AIRWAY

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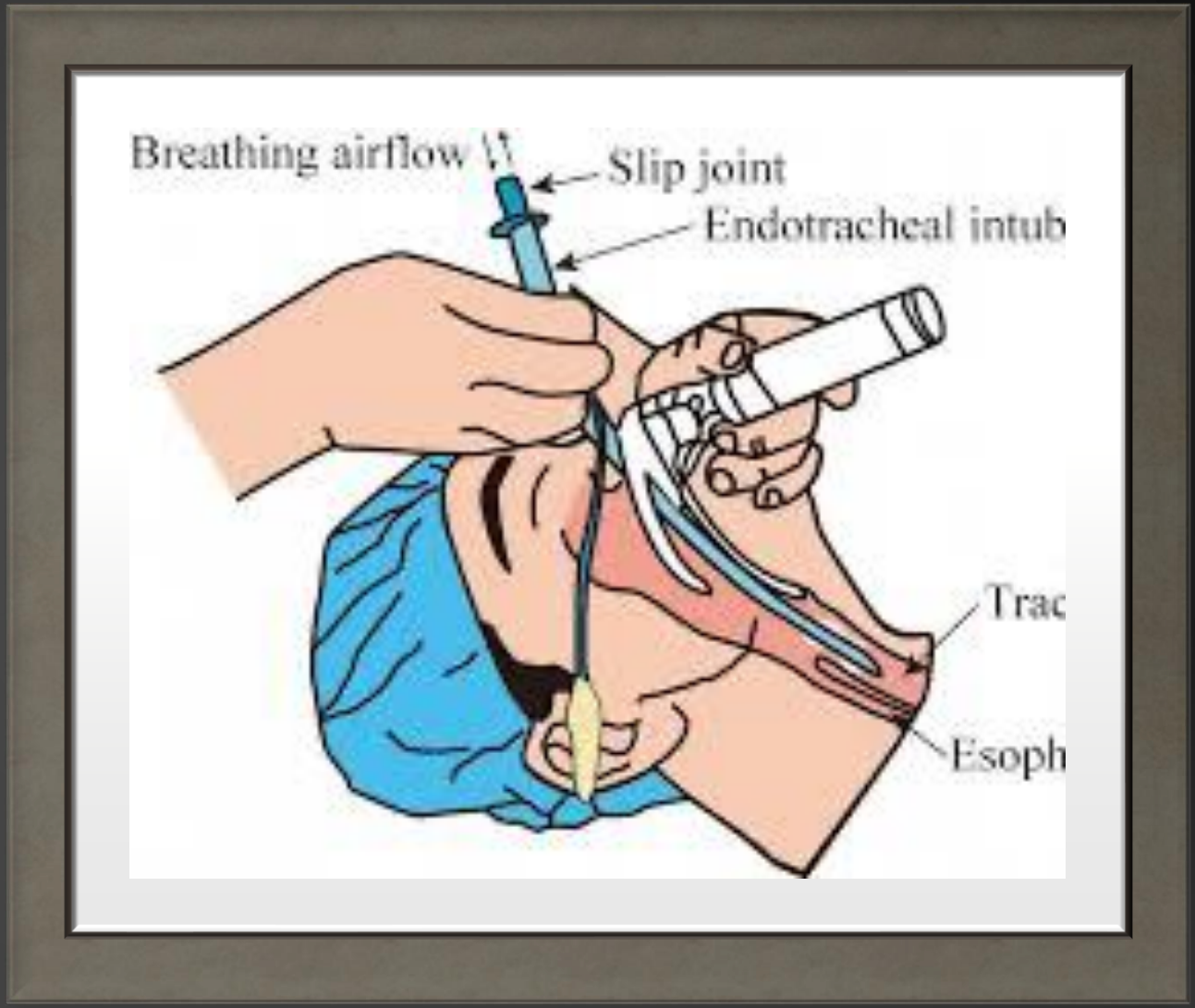
ENDOTRACHEAL INTUBATION

- Is a procedure by which a tube is inserted through the mouth down into the trachea (the large airway from the mouth to the lungs).



- **Indications for intubation**

INDICATIONS FOR INTUBATION

- Failure to Maintain or Protect the Airway.
- Failure of Ventilation or Oxygenation
- Anticipated Clinical Course

FAILURE TO PROTECT OR MAINTAIN AIRWAY

- Altered mental status
- Excessive Secretions
- Bleeding
- Hematoma
- Angioedema
- Others

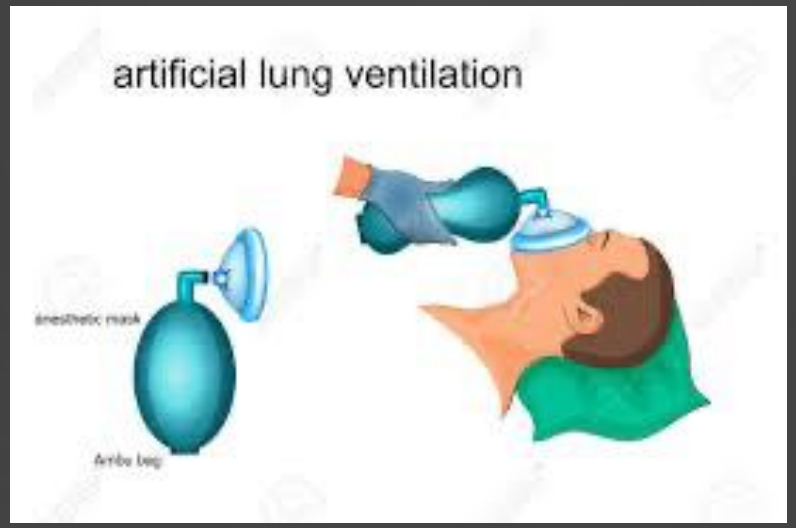
FAILURE TO VENTILATE

- Inability to remove pCO_2
- COPD
- Narcotic OD
- Myasthenia Gravis
- Stroke
- Other

