'T in patient who are anticoagulated (relative CI)
- DON'T in patients with severe craniofacial injury

For sizing, Length = distance from nasal tip to earlobe

- F = 6mm
- M = 7mm



# Prevent and Maintain O2

- Can we maintain oxygenation with **BMV** in this patient if the intubation attempt fails?
- BOOTS predictors of **DMV**
  - Beard
  - Obesity
  - Older
  - Toothless (leave dentures in during BMV!)
  - Sounds (stridor, snore, stiff)
- History of neck radiation or
- Male sex
- Mallampati III or IV

# Prevent Hypoventilation/acidosis

- Giving bicarb won't be helpful
- Minimizing apneic period to a minimum = Most experienced intubator in the room.
- Matching patient's pre-intubation resp rate when intubation is complete on the vent settings
- Continuing ventilation BVM during apnea
- Setting vent to deliver breaths in volume control mode

# Prevent Hypotension

- Correct BP with fluids / blood
- **Higher dose paralytics**

**Rocuronium** 1.2-1.5 mg/kg vs 0.6-1.2 mg/kg

**Succinylcholine** 2mg/kg vs 1.2-2mg/kg

**\*\*Be patient\*\***

- **Lower dose sedatives :**

**Ketamine** 0.25-0.5mg/kg vs 2mg/kg

**Propofol** tiny dose (10% of normal) vs 1.5 mg/kg

- Give push dose pressors or pressor infusion as needed
- BVM as little as possible, slow, small volumes

# Rapid sequence intubation

- Provider and patient positioned
- Simultaneous administration of sedatives or paralytics
- Use of DL / VL depending on availability and user comfort level
- Use L hand for device ; Use R hand for suction, head tilt, tube placement
- Slow advancement vs going too far pulling back
- An assistant is needed to hand you the prepared ETT with stylet
- BURP vs cricoid pressure
- Boogie use indicated!

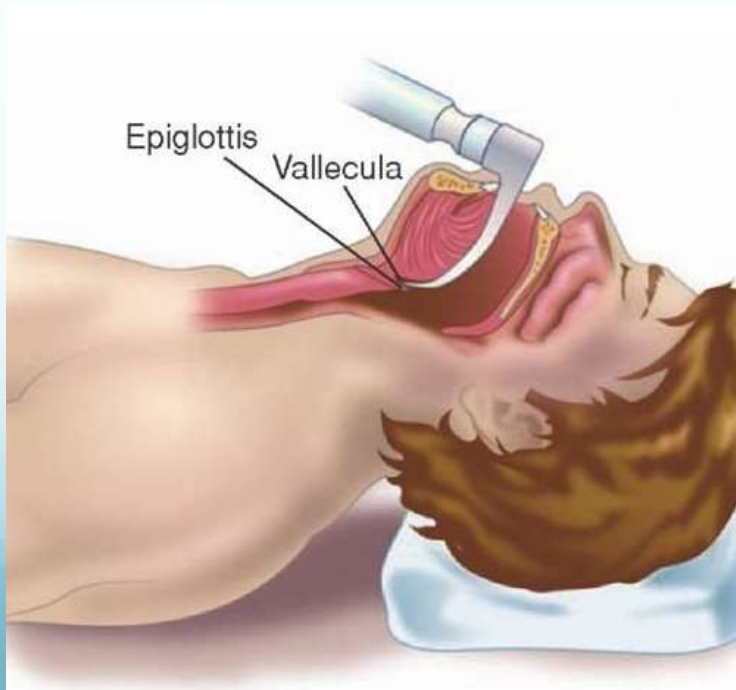
J. Adam Law and George Kovacs(2011) 'Tracheal intubationby Direct Laryngoscopy' *Airway management in emergencies*, Second edtn, People's Medical Publishing House-USA, Shelton, Connecticut, p.63

Driver BE, Prekker ME, Klein LK, et al. Effect of use of a bougie vs endotracheal tube and stylet on first-attempt intubation success among patients with difficult airways undergoing emergency intubation: a randomized clinical trial. *JAMA*. 2018;319(21):2179-2189

