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Airway

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Introduction

As part of the initial assessment of any emergency department patient, assess the airway to ensure it is

- patent,
- protected, and
- functional.

Patency describes the anatomic pathway air must travel to reach the lungs. Failures of patency may be related to trauma (ex. facial fracture, tracheal laceration, distal bronchial obstruction), allergy (angioedema of the tongue or pharynx) or any disease process that prevents or impedes a clear trajectory for air to travel.

Failures of airway protection are often related to higher order diseases that subsequently affect the patient's mental status (ex. intracranial bleeding, seizures, or shock).

When a patient’s airway is neither patent nor protected, an EM physician must intervene to prevent further decompensation.

Objectives

- To understand causes of airway compromise and which interventions may be helpful
- To describe the adjunct tools that support airway patency in a compromised patient
- To understand and describe rapid sequence intubation.
- To describe the indications and equipment for direct and video laryngoscopy.

Airway Maneuvers

A first effort to improve airway patency should always be re-positioning of the head and jaw in an attempt to relieve posterior airway obstruction. These simple maneuvers are described below.

Head-Tilt Chin-Lift

This basic maneuver should only be attempted on patients who have NO clinical suspicion of cervical spine trauma1. With one hand, the clinician levers the patient’s head by placing pressure over the forehead, angling the head superiorly. The index and middle fingers of the other hand place upward pressure on the mandible, which serves to lift the tongue off the posterior pharynx. See the image to the left. This maneuver is most effective at relieving airway obstruction from the tongue against the posterior pharynx.2

Head-Tilt Chin-Lift Maneuver
to open an obstructed airway

Jaw Thrust

This maneuver would be the favored airway technique in a patient who has any suspicion of cervical spine injury. The provider uses 2 hands to place the pads of their fingers posterior to the angles of the mandible bilaterally and lifts or pulls the mandible anteriorly.

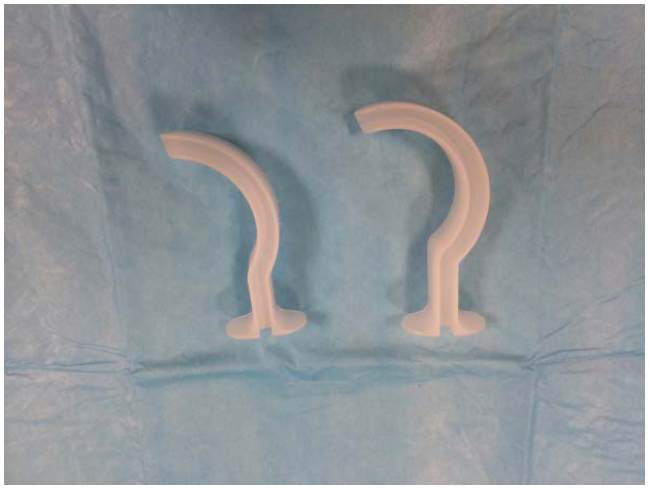
This should lift the tongue off the posterior pharynx, as well as moving it anteriorly in the oropharynx.


(https://cdemcurriculum.files.wordpress.com/2015/05/image-2-airway.jpg)

Jaw Thrust maneuver
to create a patent airway in patients with suspected cervical spine injury.

Airway adjuncts

Either of the aforementioned maneuvers can be augmented by the use of airway adjuncts, such as oropharyngeal (OPA) or nasopharyngeal (NPA) airways. The oropharyngeal airway is a small, curved piece of plastic, shaped like a hook that is placed over the tongue inside the mouth. The OPA pulls the tongue forward and maintains the tongue position away from the posterior pharynx. OPAs can only be used in unconscious patients, as it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Oropharyngeal airway
Used in patients who have no gag reflex, usually those who are unconscious. It can also be used as a bite-block in intubated patients.

may cause nausea or vomiting in a patient with an intact gag reflex.[3]

The nasopharyngeal airway is a softer, longer tube of plastic that is inserted into the nare, extending into the posterior pharynx. Clinicians must lubricate the NPA prior to insertion with a water soluble lubricant or anesthetic jelly. Unlike an OPA, a NPA may be used on a conscious or semi-conscious patient. Care should be taken to minimize trauma to the nasal passage, as epistaxis is a common side effect of this procedure.[4] NPAs are contraindicated in patients with facial trauma involving the nose or central face.

(https://cdemcurriculum.files.wordpress.com/2015/04-airway.jpg)

Nasopharyngeal Airway
A softer airway inserted through the nose which can be used in conscious patients who are having trouble maintaining their airway.

Intubation

Patients, who require more secure airway protection, or those who require assistance of both airway and breathing, will often require endotracheal intubation (the passage of a tube through the mouth into the trachea and secured at the mouth). In the ED, this is most often accomplished via rapid sequence intubation (RSI). RSI combines the rapid administration of a sedative agent followed by a paralytic agent for a quick and controlled intubation. Employing RSI minimizes aspiration risk as endotracheal intubation is achieved without the use of bag-valve-mask ventilation.