FAILURE TO OXYGENATE

- Inability to maintain pO2 > 60
- CHF
- Pneumonia
- ARDS
- Pulmonary Embolism
- Other

DIFFICULTY OF MANEUVERS SHOULD BE ASSESSED PREINTUBATION

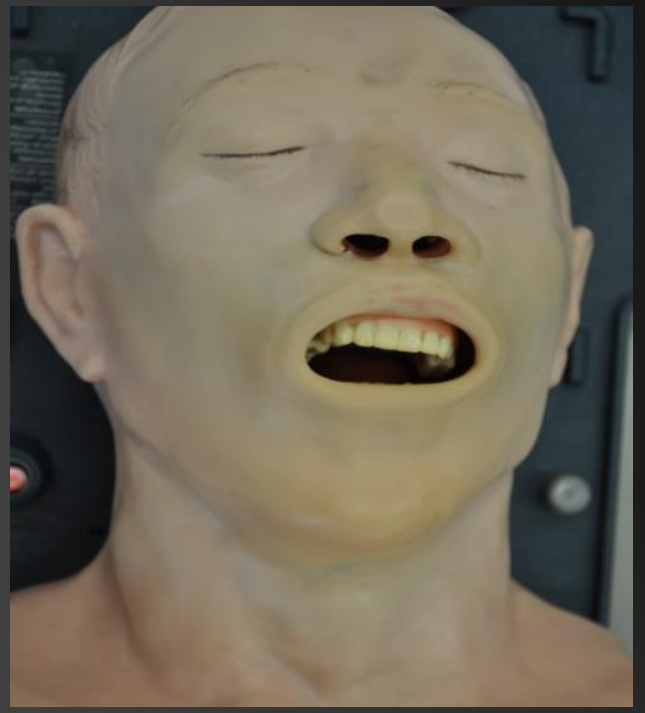


EVALUATION OF DIFFICULT DIRECT LARYNGOSCOPY

- LEMON
  - **L**ook externally ➔ 90% specific
  - **E**valuate the "3-3-2 rule"
  - **M**allampati
  - **O**bstruction/**O**besity
  - **N**eck mobility A study showed "extension-extension" position ➔ superior to sniffing

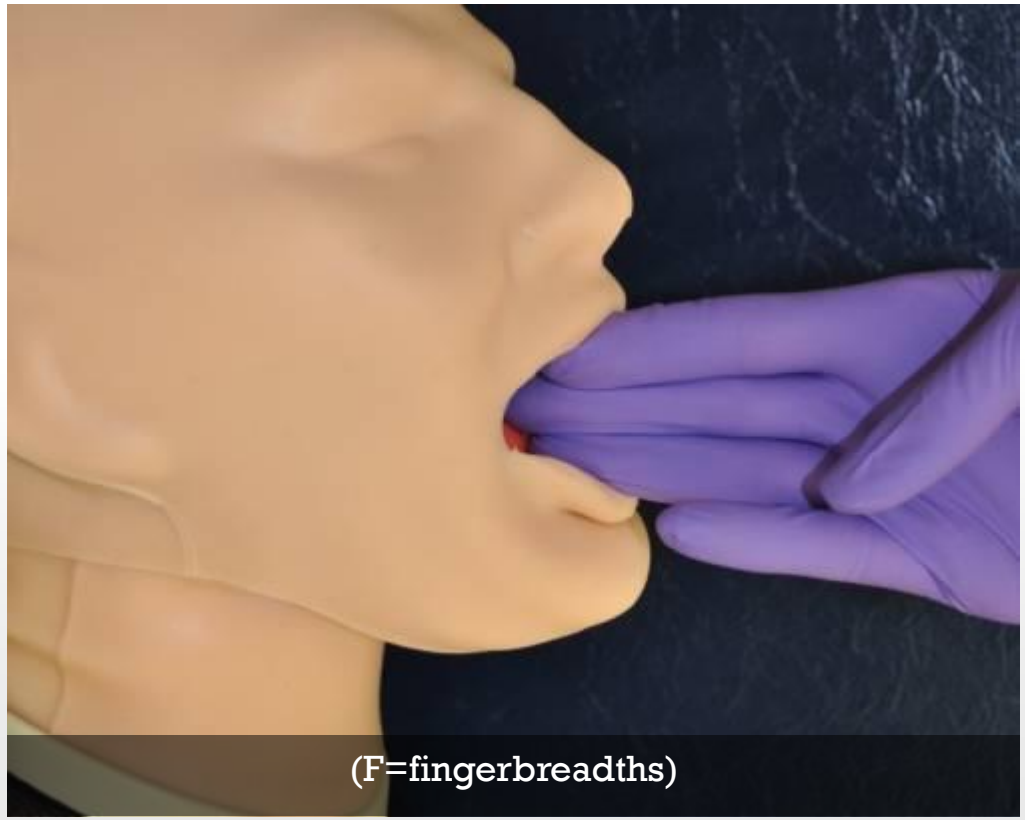
LOOK EXTERNALLY

- abnormal face shape
- sunken cheeks
- edentulous
- "buck teeth"
- receding mandible
- "bull-neck"
- narrow mouth
- obesity
- face or neck pathology



EVALUATE THE 3-3-2 RULE

- Mouth opening > 3F
-



EVALUATE THE 3-3-2 RULE

HYOID-CHIN DISTANCE > 3F

(F=fingerbreadths)