# Direct laryngoscopy

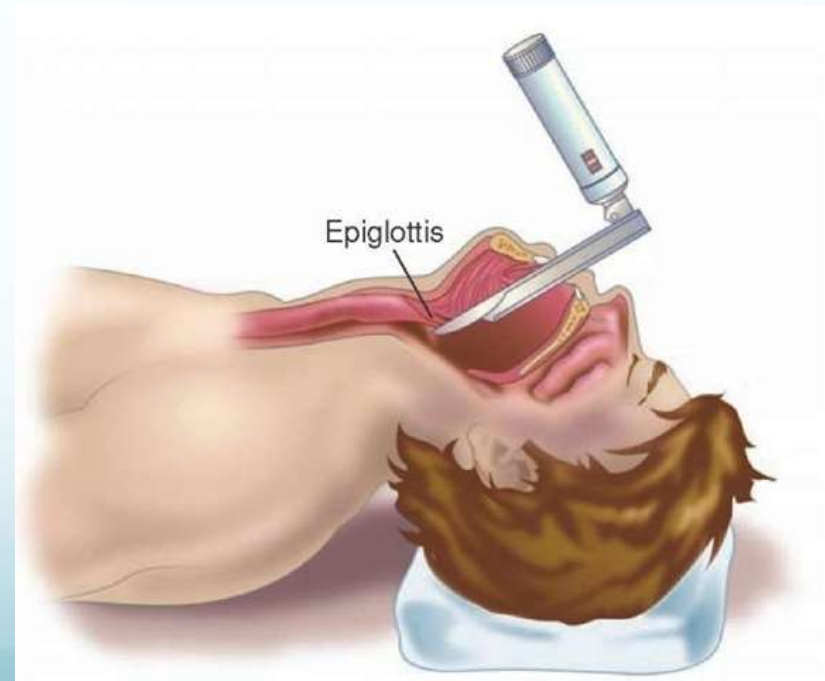
## Curved blade

- MacIntosh
- Usually a size 3 or 4



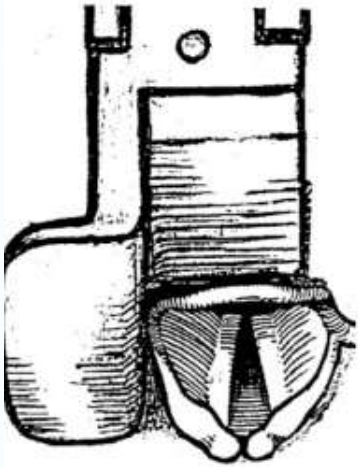
## Straight blade

- Miller, Phillips, Wisconsin
- Usually used in pediatrics

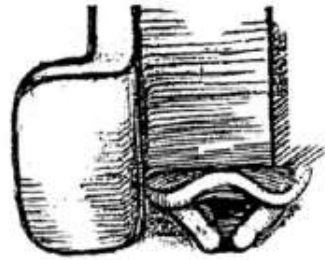




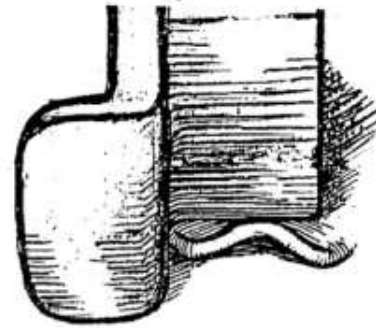
# Direct laryngoscopy



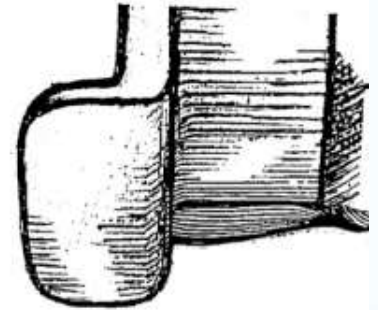
Grade 1



Grade 2



Grade 3



Grade 4

# ETT

- Passage through the cords
- Beware exaggerating the stylet curve
- Remove after the tip of the tube is passed
- 21cm at the lip for adults
- The cuff is inflated (water, not air if plane transfer)
- Confirmatory methods : ETCO<sub>2</sub> detection, chest auscultation increased O<sub>2</sub>, BMV compliance, vapor or misting, vitals, CXR

