VIDEO vs DIRECT LARYNGOSCOPY

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AIRWAY ANATOMY
Mallampati:

Class I: soft palate, fauces, uvula, pillars visible. No difficulty.

Class II: soft palate, fauces, portion of the uvula visible. No difficulty.

Class III: soft palate, base of uvula visible. Moderate difficulty.

Class IV: hard palate only. Severe difficulty.
Airway Assessment

- Mouth opening >3 fingers
- Absence of face and neck pathology
- >3 fingers for Thyromental distance
- Mallampati Class I or II
- Neck mobility intact and no facial hair
- Upper lip bite test and absence of TMJ
- No history of airway difficulty

- Mouth opening <3 fingers
- Presence of face and neck pathology (Prominent teeth, neck diameter >17”, receding mandible)
- Mallampati III or IV
- Facial hair and limited neck mobility
- TMJ and unable to perform upper lip bite test
- History of airway difficulty
HISTORY
First Operation Under Ether Anesthesia - Dr. Warren and Dr. Morton - October 16, 1846
William Macewan (1848-1924), a Glasgow surgeon, invented these steel and brass endotracheal tubes. Dr. Macewan performed the first patient endotracheal tube anesthetic, in 1878.
Endotracheal Tube (ETT)

- **Founded by:** Sir Ivan Whiteside Magill
- **Commercialized:** 1920
- **Sizes:** Adult and Pediatric

**Facts:**
Original tubes were manufactured from a roll of rubber industrial tubing which lead to the Magill curve

Red Rubber ETT reusable

Current: disposable, cuff and cuff less designs with Murphy’s eye, Hi-Lo cuff design, radiopaque line, Magill curve, and polyvinyl chloride

Types: Dr. Robertshaw Double-lumen, RAE (oral and nasal), and combitube
Indications for ETT Placement

• Protection of a patient’s airway from obstruction or aspiration (GERD, foreign object, …)

• Facilitate positive pressure ventilation (Laparoscopic procedure)

• Airway control for diagnostic or therapeutic measures (Respiratory distress, angioedema, …)
TIMELINE

1940’s
Miller & Macintosh Laryngoscopes

1970’s
Fiberoptic Intubation Scope

1990’s
Bullard & Wu Scopes

2000’s
Glidescope, Airtraq, Pentax, C-Trach, and McGrath
CONVENTIONAL LARYNGOSCOPES
Conventional Laryngoscopes

**Miller Blade:**
- **Founded by:** Robert Miller
- **Commercialized:** 1941
- **Sizes:** Adult and Pediatric
- **Manufactured by:** Many Companies
- **Type:** Conventional Laryngoscope
- **Features:** Reusable metal blade, Fiberoptic or xenon bulb light source on blade, handle with and without comfort grips, battery operated
- **Price:** Welch Allyn (Fiberoptic):
  - $141.00 Blade
  - $131.00 Handle
- **Set up time:** Minimal
- **Endotracheal Tube Size Limit:** None
Conventional Laryngoscopes

**Macintosh Blade:**
- **Founded by:** Robert Macintosh
- **Commercialized:** 1943
- **Sizes:** Adult and Pediatric
- **Manufactured by:** Many Companies
- **Type:** Conventional Laryngoscope
- **Features:** Reusable metal blade, fiberoptic or xenon bulb light source on blade, handle with and without comfort grips, battery operated
- **Price:** Heine (Xenon Bulb):
  - $235-255.00/Blade
  - $140-163.00/Handle
- **Set up time:** Minimal
- **Endotracheal Tube Size Limit:** None
Ideal Intubation Device

Characteristics:
- Applicable for emergency situations
- Portable
- Minimal assembly
- Ease of use (Maintains intubation technique)
- Enables awake intubation
- Minimal airway trauma, cervical manipulation, and hemodynamic alterations
- Pediatric and adult sizes
- Cost effective
- Delivers supplemental oxygen
- Safe
- Enhanced Viewing
VIDEO LARYNGOSCOPES
Video Laryngoscope

**Uses:**
First intubation attempt (Oral or Nasal)

Known difficult DL (Awake or RSI)

Unanticipated unsuccessful DL

Confirmation of function of recurrent laryngeal nerve

Placement of NGT, DBL ETT, NIMS ETT, or ECHO probe

Combined fiberoptic, trachlight, and video stylets

Ancillary Departments: ER, ICU, Pediatrics, NICU, Telemedicine, Air Medical, and Academics

Adjunct with tracheotomy
Eye of the Anesthesia Provider
Video Laryngoscopes

GlideScope:

- **Founded by:** Dr. John Pacey, Canadian Surgeon
- **Commercialized:** 2001
- **Sizes:** Adult and Pediatric
- **Manufactured by:** Verathon Medical (Bothell, WA) *2010 acquired by Roper Industries, Inc.
- **Type:** Video Laryngoscope Device
- **Features:** Fog resistant color camera, high-impact plastic blade (disposable or reusable), and light illumination of the airway, Video output jack
- **Price:** $5,500-10,000.00/Cobalt
  - $20-30.00/Disposable blade
- **Set up time:** Minimal
- **Endotracheal Tube Size Limit:** None
Video Laryngoscopes