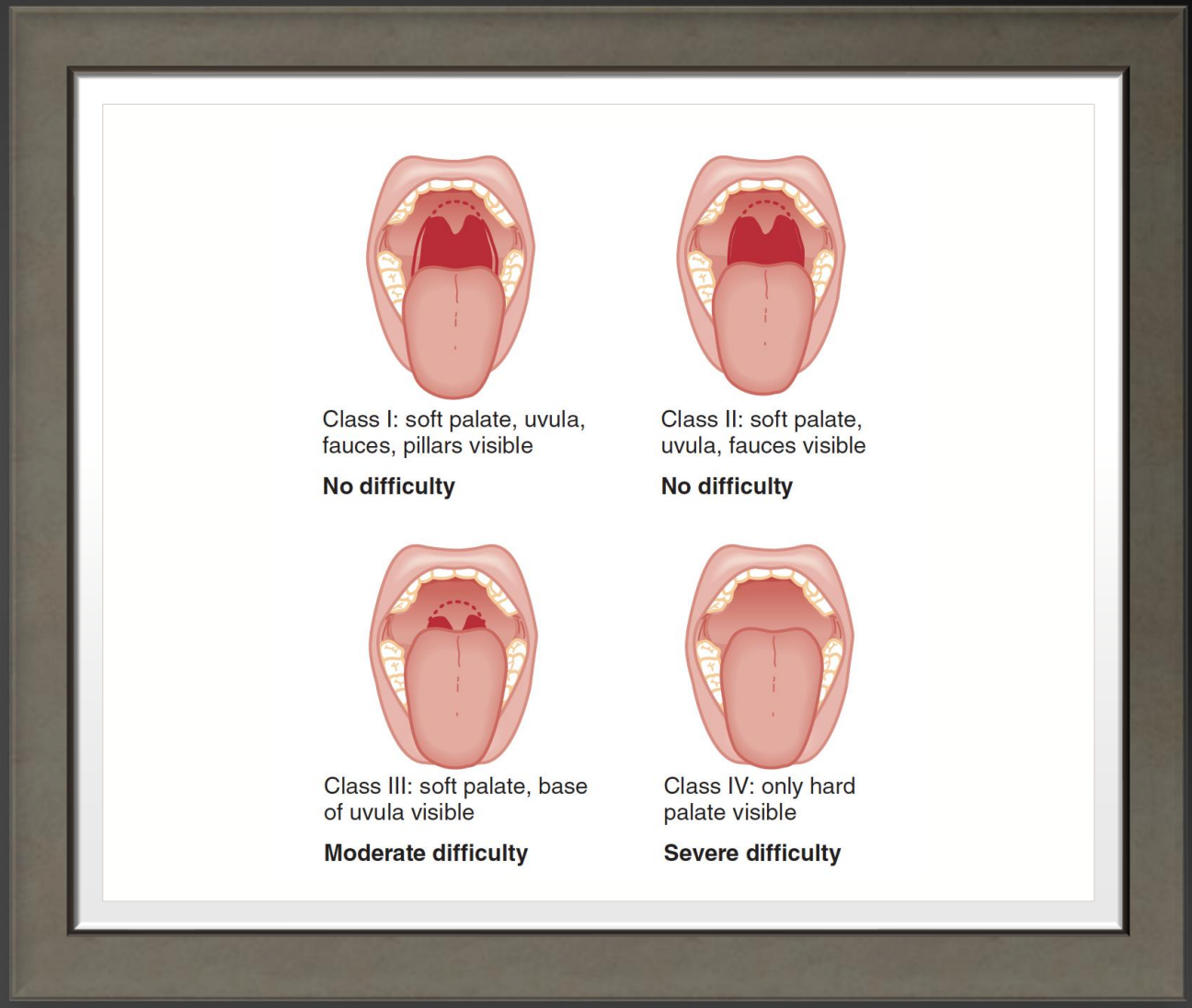
EVALUATE THE 3-3-2 RULE

- Thyroid cartilage - mouth floor distance > 2F

(F=fingerbreadths)

MALLAMPATI

NOT SUFFICIENT PREDICTOR ALONE



OBSTRUCTION

- Peri-tonsillar abscess
- Epiglottitis
- Retro-pharyngeal abscess
- Blood
- Tumor

NECK MOBILITY

- Extension of the neck at the atlanto-occipital joint brings the oral, pharyngeal, and laryngeal axes into alignment.

DIFFICULT BAG-MASK VENTILATION:

