Difficult Airway Management

Arthur Jones, EdD, RRT

This Presentation is Approved for
1 CRCE Credit Hour

Learning Objectives

- Identify conditions that predispose to difficult airway access & mask ventilation
- Describe & compare special devices & techniques for airway access & 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 SpO_2 > 90% with 100% O_2 & 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)

Difficult Intubation: Causes

- Neoplasms, e.g. laryngeal tumors
- Rheumatoid arthritis - TMJ immobility
- Diabetes mellitus
  - Stiff joints
  - Waxy skin - palm test

See links below to view temporomandibular joint & 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

Evaluation for Difficult Intubation

- Four D's of difficult airways
  - Dentition: prominent upper incisors, receding chin
  - Distortion: edema, blood, vomit, tumor, infection
  - Disproportion: short chin-to-larynx distance, bull neck, large tongue, small mouth
  - Dysmobility: TMJ & cervical spine

Difficult Airway Devices & Technique

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

See links below to view difficult airway cart

Difficult Airway Cart

- Medications
  - Neuromuscular blockers
    - Succinylcholine
    - Rocuronium
    - Rapacuronium
  - Atropine - block vagal response
  - Midazolam, fentanyl, etomidate

Direct Visualization Intubation Devices

Fiberoptic Laryngoscope

- Bullard

See links below to view Bullard laryngoscope

Fiberoptic Laryngoscope

- Bullard

Up next: Video of intubation with the Bullard scope (1 min)

Fiberoptic Laryngoscope

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

Fiberoptic Laryngoscope

- McGrath™ video laryngoscope

Image courtesy of Vitaid

Up next: Video of intubation with McGrath™ (1 min)
See links below to McGrath™ products & videos

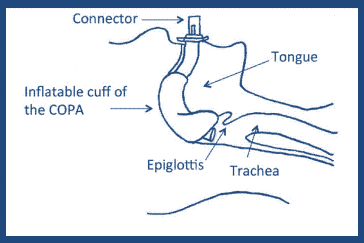
Fiberoptic Video Laryngoscopes

- Airtraq™
- Verathon Glidescope™
- Copilot VL™

See links below to view Airtraq™, Verathon Glidescope™, & Copilot VL™ laryngoscopes

Blind Intubation Devices

Mallinckrodt Cuffed Oropharyngeal Airway (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)

Vitaid Proseal™ Mask Airway (LMA)

Up next: Video of LMA placement (2.5 min)

LMA

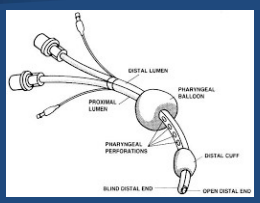
- LMA
  - Indications
  - Empty stomach (preoperative)
  - Difficult mask fit
  - Difficult intubation
  - Singers/public speakers, e.g. Julie Andrews

FYI see links below for article that includes Julie Andrews

LMA

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

Combitube™



Up next: Video of Combitube™ insertion video (1 min)

Combitube™

- Advantages
  - Ease of blind insertion
  - Protection from aspiration
  - Evacuation of stomach
- Contraindication: esophageal dx
- Military study: Combitube™ preferred over COPA & LMA

Bougie Endotracheal Introducer

- Blind (digital) intubation
- ETT exchange

Up next: Video of digital intubation with Bougie (3 min)

Lighted Stylets

- Transilluminate trachea
  - Blind intubation
  - Placement confirmation
- Brands
  - Trachlite™ (Rusch)
  - Surch-Lite™ (Aaron Medical)

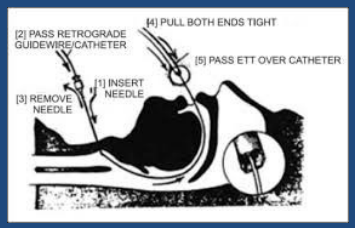
Up next: Video on
intubating with a lighted stylet (2 min)

Lighted Stylets

See links below to view Rusch Trachlight™
(scroll ↓ to see device) & Aaron Surch-Lite™

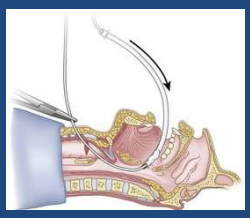
Surgical Interventions

Retrograde Intubation



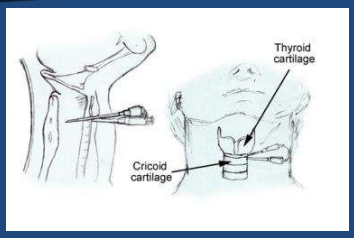
FYI see links below to view intubation
kit available from Cook Critical Care

