

Management of the Difficult Airway

EMERGENCY PHYSICIAN'S PERSPECTIVE

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Center



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Disclosures:

- I have no financial relationships with any Airway Device manufacturers/suppliers.



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Goals:

- Indications for Airway Management
- Predict a difficult airway based on clinical criteria
- Plan for appropriate action in the difficult airway
- Initiate appropriate plans of attack with confidence in the “Can’t Ventilate/Can’t Intubate” (CVCI) situation
- Become informed about some new (and not so new) airway options out there.



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Indications for Airway Management

- Inadequate Oxygenation
- Inadequate Ventilation
- Anticipation of either above
- Airway Protection



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Ideal Patient for Intubation

- Intact, clear airway
- Wide open mouth
- Pre-Oxygenated
- Intact respiratory drive
- Normal dentition
- Normal and Easily identifiable anatomy
- Good Neck Mobility



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Identifying the Difficult Airway

- This ideally should occur before you attempt!
- Review Past Medical History
- Physical Exam
 - Mallampati Classification
 - Thyromental Distance
 - Obvious deformities/Trauma
 - Signs of obstruction
 - Neck Mobility



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What qualifies as a difficult Airway



Difficult?



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Difficult Airway Definition

- According to ASA Guidelines
 - Any Clinical situation whereby conventionally trained anesthesiologists experiences difficulty with:
 - Mask Ventilation or
 - Tracheal Intubation or
 - Both (Can't Intubate, Can't Ventilate)



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Important Past Medical History

- Previous Difficult Intubations
- Previous Surgical Airway
- Congenital Conditions- Pierre Robin Syndrome
- Arthritis- Rheumatoid, Ankylosing Spondylitis
- Prior C-spine/Neck Surgeries
- Head and Neck tumors



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Physical Exam findings

- Limited Neck Mobility
- Facial Instability
- Burns
- Obesity or very small
- Short Muscular neck
- Receding Jaw
- Signs of Anaphylaxis
- Stridor/FBAO
- Scars from Previous Surgeries



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Mallampati Classification



Source: Hung OR, Murphy MF: *Management of the Difficult and Failed Airway, 2nd Edition*:
www.accessanesthesiology.com

Thyromental Distance

- Distance from lower border of the chin to thyroid notch
- Adults who have less than 3 fingerbreadths between mentum and thyroid notch may have either anterior larynx or a small mandible, which could complicate intubation



LEMON

DESIGNED TO PREDICT DIFFICULT INTUBATION

- **Look** - look externally for signs the airway may be difficult
 - Difficult to bag - facial hair, obesity
 - Difficult to intubate - obesity, cervical -collar or need for immobilization, limited neck mobility, any type of facial or oropharyngeal swelling
- **Evaluate** using the 3-3-2 rule
 - Mouth opening is 3 fingerbreadths
 - Thyromental distance (tip of chin to thyroid cartilage) is 3 fingerbreadths
 - Floor of mandible to thyroid notch is 2 fingerbreadths
- **Mallampati score**
 - A predictor of difficult intubations based on what structures are visible in the oropharynx
 - Classes I-IV (simplified description)
 - I - Soft palate, faucial pillars (the two arches - glossopalatine anteriorly and pharyngopalatine posteriorly), and uvula
 - II - Tip of uvula is blocked by tongue
 - III - Only the soft palate
 - IV - Soft palate not visualized
- **Obstruction/obesity**
- **Neck mobility**



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3-3-2 Rule



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Preparation

- Consider Alternatives for Airway Support
 - CPAP/BiPAP
 - Call Backup/Intubation in controlled OR setting
- Drugs
- Prepare for need to change equipment
 - Different blades
 - Different tube sizes
 - Bougie
 - LMA/Combitube
 - Advanced Airway Equipment- Glidescope, Fiberoptics etc
- Prepare for Surgical Airway