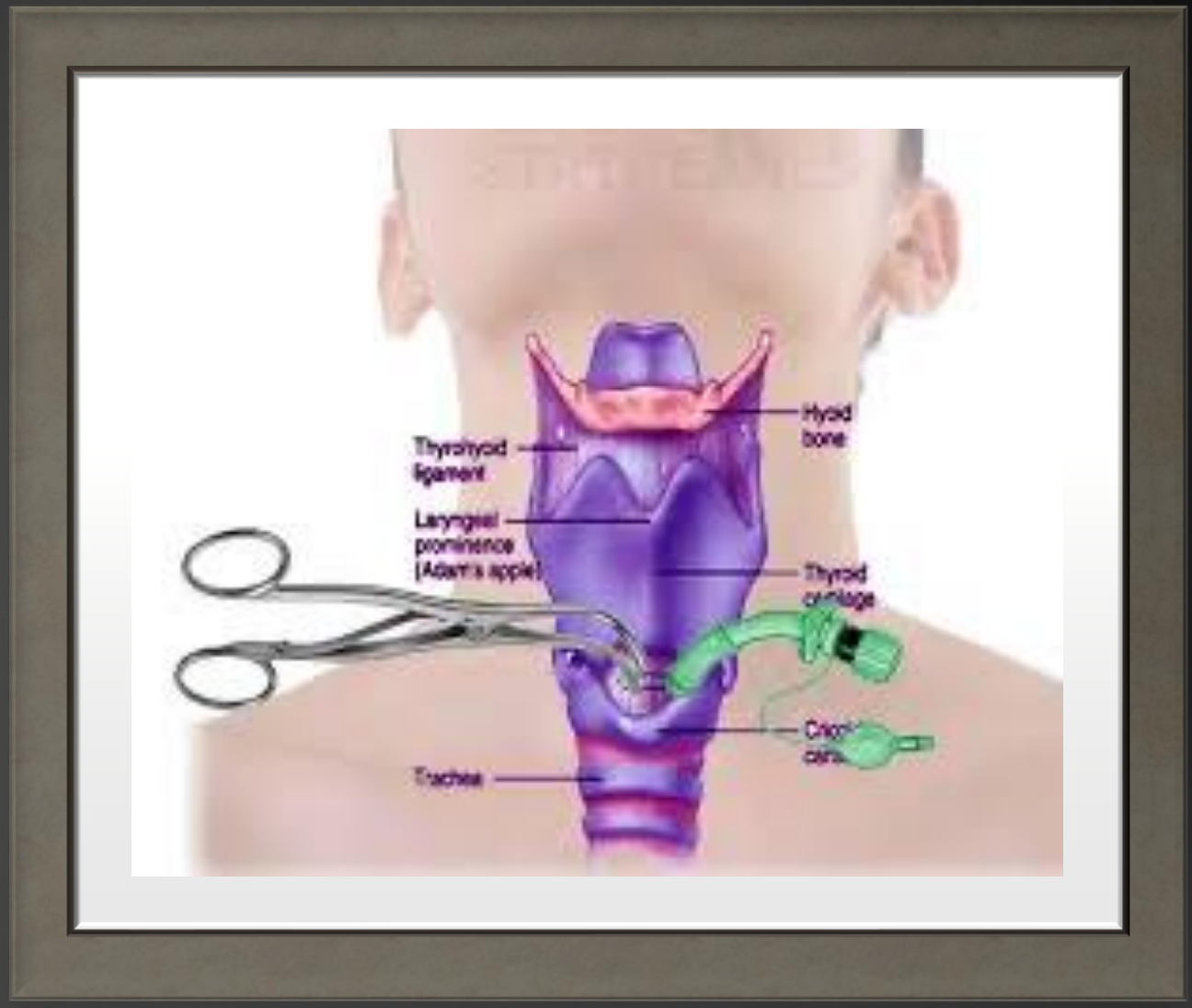
- MOANS
  - **M**ask seal
  - **O**bstruction or obesity
  - **A**ged >55
  - **N**o teeth
  - **S**tiffness (resistance to ventilation)
    - Asthma/ COPD
    - Pulmonary edema
    - Restrictive lung disease
    - Term pregnancy

DIFFICULT EXTRAGLOTTIC DEVICE PLACEMENT:

- RODS
  - **R**estricted mouth opening
  - **O**bstruction or obesity
  - **D**istorted anatomy
  - **S**tiffness (resistance to ventilation)

EVALUATION OF DIFFICULT CRICOTHYROTOMY

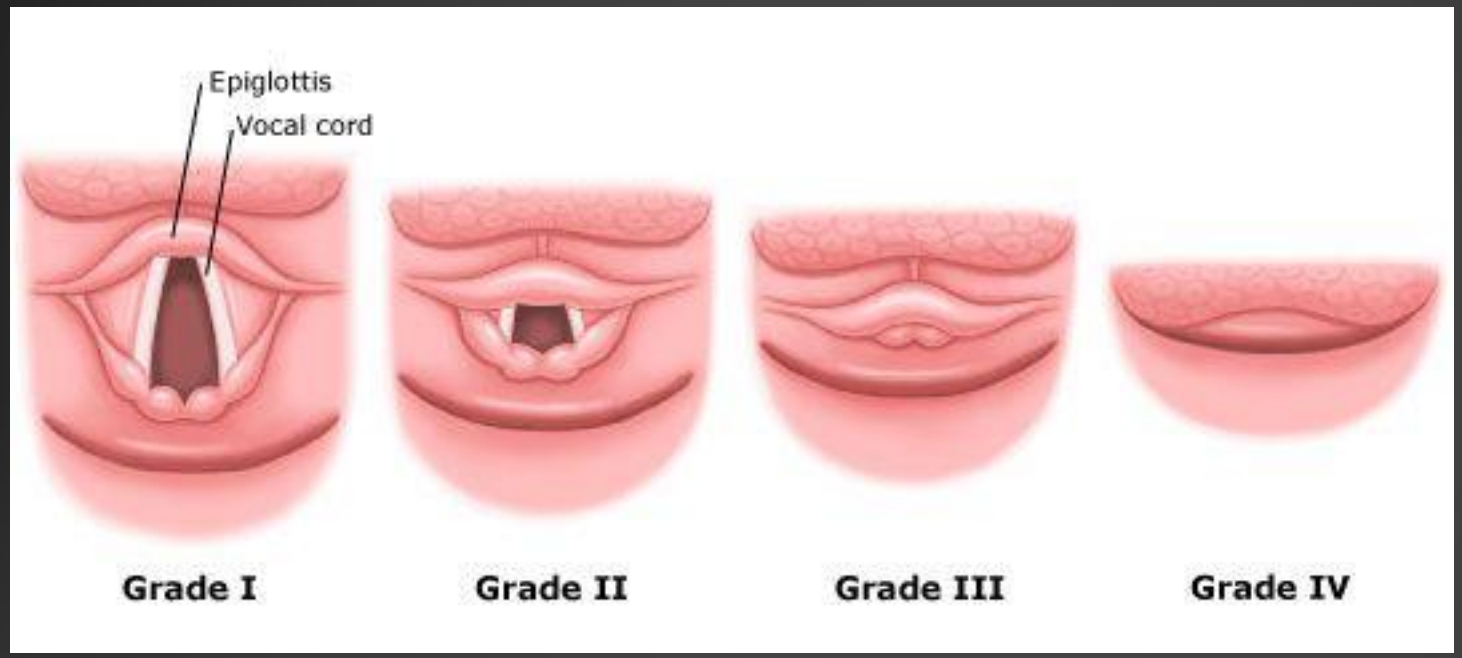
- SMART
  - Surgery
  - Mass (abscess, hematoma)
  - Access/anatomy problems (obesity, edema)
  - Radiation
  - Tumor



GRADING LARYNGOSCOPIC VIEW OF THE GLOTTIS IS THAT OF CORMACK AND LEHANE (CL)

- Grade 1: all or nearly all of the glottic aperture
- Grade 2: only a portion of the glottis
  - Grade 2a: arytenoid cartilages & part of vocal cords
  - Grade 2b: arytenoid cartilages alone or
- Grade 3: only the epiglottis.
- Grade 4: not even the epiglottis is visible.

