Difficult Airway Management

Orebaugh, SL : *J Emerg Med* 2002; 22: 31-48
Ma, Cline (6th ed) p. 3-8; 744; 768; 789
Walls, et al, http://wwwtheairwaysite.com

Objectives

Upon completion of this lecture, you should be able to:

- Define difficult airway
- Discuss the most frequently used and most successful means of intubation
- Discuss different adjuncts for assistance with both intubation and ventilation
- Discuss the consequences and vicious cycle of repeated attempts at intubation

Objectives

- Discuss how the initial intubation is optimized
- Discuss the most frequently overlooked technique for optimizing the initial intubation
- Discuss the indications for immediate surgical airway or TTJV (transtracheal jet ventilation)
- Discuss briefly the definitive surgical airway for the patient in whom intubation and ventilation fail

The Difficult Airway

- The emergency clinician should become familiar with several airway management techniques and rescue strategies
- Definition of the difficult airway
  - Failure to intubate +/or
  - Failure to ventilate

Incidence of Difficult Airway

- No evidence based conclusions on the data for prehospital patients
- Inability to easily intubate and to ventilate occurs in 6-11 % of emergency patients
- 99% success rate*
- (in 1%, crichothyrotomy was required)

* RSI : the most frequent and most successful method used

Incidence of Difficult Airway

- Emergency patients 99% success rate in the ED
- Even though the emergency patient has more ventilation and intubation obstacles
  - Full stomach
  - Facial distortion
  - Cervical collars
    - Up to 20% of collared patients will have a high grade (gr. 3 or gr. 4) obstruction of laryngeal view

Failure to Intubate / Failure to Ventilate (ASA)

- Failure to Intubate
  - Inability to place ET tube :
    - within 3 attempts, or
    - within 10 minutes
  - Causes of poor glottic visualization :
    - Mouth size; tongue size
    - Neck (obesity, length, mobility)
- Failure to ventilate
  - Inability to adequately BVM-maintain the O2 saturation above 90% (in a patient whose baseline sat was greater than 94%)

Predicting the Difficult Airway

BVM ventilation difficulty :

Difficulty with seal and airway anatomy

Problems with the "BEST O2" *[the best O2 adjunct would be the would be via a simple BVM]* or *"BONES"*

- **B** eard
- **E** lderly
- **S** noring history
- **T** eeth
- **O** bese

- B eard
- O bese
- N o teeth
- E lderly
- S noring history

Predicting Difficult Intubation

Problematic anatomy

- Mouth / Upper Neck / Lower Neck
- "*Rule of Threes*"
  - 3 fingerbreadths between the teeth
  - 3 fingers between the angle of the jaw and the hyoid bone
  - 3 fingers between the thyroid cartilage and the sternal notch

Other Predictions of Difficult Airway

- Mallampati
- Cormack and Lehane
- "Per cent of Glottic Opening (POGO)"

Mallampati Classification (Samsoon and Young modification)

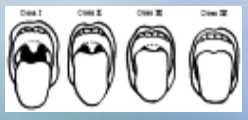
Uses a view of the posterior pharynx in order to predict difficult laryngeal exposure :

- Class I: the best grade, in which the posterior pharynx well visualized (ie, little tongue-obstruction)
- Class II: posterior pharynx only partially visualized (ie, uvula only partially visualized)
- Class III: posterior pharynx barely visualizable (ie, uvula only partially visualized)
- Class IV: posterior pharynx cannot be visualized; tongue is completely blocking all visualization.The tongue must be displaced in order to view first the posterior pharynx, then attempt to view the cords.

Mallampati Classification

Using degree of posterior pharynx in order to predict the difficulty of laryngeal exposure :

- Class I little tongue-obstruction)
- Class II: posterior pharynx only partial
- Class III: posterior pharynx barely visualizable
- Class IV: tongue blocking visualization.



Cormack and Lehane Grades

Graded as seen down the laryngoscope. Four-grade scheme has become the standard measurement of glottic views:

- Grade 1: most of the glottis (good view of cords)
- Grade 2: only posterior portion of the glottis is seen (posterior cords)
- Grade 3: only the epiglottis (no cords are seen)
- Grade 4: inability to see glottis (or even the epiglottis) at all

Grade 3 and 4 views are less common, but they are more likely to be difficult to manage

Other Difficult Airways

Incidence of other emergency patients not been well studied

- Anaphylaxis
- Angioedema [ACE Inhibitors]
- Geriatric patients
- Epiglottitis

Approach to the Patient with a Recognized Difficult Airway

- ASA Difficult Airway Algorithm is inappropriate for the emergency clinician
- The Airway Course*: [not prospectively validated] more appropriate (Ron Walls; Diane Birmbaumer, et al). http://www.theairwaysite.com
  - Universal Algorithm
  - Difficult Airway Algorithm
  - Crash Algorithm
  - Failed Airway Algorithm

* two-day immersion program in EMS airway : October 1-2, 2005 Greensboro, NC

Adjuncts for Difficult Airways

- When inability to pass ET, despite the following adjuncts and techniques, and BVM ventilation fails, then must consider surgical airway (cricothyroidotomy / TTJV)
- Hypoxia may occur rapidly
- Speed of desaturation and hypercarbia, depends
  - Preoxygenation
  - Body mass
  - Ongoing cardiopulmonary disease
  - Ann Emerg Med 2003 Dec; 42:721 "…an alarming 57% of patients desaturated during [paramedic] RSI…"