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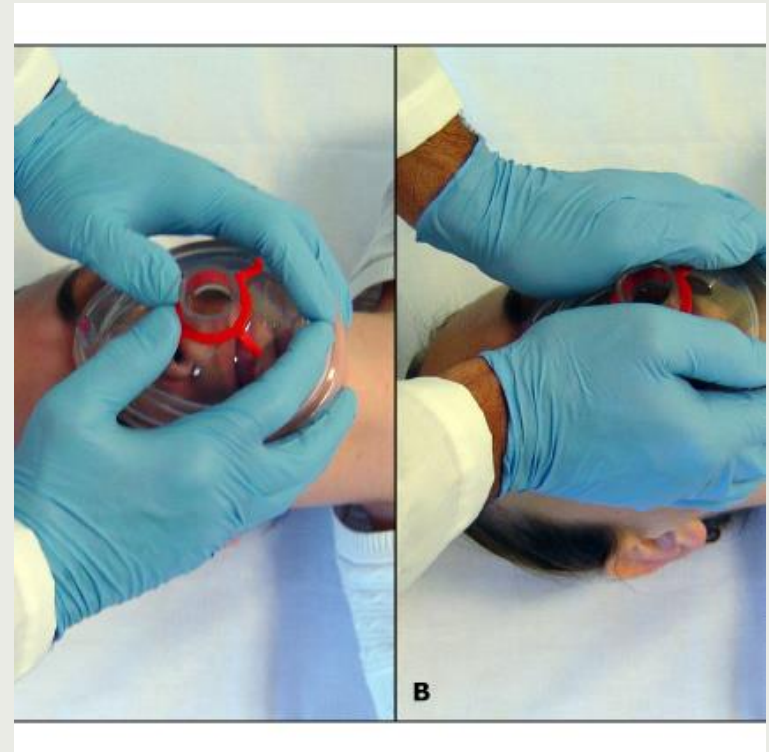
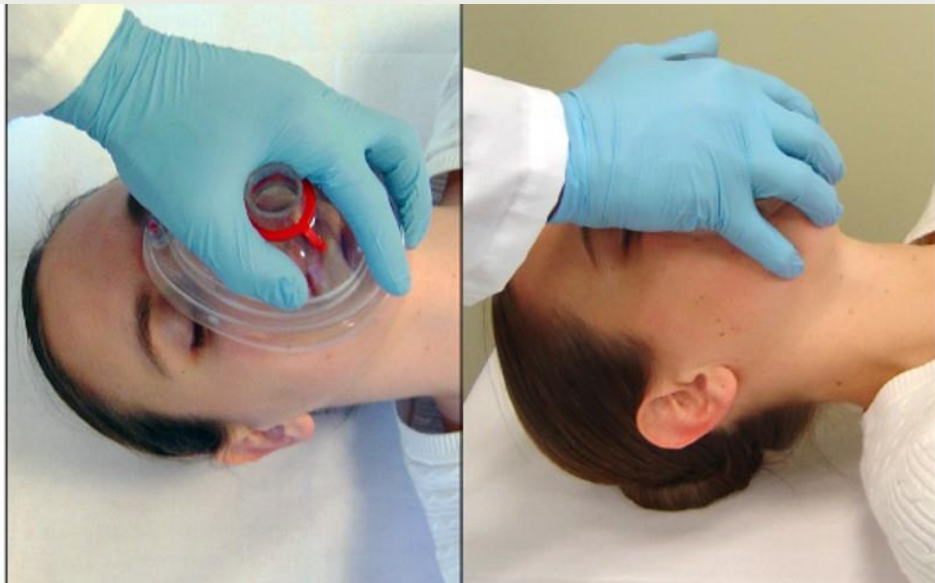
Difficult BVM

MOANS

- Mask seal:** Can't approximate mask
- Obesity:** Redundant tissues impede airflow
- Age >55yrs:** Loss of tissue elasticity
- No teeth:** Mask doesn't sit properly
- Stiff lungs/body:** ↑pressure needed



BVM Tips



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Key Techniques

- Sellick's Maneuver/Cricoid Pressure (+/-)
- BURP maneuver
- Good Positioning- Sniff position
- Always have a bougie in your pocket
- Cricothyrotomy



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Positioning

- One of the most common reasons for failed endotracheal **intubation** is improper patient positioning
- Sniffing Position
 - First Described in 1936 by Bannister and MacBeth- to align oral, pharyngeal, laryngeal axes to provide optimal exposure of the glottis
- The correct **position** is with the lower part of the cervical spine flexed, and the atlanto-occipital joint extended
- Pitfalls: Inadequate for the morbidly obese patient, not an option with suspected cervical spine injury