MEASUREMENT OF INTUBATION DIFFICULTY



Cormack and Lehane

CONFIRMATION OF ENDOTRACHEAL TUBE PLACEMENT

- Repeat laryngoscopy is not enough

- Colorimetric ETco2
  - six manual ventilations to confirm

Yellow ➔ Yes

CONFIRMATION OF ENDOTRACHEAL TUBE PLACEMENT

- Gold standard ➔ a fiberoptic scope vs. $ETCo_2$

COLORIMETRIC ETCO2

FALSE POSITIVE

- Failure to measure before 6 breaths are given
- Carbonated beverages
- Air in stomach – secondary to bagging
- Bicarb administration
- Contact with gastric contents
- Contact with acidic drugs like lidocaine and epi

FALSE NEGATIVE

- Failure to measure before 6 breaths are given
- Cardiac arrest
- Device or ETT clogged with secretions
- Severe airway obstruction
- Pulmonary edema
- Severely hypocarbic (must have at least ETCO2 of 2%)

APPROACH

- Failed intubation
  - Failure to maintain oxygenation by BVM (2 person & two hand)
  - > 3 attempts by experienced operator best position and Technique
  - Single attempt if clinician ascertain this impossible

- The difference between the difficult airway and the failed airway is that the difficult airway is planned for, and the standard is to place a cuffed ETT in the trachea. The failed airway is *not* planned for, and the standard is to provides adequate oxygenation

RAPID SEQUENCE INTUBATION (RSI)

- Success rate for ED RSI of 99%
- 7 P's (Steps)

TABLE 1.1

Sample Rapid Sequence Intubation Using Etomidate and Succinylcholine

TIME	STEP
Zero minus 10 min	Preparation
Zero minus 5 min	Preoxygenation—100% oxygen for 3 min or 8 vital capacity breaths
Zero minus 3 min	Pretreatment—as indicated
Zero	Paralysis with induction • Etomidate, 0.3 mg/kg • Succinylcholine, 1.5 mg/kg
Zero plus 30 s	Positioning—Sellick maneuver optional
Zero plus 45 s	Placement • Laryngoscopy and intubation • End-tidal carbon dioxide confirmation
Zero plus 2 min	Postintubation management • Sedation and analgesia as indicated • Initiate mechanical ventilation • NMBA only if needed after adequate sedation, analgesia

PRETREATMENT

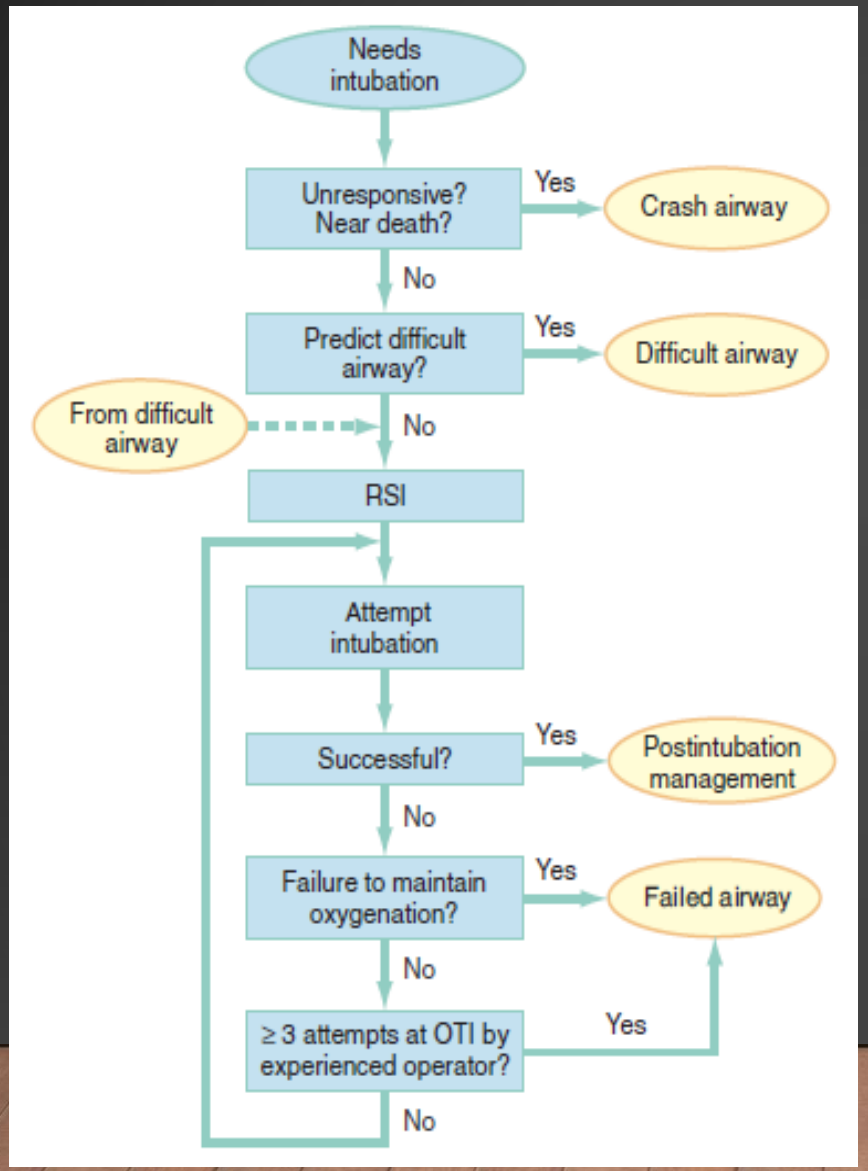
- Drugs are administered 3 minutes before administration of the succinylcholine and induction agent.

