Trauma Airway Management: Myths & Pearls
Past Present and Future

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I do not have an affiliation (financial or otherwise) with any commercial organization that may have a direct or indirect connection to the content of my presentation.
Nuts and Bolts
Expect the unexpected...
Expect the unexpected...
Plan

- ATLS and the airway
- Decisions
- C-spine
- Drugs
- Devices
Trauma Airway
past, present and future...
Who's Job is it?

Who owns the airway?

Anesthesiology?

The TTL does:
- EM, GP, CC, Surgeon,
- Others: EMS, RT

Knowledge and Skill
Experience
Availability
Committee on Trauma Presents

Airway and Ventilatory Management

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The Decision: Prioritization of Resuscitation?
Reprioritization of Resuscitation
Decisions
Intubation acuity...
DECREASED GLASGOW COMA SCALE SCORE DOES NOT MANDATE ENDOTRACHEAL INTUBATION IN THE EMERGENCY DEPARTMENT

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Be Prepared

Equipment:
Suction, O₂, bag-mask, laryngoscope, gum elastic bougie (GEB), laryngeal mask airway (LMA), laryngeal tube airway (LTA), surgical or needle cricothyroidotomy kit, endotracheal tube, pulse oximetry, CO₂ detection device, drugs

Protect C-Spine!
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**Caution**

Protect the cervical spine during airway management!
All hands on neck...
Airway and C-spine

Is it much a do about nothing?
Deficit after injury

- Prehospital phase
  - Extrication
  - Immobilization

- In ED
  - Assessment
  - Airway management
Deterioration after tube

- Case reports
- Related to difficulty/# of attempts
- Unrestricted spine movement
**Manual In-Line Stabilization for Acute Airway Management of Suspected Cervical Spine Injury: Historical Review and Current Questions**

Table 1. Studies of manual in-line stabilization and other immobilization techniques: early and supportive articles presented in the order they appear in the text.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Subjects</th>
<th>Study design</th>
<th>Key Findings</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peckleewa et al. 1983</td>
<td>25 Volunteers</td>
<td>Measured voluntary head movement with mechanical immobilization baseline radiographs in neutral position compared to radiographs during airway maneuvers.</td>
<td>Combination of collar, tape, mandible immobilization, Chin lift, and jaw thrust, more severe segmental movement than DL-010, Healed in minimal movement comparison to nasotracheal intubation.</td>
<td>No airway maneuvers, No immobilization technique. No Mils. Single caudal.</td>
</tr>
<tr>
<td>Atrashman et al. 1984</td>
<td>Single fresh cadaver. Scoliosis created 25-30 degrees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Majkovic et al. 1986</td>
<td>16 Uninjured elective surgery pts</td>
<td>Phase 1: 6 pts neutral position straight versus curved block. Phase 2: 2 groups of 4 pts. Group 1 Philadelphia collar. Group 2 Mils. Each group 2 pts curved blade, 2 pts straight blade. Neuroradiographs compared to radiographs at neck cord visualization.</td>
<td>Phase 1: No difference in movement straight versus curved blades. Phase 2: Philadelphia collar ineffective. Mils significantly reduced AD extension and movement that occurred over the lunitoic curve of the same in general.</td>
<td>First airway study to compare Mils to another immobilization technique. Immobilization groups small (4), divided 2 straight and 2 curved. Movement in uninjured spine may not produce injury, segment movement.</td>
</tr>
<tr>
<td>Sibbons et al. 1988</td>
<td>4 traumatic arrest pts with unstable cervical spine.</td>
<td>Laterral radiographs: Neutral position, axial traction, and during intubation with and without axial traction. 15 kg cause traction applied to shoulders for radiographs.</td>
<td>Traction with DL-010 decreased subluxation but increased displacement by up to 14 mm.</td>
<td>Mils not evaluated. Caudal should not be used. May have resulted in some of the adnominalisms. No statistical analysis.</td>
</tr>
<tr>
<td>Hastings and Wood 1989</td>
<td>14 Uninjured elective surgery pts class 1 airways.</td>
<td>Angle finder: measured head extension at angled view and best view. All pts 2 consecutively. 14 pts DL with and without Mils. 10 pts DL with and without axial traction. 7 pts DLs to assess reliability of angle finder.</td>
<td>Mils reduced head extention for odontoid and best view by 4 and 10 degrees, respectively. Traction nonsignificantly increased extention angles.</td>
<td>No statistical analysis.</td>
</tr>
<tr>
<td>Donaldson et al. 1993</td>
<td>5 Fresh cadavers, surgically destabilized C5-C6</td>
<td>Videofluoroscopy frame grab taken in neutral before lesion and postlistion at maximum angulation translation and flexion/extension.</td>
<td>Crash/“forced” DL-010 without Mils. non segmental movement than “direct” DL-010 with Mils. DL-013 excellent movement as DL-010 with Mils. Nasal intubation less movement that DL-010.</td>
<td>Head extension may or may not result in movement of injured spine. Two pts in Mils group, 2 pts in traction group excluded views degraded by stabilization (see text).</td>
</tr>
</tbody>
</table>