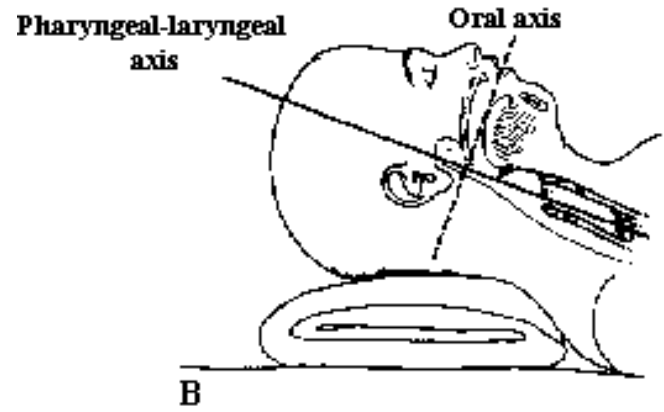
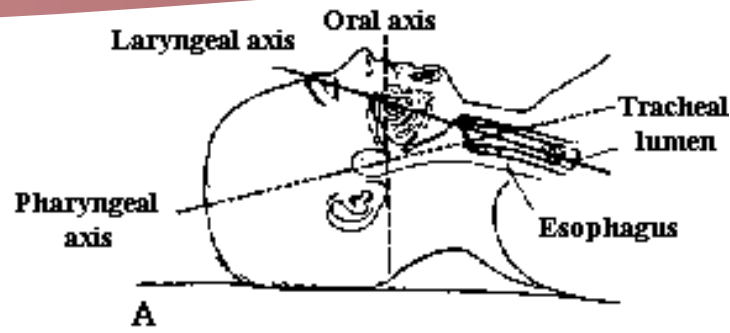


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Positioning for Obese Patients

- Ear-to-sternal notch positioning improves the mechanics of ventilation, both with spontaneous breathing, and with mask ventilation.
- In the obese patient: shoulders are elevated, the head and neck are extended, and the external auditory meatus is in line with the sternal notch