McGrath:

- **Manufactured by:** Aircraft Medical Ltd., United Kingdom
- **Commercialized:** 2006
- **Sizes:** Adult
- **Features:** Fog resistant color camera, single use blade tips disposable, light illumination of the airway, fully portable, no cables, and mounted swivel LCD screen
- **Price:** $8,000-10,000.00/Device
- **Disposable Blade Tips:** $10-20.00
- **Set up time:** Minimal
- **Endotracheal Tube Size Limit:** None
Video Laryngoscopes

Pentax:
(Pentax Airway Scope- AWS S100)

- **Manufactured by:** Pentax Corporation, Tokyo, Japan
- **Commercialized:** 2006
- **Sizes:** Adult
- **Type:** Rigid Video Laryngoscope Device
- **Features:** Fog resistant color built-in camera monitor, Disposable Pblade (Plastic Cover), and light illumination of the airway, portable, and Endotracheal tube passage channel (Rt. Side), target sites
- **Price:** $6,000-9,000.00/Device
  - $35-45.00/PBlade
- **Set up time:** Minimal
- **Endotracheal Tube Size Limit:** Yes
  (External ETT Diameter Limits)
Optical Laryngoscope

Airtraq:

• **Manufactured by**: Prodol Meditec SA, Spain
• **Commercialized**: 2007
• **Sizes**: Adult and Pediatric
• **Type**: Optical Laryngoscope Device
• **Features**: Fog resistant high definition optical channel, Disposable single-use (entire system), and light illumination of the airway, portable, and Endotracheal tube passage channel (Rt. Side)
• **Price**: $90-130.00/Device
• **Set up time**: Minimal
• **Endotracheal Tube Size Limit**: Yes (External ETT Diameter Limits)
Articles:


Concepts Researched: Non-standard laryngoscopes, difficult laryngoscope, and fiberoptic intubation

Publication Date: July 2008

Type of Article: Quantitative review and meta-analysis

Random Assignment (Yes or No): no

Describe the Subjects: There were no human subjects rather a large analysis of existing literature

Sample Size: one hundred and eighty-nine papers were reviewed and fifty-seven met inclusion criteria. The fifty-seven were composed of fifteen randomized controlled trials and forty-two case series and correspondences. The fifty-seven papers included a total of six thousand and six hundred and twenty-two patients.

Measurement Instrument: chi-square test for heterogeneity, binomial proportions, and meta-analysis

Study Outcomes: Identified the existence of a learning curve for airway assistant devices and biases of practitioners to utilize new equipment. The analysis also noted how some video laryngoscope devices have changed their device structures since the publication date of some of the articles. Noted that the bonfils and c-trach performed best in normal airways and the bonfil, c-trach, and glidescope performed best in difficult airway. Recommends the institution of a national database to record use of the non-standard laryngoscope devices.

Major Strengths of the Study: Large quantitative analysis of existing literature for non-standard laryngoscope devices.

Major Weaknesses of the Study: A researcher was a recipient of royalties from the manufacture of the c-trach.

Concepts Researched: glidescope, direct laryngoscope, nasotracheal intubation, ease of intubation, and time to intubation

Publication Date: July 2008

Type of Article: Quantitative comparative study and randomized controlled trial

Random Assignment (Yes or No): yes

Describe the Subjects: Seventy patients requiring nasotracheal intubation were randomly assigned to the glidescope or direct laryngoscope groups. The inclusion criteria required that the subjects be greater than eighteen years old and not have a known difficult intubation history. The random assignment occurred through a sealed envelope which designated the assigned group prior to induction.

Sample Size: Seventy patients from three teaching hospitals in Canada.

Measurement Instrument: Visual Analog Scale assessed the ease of intubation.

Study Outcomes: The glidescope was superior in performance of less postoperative complications from laryngoscope. The visual analog scale indicated a practitioner reporting of easier nasotracheal intubation with the glidescope than direct laryngoscope. The time to intubation was faster with the glidescope related to better glotic visuals and lack of need to manipulate the endotracheal tube with Magill forceps.

Major Strengths of the Study: The study blinded the anesthesia provider to the intubation technique prior to induction with a sealed envelope. The study was registered with the United States clinical trials database and obtained research ethics board approval.

Major Weaknesses of the Study: The anesthesia provider was aware of being timed on intubation. The anesthesia provider was experienced with the glidescope in order to be included in the study.
Correlation of Articles

- Ease of use
- Less lifting pressure with laryngoscopy
- Less traumatic to the dentition and oral cavity
- Less hemodynamic response
- Equal success rate for first-pass intubation non-difficult
- Higher success rate with difficult intubation history
FIRST-PASS INTUBATION PRACTICE
You never got the hang of the new technology, did you Miss Faversham?
Resist-Contest-Accept
Resistance

Statements:

Why not first use direct laryngoscope (DL) to check if the intubation will be difficult then use the video laryngoscope (VL)?