Table 2. Studies that do not support manual in-line stabilization presented in the order they appear in the text.

<table>
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<tbody>
<tr>
<td>Donaldson et al. 1997</td>
<td>6 Fresh cadavers. Type II odontoid fx created.</td>
<td>Chin lift, jaw thrust, oral intubation, “gently” nasotracheal intubation done pre and postintubation with Mils. Videofluoroscopy. Emphasis on space for car.</td>
<td>Jaw thrust causes greater decrease in space for car than DL or nasotracheal intubation. Oral and nasotracheal intubation caused similar decrease in space for car.</td>
<td>As with previous Donaldson study, oral intubation and “gently odontoid fx” not clearly defined.</td>
</tr>
<tr>
<td>Sawin et al. 1998</td>
<td>10 Uninjured elective surgery patients each of 1 or 2 airways.</td>
<td>Trauma DL technique without stabilization. Spinal movement assessed by cinefluorography frame grab at various stages of DL-010.</td>
<td>Extension occurred at every level and at all levels of DL-010. Most cervical motion at A0 and C1-2. Very little motion noted to C2.</td>
<td>Lennerson studies that follow include Sawin et al. and other spine guidelines.</td>
</tr>
<tr>
<td>Cugnoni et al. 2001</td>
<td>10 Fresh cadavers. C3 posteriorly destabilized by ligament section and direct block.</td>
<td>Videofluoroscopy.</td>
<td>Subluxation for all airway maneuvers. Mils with maximum flexion, suggesting that Mils is generally effective for lower cervical injuries.</td>
<td>Mils technique seemed to include an element of manual axial traction.</td>
</tr>
</tbody>
</table>

Intubation and C-spine pearls
Airway Decision Scheme

Be Prepared

Equipment:
- Suction, O₂, bag-mask, laryngoscope, gum elastic bougie (GEB), laryngeal mask airway (LMA), laryngeal tube airway (LTA), surgical or needle cricothyroidotomy kit, endotracheal tube, pulse oximetry, CO₂ detection device, drugs
- Protect C-Spine!

Preoxygenate

O₂ +/- bag-mask +/- oral airway +/- nasal airway

Able to oxygenate?

No → Definitive airway | Surgical airway

Yes → Assess airway anatomy
- Predict ease of intubation (eg, LEMON)
  - Difficult
    - Call for assistance, if available
  - Easy
    - Intubation—drug-assisted
      - Cricoid pressure
        - Unsuccessful
          - Consider adjunct (eg, GEB/LMA/LTA)
        - Definitive airway | Surgical airway
    - Intubation—crystalloids
      - Definitive airway | Surgical airway
Airway Decision Scheme

Preoxygenate

$O_2 +/-$ bag-mask $+/-$ oral airway $+/-$ nasal airway

Able to oxygenate?

No

Yes
What is our goal?

Is this a failed airway?
Redefining success

- Sample case of RSI with successful placement of ETT
- In head injured patient

*Davis et al, A Follow up Analysis of Factors Associated with Head Injury Mortality After Paramedic Rapid Sequence Intubation. J Trauma. 2005;59:484-488*

Is this a successful airway?
The point is...

The goal in airway management is **OXYGENATION** and **VENTILATION**

...by any means: BMV, EGD, ETT
(most definitive is a cuffed ETT)
Airway Decision Scheme

Be Prepared
- Equipment:
  - Suction, O₂, bag-mask, laryngoscope, gum elastic bougie (GEB), laryngeal mask airway (LMA), laryngeal tube airway (LTA), surgical or needle cricothyroidotomy kit, endotracheal tube, pulse oximetry, CO₂ detection device, drugs
- Protect C-Spine!