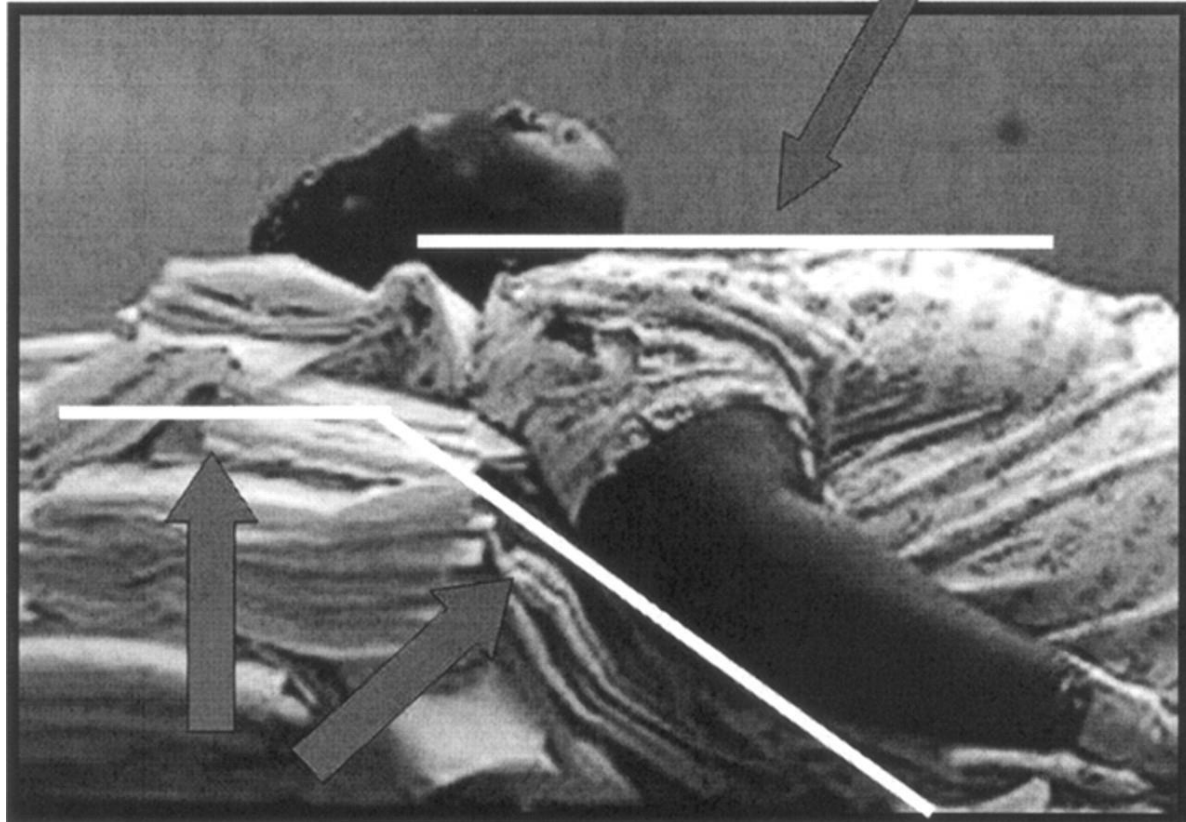


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Patient's Positioned, Now What?

- Implement a strategy to provide the highest likelihood of success.
- RSI- Rapid Sequence Intubation
- Most experienced Operator ready for attempt.
- Further optimization if 1st attempt fails
- Plan and willingness to proceed with next steps if 1st attempts fail



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RSI

7 P'S PF RSI

- Preparation
- Preoxygenation
- Pre-Intubation Optimization (Previously Pretreatment)
- Paralysis with Induction
- Protection
- Placement
- Post-Intubation Management



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PREPARATION

- Monitor (BP, Rhythm, Pulse Ox)
- IV – at least one FUNCTIONAL line – 2 preferred
- BVM, Suction, Capnography
- Functioning Laryngoscope with preferred blade
- ET Tube -
- RSI Meds – ready for administration
- Assess for possible difficult airway



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PREOXYGENATION

- Classically, it is desirable to have 3 minutes of normal tidal volume breathing or eight vital capacity breaths with 100% oxygen.
- This prevents desaturation during intubation
- Most Emergent patients will have difficulty with this.



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Apneic Oxygenation

Algorithm for emergency preoxygenation & apneic oxygenation

PLAN A Nasal cannula at 15 liters/minute plus non-rebreather facemask at 15 liters/minute

Fails or unavailable

PLAN B Nasal cannula at 15 liters/minute plus bag-valve mask with PEEP valve

Fails or unavailable

PLAN C Nasal cannula at 30-45 liters/minute



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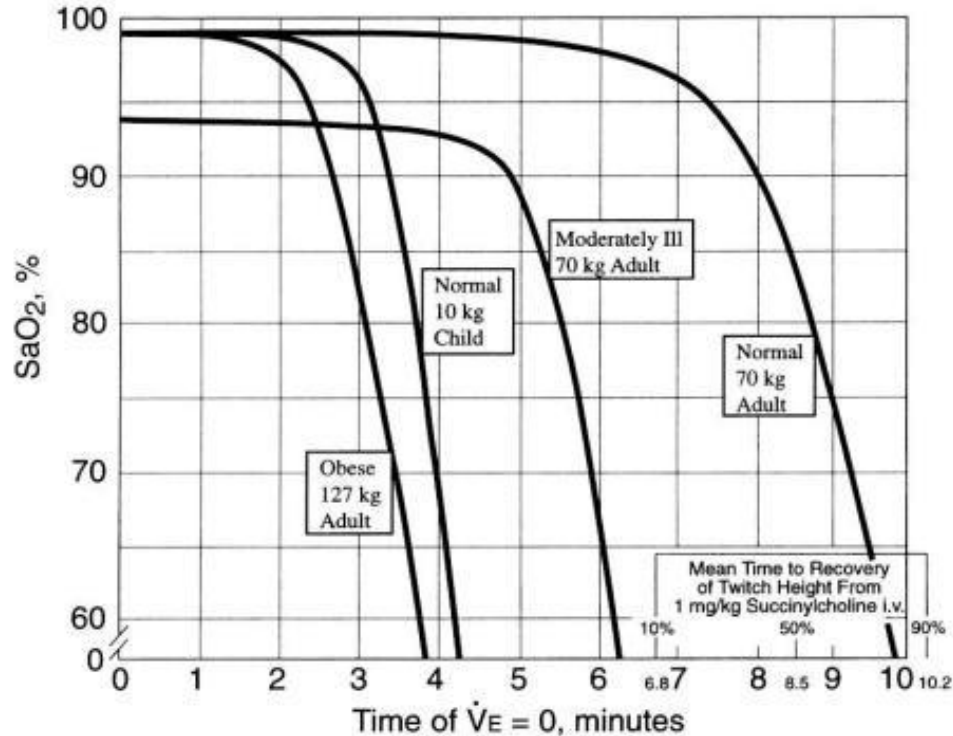