- Reactive airways disease:
  - Lidocaine 1.5 mg/kg IV, to mitigate bronchospasm.
  - Albuterol 2.5 mg by nebulizer (if time permits and not already given).

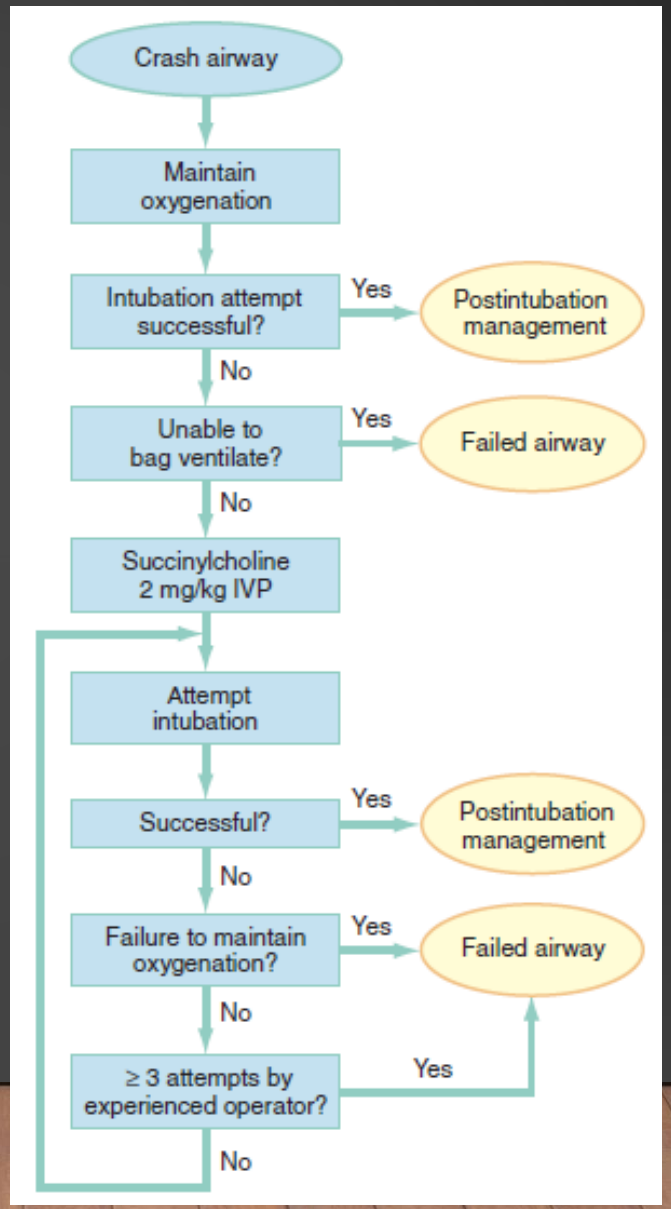
- Cardiovascular disease:
  - Fentanyl 3 μg/kg to mitigate sympathetic discharge.

- Elevated ICP:
  - Fentanyl 3 μg/kg to mitigate sympathetic discharge and attendant rise in ICP.

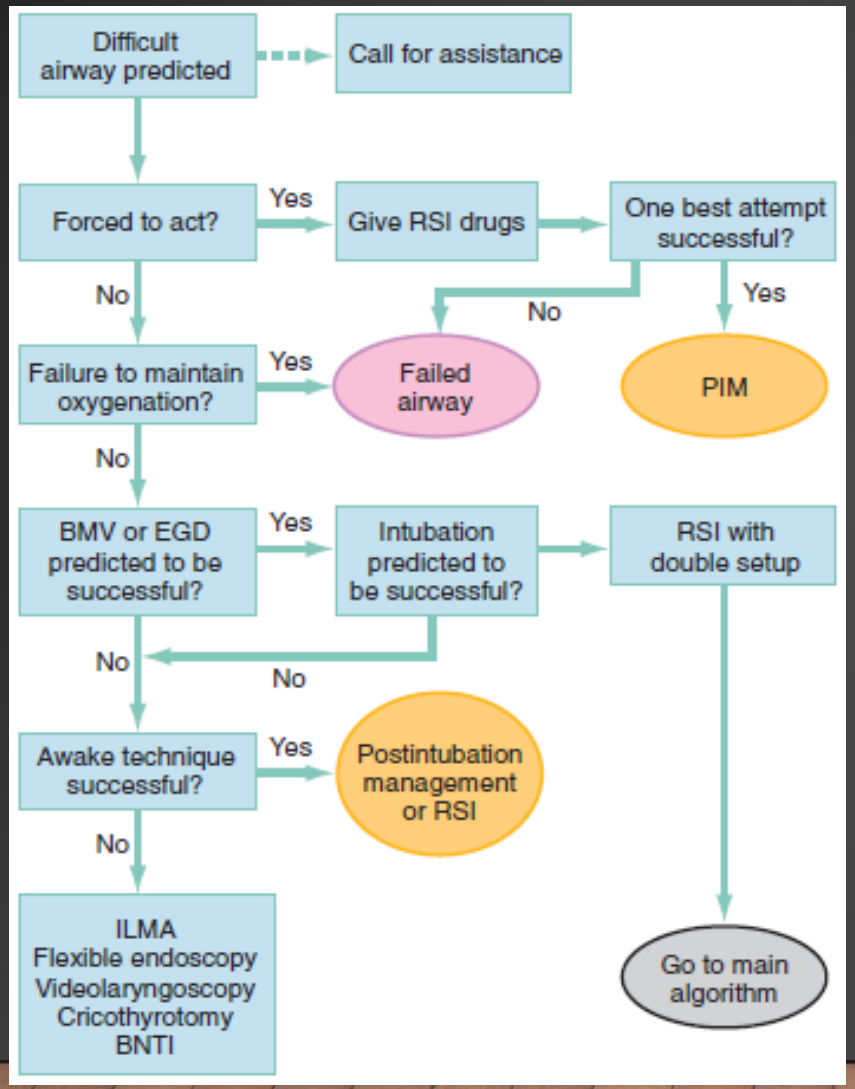
MAIN EMERGENCY AIRWAY MANAGEMENT ALGORITHM