Preparation

Preparation for intubation is critical to its success. This includes making sure the patient, the physician, and the other team members are ready for the procedure. The intubating physician should check that the equipment is functional and endotracheal tubes (ETT) of various sizes are handy. Rescue devices and a surgical airway should be readily available if a difficult airway is anticipated. Cervical immobilization or immobility, inability to fully open the mouth, or evidence of neck deformity should be recognized, and a back up plan to secure the airway should be prepared. The patient should be pre-oxygenated as early as possible by placing a non-rebreather mask with 15 L/min of oxygen flowing. Patients should also receive high flow nasal oxygen during pre-oxygenation, which should continue throughout the intubation.[5] (https://cdemcurriculum.com/airway/#_ftn5) Pre-treatment medications, generally administered at least 3 minutes prior to intubation, can potentially blunt the parasympathetic or sympathetic response to endotracheal intubation. Examples of pre-treatment medications include atropine given to infants to blunt vagal stimulation, and lidocaine given to a patient with an intracranial hemorrhage to blunt a further increase in intracranial pressure.

Medications

Once the intubating physician feels the patient, staff and environment are prepared, RSI medications should be given. The choices of induction agent and paralytic medication will vary due to patient circumstance and availability.

Sedatives

Common choices for induction agents include propofol, etomidate and ketamine. Induction is followed quickly by paralysis.

Commonly used sedatives in intubation			
Propofol 1.5 mg/kg	Onset: 30 sec	Lasts: 5-10 min	Causes hypotension
Etomidate 1-2 mg/kg	Onset: 10-15 sec	Lasts: 5-10 min	Minimal change to blood pressure
Ketamine 2 mg/kg	Onset: 45-60 sec	Lasts: 10-20 min	Raises blood pressure, brochodilation, increases secretions

Paralytics

Paralytic agents can be either depolarizing or nondepolarizing. Succinylcholine is the most common depolarizing neuromuscular blocker used in RSI, due to its rapid onset and short duration of action. Patients receiving a depolarizing NM blocker will fasciculate for less than a minute after medication delivery and be completely flaccid shortly thereafter. Patients with a contraindication to succinylcholine may receive a nondepolarizing paralytic. Muscle fasciculation is not seen with administration of nondeplarizing paralytics, and paralysis may take longer to achieve and resolve.

Commonly used paralytics in intubation			
Succinylcholine 1.5 mg/kg	Onset: 45 sec	Lasts: 5-10 min	Causes hyperkalemia, fasiculations
Rocuronium 1 mg/kg	Onset: 60-75 sec	Lasts: 40-60 min	Lasts much longer, so have a plan should intubation fail

Intubation

Once the patient is sedated and paralyzed, the intubating physician should attempt endotracheal intubation. Choice of blade type (Miller or Macintosh), blade size, and tube size will depend on operator preference and patient circumstance. Vocal cords can be visualized using a multitude of techniques and instruments. The most commonly used are direct laryngoscopy, video laryngoscopy or more recently the combination video/direct laryngoscopy.