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Importance of Preoxygenation

TIME TO HEMOGLOBIN DESATURATION WITH INITIAL $F_{A}O_2 = 0.87$



Gleason JM, Christian BR, Barton ED. Nasal Cannula Apneic Oxygenation Prevents Desaturation During Endotracheal Intubation: An Integrative Literature Review. *West J Emerg Med.* 2018;19(2):403–411. doi:10.5811/westjem.2017.12.34699

RSI (Rapid Sequence Intubation)

TO BAG OR NOT TO BAG

- **Rapid sequence intubation (RSI)** – In its purest form, this involves pushing medication, waiting for paralysis without any ventilation, and then proceeding with laryngoscopy. Avoidance of any mask ventilation should theoretically reduce the risk of gastric insufflation and aspiration.
- **Bag-Mask Ventilation** – After pushing medication, the patient is gently mask ventilated while the drugs take effect. This may help prevent atelectasis and shunt physiology, thereby improving oxygenation.



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PRE-INTUBATION OPTIMIZATION

- Previously referred to as Pre-Treatment
- Traditionally aimed at mitigating response to drugs used during RSI
 - Lidocaine for Head Injury patients or Reactive airway disease
- Atropine in children to prevent Bradycardia
- Supraglottic airway
- IVF Bolus



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PARALYSIS WITH INDUCTION

- Drugs
- Use these to provide optimum conditions
- Induction
- Paralytics



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RSI Drugs Options

- There are a number of options for RSI- choose wisely
- Succinylcholine vs. Rocuronium/Vecuronium
- Consider potential for awake intubation/sedated but not paralyzed intubation
- Know your drugs and your doses



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Induction and Paralytics

Induction Agents for RSI

	IV Dose Standard	Suggested Dose 70 kg adult	IV Dose Shock	Onset	Duration	Pros	Cons
Ketamine	1 to 2 mg/kg (3 to 4 mg/kg IM)*	140 mg (2 mg/kg)	1 mg/kg	60 to 90 sec	5 to 15 min	Good for: -Hemodynamically unstable -Bronchospasm	-Increases secretions -Caution in hypertensive patients -Nausea, vomiting
Etomidate	0.2 to 0.6 mg/kg	20 mg (0.3 mg/kg)	0.2 mg/kg	15 to 45 sec	3 to 10 min	Good for most intubations	-Myoclonus -Adrenal suppression (unclear if clinically relevant) -Pain on injection -Nausea, vomiting
Propofol	1 to 2 mg/kg	105 mg (1.5 mg/kg)	0.2 mg/kg starting dose and titrate	15 to 45 sec	5 to 10 min	Good for: -Bronchospasm -Seizures	-Lowers BP -Caution in head injury (drops MAP and CPP) -Allergy to egg or soy -Pain on injection

*Intramuscular administration may significantly delay onset

Paralytic Agents for RSI

	IV Dose Standard	Suggested Dose 70 kg adult	Onset	Duration	Pros	Cons
Succinylcholine	1.5 mg/kg (2 mg/kg infants and small children) (3 to 4 mg/kg IM)*	105 mg (1.5 mg/kg)	45 to 60 sec (2 to 3 min IM)	5 to 15 min	Shorter duration allows return of neuro exam	Contraindications: HyperK, Guillain-Barre, malignant hyperthermia, >3d post burn or denervation, neuromuscular disorders, digitalis toxicity -Bradycardia, transient incr. in ICP & IOP -Aminoglycosides may prolong effects
Rocuronium	0.6 to 1.2 mg/kg	70 mg (1 mg/kg)	60 to 120 sec	3 to 10 min	Good for most intubations	-Delays return of neuro exam -Reversed by sugammadex (costly, not widely available)

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Ketamine

- Dosage: 1-2mg/kg slow IVP
- Onset: 30 seconds to 1 minute
- Duration: 5-10 minutes
- Benefits: Potent Bronchodilator, leaves protective airway reflexes intact, maintains cardiovascular stability
- Caution: Old Dogma regarding elevated ICP with use, increases sympathetic tone, emergence delirium common



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Ketamine in Trauma

- Often underutilized due to old dogma regarding ICP
- Ketamine is a non-competitive NMDA receptor antagonist and has neuroprotective effects
- Studies claiming ketamine should be avoided in head injury are based on 3 studies from the 1970's, recent studies have shown no convincing evidence that these claims are valid
- Acute agitation and emergence reactions may be of concern for conscious sedation. However, in the RSI population where continued sedation with benzodiazepines is possible, this is of less concern.