# Video laryngoscope technique

- Mouth — look in the mouth as you insert the video laryngoscope (to avoid oropharyngeal trauma)
- Screen — look at the screen to visualise the epiglottis followed by the glottis itself
- Mouth — look in the mouth as you insert the endotracheal tube into the mouth (to avoid oropharyngeal trauma)
- Screen — look at the screen as you pass the tube through the larynx

# Video laryngoscopy devices

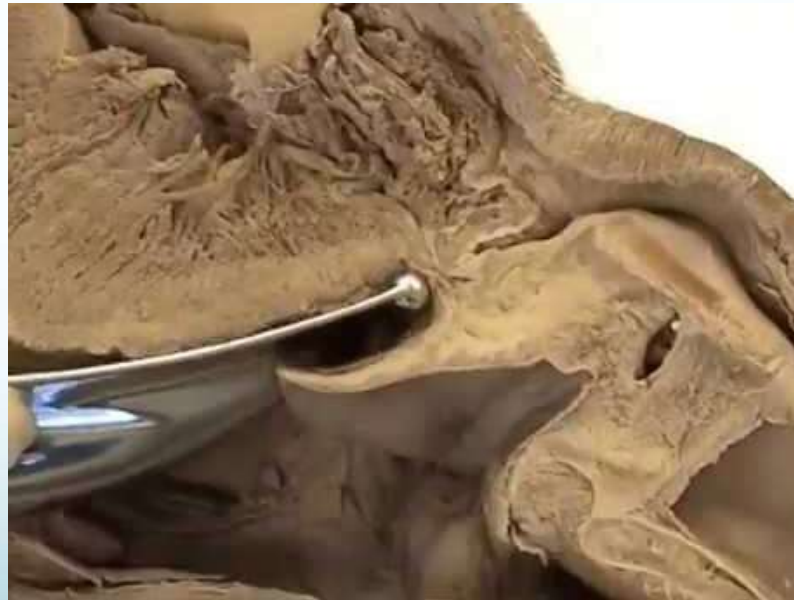
- CMAC
- Glidescope
- McGrath
- King
- Pentax

# Video Laryngoscopy technique - EVLT

- **Epiglottoscopy**
  - Proceed midline down the tongue
  - Look for the uvula as your guide
  - SUCCION blood and secretions
  - Light grip, inline with the forearm

