Role of video laryngoscopes in anesthesia practice

Maya S Suresh, MD*

* The following presentation is the intellectual property of Maya S. Suresh, M.D., Baylor College of Medicine, Houston, Texas

OBJECTIVES

- Briefly discuss the airway–related closed claims studies in surgical/obstetrical patients
- Discuss the introduction of video laryngoscopy in airway management
- Discuss the different types of video laryngoscopes currently available in anesthesia practice
- Discuss the role of video laryngoscopes in the airway management of unanticipated, difficult or failed intubation
  – Obstetrical patients

ASA CLOSED CLAIMS PROJECT

Incidence of death and brain damage % of total claims

Cheney FW. The ASA closed claims project: What have we learned, How has it affected practice, & how will it affect practice in future-anesthesiology, 1999;91(2):552-556.
COMPARISON OF INJURIES IN OBSTETRIC ANESTHESIA CLAIMS BEFORE AND AFTER 1990


CLOSED CLAIMS STUDY IN OBSTETRICAL PATIENTS 1990-2003

- Closed claims study: Obstetric anesthesia claims for injuries from 1990 to 2003 compared to obstetric claims for injuries before 1990
  - Obstetric claims 1990-2003,
    - Maternal death or brain damage and newborn death or brain damage decreased
  - Respiratory causes of injuries decreased in claims from 1990 or later
    - 24% - pre-1990
    - 4% - 1990 or later
- Claims related to inadequate oxygenation/ventilation, aspiration decreased
- Claims related to difficult intubation did not change

DIFFICULT AIRWAY INCIDENCE

Surgical patients

- Difficult Intubation occurs relatively commonly in association with GA
  - Estimated incidence 1-3%

Obstetrical patients

- Cormack & Lehane
  - Difficult laryngoscopy Grade III view 1:2,000

- Hawthorne
  - Failed intubation 1:250

<table>
<thead>
<tr>
<th></th>
<th>Pre-1990*</th>
<th>1990 or later</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of perioperative claims</td>
<td>190 (12%)</td>
<td>426 (13%)</td>
<td>NS</td>
</tr>
<tr>
<td>Mean age, yr (SD)</td>
<td>28 (5)</td>
<td>29 (6)</td>
<td>0.044</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cesarean section</td>
<td>127 (67%)</td>
<td>246 (58%)</td>
<td>0.029</td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>63 (33%)</td>
<td>180 (42%)</td>
<td>0.029</td>
</tr>
<tr>
<td>Primary anesthetic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional anesthesia</td>
<td>124 (65%)</td>
<td>342 (80%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>General anesthesia</td>
<td>62 (33%)</td>
<td>73 (17%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Other or unknown</td>
<td>4 (2%)</td>
<td>11 (3%)</td>
<td></td>
</tr>
<tr>
<td>Respiratory damaging event</td>
<td>46 (24%)</td>
<td>17 (4%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Aspiration of gastric contents</td>
<td>8 (4%)</td>
<td>2 (&lt; 1%)</td>
<td>0.012</td>
</tr>
<tr>
<td>Difficult intubation</td>
<td>10 (5%)</td>
<td>11 (3%)</td>
<td>NS</td>
</tr>
<tr>
<td>Esophageal intubation</td>
<td>7 (4%)</td>
<td>0 (0%)</td>
<td>0.007</td>
</tr>
<tr>
<td>Inadequate oxygenation/ventilation</td>
<td>10 (5%)</td>
<td>3 (1%)</td>
<td>0.006</td>
</tr>
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</table>

- Cannot intubate—cannot ventilate (CICV)
  - Estimated incidence CICV – 0.0.01% to 2 per 10,000

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<tr>
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</thead>
<tbody>
<tr>
<td>Adjusted total payment in 2007 dollars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>$455,000</td>
<td>$222,000</td>
<td>NS</td>
</tr>
<tr>
<td>Range</td>
<td>$1,539-</td>
<td>$1,196-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$19,656,000</td>
<td>$18,400,000</td>
<td></td>
</tr>
</tbody>
</table>
DL & Tracheal Intubation involves three distinct challenges:

- Direct laryngoscopy (DL): Technology developed in the 1940s (Miller and Macintosh)
- DL & Tracheal Intubation involves three distinct challenges:
  - Laryngeal (glottic opening) sighting
  - Delivering the tube to the glottic opening
  - Advancing the tube beyond the target into the trachea