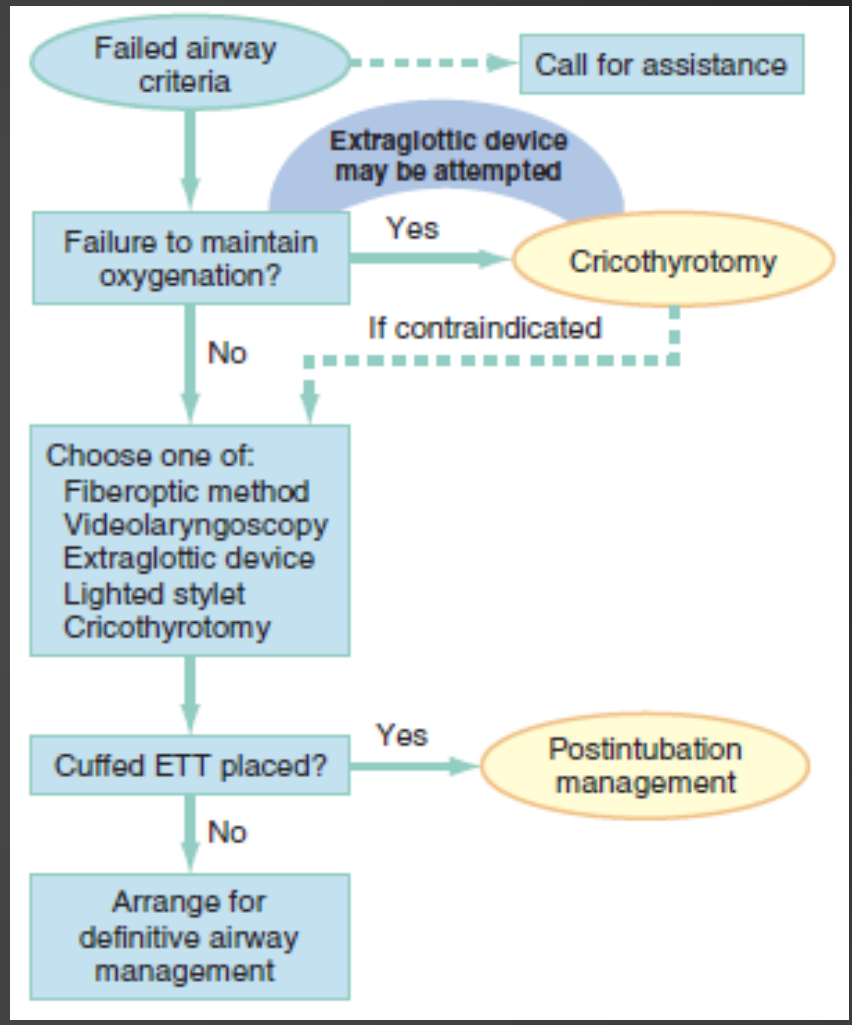
CRASH AIRWAY ALGORITHM



DIFFICULT AIRWAY ALGORITHM



FAILED AIRWAY ALGORITHM



OTHER INTUBATION TECHNIQUE

- Awake Oral Intubation
  - With local anesthesia
  - Sedation without paralysis called non paralytic RSI

- Crash intubation
  - unconscious, unresponsive
  - If unable to visualize single dose succinylcholine may help

NEUROMUSCULAR BLOCKING AGENTS

- The depolarizing agent
  - succinylcholine,
  - binding noncompetitively with ACh

- the competitive, or nondepolarizing,
  - bind competitively to ACh receptors
  - No histamine or cardiac effect

SUCCINYLCHOLINE (DEPOLARIZING)

- rapid onset
- complete reliability
- short duration of action
- absence of common serious side effects

- Dose:
  - 1.5 mg/kg IV
  - 3 – 4 mg/kg IM

- Wait 45 seconds

- Clinical duration of action before spontaneous respiration: 6 - 10 minutes

- Full recovery of normal neuromuscular function: within 15 minutes

SUCCINYLCHOLINE

- Masseter Spasm
  - Rare
  - Administer a competitive NMBA
  - If persists, suspect malignant hyperthermia
- Cardiovascular Effects
  - can be a negative chronotrope ➔ sinus bradycardia
  - self-limiting
  - atropine if necessary

TABLE 1.2

Conditions Associated With Hyperkalemia After Succinylcholine Administration

CONDITION	PERIOD OF CONCERN
Burns > 10% BSA	>5 days until healed
Crush injury	>5 days until healed
Denervation (stroke, spinal cord injury)	>5 days until 6 mo postinjury
Neuromuscular disease (ALS, MS, MD)	Indefinitely
Intraabdominal sepsis	>5 days until resolution

ALS, Amyotrophic lateral sclerosis; *BSA*, body surface area; *MD*, muscular dystrophy; *MS*, multiple sclerosis.

ROCURONIUM (COMPETITIVE, NONDEPOLARIZING)

- Dose: 1.0 mg/kg IV
- Wait 60 seconds
- Lasts approximately 50 minutes
- sugammadex (a nondepolarizing reversal agent)

VECURONIUM

- Dose:
  - First, 0.01 mg/kg "priming" dose.
  - After 3 minutes, 0.15 mg/kg is given for paralysis.