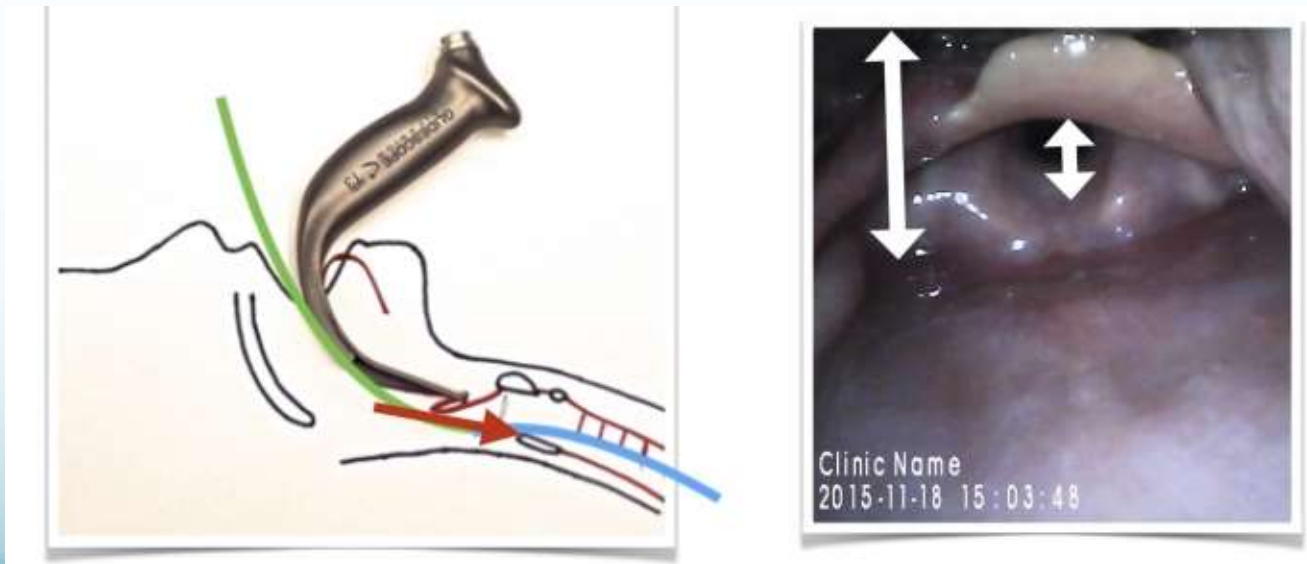
# EVLI

- **Valleculoscopy**
  - Appropriate positioning of the tip of the blade in the vallecular space



# EVLI

- **Laryngoscopy**
  - Do not get too close to the larynx. Attempt to keep structures in the upper half of the screen



# EVLI

- **Intubation**
- C-MAC :
  - “Hockey stick” 30-40 degree bend
  - Consider boogie
  - Rotate Left
- HA- VL :
  - 60-70 degree bend “fish hook”
  - Rotate right



# EVLI

- **Intubation**

- Advance the tube **slowly**, until the **tip** comes into view
- Then adjust your **insertion angle** and direction as needed to get to the second stage of tube delivery (i.e. insertion into the larynx)
- **“STOP, POP and DROP”** method
  - stop stylet insertion after the tip is through the cords
  - pop the stylet out of the tube, and then
  - drop the now partially non-styleteted tube into the trachea

# Case

- A 40 yo man who suffers from asthma presents after he attempted to rob an ATM machine.
- Used an electric saw, caused a small electrical fire. He was caught in a small space with lots of smoke and debris. Police brought him in for respiratory distress.
- His O<sub>2</sub> sat is 95% on 100% NR mask, his RR is 36/min, HR is 130 and BP is 145/90. He has a horse voice, a very noisy breathing, both inspiratory and expiratory with indrawing movements. His nose hairs are singed and there is soot around his nostrils and mouth.

# Awake intubation

- Appropriate for patients with an anatomic, pathologic, or physiologic features that would make RSI problematic.
- I.E. Burn, Penetrating neck injuries, Deep neck space infection
- The awake intubation is a “have time” approach, and the patient must be able to maintain spontaneous respiration and remain cooperative.
- There is no sedation involved.
- Requires topicalization with generous amounts of lidocaine spray, atomizer, nebulized lidocaine, gargle
- Glycopyrolate 0.2 mg is used prior to decrease secretions
- Suction tube is handed to the patient to further dry up the mouth.
- It is not device-specific and can be performed using DL, VL, or an FIE

# Flexible bronchoscopes

- Used mostly in the OR
- Steep learning curve but practice devices exist
- Stand in front of the patient or above on a stool or chair
- Non dominant hand guides distal end dominant hand moves the lever
- View of the larynx will be upside-down if you are facing the patient.
- Pass the cords during inspiration and position 3 cm above carina.
- Patient can take deep breath to aid in this
- Paralyze and sedate once tube is passed.