Preoxygenate
- O₂ +/- bag-mask +/- oral airway +/- nasal airway

Able to oxygenate?
- No → Definitive airway | Surgical airway
- Yes
  - Assess airway anatomy
  - Predict ease of intubation (eg, LEMON)
    - Difficult
      - Call for assistance, if available
    - Easy
      - Intubation—drug-assisted
        - Cricoid pressure
      - Unsuccessful
        - Consider adjunct (eg, GEB/LMA/LTA)
        - Definitive airway | Surgical airway
Airway Decision Scheme

Assess airway anatomy
Predict ease of intubation (eg, LEMON)

Easy

Intubation—drug-assisted Cricoid pressure
Definitions and Drugs

• Rapid Sequence Induction (OR)
  – *Intubated to provide anesthesia*

• Rapid Sequence Intubation (ED)
  – *Anesthetized/paralyzed to facilitate intubation*
Definitions and Drugs

To Sux or Not to Sux…
• Propofol alone vs Propofol with Sux
• Optimal conditions: 30% vs 98%

Naguib M. Anesthesiology 2003
Airway Drugs
Success & Safety
What’s new what’s old?

Single-Dose Etomidate for Rapid Sequence Intubation May Impact Outcome After Severe Injury

Warner K et al. J Trauma. 2009

Medical Mythology

Myth: Ketamine should not be used as an induction agent for intubation in patients with head injury

Filannysky Y, Miller P. CJEM. 2010
Case: single shot .22
“In conclusion RSI is the preferred method of intubation for patients presenting with PNI.”
Is it?

- *Penetrating neck injury* is only a ‘marker’ for airway injury
- Is RSI safe with a *penetrating neck injury*?
- Is RSI safe with a *penetrating airway injury*?
- IF using an RSI:
  - Don’t mask vent
  - No blind device use
  - Get it on 1st attempt
Airway Decision Scheme

**Be Prepared**

Equipment:
- Suction, O₂, bag-mask, laryngoscope, gum elastic bougie (GEB), laryngeal mask airway (LMA), laryngeal tube airway (LTA), surgical or needle cricothyroidotomy kit, endotracheal tube, pulse oximetry, CO₂ detection device, drugs

**Protect C-Spine!**

**Preoxygenate**

O₂ +/- bag-mask +/- oral airway +/- nasal airway

Able to oxygenate?  

- **No**  
  - Definitive airway | Surgical airway

- **Yes**

  **Assess airway anatomy**

  **Predict ease of intubation (eg, LEMON)**

  **Easy**

  - Intubation—drug-assisted
  - Cricoid pressure

  **Unsuccessful**

  - Consider adjunct (eg, GEB/LMA/LTA)

  **Definitive airway | Surgical airway**

  **Difficult**

  - Call for assistance, if available

  - Consider awake intubation
Airway Decision Scheme

Intubation—drug-assisted
Cricoid pressure

Unsuccessful
Consider adjunct (eg, GEB/LMA/LTA)
Where do you press?

Pushing on the thyroid cartilage usually helps the view…
With ELM/BURP most patients improved one full laryngoscopic grade.

*Benumof JL et.al. J. Clinical Anesthesia 1996*

Pushing on the cricoid cartilage may worsen the view …
With Cricoid pressure (not ELM/BURP) worsens DL view in 30% of cases

Airway Decision Scheme

Intubation—drug-assisted Cricoid pressure

Unsuccessful

Consider adjunct (eg, GEB/LMA/LTA)
Device confusion

“... turned out to be a difficult intubation. After desaturation and bradycardia we switched to a lightwand which was successful.”