The VL will cause current and future anesthesia providers to lose one’s DL skills.

What if the VL becomes broken and you have to use DL for intubation?

Why change first-pass intubation technique after 70 years?

The use of VL is expensive.
Resistance

**Generational**
Boomers 1946-1964
- 74 million Approx.
- **Work Themes:**
  - Equality
  - Dedication to Employer
  - Goal Attainment
  - Involvement
  - Social Consciousness
  - Conforms to Rules
  - Seniority (Pay Your Dues)
  - *Technology* Skills are Acquired

Generation X 1965-1980
- 49 million Approx.
- **Work Themes:**
  - Self-Reliant
  - Resume Builders
  - Lack Orientation to Time
  - Unimpressed by Authority or Hierarchy (It is Just a Job)
  - Skeptic
  - Adventurous
  - *Technology* Oriented
Generational

Millennials 1981-2000

- 78 Million Approx.
- **Work Themes:**
  - Life-long Learning
  - Problem Solvers
  - Team Work
  - *Technology* Dependent
  - Holistic Lifestyle
  - Self Inventive/Creative
    (Rewrite the Rules)

Emotional Literacy
Communication
Contest

- Literature analyzed and identified differences with video laryngoscopes (VL)
- VL devices are less expensive than loss of life from a sentinel airway event
- Literature compared conventional laryngoscopes to VL

*Remember:* Increased application = Increased technique/skill = Increased acceptance = Increased patient safety with general endotracheal anesthesia from best intubation practice
Acceptance

• Increased utilization of video laryngoscopes
• Increased patient safety with general endotracheal anesthesia
• Preservation of the anesthesia provider
• Development of video laryngoscope applications
• Development of video laryngoscope insertion techniques

Remember:

NO AIRWAY/BREATHING = NO CASE!!
I can't imagine writing nurses' notes without my computer.

I'm using the computer, but I still rely on my written nurses' notes.

I wonder... could teaching plans be computerized?

Well, maybe a computer would be faster?

I can chart better on paper than I can on a computer.

Integration

Transference

Assimilation

Uncertainty

Resistance
BEST PRACTICES
• Pulse Oximetry

1st Tested on patients in 1975

Biox - 1st commercial product in 1981

Standard of Anesthesia Practice in 1987
Endoscopy

Combined Technology:
1952 Olympus found the Gastroscope
1950 Hopkin’s Fiberscope
1960 Storz and Hopkin found the Endoscope
Advancement of Video Transmission and Display Technology

Anesthesia

EYE!!!
CASE STUDIES
Airway Management

Case Report #1:
- Female
- 63 yr. old
- Weight 250 lbs.
- Height 5’4”
- Surgical Procedure: Total Thyroidectomy with Electromyography Monitoring
- Anesthesia History: Difficult intubation.
- Positioned Supine with TOP Axis's aligned, preoxygenation, and standard monitors
- Plan: Total intravenous general anesthesia (TIVA) without nondepolarizing or depolarizing muscle relaxants
- Outcome: Medtronic NIM EMG endotracheal tube placed atraumatically with one attempt

Discussion:
- Visualization provided by the Glidescope was instrumental in ensuring proper placement of the Medtronic NIM EMG endotracheal tube
- The utilization of the Glidescope in prior thyroidectomy patients for placement of the specialized electromyography monitoring endotracheal tube influenced the difficult airway management technique selection.
- Fiberoptic intubation technique for securing the difficult airway female thyroidectomy patient was substituted with the Glidescope CoBalt video laryngoscope instrument.
- The Glidescope approach enabled for electromyography monitoring since local anesthetics were not utilized for intubation.
Airway Management

Case Report #2:
- 2-Males
- 46 and 60 yr. old
- Weight: 310lbs. and 516lbs.
- Height: 5’6” and 5’8”
- Surgical Procedure: Tracheotomy
- Admission History: Both males intubated >2 weeks
- Positioned Supine with TOP Axis’s aligned shoulder roll, preoxygenation, and standard monitors
- Plan: General Anesthesia
- Outcome: Glidescope viewing of endotracheal tube retraction with tracheal cannulation

Discussion:
- Visualization by the Glidescope was instrumental in ensuring proper retraction of the endotracheal tube's
- The utilization of the Glidescope in airway management of a tracheotomy patient's enabled for identification of airway anatomy prior to retraction.
- The Glidescope enabled for repositioning and self-sealing of the perforated endotracheal tube cuff within the 516lbs. patient
CONCLUSION
Endotracheal Tube Advancement Difficulty

- Cricoid manipulation
- Clockwise rotation with stylet retraction
- Angling of ETT with stylet (Rigid or Malleable)
- Use of malleable satin slip stylet 14french from Mallinckrodt (HMM)
Comments

Best airway management practice for the patient and practitioner

As technology continues to advance we as anesthesia providers need to embrace the proven methods and tools for intubation.

In order to become proficient with a tool one needs to utilize the tool.

The application of new methods provides opportunity for new beginnings and findings.
Thank You!!
Questions?