Videolaryngoscopy in Trauma

Terence O’Keeffe
Associate Professor
Trauma, Critical Care, Emergency Surgery
University of Arizona
Direct Laryngoscopy
Direct Laryngoscopy
Direct Laryngoscopy

- Challenging in Trauma patients
  - Need for Rapid intubation
  - Potential for cervical trauma
  - Cervical immobilization
  - Facial fractures
  - Blood or vomitus in the airway
Direct Laryngoscopy
EMERGENCY MEDICINE: The Cowboys

Patient's leg is bleeding! No time to call Surgery! Tourniquet and amputate! Quick, throw me a scalpel!

This patient looks like she can't breathe!

Yes I can.

No time! Stat trache! Get me a straw!!
YOU WANT WHAT???
I INTEGATE, THEREFORE I AM
TRACHEAL INTUBATION IN THE EMERGENCY DEPARTMENT: A COMPARISON OF GLIDESCOPE® VIDEO LARYNGOSCOPY TO DIRECT LARYNGOSCOPY IN 822 INTUBATIONS

John C. Sakles, MD, Jarrod M. Mosier, MD, Stephen Chiu, BA, and Samuel M. Keim, MD, MS
Video laryngoscopy

- Magnification of larynx
- Improves laryngeal view
- Less cervical motion
- Multiple simultaneous viewers

Rai, MR et al *Anaesthesia*. 2005
A Comparison Of Direct Laryngoscopy To Videolaryngoscopy For Trauma Patients In The ED

Michailidou M, Mosier JM, Friese RS, Rhee P, Sakles J, O’Keeffe T
Methods

• Prospectively observational study
  – All trauma patients
  – Jan 1 2008 to June 2011
  – Type of devices
    • Attending preference

• Successful intubation
  – First attempt
## Methods

### Airway CQI Form

<table>
<thead>
<tr>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Attending:** 

**Resident:** 

- [ ] Trauma
- [ ] Mechanism
- [ ] Trauma Dx
- [ ] Medical
- [ ] Diagnosis

**Was there a failed intubation attempt PREHOSPITAL?**  
- [ ] No
- [ ] Yes

**Reason for Intubation:**
- [ ] Respiratory Failure
- [ ] Airway Protection
- [ ] Patient Control
- [ ] Cardiac Arrest
- [ ] Hypoxia

**Method Used:**
- [ ] RSI
- [ ] Oral (Sedation Only)
- [ ] Oral (NO Meds)
- [ ] Nasal

**Drugs Used:**
- [ ] Succinylcholine
- [ ] Rocuronium
- [ ] Etomidate
- [ ] Ketamine
- [ ] Atropine
- [ ] Lidocaine
- [ ] Other

### Reason for Initial Device Selection (Check ONE):
- [ ] Standard Device
- [ ] Difficult Airway Suspected
- [ ] Educational Purposes

**Difficult Airway Predictors (check ALL that Apply):**
- [ ] Blood in Airway
- [ ] Facial/Neck Trauma
- [ ] Obesity
- [ ] Other
- [ ] Other
- [ ] Small Mandible
- [ ] Short Neck
- [ ] None

**Intubation Attempts** See other side for device codes

*If more than 3 attempts, please attach an additional airway form*

<table>
<thead>
<tr>
<th>Attempt #1</th>
<th>Attempt #2</th>
<th>Attempt #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intubator:</strong></td>
<td><strong>Intubator:</strong></td>
<td><strong>Intubator:</strong></td>
</tr>
<tr>
<td><strong>Device:</strong></td>
<td><strong>Device:</strong></td>
<td><strong>Device:</strong></td>
</tr>
<tr>
<td><strong>Type/Size:</strong></td>
<td><strong>Type/Size:</strong></td>
<td><strong>Type/Size:</strong></td>
</tr>
</tbody>
</table>