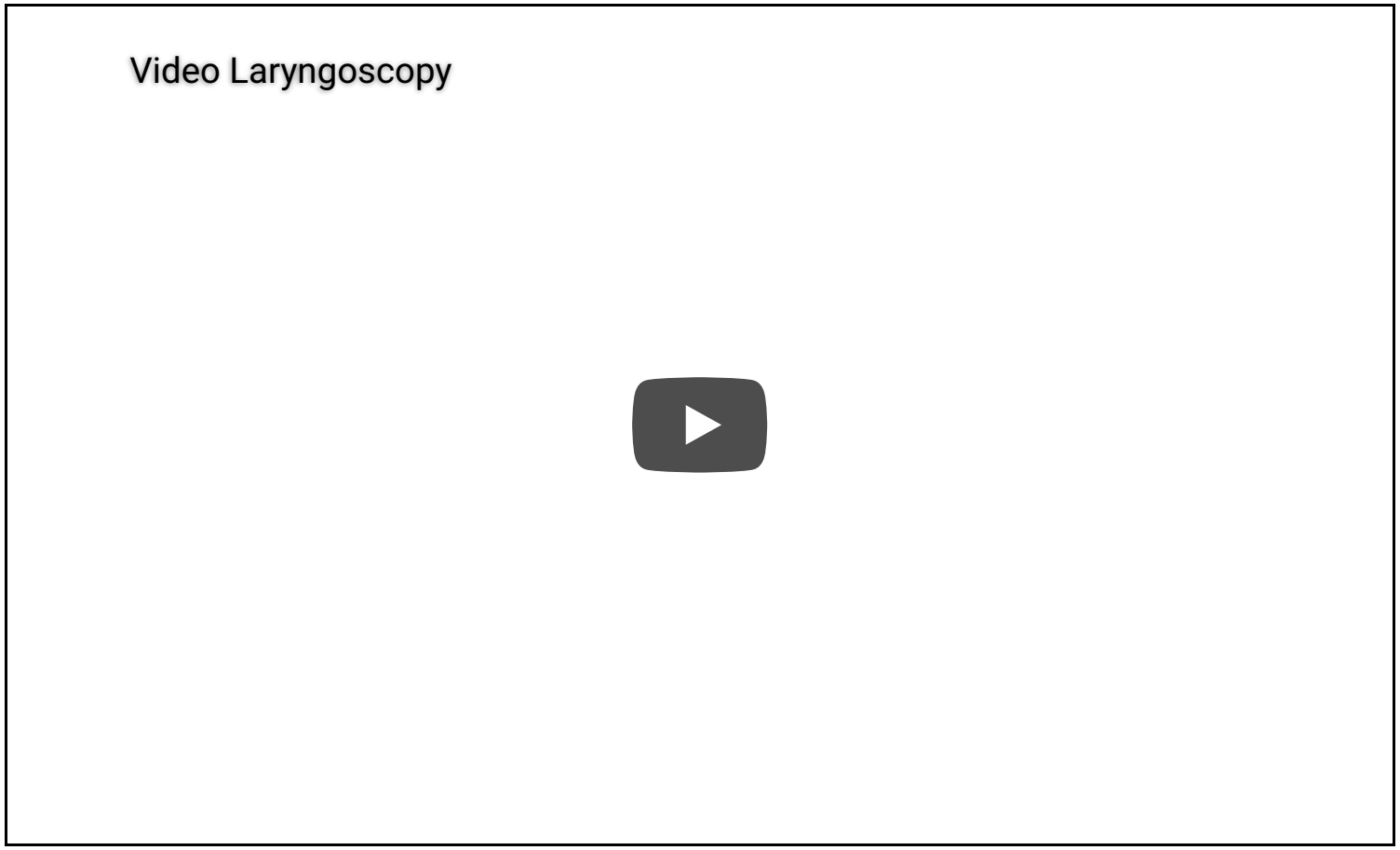
Direct Laryngoscopy

Direct laryngoscopy (DL) is the mainstay of ED intubation. The operator stands at the head of the bead and places the patient into the sniffing position (tilting the head back and extending the cervical spine). As in the head-tilt chin-lift maneuver, care should be taken in the patient with suspected cervical spine injury. Once the patient is adequately paralyzed, the operator should open the patient's mouth with their right hand and remove any false teeth or other dental hardware. The mouth should be held open with the right hand, in a scissoring motion with the thumb and forefinger. The laryngoscope handle is then held in the left hand and the blade is inserted at the right side of the tongue, sweeping the tongue superiorly and medially as gentle upward force is being placed on the mandible. Depending on the type of blade used, the operator will either place the blade in the vallecula (the recess between the base of the tongue and the folds of the throat) or directly on top of the epiglottis. As the operator lifts superiorly and forward, the vocal cords will become directly visualized. The operator then passes the endotracheal tube with their right hand through the cords and inflates the cuff with 10cc of air to create a seal. Tube placement should then be confirmed and the patient sedated.

Video Laryngoscopy

Video laryngoscopy (VL) is similar to direct laryngoscopy insofar as to say a blade and handle are used to expose the vocal cords and an ETT is passed into the trachea to secure the patient's airway and provide ventilation. However in VL, the patient's head can remain in the neutral position and the blade is passed directly over the tongue as opposed to the side. The operator performs VL by watching a screen instead of looking in the patient's mouth. There are many advantages to video laryngoscopy including improved visualization in patients that have an anterior airway or large tongue. Additionally, VL allows the operator and any other physicians to have identical views of the patient's airway, providing an early look for a second provider, as well as assistance in troubleshooting a challenging airway. The techniques for blade insertion and tube placement are modified slightly based on brand and viewpoint, and should be practiced frequently to ensure success in a critical situation.

Of note, there are now video laryngoscopes that use a traditional Macintosh or Miller blade that can be used for either direct or video laryngoscopy. These devices have fiberoptics at the end of the blade which provides the video image, allowing an operator to initially perform DL, while giving any other physicians a similar view simultaneously, allowing for instruction and advice, if the airway becomes difficult.



Confirm placement

If the operator has visualized the endotracheal tube passing through the cords, they must officially confirm tube placement. Methods of confirmation include: end tidal CO2 detection (color change or waveform capnography), auscultation of bilateral breath sounds on insufflations with the bag-valve mask, and chest x-ray confirmation of correct tracheal ETT positioning are commonly used in serial to avoid the devastating consequences of an unrecognized failed intubation attempt.

Post-intubation Management

Lastly, the intubating physician should secure the endotracheal tube in place and write for appropriate post intubation sedation. Intubated patients are commonly sedated with continuous infusions of benzodiazepines and opiates. Patients who are inadequately sedated are at risk for barotrauma, poor ventilation, and self-extubation.

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