**BREAKING DOWN COMPLEXITIES OF ENDOTRACHEAL INTUBATION**

- Failed intubation 1:300
- Failed intubation 1:283
- Failed intubation 1:750
- CICV 1:98

**VISUALIZATION OF THE GLOTTIS**

- Video and optical/mirror laryngoscopes: (Routine & difficult intubation; teaching & training)
  - Achieve laryngeal exposure
  - These devices look around the curve of the tongue
  - Bypass the mechanical challenges of creating a direct line of sight to the larynx
  - Miniature video camera (charge coupling device) or prisms/mirrors at the tip of the scope transmits image of glottic area/vocal cords & can be viewed on a monitor screen

**ALTERNATIVE DEVICES IN INTUBATION VIDEO & MIRROR/OPTICAL LARYNGOSCOPES**

- Glide scope video laryngoscope
- Storz C-MAC video laryngoscope
- McGrath video laryngoscope
- Airtraq
- Pentax
- King vision
FEATURES AND COST OF VIDEO-LARYNGOSCOPES

<table>
<thead>
<tr>
<th>Video-laryngoscope</th>
<th>Blade shape</th>
<th>Monitor</th>
<th>Portability</th>
<th>Disposability</th>
<th>Size range</th>
<th>Anti-fog mechanism</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storz C-Mac</td>
<td>Standard Macintosh blade</td>
<td>Separate, 7 in. TFT monitor</td>
<td>Yes</td>
<td>Reusable</td>
<td>Sizes</td>
<td>Yes</td>
<td>$ 7,980 VL, Monitor D-Blade: $5,300</td>
</tr>
<tr>
<td>Glidescope original</td>
<td>Angulated blade</td>
<td>Separate, 7 in. LCD monitor</td>
<td>No</td>
<td>Reusable</td>
<td>Sizes 2 – 5</td>
<td>Yes</td>
<td>GVL :$11,000 Additional blades $4,000</td>
</tr>
<tr>
<td>Glidescope Cobalt</td>
<td>Angulated blade</td>
<td>Separate, 7 in. LCD monitor</td>
<td>No</td>
<td>Single-use blades</td>
<td>Sizes 1 – 4</td>
<td>Yes</td>
<td>Video, monitor, Cable, scope 11,000 Disposable blades $15/each</td>
</tr>
<tr>
<td>Glidescope Ranger</td>
<td>Angulated blade</td>
<td>Separate, 3.5 in. LCD monitor</td>
<td>Yes</td>
<td>Reusable or single-use formats</td>
<td>Reusable: 3-4 Single use: 1-4</td>
<td>Yes</td>
<td>$11,000</td>
</tr>
<tr>
<td>McGrath</td>
<td>Angulated blade</td>
<td>Integrated, 1.7 in. LCD monitor</td>
<td>Yes</td>
<td>Single-use blades</td>
<td>Three adult lengths</td>
<td>No</td>
<td>$8,900 blades $10/each</td>
</tr>
<tr>
<td>Pentax-AWS</td>
<td>Anatomically shaped blade with a guide channel</td>
<td>Integrated, 2.4 in. LCD Monitor</td>
<td>Yes</td>
<td>Single-use blades</td>
<td>One size available</td>
<td>No</td>
<td>$10,000 Blades $20/each</td>
</tr>
<tr>
<td>Airtraq</td>
<td>Anatomically shaped blade with a guide channel</td>
<td>External monitor (when used as a video-laryngoscope)</td>
<td>Not when used as a video-laryngoscope</td>
<td>Single-use device</td>
<td>Four sizes available</td>
<td>Yes</td>
<td>$80 each disposable blade Monitor $500</td>
</tr>
</tbody>
</table>


ACHIEVING LARYNGEAL VIEW DEFINING THE VIEW AXIS

- Miller blade has a very defined & limited view axis to target (narrow spatula/flange height)
- View axis is a straight line perpendicular to the handle 900
- Laryngeal sighting is by direct line of sight

- Macintosh blade permits the view axis to pivot
- Amount of pivoting is restricted:
  - by the flange
  - curve of the spatula,
  - patient specific features:
- mouth opening, upper dentition, tongue characteristics, epiglottis lift