Retrograde Intubation



Up next: Video of retrograde wire intubation (2 min)

Cricothyrotomy



Up next: Video of needle cricothyrotomy

Tube Placement Confirmation

Colorimetric CO_2 Detectors

See links below to view Portex™ & Mercury™ colorimetric indicators

Exhaled CO_2 Monitor (Capnography)

- Method recommended by ACLS guidelines
- Measures exhaled CO_2
- Waveform display (some of them)
- Evaluates compression effectiveness
- Predicts resuscitation survival

See links below to view various capnometer brands & BCIC Capnocheck™, FYI see links below for information on exhaled CO_2 & resuscitation

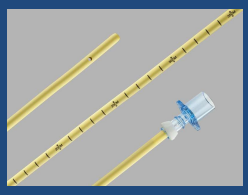
Beck Airway Airflow Monitor (BAAM™)

Creates a whistle

????

Special Airways & Devices

Airway Exchange Catheter



FYI see links below to view Arndt Airway exchange catheter

Cook Airway Exchange Catheter™

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

Malinckrodt Emergency Medicine Tube™

Double Lumen Endobrachial Tube

Summary & Review

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

Summary & Review

- Alternate devices: blind access
  - Cuffed oropharyngeal airway
  - Laryngeal mask airway
  - Combitube™
  - Lighted stylet
  - Bougie ETTI
- Surgical interventions
  - Retrograde intubation
  - Cricothyrotomy

Summary & Review

- Tube placement confirmation
  - Lighted stylets
  - CO_2 detectors, monitors
  - Beck airway airflow detector
- Special airways & devices
  - Cook Airway Exchange Catheter™
  - Emergency Medicine Tube™
  - Double lumen endobronchial tube

References

- Mahul P, Auboyer C, Jospe R, et al:Prevention of nosocomial pneumonia in intubated patients: respective role of mechanical subglottic secretions drainage and stress ulcer prophylaxis. Intesive Care Med 1992; 18: 20-25.
- Crosby ET, Upper Airway Management- Application of New Technologies. http://www.anesthesia.org/winterlude/wl97/W_Airway.html
- Moscati R. Jehle D. Christiansen G. D'Aprix T. Radford J. Connery C. Billittier A 4th. Endotracheal tube introducer for failed intubations: a variant of the gum elastic bougie

References

- Calkins MD. Robinson TD. Combat trauma airway management: endotracheal intubation versus laryngeal mask airway versus combitube use by Navy SEAL and Reconnaissance combat corpsmen. Journal of Trauma-Injury Infection & Critical Care. 46(5):927-32, 1999.
- Greenberg RS. Brimacombe J. Berry A. Gouze V. Piantadosi S. Dake EM. A randomized controlled trial comparing the cuffed oropharyngeal airway and the laryngeal mask airway in spontaneously breathing anesthetized adults [see comments]. Anesthesiology. 88(4):970-7, 1998
- American Society of Anesthesiologists. Practice Guidelines for Management of the Difficult AirwayAnesthesiology 78:597-602, 1993

References

- Valles J, Artigas A, Rello J, et al:Continuous aspiration of subglottic secretions in preventing ventilator-associated pneumonia. Ann Intern Med 1995; 122: 179-186.
- Mashour GA, Kheterpal S, Vanaharam V, Shanks A, Wang LY, Sandberg WS, Tremper KK. The extended Mallampati score and a diagnosis of diabetes mellitus are predictors of difficult laryngoscopy in the morbidly obese. Anesth Analg. 2008 Dec;107(6):1919-23.
- Diane M. Birnbaumer, M.D., and Charles V. Pollack Jr., M.A., M.D.Troubleshooting and Managing the Difficult Airway. Semin Respir Crit Care Med 23(1):3-9, 2002. © 2002 Thieme Medical Publishers

References

- Vani V, Kamath,S, Naik,L. The palm print as a sensitive predictor of difficult laryngoscopy in diabetics: a comparison with other airway evaluation indices. Journal of Postgraduate Medicine 2000;46:74-79.