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Propofol

- Dosage: 2-3 mg/kg IV Push
- Onset of action: < 1 minute
- Duration 3-10minutes
- Benefits: Rapid onset, brief duration, amnestic
- Caution: Causes cardiovascular depression and hypotension



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Benzodiazepines/Opiates

- Dosage needs vary from patient to patient
- Onset of action can be unpredictable
- Poor choice for true Rapid Sequence Intubation



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RSI

PROTECTION



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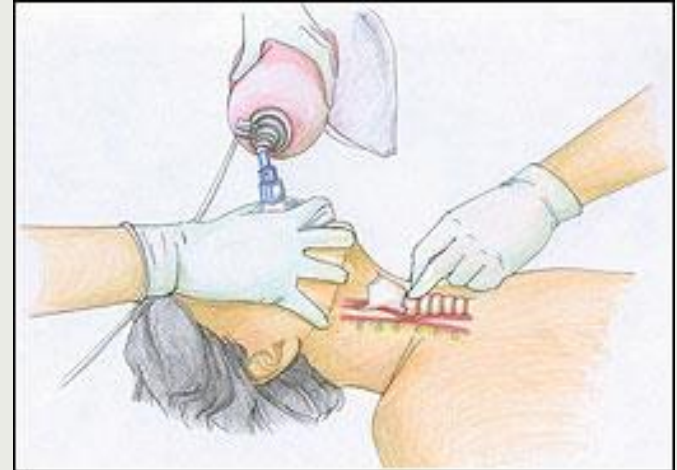


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Sellick's Maneuver

- Application of pressure to a patient's cricoid cartilage during endotracheal intubation to prevent aspiration
- Pitfalls:
 - Potential for Airway obstruction
 - Evidence that it actually prevents aspiration is lacking
 - A 2007 study published in Annals of Emergency Medicine recommended that "the removal of cricoid pressure be an immediate consideration if there is any difficulty either in intubating or ventilating the ED patient." (Ellis)



RSI

PLACEMENT

- Ideally would use DL and pass tube through the vocal cords
- Inflate cuff
- Confirm placement
- Secure tube
- Assistive techniques
- Alternatives



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BURP

- BURP : “backward-upward-rightward pressure” of the larynx
 - Displaces the thyroid cartilage dorsally so that the larynx is pressed against cervical vertebrae’s body
 - Ideally two centimeters in cephalic direction, until resistance is felt
 - Next it should be displaced 0.5 cm -2.0 cm rightward
- When used with Sellick’s may actually worsen view



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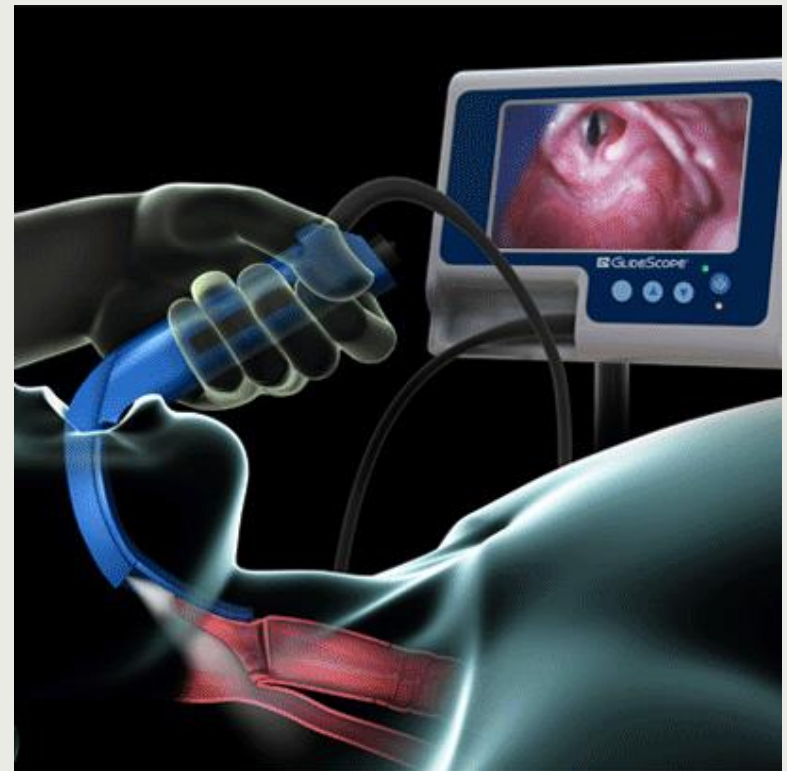