• Laryngeal sighting is by direct line of sight


ACHIEVING LARYNGEAL VIEW DEFINING THE VIEW AXIS

McGrath Glide video- C-MAC videoveloryngoscope laryngoscope olaryngoscope

• Compared to direct laryngoscopy these videolaryngoscopes (VL) provide a look around the curve from 0 degrees to a visual axis of approximately 270 to 300°
• The distal tips of these video laryngoscopes point toward the 290°
• The cameras have a wide field of view: both up & down; left to right; including the distal tip of their blades
• Result is supraepiglottic panoramic view of the larynx, from above the epiglottis & posterior to the base of the tongue.


GLIDESCOPE VIDEO SYSTEM

Airtraq airway scope Pentax airway scope

Airtraq & Pentax airway scope (AWS)

• Provides unobstructed & clear magnified view of the airway on a monitor
• Provides a view that is more anterior than the operator would expect
• Novice user may experience difficulty in placing the ETT between the cords
• Requires a fair amount of hand-eye coordination
DELIVERING THE TUBE TO THE TARGET: GLIDE RITE STYLET

- The glide rite stylet, promoted by the GlideScope manufacturer
- The bend angle approximates 70 degrees
- The large plastic proximal stop permits 1-handed retraction of the stylet after the tube tip has passed through the vocal cords.


CLINICAL PEARLS: SUCCESSFUL VIDEOLARYNGOSCOPY GETTING AROUND THE CURVATURE OF THE TONGUE TO THE GLOTTIC OPENING DELIVERING THE TUBE TO THE GLOTTIC OPENING

4 Steps: First pass success

- Step 1: Look in the mouth to introduce the scope in midline
- Step 2: Look at video screen to obtain best optimal glottic view (top 1/3 of the video screen)
- Step 3: Back to mouth to introduce TT:
  - Use the glide rite 700 angled stylet reinforced TT
  - or ET bent into a 900
  - Insert the TT sideways in a horizontal plane through the mouth; along the blade
- Step 4: Final step: Look at screen to intubate the trachea

CLINICAL PEARLS FOR SUCCESSFUL VIDEOLARYNGOSCOPY:
## SUCCESSFUL INTUBATIONS WITH GLIDESCOPE

<table>
<thead>
<tr>
<th>First author</th>
<th>Number of patients</th>
<th>Operators’ experience with Glidescope</th>
<th>Laryngoscopy Improvement in the C/L grade with Glidescope</th>
<th>Intubation with Glidescope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper</td>
<td>728 adults</td>
<td>Limited or no previous experience with Glidescope</td>
<td>20 C/L III → 15 C/L I and 1 C/L II, 15 C/L IV → 0 C/L I and 2 C/L II</td>
<td>696/722 (96.3) 15/18 (83.3) –</td>
</tr>
<tr>
<td>Rai</td>
<td>50 adults</td>
<td>No previous experience with Glidescope</td>
<td>2 C/L III → 1 C/L I and 1 C/L II</td>
<td>47/50 (94) – 40</td>
</tr>
<tr>
<td>Nouruzi-Sedeh</td>
<td>200 adults</td>
<td>Only manikin training</td>
<td>37 C/L III and 13 C/L IV → 5 C/L III and 3 C/L IV</td>
<td>93/100 (93) – 63 ± 30</td>
</tr>
<tr>
<td>Xue</td>
<td>91 adults</td>
<td>No previous experience with Glidescope</td>
<td>17 C/L III and 2 C/L IV → 19 C/L I and II</td>
<td>91/91 (100) 27/27 (100) 38 ± 11</td>
</tr>
<tr>
<td>Stroumpoulis</td>
<td>112 adults</td>
<td>Good familiarity with Glidescope</td>
<td>28 C/L III and 13 C/L IV → 9 C/L III and 2 C/L IV</td>
<td>110/112 (98.2) 39/41 (95.1) 44.9 ± 19.7</td>
</tr>
<tr>
<td>Malik</td>
<td>75 adults</td>
<td>Good familiarity with Glidescope</td>
<td>6 C/L III and 2 C/L IV → 0 C/L III and IV</td>
<td>24/25 (96) – 17 ± 12.31</td>
</tr>
<tr>
<td>Malik</td>
<td>120 adults with c-spine immobilization</td>
<td>Good familiarity with Glidescope</td>
<td>5 C/L III → 0 C/L &gt; II</td>
<td>30/30 (100) – 18.9 ± 6</td>
</tr>
<tr>
<td>Maassen</td>
<td>150 morbidly obese adults</td>
<td>Good familiarity with Glidescope</td>
<td>Mean C/L = 2.1 ± 0.8 → Mean C/L = 1.1 ± 0.24</td>
<td>50/50 (100) 17/17 (100) 33 ± 18</td>
</tr>
<tr>
<td>Liu</td>
<td>70 adults with c-spine immobilization</td>
<td>Good familiarity with Glidescope</td>
<td>14 C/L III and 6 C/L IV → 0 C/L III and IV</td>
<td>31/35 (88.6) – 71.9 ± 47.9</td>
</tr>
<tr>
<td>Van Zundert</td>
<td>450 adults</td>
<td>More than 30 intubations with Glidescope</td>
<td>Mean C/L = 1.68 ± 0.76 → Mean C/L = 1.01 ± 0.11</td>
<td>150/150 (100) – 34 ± 20</td>
</tr>
<tr>
<td>Sun</td>
<td>200 adults</td>
<td>Good familiarity with Glidescope</td>
<td>15 C/L III → 8 C/L I and 6 C/L II</td>
<td>100/100 (100) 15/15 (100) 46</td>
</tr>
<tr>
<td>Xue</td>
<td>57 adults</td>
<td>Good familiarity with Glidescope</td>
<td>–</td>
<td>30/10 (100) – 37.4 ± 9.9</td>
</tr>
</tbody>
</table>

