On the Field Management of the Injured Athlete

Spine Injuries and Stingers
Scott R. Laker, M.D.
Assistant Professor
University of Colorado
Department of Physical Medicine and Rehabilitation
Division of Sports Medicine

Disclosures

- Chair of AAPMR Health Policy and Legislation Committee
- No conflicts of interest
# SCI Decreasing Risk

- Incidence of *cervical spinal cord injury in football* per 100,000 participants

<table>
<thead>
<tr>
<th>Year</th>
<th>High School</th>
<th>College</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>2.24</td>
<td>10.66</td>
</tr>
<tr>
<td>1977</td>
<td>1.3</td>
<td>2.66</td>
</tr>
<tr>
<td>1989 to 2002</td>
<td>0.5</td>
<td>0.82</td>
</tr>
<tr>
<td>2006 to 2010</td>
<td>0.48</td>
<td>1.33</td>
</tr>
</tbody>
</table>

- A rule change in 1976 banning spear tackling led to an immediate and sustained drop in the rates of cervical spinal cord injury in football.
Assess

1. Note exact time of injury. Management decisions are based on duration of symptoms.

2. Assess loss of consciousness. Management of unresponsive athletes should follow the ABCs of trauma care (i.e., check airway, breathing, and circulation).

3. Assess peripheral strength and sensation without moving the athlete’s head or neck.
Examine

4. Palpate the neck for asymmetric spasm or tenderness at the spine.

5. Assess isometric neck strength without moving the athlete’s head or neck.

6. Assess active range of motion at the neck.

7. Perform axial compression and Spurling test. If negative, athlete may be moved.
8. Assess recent memory and postural instability.

9. Inquire about symptoms such as headache, nausea, dizziness, or blurred vision.
On-field Evaluation

- **Red Flags of injury**
  - Bilateral upper (or lower) extremity symptoms
  - Persistent neck pain
    - Point tenderness
    - Stiffness
  - Spinal deformity
  - Fear of moving the head
Supine Athlete
Logroll
Prone Athlete

Log roll-push technique
Thumbs point to the mask
Pre-hospital Care

- Facemask removal
  - Regardless of respiratory status
  - ATCs are all trained in this procedure
- Helmet and pads remain in place
“All or Nothing”

- Large changes when the helmet is removed separately
- No significant change in Cobb angles when pads and helmet removed together

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Cobb and Subaxial Angle Measurements (Mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cobb Angle</td>
</tr>
<tr>
<td>Helmet + shoulder pads</td>
<td>24.2 ± 13.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Shoulder pads only</td>
<td>34.6 ± 13.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>No equipment</td>
<td>22.9 ± 14.9</td>
</tr>
<tr>
<td>Change with helmet and shoulder pads compared with angle with no equipment</td>
<td>1.4 ± 16.7&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Change with shoulder pads only compared with angle with no equipment</td>
<td>11.7 ± 14.9</td>
</tr>
</tbody>
</table>

Source: Treme AJSM 2008
Exceptions

- Poorly fitted helmets
- Dislodged helmet
Football

Figure 1. Sample supine lateral radiographs taken of a 12-year-old child wearing helmet and shoulder pads (A), shoulder pads only (B), and no equipment (C).
Key points

- Get familiar with your teams’ helmets
- Remove facemask on the field in preparation for transport
- All or none
- Practice with your sideline team
- Touch base with EMS and your ED
Consensus Statement

- National Collegiate Athletic Association Committee on Competitive Safeguards and Medical Aspects of Sports
- National Athletic Trainers’ Association
- American Association of Neurological Surgeons
- Osteopathic Academy of Sports Medicine
- Professional Football Athletic Trainers’ Society
- National Registry of Emergency Medical Technicians
- National Federation of State High School Associations
- Emergency Medical Services Physicians
- National Athletic Trainers’ Association
- National Football League Physicians Society
- Physiatric Association of Spine, Sports & Occupational Rehabilitation
- American Orthopaedic Society for Sports Medicine
- American College of Sports Medicine
- North American Spine Society
- American Chiropractic Association Council on Sports Injuries & Physical Fitness
- American Academy of Pediatrics Committee on Sports Medicine and Fitness
- United States Olympic Committee
- National Athletic Trainers’ Association
- College and University Athletic Trainers’ Committee
- National Association of Emergency Medical Technicians
- National Operating Committee on Safety and Equipment
- Orthopaedic Trauma Association
- American Physical Therapy Association Sports Physical Therapy Section
- American Academy of Family Physicians
- National Association of Intercollegiate Athletics
- American Academy of Orthopaedic Surgeons Committee on the Spine
Presentation

- Unilateral shoulder or arm pain
  - Dysesthesias/paresthesias
  - C5-6 distribution most common
  - Uncommon for lower trunk involvement

- Weakness
  - Biceps, deltoid, SS, Infraspinatus

- Transient symptoms
  - 1-2 minutes for resolution
  - Prolonged symptoms are relatively common
Epidemiology