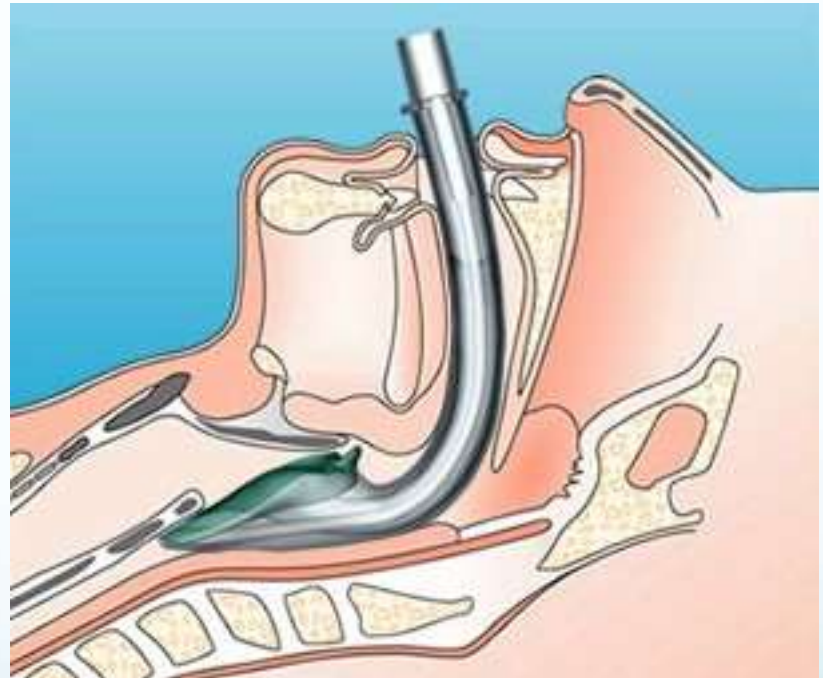
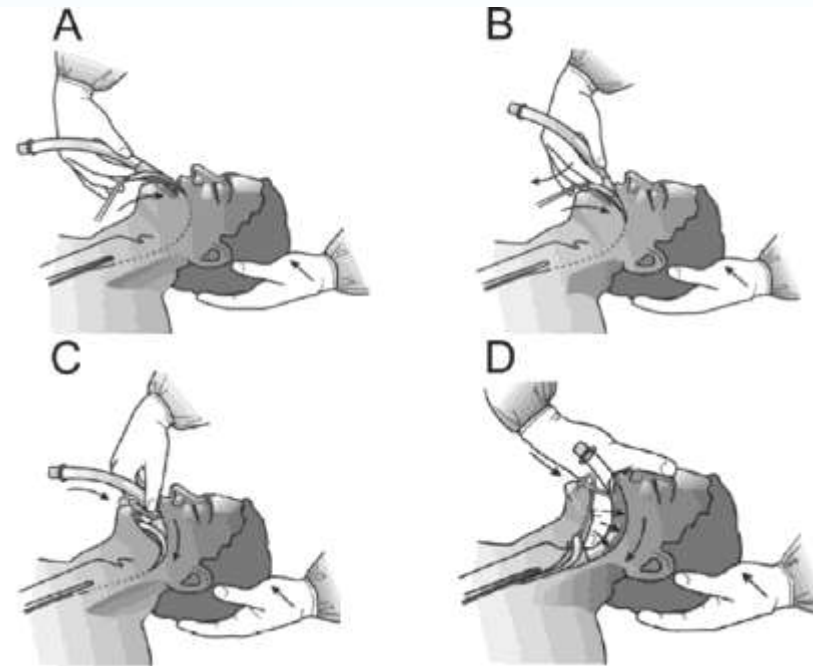
# Awake intubation