C/L, Cormack–Lehane; c-spine, cervical spine.


## CASE SERIES OF SUCCESSFUL VIDEOLARYNGOSCOPIC INTUBATION IN OBSTETRIC PATIENTS GLOTTIC VIEW AT INTUBATION

<table>
<thead>
<tr>
<th>C+L 1</th>
<th>C+L 2</th>
<th>C+L 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard view</td>
<td>14 (52)</td>
<td>12 (44)</td>
</tr>
<tr>
<td>Videolaryngoscope view</td>
<td>27 (100)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

- An improved C&L view with VL was clearly evident – 100% grade I view
- All 27 parturients intubated successfully with VL
- VL shown to be superior to conventional laryngoscopy

## COMPLICATIONS WITH GLIDESCOPE

- Perforation of the right palatopharyngeal arch (two reports)
- Perforation of the right soft palate
- Perforation of the right anterior tonsillar pillar

- 27 patients requiring general anesthesia were intubation successfully with videolaryngoscope
• Diversion of attention from mouth to the monitor
• Injury to the lips, teeth, tongue
• Practitioner unaware of the location of the ETT
• As the VL is advanced to achieve laryngeal visualization upward force stretches the tonsillar pillars making them taut
  • Susceptible to perforation by an advancing ETT

• Glide VL should be introduced into the mouth, in the midline under direct visual control
• To avoid injury, insertion of the ETT parallel to and as close as possible to the laryngoscope blade attempting to reproduce its course
• Introduce ETT midline, with proximal end oriented towards the right & then rotate counterclockwise 90º in a horizontal plane bringing it parallel to the blade
• Visualize the ETT go into the mouth and around the tongue
• If slightest resistance encountered STOP do not use force


Unlike the broad, side-beveled tips of standard tracheal tubes, the tapered, centered tip of the Parker tube tends to move along the midline of the airway and through the center of the glottic opening. After entering the trachea, the resilient tip returns to its original shape, and is configured to «ski» smoothly down the tracheal wall on its broad, curved backside – unlike the tips of standard tracheal tubes which tend to scrape the tracheal wall.