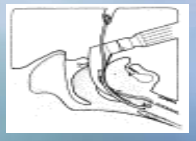
Adjuncts

- Eschmann stylete
- Blind Nasotracheal Intubation
- Blind Lighted Stylet Intubation
- **Aids to ventilation**
  - laryngeal mask airway (LMA)

Eschmann Stylete

Eschmann stylete (gum elastic bougie)

- Facilitates blind intubation of a poorly visualized glottis
- Malleable stylet, has stiff, angulated end
- Small enough to be maneuverable in pharynx,
- Can "probe" for the glottic opening
- Its tip is firm enough to rattle against the tracheal rings as it is placed in the trachea



Blind Nasotracheal Intubation

- In the National Emergency Airway Registry data base:
  - 5% of ED intubations
  - Rate of successful intubation 68%, vs
    no ET failures when using laryngoscopy and succinylcholine, with [60]. In addition,
- Complication rates were much higher
- Paramedics BNTI, ET placement improved from 58% to 72% when a directional tip control tube used

Blind Lighted Stylet Intubation

- Light shines through thee anterior neck
- In suspected cervical spine injury,
  - lighted stylet for intubation with 100% success (as reported by Weiss)
- High success rate (88%) ; in less than 45 sec
- Proven useful in facial trauma, aiding intubation while maintaining cervical spine immobility

Aids for Rescue Ventilation

Laryngeal mask airway (LMA)

- Both an alternative to BVM in CPR arrest and a rescue device in difficult airway management.
- Untrained volunteers : ventilation and oxygenation with LMA (vs BVM) (Alexander)
- Problem withgood seal when high airway pressures are applied

Combitube (ETC)

- Airway rescue device for ventilation and bringing source of O2 closer to the glottis / Dual lumen tube inserted blindly into pharynx / Advanced into either the esophagus (95–99% of cases)
- Ventilation: colored, numbered tubes / proper tube selection.
- Lacerations to piriform area and esophagus can occur

Transtracheal Jet Ventilation

If rescue ETC and LMA ineffectual

- Supraglottic or glottic swelling, abscess, tumor or FBAO

Technique

- Large-bore # 12, 14gu IV catheter - through cricothyroid membrane
- Connected, by tight-fitting luer-lock connection, to high-pressure O2 source
- Alternatively, catheter may be attached to BVM bag via a pediatric # 3 ET connector
- Most effective : high pressure (50 PSI) O2 source, connected via tubing to IV catheter (ie, not the BVM)
- Using hole cut in tubing to control flow of O2 by periodic occlusion with the thumb

TTJV

Indications

- in cardiac arrest patients as early as 1972
- as a ventilation strategy in cannot-intubate and cannot-ventilate ("failed airway") situation
- useful in pediatric airway emergencies

Complications

- Must allow time for the passive recoil of lungs to force exhalation (2–3 sec), or "stacking" of breaths, and barotrauma may result.
- Pneumothorax, pneumomediastinum, and subcutaneous air

Contraindications

- Distorted airway anatomy
- Complete airway obstruction [because of increased complications]

Retrograde Intubation

Indications

- BAD

Technique

- invasive technique : blind placement of an endotracheal tube over guidewire
- guidewire is inserted ("Seldinger technique -like") at level of the cricothyroid membrane and then
- directed "retrograde" through the pharynx to the mouth (or nose)

Complications

- Hematoma, bleeding, pneumomediastinum, and subcutaneous air

Contraindications

- Distorted airway or laryngeal anatomy

Surgical Airway

Indications

- Most definitive and reliable airway procedure in a "failed airway" scenario
- "The time-honored means of obtaining a rapid definitive airway when both intubation and ventilation fail is the insertion of a tracheal tube through an incision in the neck." [Orebaugh]

Technique

- Vertical midline incision
- followed by a transverse incision in the cricothyroid membrane,
- then placement of the endotracheal tube
- (alternatively, a single transverse incision through the skin, s.c. tissue, and cricothyroid membrane - if the space is easily palpable)

Complications

- Hematoma; subcutaneous air
- extensive bleeding

Contraindications

- Moving patient ; uncontrolled setting

Preventing the Failed Airway

Best way to prevent a difficult intubation or failed airway

- Prevent their occurrence altogether:
  - By ***optimizing*** the initial direct laryngoscopy
  - Proper preparation
    - may prevent the vicious cycle of each attempt resulting in more and more soft tissue swelling, bleeding, and distortion of landmarks
      - making each subsequent attempt more difficult

Optimizing Initial Direct Laryngoscopy

- BURP maneuver
  - Operator, then assistant applies pressure "backwards, upwards and rightwards"
- First attempt is likely to be the best attempt
- Attention to
  - patient positioning,
  - muscle relaxation,
  - type of laryngoscope blade, and
  - external laryngeal pressure

  will all reduce incidence of poor laryngoscopic visualization.
- For those situations in which adjuncts may not useful or in which ventilation by BVM may not be possible, then direct access to the larynx via a surgical airway or transtracheal jet ventilation may be necessary

Summary

- We have discussed :
- How a small subset of patients will have difficulty in intubation and BVM ventilation
- How these patients may require different adjuncts for assistance with both intubation and ventilation
- Methods for optimizing the initial intubation
- Circumstances in which BVM is impossible and immediate surgical airway is indicated