**Outcome (Check ONE):**
- [ ] SUCCESS!

<table>
<thead>
<tr>
<th>If Failed Attempt:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Esophageal Intubation</td>
</tr>
<tr>
<td>[ ] Can't See Cords</td>
</tr>
<tr>
<td>[ ] Can't Direct Tube</td>
</tr>
<tr>
<td>[ ] Equipment Failure</td>
</tr>
</tbody>
</table>

**Complication(s) (ALL that apply):**
- [ ] None
- [ ] Desaturation
- [ ] Mainstem
- [ ] Hypoxemia
- [ ] Aspiration
- [ ] Airway/Dental Trauma
- [ ] Other

**Starting Sat:** 

<table>
<thead>
<tr>
<th>% (PRIOR to intubation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Lowest Sat:** 

<table>
<thead>
<tr>
<th>% (DURING intubation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Grade of Laryngoscopic View**

- [ ] Grade I
- [ ] Grade II
- [ ] Grade III
- [ ] Grade IV

**Dates:** 

- [ ] VL View (Att #):
- [ ] DL View (Att #):

**Stylet Used:**
- [ ] Standard
- [ ] Saturn
- [ ] None

**Bougie Used?**
- [ ] Yes
- [ ] No

**3VL Direct/ICMAC Questions Only:**
- [ ] Used as DL
- [ ] DL to VL Switch
- [ ] Used as VL
- [ ] VL to DL Switch

**Clarity of Optical View**

(Videoscopes, Fiberoptics, and Optically-Assisted Devices)

*Please label each attempt*

- [ ] Lens Contamination
  - [ ] None
  - [ ] Mild (Contaminated, cords easily visible)
  - [ ] Moderate (Moderate Contamination, cords still visible)
  - [ ] Severe (Contaminated, cords NOT visible)

**Other Questions:**

- [ ] Video Recorded? 🙂

*Please provide any important comments regarding the intubation:

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

See Other Side

See Other Side
Methods

- Data collection sheet  CQI
  - Indications for use of each device
  - Difficult airway predictors
  - Intubation outcome
  - Reason for failure
  - Grade of laryngoscopic view
  - Level of intubator
722 total

13 excluded*

Direct Laryngoscopy
45%  
(n=322)

Video Laryngoscopy
55%  
(n=387)

* 7 fiberoptic
  2 no device
  1 TrachLight,
  1 primary
  1 cricothyroidotomy
  2 tube exchanger
Increasing VL use over time
# Demographics/Clinical Data

<table>
<thead>
<tr>
<th></th>
<th>DL (n=332)</th>
<th>VL (n=387)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>37 ± 22</td>
<td>39 ± 19</td>
<td>0.21</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>75</td>
<td>77</td>
<td>0.45</td>
</tr>
<tr>
<td>Blunt mechanism (%)</td>
<td>81</td>
<td>83</td>
<td>0.46</td>
</tr>
<tr>
<td>SBP &lt; 90 mmHg</td>
<td>9.9</td>
<td>15.8</td>
<td>0.02</td>
</tr>
<tr>
<td>ISS</td>
<td>21 ± 15</td>
<td>24 ± 15</td>
<td>0.02</td>
</tr>
<tr>
<td>Head AIS</td>
<td>3.7 ± 1.3</td>
<td>3.8 ± 1.2</td>
<td>0.39</td>
</tr>
<tr>
<td>Face AIS</td>
<td>1.8 ± 0.8</td>
<td>2 ± 0.9</td>
<td>0.15</td>
</tr>
<tr>
<td>DAP (n)</td>
<td>1.6 ± 1.5</td>
<td>2.1 ± 1.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Median PGY level</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>DL (%)</td>
<td>VL(%)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>All patients</td>
<td>709</td>
<td>83</td>
<td>88</td>
</tr>
<tr>
<td>Blunt trauma</td>
<td>582</td>
<td>82</td>
<td>88</td>
</tr>
<tr>
<td>C-spine immobilization</td>
<td>483</td>
<td>80</td>
<td>87</td>
</tr>
<tr>
<td>≥ 5 DAPs</td>
<td>31</td>
<td>54</td>
<td>89</td>
</tr>
</tbody>
</table>
## Intubation failure

