Current Cervical Spine Clearance Protocols in Level I Trauma Centers in the United States

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Cervical spine injury

- Cervical spine injury prevalence 3.7%
- 43% unstable

Disclosures

- None related to this study

Cervical spine injury

- Rate of neurologic deficit secondary to unrecognized spine injuries:
  - Cervical spine Injury: 0.2%
  - Blunt trauma patients: 0.03%

- California EMS Data:
  - 2009: 52,000 adult blunt trauma visits ➔ 15 patients
Costs

<table>
<thead>
<tr>
<th>Severity of Injury</th>
<th>Average Yearly Expenses (in 2007 dollars)</th>
<th>Estimated Lifetime Costs by Age at Injury (discounted at 2%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Year</td>
<td>Each Subsequent Year</td>
</tr>
<tr>
<td>High Tetraplegia (C2-C4)</td>
<td>$775,567</td>
<td>$138,923</td>
</tr>
<tr>
<td>Low Tetraplegia (C5-C8)</td>
<td>$500,329</td>
<td>$125,906</td>
</tr>
<tr>
<td>Paraplegia</td>
<td>$233,388</td>
<td>$29,837</td>
</tr>
<tr>
<td>Incomplete Motor Functional at Any Level</td>
<td>$120,566</td>
<td>$16,919</td>
</tr>
</tbody>
</table>

- Mean cost of litigation: $2.9 million
  - $153,000 – $8.9 million

C-spine clearance protocols

- Goal:
  - Standardization
  - Prevention of neurologic deficits

- Protocols evolve:
  - As new imaging techniques become available and new clinical outcomes reported

Objective

- To determine the current extent of written (evidence based) cervical spine clearance protocols in Level I trauma centers in the US
Study design

• Level 1 trauma centers in the US identified:
  - Each state’s EMS Authority
  - American College of Surgeon’s website

• Trauma Managers were contacted: phone, e-mail

• If had a protocol, were asked to review:

• Protocols compared to 2009 EAST recommendations

Results

• Response rate: 87% (166/191)
  - 57% w/protocol
  - ACS verified: 66%
  - Academic: 69%
  - 24-hr access to
    • CT (100%)
    • MRI (94%)

Asymptomatic Patients

**EAST 2009 Recommendations:**

“In awake, alert patients w/o neurologic deficit or distracting injury who have no neck pain or tenderness with full ROM of the CS - imaging is not necessary”

<table>
<thead>
<tr>
<th></th>
<th>NEXUS</th>
<th>NEXUS + Active ROM*</th>
<th>Canadian C-Spine Rules</th>
<th>Not specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I (n=108)</td>
<td>50 (46%)</td>
<td>46 (43%)</td>
<td>2 (2%)</td>
<td>10 (9%)</td>
</tr>
</tbody>
</table>

Current Study:

**EAST 2009 Recommendations:**

Multi-detector CT scans

<table>
<thead>
<tr>
<th></th>
<th>CT</th>
<th>X-ray</th>
<th>X-ray / CT*</th>
<th>X-ray or CT</th>
<th>Not specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I (n=108)</td>
<td>65 (60%)</td>
<td>20 (19%)</td>
<td>10 (9%)</td>
<td>7 (7%)</td>
<td>6 (6%)</td>
</tr>
</tbody>
</table>
Normal CT + Neck Pain

**EAST 2009 Recommendations:**
- Continue hard collar
- Discontinue collar after negative MRI
- Discontinue collar after adequate and negative flex/ext

**Current Study:**

<table>
<thead>
<tr>
<th>Flexion-Extension</th>
<th>32 (30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not specified</td>
<td>19 (17%)</td>
</tr>
<tr>
<td>MRI</td>
<td>15 (14%)</td>
</tr>
<tr>
<td>Clinics</td>
<td>13 (12%)</td>
</tr>
<tr>
<td>MRI/Flex-Ext</td>
<td>13 (12%)</td>
</tr>
</tbody>
</table>

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The Obtunded Patient

**EAST 2009 Recommendations:**
- Continue collar until a clinical exam can be performed
- Discontinue collar based on CT scan only
- Obtain immediate MRI
- Flex/ext x-rays should NOT be performed!

**Current Study:**

<table>
<thead>
<tr>
<th>MRI</th>
<th>33 (30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not specified</td>
<td>30 (28%)</td>
</tr>
<tr>
<td>CT only</td>
<td>16 (15%)</td>
</tr>
<tr>
<td>MRI/Flex-Ext</td>
<td>6 (5%)</td>
</tr>
<tr>
<td>C-collar/CT only/MRI</td>
<td>6 (5%)</td>
</tr>
</tbody>
</table>

**8% flex-ext recommended!**

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Comparison with EAST 2009

<table>
<thead>
<tr>
<th>EAST Protocol</th>
<th>Asymptomatic</th>
<th>First line of imaging</th>
<th>Tx after a negative CT</th>
<th>Obtunded Patient</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>43%</td>
<td>60%</td>
<td>76%</td>
<td>60%</td>
<td>60%</td>
</tr>
</tbody>
</table>

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Conclusions

- Only **57%** of the participating level I trauma centers in the United States have a **written cervical spine clearance protocol**.
- Protocols were highly variable
- In obtunded patients
  - 8% of the centers reported using **dynamic flexion-extension views**, which are currently contraindicated.
- Standardized protocols should be encouraged in all trauma centers in order to avoid missed injuries and prevent significant neurological sequelae.
THANK YOU