### ADVANCING THE TUBE INTO THE TRACHEA: TRACHEAL AXIS AND TRACHEAL RINGS

**Top:** Leading edge of the tube impinging between the 1st and 2nd tracheal rings

**Middle:** Rotation of the tube clockwise drops the tip downward, disengaging it from the tracheal rings

**Bottom:** The symmetric, ski-tip distal tip of the Parker endotracheal tube, advocated by the manufacturer

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Parker Flex-Tip® «Hugs» all tubular intubation guides (fiberoptic cables, bougies, ET tube exchangers)

<table>
<thead>
<tr>
<th>PATIENT CHARACTERISTICS AND INTUBATION PROFILES</th>
</tr>
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<tbody>
<tr>
<td>Standard tube</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>ASA PS (I/II/III)</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Height (cm)</td>
</tr>
<tr>
<td>Weight (kg)</td>
</tr>
<tr>
<td>TMD (mm)</td>
</tr>
<tr>
<td>POGO (%)</td>
</tr>
<tr>
<td>Success rate at first attempt</td>
</tr>
<tr>
<td>Cumulative success rate by second attempt</td>
</tr>
<tr>
<td>Intubation time (s)</td>
</tr>
<tr>
<td>Postoperative sore throat</td>
</tr>
<tr>
<td>Postoperative hoarseness</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD or actual number
NS not significant, ASA PS American Society of Anesthesiology Physical Status, TMD thyromental distance, POGO percentage of glottic opening
The top image shows a left-facing bevel of a standard endotracheal tube, with the leading edge of the tube between the first and second tracheal rings (the vocal cords are denoted by the thin vertical line; the rings, by solid dots). The drawing is from a lateral perspective of the trachea, with the round dots representing a sagittal cross-section of the tracheal rings. An inset shows the tracheal rings as they appear with a fiberoptic instrument. Rotation of the tube clockwise (middle image) drops the tip downward, disengaging it from the tracheal rings, and also lowering the trajectory of the tube. At the bottom is the symmetric, ski-tip distal tip of the Parker endotracheal tube. This tube design is also advocated by the manufacturer of the GlideScope.


**MCGRATH VIDEOLARYNGOSCOPE (MVL)**

- Designed by a British Student
  - Won the 1999 Royal Society of Arts student design competition
- Series 5 McGrath VL is available for clinical use
- Fully portable video laryngoscope
- Single-use blade
  - Placed in three different positions
- On board mini color camera
- Flat screen monitor mounted on handle
- Battery powered
  - Single AA battery

**MCGRATH VIDEOLARYNGOSCOPE**

With permission of Dr. James Du Canto

**CASE SERIES: THE MCGRATH® VIDEOLARYNGOSCOPE – AN INITIAL CLINICAL EVALUATION**

[Série de cas: Le vidéolaryngoscope McGrath® - une première évaluation Chinique]

Ben Shippey BMBS MRCP FRCA, David Ray MD FRCA, Dermot McKcown MBChB FRCA

- Prospectively recorded factors associated with difficult tracheal intubation and complications using the McGrath in patients with normal airways
  - Phase I – 75 patients, experience with airway instrumentation was documented
  - Phase II – 75 patients, time to obtain an optimal view of the larynx and to complete tracheal intubation
- 98% of all intubations were successful using the McGrath
  - CL grade I views were obtained in 143 patients (95%)
  - Median time to obtain an adequate view was 6.3 seconds
  - Tracheal intubation was 24.7 sec
  - No complications were encountered in any patient
- The McGrath is an effective aid to airway management in patients with normal airways

**USE OF THE MCGRATH® VIDEOLARYNGOSCOPE IN THE MANAGEMENT OF DIFFICULT AND FAILED TRACHEAL INTUBATION**

B. Shippey,† D. Ray† and D. McKeown†
• Report of 3 patients who had Grade 3 or 4 views in whom tracheal intubation was not possible using a conventional Macintosh laryngoscope
• Using the McGrath resulted in a Grade 1 laryngoscopic view followed by successful intubation
• Intubation was more awkward because of the more anterior view of the larynx with the McGrath -stylet is required for intubation
• Offers a valuable addition to the equipment currently available to rescue difficult or failed tracheal intubation


ALTERNATIVES APPROACHES TO INTUBATION:
STORZ VIDEO LARYNGOSCOPE

• The C-MAC VL contains a small camera and a light source at the distal third of the blade
• Two different types of Blades
  – Mac#3 & #4 Blades
  – D- Doerges Difficult airway blade
• Two different ways to visualize the glottis
  • Classic direct view using the naked eye similar to Macintosh blade
  • Indirect view via a miniature camera at the blade tip visualize the image on the monitor