<table>
<thead>
<tr>
<th>Intubation failure (%)</th>
<th>DL N=85</th>
<th>VL N=87</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inability to visualize cords</td>
<td>64.7</td>
<td>46</td>
</tr>
<tr>
<td>Failure to direct ETT tube</td>
<td>18.8</td>
<td>37.9</td>
</tr>
<tr>
<td>Esophageal intubation</td>
<td>10.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Equipment failure</td>
<td>2.4</td>
<td>4.6</td>
</tr>
</tbody>
</table>
### Independent predictors of initial intubation failure

<table>
<thead>
<tr>
<th></th>
<th>DL</th>
<th>VL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood in airway</td>
<td>NS</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.0-9.9)</td>
</tr>
<tr>
<td>Small mandible</td>
<td>5.6</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>(1.4-22)</td>
<td>(2.0-29)</td>
</tr>
</tbody>
</table>

Odds ratio (95% CI)
Summary

- VL was overall more successful than DL
- VL was more successful in difficult airways
- Clear indications exist for and against VL
Video laryngoscopes

CMAC

Glidescope (GVL)
The CMAC Videolaryngoscope is Superior To The Glidescope For The Intubation Of Trauma Patients
Results

Videolaryngoscopy
341 patients

Glidescope (GVL)
200 (59%)

CMAC
141 (41%)
## Success rates

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>CMAC (%)</th>
<th>GVL (%)</th>
<th>DL (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>580</td>
<td>94.3%</td>
<td>87.0%</td>
<td>84.1%</td>
<td>0.01</td>
</tr>
<tr>
<td>Blunt trauma</td>
<td>470</td>
<td>95.3%</td>
<td>87.0%</td>
<td>84.0%</td>
<td>0.02</td>
</tr>
<tr>
<td>C-spine immobilization</td>
<td>386</td>
<td>95.5%</td>
<td>86.8%</td>
<td>82.6%</td>
<td>0.02</td>
</tr>
<tr>
<td>Success at 2(^{nd}) attempt</td>
<td>97</td>
<td>86.7%</td>
<td>65.5%</td>
<td>44.7%</td>
<td>0.002</td>
</tr>
<tr>
<td>Esophagelal Intubation</td>
<td>22</td>
<td>2.8%</td>
<td>5.0%</td>
<td>3.0%</td>
<td>NS</td>
</tr>
<tr>
<td>Intubation failure (%)</td>
<td>CMAC N=141</td>
<td>GVL N=200</td>
<td>DL N=239</td>
<td>P value</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------</td>
<td>-----------</td>
<td>----------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Inability to visualize cords</td>
<td>14%</td>
<td>9%</td>
<td>16%</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Failure to direct ETT tube</td>
<td>7%</td>
<td>11%</td>
<td>2.5%</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Esophageal intubation</td>
<td>2.1%</td>
<td>2.5%</td>
<td>4.2%</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Equipment failure</td>
<td>1.4%</td>
<td>0.5%</td>
<td>0.8%</td>
<td>0.66</td>
<td></td>
</tr>
</tbody>
</table>
Glidescope

- Glidescope did not outperform DL
  - (87% vs. 84%, p=0.4)

- Differences in Glidescope performance
  - Ranger 100% (N=11)
  - Standard GVL 86.9% (N=148)
  - Cobalt GVL 50% (N=14)
Stylet
## Table 3 First attempt and ultimate success rates by level of training