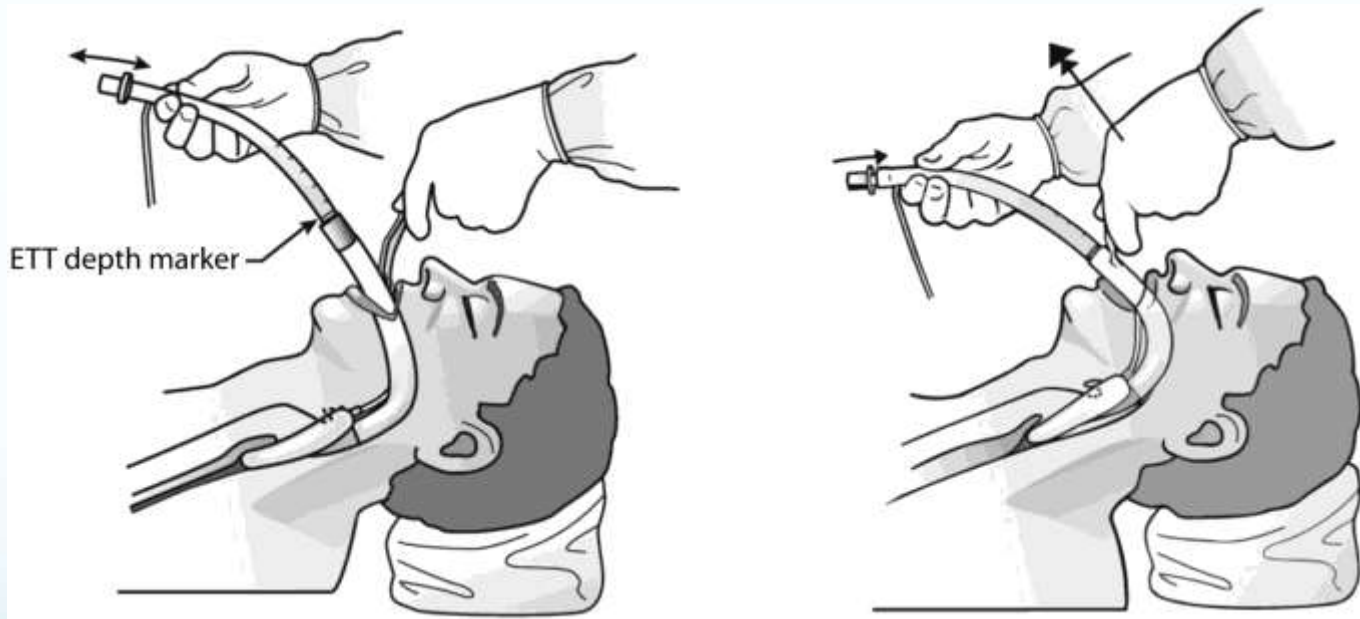
# Supraglottic devices / rescue devices

- Can be used as primary emergency airway, to facilitate oxygenation during RSI, following failed intubation, failed BMV
- Perilaryngeal sealers : LMA, Igel,
- Pharyngeal sealers : Combitube, King LT
- You can attempt intubation through these devices

# Supraglottic devices



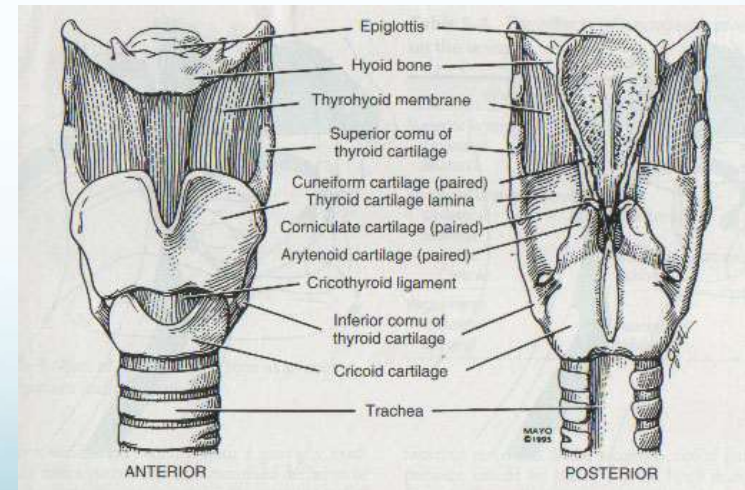
# Supraglottic devices





# Cricothyroidotomy

- Less than 2% of airway
  - Open vs Needle
  - Rapid 4 step technique vs Standard open cric
- 1) Palpate with index finger, stabilize with thumb and long finger
  - 2) Single vertical 3-4cm incision through the skin with a number 11 blade
  - 3) Palpate membrane with index finger again
  - 4) A horizontal incision through membrane
  - 5) Use dilator. Consider using boogie first.
  - 6) Insert size 4 trach tube OR ETT number 6.



# Difficult airway algorithm

- BARS

B = best look laryngoscopy included BURP, Boogie, Blade change

\*\*\*what went wrong?\*\*\*

A = alternative technique or 2nd attempt

R = rescue oxygenation with supraglottic device

S = surgical airway

- Call for help if first attempt unsuccessful

# What do I use

- VL advantages
  - Can convert to the DL if CMAC
  - Some experts say you learn better and faster
  - Ideal for teaching
  - Further away
- VL or DL + boogie
  - Highest success rate

# Suggested reading/courses

- *Airway Management in Emergency Medicine* by George Kovacs and J. Adam Law
- [emcrit.org](http://emcrit.org)
- [lifeinthefastlane.com](http://lifeinthefastlane.com)
- [acep.org](http://acep.org)
- AIME course by CAEP