FIRST CLINICAL EVALUATION OF THE C-MAC D-BLADE VIDEO LARYNGOSCOPE DURING ROUTINE AND DIFFICULT INTUBATION

Comparison of the conventional C-MAC videolaryngoscope blades (Macintosh sizes 3 and 4; left panel, A,B) with the curved C-Mac D-Blade (right panel, C)


PERFORMANCE OF THE C-MAC VIDEO LARYNGOSCOPE IN PATIENTS WITH LIMITED GLOTTIC VIEW USING MACINTOSH LARYNGOSCOPY

• 52 consecutive patients found to have unanticipated CL grade 3 (n = 49) and CL grade 4 (n = 3)  
• The percentage of glottic opening (POGO)/glottic view improved in 49 of 52 patients
• Tracheal intubation in 3 patients failed
Maya S Suresh. Role of video laryngoscopes in anesthesia practice


- The percentage of glottic opening (POGO) improved in 49 of 52 patients.
- Tracheal intubation in 3 patients failed.


Maya S Suressh. Role of video laryngoscopes in anesthesia practice

COMPARATIVE EFFECTIVENESS OF THE C-MAC VIDEOLARYNGOSCOPE VS DIRECT LARYNGOSCOPY IN PREDICTED DIFFICULT AIRWAYS

- Use of C-MAC in patients with predicted difficult airway
- Diverse group of providers (residents, anesthesiologists, CRNAs) achieved higher and more successful intubations on first attempt using the C-MAC VL
- Use of gum –elastic bougie and /or external laryngeal manipulation were required less with C-MAC compared to DL
  - Time to intubation:
    - C-MAC was 46 s (40-51)
    - DL was 33 s (29-36) < 0.001


FIRST CLINICAL EVALUATION OF THE C-MAC D-BLADE VIDEOLARYNGOSCOPE DURING ROUTINE AND DIFFICULT INTUBATION

Curved C-Mac D-Blade angle is increased from 18° to 40°

Diverse group of providers (residents, anesthesiologists, CRNAs) achieved higher and more successful intubations on first attempt using the C-MAC VL

FIRST CLINICAL EVALUATION OF THE C-MAC D-BLADE VL DURING ROUTINE & DIFFICULT INTUBATION

Time to optimal view: 11(5-45 secs)
Time to successful intubation: 17 secs (3-80 secs)
Improvement of Cormack-Lehane grade from conventional direct laryngoscopy (DL) to C-MAC D-Blade view in patients with difficult airway (n = 20)

DELIBER OF THE TUBE THE TARGET WITH C-MAC VL

- Shape and size of the C-MAC proximal blade makes tube delivery to the glottis much more straightforward
- The trajectory of the tube tip inserted into the oropharynx, then advanced into the hypopharynx is tilted upward into the larynx
  - Stylet if required (10%) straight to cuff with 35° bend or may not be necessary

C MAC PORTABLE–POCKET MONITOR

COMPARISON OF THREE VIDEOLARYNGOSCOPEs IN MORBIDLY OBESE PATIENTS

C-MAC > Glidescope > McGrath

Comparison of number of laryngoscopy attempts for 3 videolaryngoscopes (VLSs). There are significantly fewer attempts necessary with the Storz® VLS than with both the GlideScope® and the McGrath® (P < 0.01), and fewer attempts necessary with the GlideScope than with the McGrath VLS (p < 0.05).


COMPARISON OF THREE VIDEOLARYNGOSCOPEs IN MORBIDLY OBESE PATIENTS

C-MAC > Glidescope > McGrath

Comparison of required intubation attempts for 3 videolaryngoscopes (VLSs) for Cormack and Lehane (C&L) grade as assessed with a classic laryngoscope. The Storz® VLS performed better than both the GlideScope® and McGrath® VLSs with fewer attempts required across the spectrum of patient C&L grades (p < 0.01). C&L grade as assessed by classic laryngoscopy was a significant factor in the number of intubation attempts with the different VLSs (p < 0.01).