<table>
<thead>
<tr>
<th>Training level</th>
<th>First attempt success - DL</th>
<th>First attempt success - VL</th>
<th>P-value</th>
<th>Ultimate success - DL</th>
<th>Ultimate success - VL</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residents (PGY 1 to 3)</td>
<td>59% (16/27)</td>
<td>73% (72/98)</td>
<td>0.16</td>
<td>93% (25/27)</td>
<td>97% (95/98)</td>
<td>0.29</td>
</tr>
<tr>
<td>Fellows/Attendings (PGY 4+)</td>
<td>62% (18/29)</td>
<td>82% (112/136)</td>
<td>0.02</td>
<td>93% (26/28)</td>
<td>99% (134/136)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Table 3: Compares the first attempt and ultimate success rates between VL and DL by residents and fellows/attendings. DL, direct laryngoscope/laryngoscopy; PGY, post-graduate year; VL, video laryngoscope/laryngoscopy.
Summary

- VL was more successful than DL
  - especially in difficult airways

- The type of VL appears to be a factor
  - CMAC - higher success rate than GVL
End of story?

YOU ARE A PARAMEDIC... AREN'T YOU?

NO...BUT I DID SLEEP AT A HOLIDAY INN LAST NIGHT.
Limitations

- Not randomized
- Operator bias
- Small numbers of CMAC intubations
- Single institution
But what about training?

- Not everywhere will have a videolaryngoscope
- Expensive
- They can malfunction
- Trainees need to know how to use DL
- Most of the studies are on manikins
ORIGINAL ARTICLE

Effect of video laryngoscopy on trauma patient survival: A randomized controlled trial

Dale J. Yeatts, MD, Richard P. Dutton, MD, MBA, Peter F. Hu, MS, Yu-Wei W. Chang, MS, Clayton H. Brown, PhD, Hegang Chen, PhD, Thomas E. Grissom, MD, Joseph A. Kufera, MA, and Thomas M. Scalea, MD, Baltimore, Maryland
Figure 2. Patient flow diagram.
<table>
<thead>
<tr>
<th>Specialty</th>
<th>First-Pass Success, %</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia</td>
<td>68.6</td>
<td>51</td>
</tr>
<tr>
<td>Critical care medicine</td>
<td>82.6</td>
<td>86</td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>83.6</td>
<td>323</td>
</tr>
<tr>
<td>Surgery</td>
<td>66.7</td>
<td>3</td>
</tr>
<tr>
<td>Experience level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGY 2</td>
<td>83.3</td>
<td>270</td>
</tr>
<tr>
<td>PGY 3</td>
<td>77.6</td>
<td>49</td>
</tr>
<tr>
<td>PGY 4</td>
<td>84.1</td>
<td>44</td>
</tr>
<tr>
<td>PGY 5</td>
<td>100.0</td>
<td>20</td>
</tr>
<tr>
<td>PGY 6</td>
<td>74.1</td>
<td>27</td>
</tr>
<tr>
<td>Attending</td>
<td>66.7</td>
<td>18</td>
</tr>
<tr>
<td>Certified registered nurse anesthetist</td>
<td>85.7</td>
<td>7</td>
</tr>
<tr>
<td>Student registered nurse anesthetist</td>
<td>73.9</td>
<td>23</td>
</tr>
</tbody>
</table>
Results

- No difference in survival
- VL had longer intubation times
- No differences in first-pass success
- Head injury patient subgroup
  - Greater incidence of hypoxia
  - Higher mortality
No meaningful differences between the two groups were found in the first-pass success rates (81% for DL and 80% for GVL, \( p = 0.46 \)).

Of the 336 patients for whom Mallampati scores were recorded, 178 were randomized to intubation with the DL and 158 were randomized to intubation with the GlideScope. Among patients with anticipated “difficult” airways, there was no difference between cohorts regarding number of intubation attempts or intubation attempt duration.
The Emperor's New Clothes

by HANS CHRISTIAN ANDERSEN

Retold by RUTH BELOV GROSS
Pictures by JACK KENT
Take home messages

- VL is useful in SPECIFIC situations
- Better for the infrequent intubator
- Will likely become standard of care

- BUT
  - Be familiar with and practice with DL
A final word about job security
Questions?