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Glidescope

- Cost: \$11,000 for the Cobalt
- Benefits: Easy to use, easy to observe student/resident procedures, minimal need to manipulate the neck
- Features- Pediatric and Adult Sizes, unique 60 degree blade, disposable and reusable options
- 3 options: Cobalt, Ranger, GVL
- Pitfalls: Expensive, limited visibility with significant secretions or blood



Other Devices



Bougie Assisted Intubation



RSI

POST-INTUBATION MANAGEMENT

- Sedation
- CXR
- Initiate mechanical ventilation



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Failed intubation

- Rescue techniques
 - Cannula cricothyroidotomy (Jet ventilation)
 - Surgical cricothyroidotomy



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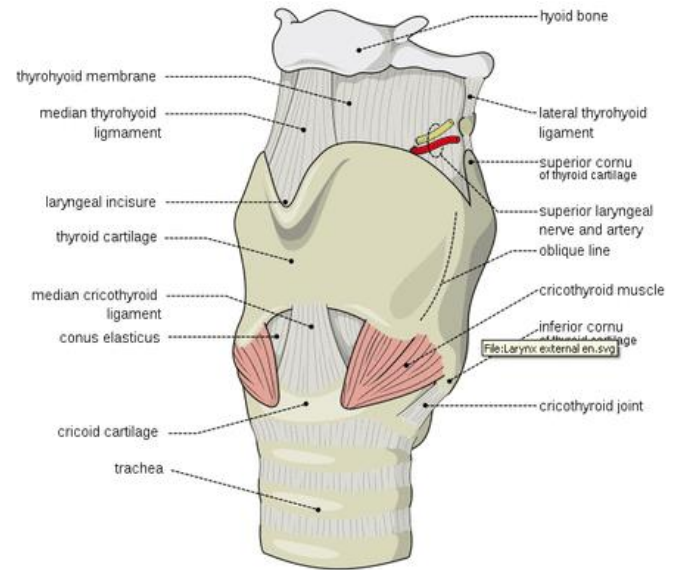
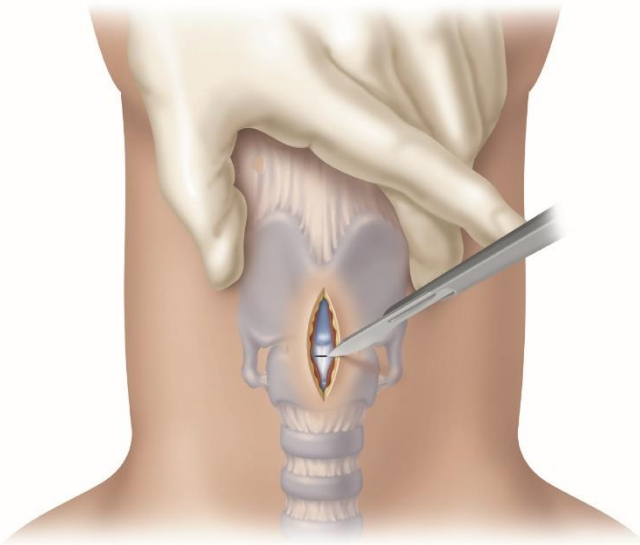
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Cannula cricothyroidotomy (Jet ventilation)



Surgical cricothyroidotomy



Questions/References

- EMRAP.org
- EMCRIT.org
- Reed MJ et al. Can an airway assessment score predict difficulty at intubation in the emergency department? *Emerg Med J* 2005 Feb; 22:99-102.
- Gleason JM, Christian BR, Barton ED. Nasal Cannula Apneic Oxygenation Prevents Desaturation During Endotracheal Intubation: An Integrative Literature Review. *West J Emerg Med.* 2018;19(2):403–411. doi:10.5811/westjem.2017.12.34699



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