- Majority of stingers are reported in football
- >50% of college football players experienced a stinger in single season
- 70% of college football players have had a stinger in 4 year career
- Recurrence rate up to 85%

Sallis, 1992
NCAA guidelines, 2011-12
Sallis, 1991
Safran, 2004
Brachial plexus

- **Roots**
  - C5-T1

- **Trunks**
  - Upper, middle, lower

- **Divisions**

- **Cords**
  - Lateral, posterior, medial

- **Peripheral nerves**
  - Median, Ulnar, Radial, MC
Traction Injury

- Most common mechanism
- Upper trunk BP injury
- Blocking and tackling, landing on the shoulder
  - Football > wrestling
- Younger athlete

Safran, 2004
Compression

- “Mature” athletes
  - Collegiate/professional
- Neck extension with lateral flexion
  - Ipsilateral symptoms
- Foraminal narrowing
  - C4-5, C5-6 levels
- Underlying spondylitic changes
Direct trauma

- Blow to Erb’s point or supraclavicular region
- Superficial, vulnerable location of the plexus
- Compression of plexus between helmet/shoulder pad and superior medial scapula
Pathophysiology

Excessive compression or traction on peripheral nerves

- Obstruct neural blood flow
- Deform myelin sheaths
- Slow axonal transport
- Disrupt nerve conduction
Return to Play #1

- **No contraindications:**
  - 1st episode, transient and no residual symptoms
  - Athlete suffering repeated stingers may return that day if <3 prior episodes lasting less than 24 hours w/ full ROM and no deficits

- **Relative contraindications:**
  - Prolonged symptoms >24 hrs
  - ≥3 stingers/burners with full ROM, no pain, no deficits
  - Discussion with player, family, coaches of risks

- **Absolute contraindications:**
  - Neck pain, decreased ROM, persistent deficits following injury

Vaccaro, 2001
Return to Play #2

- Multiple stingers in same season
  - 2 stingers: 2 weeks
  - 3 stingers: 3 weeks
    - Consider ending the season
  - Rehabilitation

- Prolonged recovery and/or multiple stingers
  - More severe symptoms
  - Up to 5x increased risk for recurrence
  - Further work-up
  - Rehabilitation

Weinstein, 2009
Andrish 1977
Albright 1985
Diagnostic Testing

- Radiographs cervical spine
  - AP, Lat, Obliques, Flex-ext views

- MRI cervical spine

- Electrodiagnostic testing (NCS/EMG)
  - Symptoms >2-3 weeks
Transient Quadriplegia

- Transient neurologic sequelae of para-, hemi-, or tetraplegia
- No radiologic findings
- Symptoms last < 24 hours

- Not a stinger!!
Hyperextension Pincer Mechanism

- the cord is compressed between the inferior margin of the superior vertebral body and the anterior superior aspect of the spinolaminar line

Penning 1962
Hyperflexion

- With hyperflexion, the anterosuperior aspect of the spinolaminar line of the superior vertebra and the posterosuperior margin of the inferior vertebra would be the "pincers."
Transient Quadriplegia

- Any high risk athlete with neurological symptoms in more than one limb, no matter how transient should be evaluated with a cervical MRI.
Cervical Stenosis

- More recently “Functional cervical spinal stenosis”
- Defined as “cervical spinal canal so small as to obliterate the protective cushion of CSF”

Cantu 2005
Cervical Stenosis

(a) Grade 0
(b) Grade 1
(c) Grade 2
(d) Grade 3

Muhle 1998
Contraindications to RTP

- Persistent neurological findings, cervical pain, or loss of ROM
- MRI evidence of spinal cord defect or edema
- Functional spinal stenosis on MRI
- Acute cervical fracture or ligamentous disruption
- Acute or chronic cervical disc herniation
- Cervical spine segmental instability
- Arnold-Chiari malformation
- Basilar invagination

• Os odontoideum
• Atlanto-occipital fusion or instability
• Klippel-Feil fusion greater than two levels
• Multi level surgical fusion
• Segmental instability was defined as anterior dens interval of 4 mm
• C1-C2 hyper-mobility
• Kyphotic deformity on flexion or extension radiographs
Key Points

- Disagreement in the way cervical stenosis is measured.
- Some feel increased risk.
- In the presence of stenosis, withhold participation in contact sports
- Second episode, another complete work-up is necessitated
Equipment/Prevention

- Shoulder pad assessment
- Neck rolls/collars
  - Clear decreases in extension
  - No studies show a reduction in stingers
- Assessment of tackling techniques
  - Avoidance of shoulder depression and lateral flexion and neck extension
  - Upright, vertical technique
    - “See what you hit”
- Neck and Shoulder strengthening/conditioning
Contact information

Email: scott.laker@ucdenver.edu

Mobile: 303-882-4646