Difficult Airway Management

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Learning Objectives

- Describe conditions that predispose to difficult airway access and mask ventilation.
- Describe and compare special devices and techniques for airway access and management.

Difficult Airway Access

Difficult Intubation

- Defined (ASA)- clinical situation in which a trained anesthesiologist experiences difficulty with mask ventilation, difficulty with intubation, or both.
- Insertion of tube under standard laryngoscopy requires:
  - more than three attempts
  - more than ten minutes

Difficult mask ventilation

- Inability to maintain SpO2 > 90% with 100% O2 and PPV with mask
- Inability to prevent or reverse signs of hypoventilation with mask PPV
  - chest excursion
  - auscultatory signs
  - hemodynamic signs; e.g., blood pressure

Difficult mask ventilation

- Causes
  - trauma- face, airways
  - burns - edema
  - beards - no seal
  - edentulous patients - no cheeks
**Difficult intubation - causes**

**Anatomic**
- micrognathia - small mandible
- macroglossia - large tongue
- short or fixed neck
- anterior vocal cords

**Trauma - neck or face**
- Burns - airway edema

**Difficult intubation - causes**

- Infections - edema
  - retropharyngeal abscess
  - submandibular abscess
  - epiglottitis
  - laryngotracheobronchitis (croup)

- Neoplasms; e.g., laryngeal tumors
- Rheumatoid arthritis - TMJ immobility
- Diabetes mellitus
  - stiff joints
  - waxy skin - palm test

**Difficult intubation causes**

- Pregnancy
  - high metabolic rate
  - decreased FRC - rapid desaturation
  - airway closure in supine position
- Morbid obesity
  - decreased FRC - rapid desaturation
  - redundant tissues in airways
- Anaphylaxis
  - airway edema
  - laryngospasm

**Evaluation for difficult intubation**

- Medical history for predisposing conditions
- Clinical examination
  - Facial deformities
  - Mallampati score - visualization of oral structures
  - Measurement of mouth opening
  - Atlanto-occipital extension - degree of head extension

**Four D’s of difficult airways**

- Dentition (prominent upper incisors, receding chin)
- Distortion (edema, blood, vomits, tumor, infection)
- Disproportion (short chin-to-larynx distance, bull neck, large tongue, small mouth)
- Dysmobility (TMJ and cervical spine)

Click to see video evaluation for difficult intubation (2.5 min)
http://www.youtube.com/watch?v=LEINTcbeVZ0
Difficult Airway Devices & Techniques

Difficult airway cart
◆ Equipment
  ▶ Fiberoptic bronchoscope
  ▶ Fiberoptic laryngoscope
  ▶ Laryngeal mask airway
  ▶ Combitube
  ▶ Lighted stylet
  ▶ Endotracheal tube introducer

Difficult airway cart
◆ Equipment
  ▶ Retrograde intubation kit
  ▶ Cricothyrotomy kit
  ▶ Percutaneous tracheotomy, ventilation
  ▶ Extra bulbs, batteries

Difficult airway cart
◆ Medications
  ▶ Neuromuscular blockers
  ◆ succinylcholine
  ◆ rocuronium
  ◆ rapacuronium
  ▶ atropine - block vagal response
  ▶ midazolam, fentanyl, etomidate

Direct Visualization Intubation Devices

Fiberoptic laryngoscope
▶ Bullard

Click to see difficult airway cart

Click to see the Bullard laryngoscope
http://vam.anest.ufl.edu/airwaydevice/bullard/index.html
**Fiberoptic laryngoscope**

- **Bullard**
  - Direct visualization of vocal cords
  - Non-alignment of oral-laryngeal axes
  - Minimal head manipulation
  - Accommodates small mouth

Click to intubation with the Bullard scope (1 min.)
http://vam.anest.ufl.edu/airwaydevice/videolibrary/bullard1p3.html#sim

**Fiberoptic laryngoscope**

- **McGrath™ video laryngoscope**
  - Image Courtesy of Vitaid

Link to intubation with McGrath™ (1 min.)
http://www.youtube.com/watch?v=WjbJJX8B67I&feature=related
Link to McGrath™ products and videos
http://www.aircraftmedical.com/

**Fiberoptic video laryngoscopes**

- **Airtraq™**
- **Verathon Glidescope™**
- **Copilot VL™**

Click to see Airtraq laryngoscope
Click to see Verathon Glidescope
http://www.verathon.com/Products/GlideScope.aspx
Click to see Copilot VL laryngoscope
http://cdn.medgadget.com/img/77fyxz5u.png

