Blunt and Penetrating Neck Trauma

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Objectives

- Blunt Neck Trauma
  - Evaluation of the low mechanism, low risk pt
  - Discuss the role of plain film versus CT
  - Blunt cerebrovascular injuries

- Penetrating Neck Trauma
  - Diagnosis of zone II injuries of the neck

Case 1

- 22 yr old unrestrained driver s/p MVC

Case 1

- 72 yr old unrestrained driver s/p MVC

Blunt cervical spine injury

Who needs imaging?

- NEXUS (National Emergency X-Ray Utilization Study)
  - Prospective, observational study, decision rule
  - 34,069 patients, all with c-spine radiography
  - Five criteria to be judged “low risk for injury”
    - No ALOC
    - No midline C-spine tenderness
    - No distracting injury
    - No intoxication
    - No focal neuro deficits

Has anything changed?

Practice Management Guidelines for Identification of Cervical Spine Injuries Following Trauma: Update from the Eastern Association for the Surgery of Trauma Practice Management Guidelines Committee

John J. Conner, MD, John J. Diorio, MD, C. Michael Dechman, MD, William C. Chiu, MD, Victor M. Acosta, MD, Anthony J. Ting, MD, Michael S. McGinty, MD, Howard S. Edelman, MD, John A. Maglione, MD, Michael B. Topazian, MD, and Thomas S. Watson, MD

(J Trauma 2009;67: 651–659)

East PMG (2009)

- Clinical clearance
  - Awake, alert, no neurologic deficit, no distracting injuries, with no midline tenderness, FROM
  - C-spine imaging not necessary
  - Evidence for consideration of age, mechanism not strong enough to change recommendations

- All others need radiographic evaluation
  - Primary screening modality is axial CT with sagittal & coronal recons (Level 2)
  - Plain radiographs contribute no additional information & should not be obtained (Level 2)
  - Neck pain with negative CT
    - Continue C-collar
    - MRI (Level 3)
    - Adequate flexion-extension films (Level 3)

Are plain films of the c-spine obsolete?

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>CSR</th>
<th>CSF</th>
<th>False (-) Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henry 1999</td>
<td>80</td>
<td>88</td>
<td>93</td>
<td>89 (902)</td>
</tr>
<tr>
<td>Graber 1980</td>
<td>167</td>
<td>20</td>
<td>14</td>
<td>13 (49)</td>
</tr>
<tr>
<td>Davis 1980</td>
<td>304</td>
<td>15</td>
<td>14</td>
<td>11 (70)</td>
</tr>
<tr>
<td>Griffin 2002</td>
<td>1,181</td>
<td>186</td>
<td>29</td>
<td>34 (58)</td>
</tr>
</tbody>
</table>

Total 3,034 c-spine evaluations with CSR detected injury only 53% of the time.
False (-) rate 47%

Griffin, J Trauma 2002

What about the low mechanism, low risk blunt trauma patient?

- EAST recommendations don’t differentiate
- Factors to consider
  - Accuracy, adequacy of plain films
  - Body habitus
  - Age
  - Cost
  - Radiation exposure
  - Time
Case 2

- 23 year old woman
- Restrained driver, high speed rollover MVC
- EMS:
  - Minimally responsive
  - HR 86, BP 118/78, RR 8
  - RSI performed

Blunt Cerebrovascular Injury

- Incidence
  - 1/1000 (0.1%) trauma patients/year
  - Blunt Carotid Arterial Injuries (BCI)
  - Blunt Vertebral Arterial Injuries (BVI)
  - Most injuries found once patient symptomatic
- Screening asymptomatic patients
  - Incidence increases to 1% trauma patients
  - The more you look, the more you find...
    - Why do we care???

Blunt Cerebrovascular Injuries

- Clinical questions:
  - 1. How do you classify BCVI?
  - 2. Who do you screen?
  - 3. What screening modality should be used?
  - 4. How do you treat BCVI? Is treatment necessary?

Grading of BCVI

<table>
<thead>
<tr>
<th>Injury Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Luminal irregularity or dissection with &gt;25% luminal narrowing</td>
</tr>
<tr>
<td>II</td>
<td>Dissection or intramural hematoma with &gt;25% luminal narrowing, intra-luminal thrombus, or noted internal flap</td>
</tr>
<tr>
<td>III</td>
<td>Pseudoaneurysm</td>
</tr>
<tr>
<td>IV</td>
<td>Occlusion</td>
</tr>
<tr>
<td>V</td>
<td>Transection with free extravasation</td>
</tr>
</tbody>
</table>

*Add 1 point if neurologic deficit (stroke) is not head-injury related. Internal carotid artery injury: ICD-9 code for common carotid artery injury is 900.01.