Role of video laryngoscopes in anesthesia practice

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AIRTRAQ VIDEOLARYNGOSCOPE: CHANNEL VL

- Airtraq videolaryngoscope

- Designed to provide a view of the glottis without alignment of oral, pharyngeal, and tracheal axis
- Operator must learn to maneuver the device rather than the ET for proper insertion

TRACHEAL INTUBATION USING THE AIRTRAQ® IN MORBIDLY OBESE PARTURIENTS UNDERGOING EMERGENCY CESAREAN DELIVERY

Case report:

- Report of two cases morbidly obese parturients undergoing emergency cesarean delivery
- Airway exam: MP III (IV) in operating room. Following RSI CL Grade 3 or 4 with regular Macintosh blade
- Failed DL intubation, failed Bougie
- Rapid tracheal intubation successful with Airtraq laryngoscope

New disposable intubating laryngoscope
- Inexpensive, portable, lightweight
- Alternative approach to emergency airway management

DCI, Direct coupler interface; DL, direct laryngoscopy; LCD, liquid crystal display.

Table II. Comparison of video laryngoscopes and related devices.

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>Size</th>
<th>Angles, degrees</th>
<th>Type of Monitor</th>
<th>Battery</th>
<th>Minitor Size, In</th>
<th>Location of monitor</th>
<th>Single-use blade</th>
<th>Can be used for conventional DL</th>
<th>Defogger required</th>
<th>Channel guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airtraq</td>
<td>Coming soon</td>
<td>95</td>
<td>Monitor</td>
<td>Yes</td>
<td>N/A</td>
<td>Unattached</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Berci-Kaplan Mac 3&amp;4</td>
<td>DCI</td>
<td>60-80</td>
<td>Ranger; rechargeable</td>
<td>Yes</td>
<td>7</td>
<td>Unattached</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>GlideScope</td>
<td>Small &amp; adult</td>
<td>50-60</td>
<td>(rechargeable)</td>
<td>Yes</td>
<td>1.7</td>
<td>Attached</td>
<td>Yes</td>
<td>Possible, but not recommended</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>McGrath</td>
<td>Child, adult</td>
<td>35-45</td>
<td>(rechargeable)</td>
<td>Yes</td>
<td>2.4</td>
<td>Attached</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pentax airway scope</td>
<td>Single size</td>
<td>90</td>
<td>(rechargeable)</td>
<td>Yes</td>
<td>2.5</td>
<td>Attached</td>
<td>No</td>
<td>Optional</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Truview premier</td>
<td>Small &amp; adult</td>
<td>42</td>
<td>(rechargeable)</td>
<td>Yes</td>
<td>2.5</td>
<td>Attached; can be used with eyepiece</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Weiss angulated video-intubation laryngoscope</td>
<td>Single size</td>
<td>70</td>
<td>(rechargeable)</td>
<td>No</td>
<td>N/A</td>
<td>Unattached</td>
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<td>No</td>
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- Designed to provide a view of the glottis without alignment of oral, pharyngeal, and tracheal axis
- Operator must learn to maneuver the device rather than the ET for proper insertion

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• Time to optimal glottic view: 10 & 14 secs respectively
• Time to securing airway 21 & 23 secs respectively

PENTAX AIRWAY SCOPE

Pentax AirWay Scope showing tracheal tube in track.

VIDEO-ASSISTED LARYNGOSCOPY AIRTRAQ

Video Screen and target sights on Airway Scope.

• Pentax –AWS (Pentax corp Tokyo, Japan) is a new rigid, portable, indirect laryngoscope
• Has an integrated tube passage function, monitor, single-use blade (p-blade)
• Channel on the right side of the p-blade guides the tube
• A target mark on the monitor indicates the tracheal tube direction and helps in advancement of tracheal tube direction
Pentax –AWS a new VL; is more effective than the Macintosh for tracheal intubation in patients with restricted neck movements randomized comparative study

View of the glottis at laryngoscopy with Pentax –AWS and Macintosh DL

<table>
<thead>
<tr>
<th>Cormack &amp; Lehane classification</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macintosh</td>
<td>124</td>
<td>57</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>Pentax-AWS</td>
<td>203</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


PENTAX –AWS A NEW VL; IS MORE EFFECTIVE THAN THE MACINTOSH FOR TRACHEAL INTUBATION IN PATIENTS WITH RESTRICTED NECK MOVEMENTS RANDOMIZED COMPARATIVE STUDY

Success or failure of tracheal intubation using a Macintosh laryngoscope or the Pentax-AWS, within 120 s