**Blind Intubation Devices**

Click to see the COPA

**Mallinckrodt Cuffed Oropharyngeal Airway (COPA)™**

Click to see the COPA
Mallinckrodt Cuffed Oropharyngeal Airway (COPA)™
- **Indication**: difficult mask ventilation, intubation
- **Advantage**: ease of insertion
- **Disadvantage**: no protection from aspiration
- **Caution**: teeth may tear cuff

Laryngeal Mask Airway (LMA)

![Laryngeal Mask Airway (LMA)](image)

- **Indications**
  - Empty stomach (preoperative)
  - Difficult mask fit
  - Difficult intubation
  - Singers/public speakers; e.g., Julie Andrews

FYI - click to see article that includes Julie Andrews
http://thismakesmesick.typepad.com/this_make_sick/2006/04/celebrities_and.html

Vitaid Proseal™ Mask Airway (LMA)

- **Indications**
  - Empty stomach (preoperative)
  - Difficult mask fit
  - Difficult intubation
  - Singers/public speakers; e.g., Julie Andrews

Click to see LMA placement video (2.5 min)
http://www.youtube.com/watch?v=96e46PyARaU&feature=related

Combitube™

- **Advantage**: ease of blind insertion
- **Disadvantage**: no protection from aspiration

Click to see Combitube™ insertion video (1 min.)
http://www.youtube.com/watch?v=skhWQRXtUU&feature=related
Combitube™
- Advantages
  - Ease of blind insertion
  - Protection from aspiration
  - Evacuation of stomach
- Contraindication - esophageal dx
- Military study - Combitube preferred over COPA and LMA

Bougie Endotracheal Introducer
- Blind (digital) intubation
- ETT exchange

Click to see digital intubation with Bougie (3 min)
http://www.youtube.com/watch?v=E7Lu1zD2Brk

Lighted stylets
- Transilluminate trachea
  - Blind intubation
  - Placement confirmation
- Brands:
  - Trachlite ® (Rusch)
  - Surch-lite ® (Aaron Medical)

Click to see video on intubating with a lighted stylet (2.0 min.)
http://www.youtube.com/watch?v=9Op_iSDqrsE

Lighted stylets

Surgical Interventions

Retrograde Intubation

Wire through cricoid membrane

Image courtesy Cook Critical Care

FYI - Intubation kit available from Cook Critical Care
https://www.cookmedical.com/product/-/catalog/display?ccc_retro_web&zoom=0
Retrograde Intubation

ETT guided over wire

Click to see video on retrograde wire intubation (2 min.)
http://www.youtube.com/watch?v=s0soO1JuZ-Q

Cricothyrotomy

Click to see needle cricothyrotomy
http://www.youtube.com/watch?v=FqSYCpYTYUY&feature=related

Tube Placement Confirmation

Colorimetric CO2 detectors

Image courtesy of Vital Signs
Vital Signs (TM) C-CO2 indicator

Click to see Portex™ colorimetric indicator
http://www.absolutemed.com/Medical-Equipment/Capnography
Click to see Mercury™ colorimetric indicator
http://boundtree.co.uk/mercury-medical-co2-detector

Exhaled CO2 monitor (capnography)

- Method recommended by ACLS guidelines
- Measures exhaled CO2
- Waveform display (some of them)
- Evaluates compression effectiveness
- Predicts resuscitation survival

Click to see various capnometer brands
http://www.absolutemed.com/Medical-Equipment/Capnography
Click to see BCI Capnocheck™
http://www.medexsupply.com/images/BCI-WW8110-000SYS.jpg
FYI - Click for information on exhaled CO2 and resuscitation
http://enw.org/ETCO2inCPR.htm

Beck airway airflow monitor (BAAM)™

Airflow creates a whistle
Special Airways & Devices

Airway Exchange Catheter

Cook Airway Exchange Catheter (TM)

◆ Exchanger advanced in ETT
◆ Old ETT removed over exchanger
◆ New ETT advanced over exchanger
◆ Adapter to ventilate through catheter

Mallinckrodt Emergency Medicine Tube (TM)

Port in ETT lumen for medications

Reprinted by permission from Nellcor Puritan Bennett LLC Boulder, CO, part of Covidian

Double lumen endobronchial tube

tracheal cuff bronchial cuff ventilation connections
Summary & Review

- Causes of difficult intubation & mask ventilation.
- Contents of difficult airway cart.
- Intubation devices
  - fiberoptic bronchoscope
  - fiberoptic laryngoscope

Alternate devices - blind access
- cuffed oropharyngeal airway
- laryngeal mask airway
- Combitube
- lighted stylet
- Bougie ETTI

Surgical interventions
- retrograde intubation
- cricothyrotomy

Tube placement confirmation
- lighted stylets
- CO₂ detectors, monitors
- Beck airway airflow detector

Special airways & devices
- Cook Airway Exchange Catheter
- Emergency Medicine Tube
- double lumen endobronchial tube

References


References