Who gets screened?


What about a seat belt sign?

- “An isolated cervical seat belt sign without other risk factors and normal physical exam has failed to be identified as an independent risk factor in two retrospective studies and should not be utilized as the sole criteria to stratify patients for screening”


Screening modality

- Angiography (FVCA, DSA)
- Duplex Ultrasound
- CT angiography
- Magnetic Resonance Imaging (MRA)

Blunt Cerebrovascular Injuries: Does Treatment Always Matter?

- 200 carotid or vertebral artery injuries
  - Incidence BCVI 1.2%
  - Mortality 13%
  - Anatomic injury risk factors present 78%
- 18 patients with stroke
  - 8 at admission, 6 within 72 hours, 4 after 1 week

J Trauma 2009;66:132-44

- Stroke rates
  - Untreated patients 25.8%
  - Treated patients 3.9%
    - Endovascular therapy
    - Antiplatelet medication
    - Anticoagulation
    - Combination antiplatelet and anticoagulation

J Trauma 2009;66:132-44
Treatment for Blunt Cerebrovascular Injuries

Table 4: Injury Outcome Stratified by Treatment Modality

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No of ICH (n=237)</th>
<th>No of ICH (n=292)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nippon sodium</td>
<td>112</td>
<td>151</td>
</tr>
<tr>
<td>Angiotensin</td>
<td>67</td>
<td>9</td>
</tr>
<tr>
<td>Nippon sodium +</td>
<td>23</td>
<td>0</td>
</tr>
</tbody>
</table>

Mean time to CVA 58 hrs post-injury
- 8 patients with bleeding complications
- Stroke rate of patients not treated 21%

Case 3
- 10:30 Friday night, working in your hospital
- EMS presents with a 32 year old man who was stabbed to the side of the neck.

EMS vitals: HR 84, BP 140/68, RR 22

What do you do?
- A. Call your covering general surgeon in from home to take him to the OR
- B. Transfer immediately to the most appropriate trauma center
- C. Get a diagnostic test
- D. Probe the wound with a cotton swab to see how deep the wound penetrates

Before you answer...
- What do you need to know?
- What structures are you worried about?
- What is the physical exam?
- What resources does your facility have?
  - Radiology (performance and results)
  - Specialists coverage
- To what extent does this injury need to be worked up?

First thing’s first...
- Airway
- Airway
- Airway

He says, “my throat feels funny”
Penetrating neck trauma

- Historically, all zone II injuries penetrating the platysma mandated surgical exploration
- Many non-therapeutic operations
- Not all injuries needed surgical intervention
- Evolution to more selective management
- Safe
- Operative management still required for “hard signs” of injury

Hard signs of vascular injury

- Expanding hematoma
- Severe, active or pulsatile bleeding
- Presence of bruit or thrill
- Shock, unresponsive to fluids
- Focal neurologic deficit or signs of cerebral infarction
- Diminished distal pulses

Signs of Injury to Trachea or Esophagus

- Air bubbling from the wound
- Hematemesis
- Odynophagia
- Subcutaneous emphysema
- Blood in saliva or NGT aspirate

Diagnosis of Arterial Injury-
Recommendations

- CT angiography or duplex US can be used in lieu of arteriography to rule out arterial injury
- CT of neck (without angiography) can be used to rule out significant vascular injury if trajectory of object is remote

Diagnosis of Esophageal Injury-
Recommendations

- Either contrast esophagography or esophagoscopy can be used to rule out esophageal perforation
- Diagnostic work-up should be expeditious
- Morbidity increases if delay by > 24 hours

What do you do?

A. Call your covering general surgeon in from home to take him to the OR
B. Transfer immediately to the most appropriate trauma center
C. Get a diagnostic test
D. Probe the wound with a cotton swab to see how deep the knife penetrates

Conclusions- Blunt Cervical Spine

- NEXUS criteria is still widely used
- The role of plain radiographs for clearance is controversial
  - Age
  - Mechanism of injury
  - Body habitus
  - Adequacy and accuracy of plain films

Conclusions- BCVI

- BCVI can have devastating consequences
  - Neurologic morbidity up to 32%
- Risk factors for BCVI are numerous, non-specific and not always identifiable prior to neurovascular event
- It is possible that an aggressive screening protocol and early treatment may prevent neurologic sequelae

Conclusions- Penetrating neck trauma

- Any hard signs of injury to vital structures of the neck or hemodynamic instability still warrant surgical evaluation
- For others, selective management with CT angiography, Duplex US, esophagography, or esophagoscopy is safe and accepted
- Transfer to a trauma center is mandated if your facility does not have the capability to adequately evaluate the injury

Questions?