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Success (%)</th>
<th>Recommended case load (Mean)</th>
<th>95% confidence interval for success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intubation</td>
<td>90</td>
<td>57</td>
<td>0.80-0.99</td>
</tr>
<tr>
<td>Spinal anesthesia</td>
<td>90</td>
<td>71</td>
<td>0.75-1.0</td>
</tr>
<tr>
<td>Epidural anesthesia</td>
<td>78</td>
<td>90</td>
<td>0.71-0.85</td>
</tr>
<tr>
<td>Brachial plexus Block</td>
<td>87</td>
<td>62</td>
<td>0.76-0.97</td>
</tr>
<tr>
<td>Arterial line</td>
<td>84</td>
<td>60</td>
<td>0.60-1.0</td>
</tr>
</tbody>
</table>

*Confidence intervals are given for the mean recommended numbers (values were calculated from all 11 residents).


SIMULATED NORMAL AIRWAY SCENARIO

<table>
<thead>
<tr>
<th>Procedure</th>
<th>GlideScope (n = 20)</th>
<th>Pentax airway scope (n = 20)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time taken to visualize glottis; s</td>
<td>4.5 (3.7-5.8 [2.0-14.9])</td>
<td>3.2 (2.4-5.3 [1.0-9.4])</td>
<td>0.037</td>
</tr>
<tr>
<td>Time taken from visualization of glottis to insertion of tracheal tube; s</td>
<td>5.4 (3.3-10.9 [1.0-13.2])</td>
<td>3.6 (2.7-6.7 [1.3-13.5])</td>
<td>0.1</td>
</tr>
<tr>
<td>Total time taken for tracheal intubation; s</td>
<td>10.4 (7.4-14.9 [6.0-28.1])</td>
<td>7.6 (5.6-10.5 [3.4-18.0])</td>
<td>0.044</td>
</tr>
<tr>
<td>Success of tracheal intubation</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Ease of intubation</td>
<td>2 (1.0-2.8 [1-3])</td>
<td>1 (1-2 [1-2])</td>
<td>0.022</td>
</tr>
<tr>
<td>Choice of device</td>
<td>5 (25%)</td>
<td>14 (70%)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>


- Statistical modeling: Ninety percent probability of a «good/successful» intubation required 57 laryngoscopic intubation procedures.
Maya S Suresh. *Role of video laryngoscopes in anesthesia practice* (interquartile range [range]) or number (%). Ease of intubation was scored: 1 = very easy, 2 = easy, 3 = difficult, 4 = very difficult.


**SUMMARY**

- Direct laryngoscopy/devices for intubation introduced 70 years ago
- Video and optical laryngoscopy technology/devices one of the most significant advances for airway management:
  - Indirect laryngoscopy
  - Normal & difficult airways, teaching and training, unstable spine, trauma, and in obstetrical patients
- VL & Optical Laryngoscopes are now used:
  - Either as primary airway device or immediately available in patients with predicted difficult intubation
  - or as rescue device in unanticipated difficult intubation

Thank You

Annual refresher course of anesthesiology and perioperative medicine México City:

I have no financial disclosures or conflict of interest.

<table>
<thead>
<tr>
<th>SIMULATED DIFFICULT AIRWAY SCENARIO</th>
<th>GlideScope (n = 20)</th>
<th>Pentax airway scope (n = 20)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time taken to visualize glottis; s</td>
<td>5.5 (3.17-2) [2.0-10.2])</td>
<td>4.2 (3.4-4.9 [2.6-6.8])</td>
<td>0.2</td>
</tr>
<tr>
<td>Time taken from visualization of glottis to insertion of tracheal tube; s</td>
<td>12.1 (8.1-15.7 [5.7-24.5])</td>
<td>5.7 (2.9-8.4 [1.5-10.4])</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total time taken for tracheal intubation; s</td>
<td>17.3 (13.3-20.3 [9.6-32.4])</td>
<td>10.0 (7.0-12.6 [5.2-16.3])</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Success of tracheal intubation</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Ease of intubation</td>
<td>2.5 (2-3 [1-4])</td>
<td>1.5 (1-2 [1-3])</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Choice of device</td>
<td>2 (10%)</td>
<td>16 (80%)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Time taken and success of tracheal intubation by medical students in simulated normal airway scenario. Results are expressed as median.