... Fixation error
Device Confusion
First attempt at laryngoscopy/intubation fails

Perform optimal bag-mask ventilation (BMV)

- **Can** oxygenate with BMV
  - **You have time!**
    - to wait for help, bail out to an extraglottic device (EGD), or proceed with another intubation attempt
    - Maximum of 1 or 2 more intubation attempts...
      - e.g., untried component of ‘best look’ laryngoscopy
      - move early to an alternative intubation device
    - **succeeds**
      - 3 failed intubation attempts = **Failed Intubation!**
        - revert to rescue oxygenation using an EGD or BMV
    - **fails**
      - Once the situation has stabilized and the patient is oxygenated, make arrangements for definitive care

- **Cannot** oxygenate with BMV
  - **You have NO time!**
    - ...for further intubation attempts
    - **Failed Oxygenation!**
      - While rapidly preparing for cricothyrotomy, make one quick attempt at rescue by placing an EGD
      - If the single attempt at BMV rescue oxygenation fails, proceed without delay to **cricothyrotomy**
  - **succeeds**
  - **fails**
  - Once the situation has stabilized and the patient is oxygenated, make arrangements for definitive care

Post-intubation care
I can’t get the tube…

• You see this…

• “89, 88, 86, 84”
First attempt at laryngoscopy/intubation fails

Perform optimal bag-mask ventilation (BMV)

Can oxygenate with BMV

You have time:
- to wait for help, bail out to an extraglottic device (EGD), or proceed with another intubation attempt

Cannot oxygenate with BMV

You have NO time!
...for further intubation attempts

Failed Oxygenation:
- While rapidly preparing for cricothyrotomy, make one quick attempt at rescue by placing an EGD

Failed Intubation:
- revert to rescue oxygenation using an EGD, or BMV

Maximum of 1 or 2 more intubation attempts...
- e.g., untried component of ‘best look’ laryngoscopy
- move early to an alternative intubation device

Once the situation has stabilized and the patient is oxygenated, make arrangements for definitive care

Post-intubation care
Can I Bag’em?

YES  NO
Can I Bag’em?

YES

You have time...

NO

You have NO time...
First attempt at laryngoscopy/intubation fails

Perform optimal bag-mask ventilation (BMV)

**Can** oxygenate with BMV

You have time:
- to wait for help, bail out to an extraglottic device (EGD), or proceed with another intubation attempt

Maximum of 1 or 2 more intubation attempts...
- e.g., untried component of 'best look' laryngoscopy
- move early to an alternative intubation device

- **succeeds**
  - 3 failed intubation attempts = **Failed Intubation**
    - revert to rescue oxygenation using an EGD, or BMV

- **fails**
  - **Failed Oxygenation**
    - While rapidly preparing for cricothyrotomy, make one quick attempt at rescue by placing an EGD

- **fails**
  - If the single attempt at EGD rescue oxygenation fails, proceed without delay to **Cricothyrotomy**

**Cannot** oxygenate with BMV

You have NO time!
...for further intubation attempts

Once the situation has stabilized and the patient is oxygenated, make arrangements for definitive care

Post-intubation care
Have time devices
First attempt at laryngoscopy/intubation fails

Perform optimal bag-mask ventilation (BMV)

**Can** oxygenate with BMV

- You have time
  - to wait for help, bail out to an extraglottic device (EGD), or proceed with another intubation attempt

  Maximum of 1 or 2 more intubation attempts...
  - e.g., untried component of 'best look' laryngoscopy
  - move early to an alternative intubation device

  - succeeds
    - 3 failed intubation attempts = **Failed Intubation**
      - revert to rescue oxygenation using an EGD, or BMV

  - fails

**Cannot** oxygenate with BMV

- You have NO time
  - ...for further intubation attempts

  **Failed Oxygenation**
  - While rapidly preparing for cricothyrotomy, make one quick attempt at rescue by placing an EGD

- fails

- succeeds

Once the situation has stabilized and the patient is oxygenated, make arrangements for definitive care

Post-intubation care
No time devices
Airway Decision Scheme

Be Prepared
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Able to oxygenate?
- No: Definitive airway | Surgical airway
- Yes: Assess airway anatomy

Predict ease of intubation (eg, LEMON)
- Difficult
- Easy

Intubation—drug-assisted
- Cricoid pressure
  - Unsuccessful: Consider adjunct (eg, GEB/LMA/LTA)
    - Definitive airway | Surgical airway
  - Consider awake intubation

Call for assistance, if available
Airway Decision Scheme

1. Consider adjunct (e.g., GEB/LMA/LTA)
2. Definitive airway → Surgical airway
Surgical airway
when, why, what & where

• Cricothyroidotomy vs Tracheostomy
• Open, 4-step, Qick-trach, Minitrach
• Melker, etc…
Surgical airway
when, why, what & where

Surgical airway...
The future...
“Good judgment may come from experience but experience comes from bad judgment.”

...Mark Twain
Expect the Unexpected