- Paralysis achieved in about 75 - 90 seconds

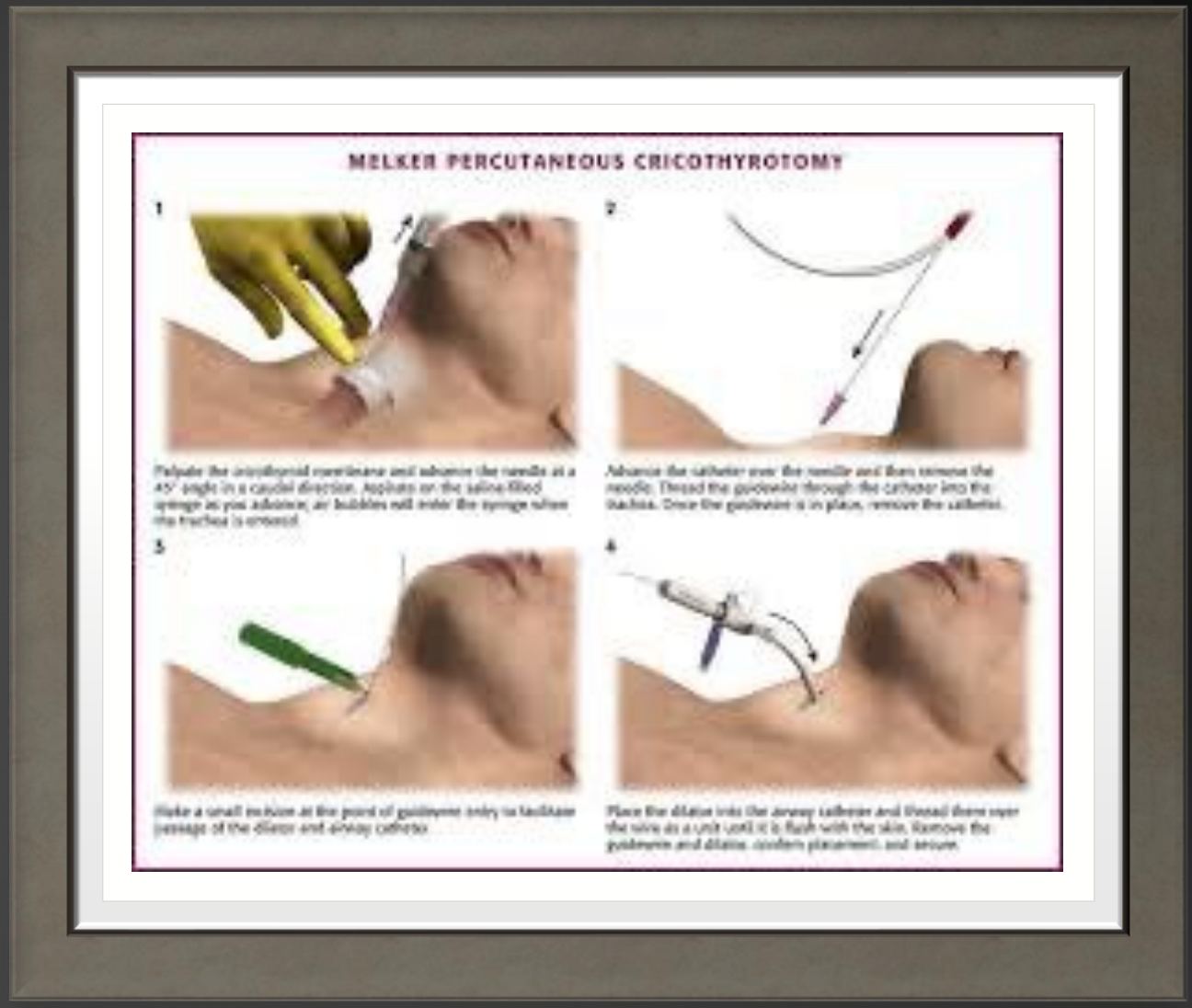
INDUCTION AGENTS

- *Etomidate*
  - decrease ICP, cerebral blood flow, and cerebral metabolic rate
  - Not affecting systemic mean arterial blood pressure and CPP
  - Recent RCT showed adrenal suppression has no effect on clinical
- *Barbiturates.*
  - Thiopental is a negative inotrope and a potent venodilator
- *Benzodiazepines*
  - *Negative inotrope*
- *Ketamine.*
  - *Reserve protective reflex*
  - *Used in bronchial asthma and hemodynamically unstable (direct bronchodilator and release catecholamine)*
  - *High ICP in trauma ➔ controversy use if patient hypotensive*

Drug	Dose	Induction	Duration	Benefits	Caveats
Etomidate	0.3 mg/kg	< 1 min	10 – 20 min	-Decrease ICP -Neutral BP	-Myoclonus -Adrenal supp. -Vomiting -No analgesia
Ketamine	1-2 mg/kg IV 6.5 – 13 mg/kg IM	30 sec Peak: 1 min	10 - 15 min	-Bronchodilator -Dissociative amnesia	-Increased secretions -Emergence phenomenon -May inc. BP
Propofol	1.5 - 2 mg/kg	20-40 sec	8 - 15 min	-Antiemetic -Anticonvulsant -Decrease ICP	-Apnea -Decrease BP -Pain at the site of admin. -No analgesia
Midazolam	0.2 - 0.3 mg/kg	30 sec	15 - 20 min	-Anticonvulsant -Decrease ICP	-Decreased BP -No analgesia
Thiopental	3 mg/kg	< 30 sec Peak: 1 min	5 - 8 min	-Decrease ICP	-Histamine release (BA) -Decrease BP

SURGICAL CRICOTHYROTOMY

- Contraindicated (relative)
  - Distorted neck anatomy
  - Preexisting infection in the neck
  - Coagulopathy
- Contraindicated (absolute)
  - Children < 10 years



TAKE HOME MASSAGE

- Know when to intubate .
- Prepaere your equipment before tgime Zero .
- Always have you paln B and call for help .