Evaluation of Neck Pain in Athletes: A Sideline and Sports Medicine Approach

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Objectives

- Review Relevant Anatomy and Biomechanics of the Cervical Spine
- Discuss Common Sources and Presentations of Neck Pain in the Athletic Population
- Touch on On-field Management, Imaging Considerations, and RTP Guidelines
Spectrum of Injuries

Common

- Strains/Sprains/Whiplash
- Apophyseal Injuries
- Stingers/Burners
- Cervical Postural Syndromes

Uncommon

- Acute Cervical Disc Herniations
- Cervical Fractures/Dislocations
- Transient Quadriplegia/Spinal Cord Injury
- Spear Tacklers Spine

*Not talking about Head Injuries: Subdural/Epidural Hematomas, Hemorrhages, Or Concussion*
# Injury Classification

<table>
<thead>
<tr>
<th>Catastrophic</th>
<th>Non-catastrophic</th>
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<tbody>
<tr>
<td>cervical subluxation</td>
<td>brachial plexus injury</td>
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<tr>
<td>spinal cord trauma</td>
<td>cervical sprains or strains</td>
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<tr>
<td>facet dislocations</td>
<td>intervertebral disc injury</td>
</tr>
<tr>
<td>unstable cervical fractures</td>
<td>transient quadriplegia</td>
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<tr>
<td></td>
<td>stable fractures</td>
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Case Scenarios

- 15 year old cheerleader brought into your office by her mom after sustaining an injury while stunting over the weekend. Pt complains of resolved bilateral paresthesias and neck pain. Mom anxious to get her cleared so she can get back to cheer. Should you allow her? Imaging needed?

- 8 year old female soccer player gets injured at a tournament your daughter is playing in on the weekend. She is laying motionless on the field. Someone calls for a doctor? Do you admit you are one? What next steps should you do?

- 17 yo senior college football player brought to you on the sideline of a game you are covering with symptoms of “dead arm” including unilateral diffuse paresthesias and weakness that the trainer says lasted for approximately 2 minutes and then fully resolved. Episode never happened before. Exam is normal with exception of weakness of deltoid. Coach wants to get player back into the game. Is he ok to return to play?
Cervical Spine Injury
Epidemiology

- Most commonly seen in contact collision sports, also in cheerleading and track and field/gymnastics, diving
- 12,500 spinal cord injuries yearly-10-15% sports related
- 14% of catastrophic injuries were to cervical spine (2014-2015 data)
- 6 quadriplegia events yearly (1997-2016)
- Leonard et. al. *Brain*: in children 8-15, sports accounted for as many injuries as MVAs
Mechanism of Cervical Spine Injury

Torg et al.
AJSM. 1990
Anatomical Considerations

- Cervical spine most mobile region of entire spinal column.
- Atlanto-occipital joint allows for 50% of cervical flexion/extension.
- Atlanto-axial joint allows for 50% of cervical rotation.
- Unlike other regions of the spine, a transverse foramen exists in each vertebra.
- All cervical nerves exist above corresponding vertebra, except C8 which is below.
Anatomy of the Cervical Spine: Pain Generators

- Skin/Vasculature
- Muscles (SCM, trap, scalene)
- Bones (cervical vertebrae, facets)
- Ligaments (ant/post long)
- Intervertebral Discs (annulus)
- Cervical Nerve Roots
- Peripheral Nerves
Associated Conditions

- Previous trauma
- Down Syndrome (AAI)
- Spear tacklers spine
- Connective tissue disorders
- Klippel-Feil abnormalities
- Congenital anomalies (odontoid hypoplasia/atlanto-occipital fusion, os odontoidem)
- Developmental or congenital narrowing/stenosis
Assessment of Injured Athlete (On-Field)
ON-FIELD EVALUATION
OF INJURED ATHLETE

Primary Survey:

• Assess Level of Consciousness, Stabilize the Cervical Spine (neutral, no traction!)

• Airway (jaw thrust not head tilt), Breathing, Circulation

*Tips: Tell coach/supports staff not to move the athlete, get to head first and stabilize cervical spine
ON-FIELD EVALUATION OF INJURED ATHLETE

Secondary Survey

- History: mechanism, location of injury, severity
- Inspection: obvious deformities?
- Physical Exam:
  - palpation: step off?
  - neurologic exam: strength, sensation, reflexes
When Do I Need To Spineboard?

- unconsciousness or altered level of consciousness
- bilateral neurologic findings or complaints
- significant midline spine pain with or without palpation
- obvious spinal column deformity


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Initiation of Emergency Action Plan

- continue to stabilize cervical spine with head squeeze technique
- log roll to supine position if prone
- lift and slide technique preferable over log roll (with 6+ people, 8 ideally) onto backboard
- remove facemask, leave pads and helmet on?
- further stabilize with cervical collars, foam rolls, head straps
- transport to ambulance
Sideline/Office Evaluation of Neck Pain

- Mechanism of Injury / OPQRST
- Hx of prior injuries/pain
- radicular sx/hx of repetitive burners
- PE: sensation/strength/reflexes/special testing
Provocative Tests of Cervical Spine

- **Spurling Test**: foramina compression test, specific but not sensitive for cervical radiculopathy
- **Hoffman Test**: sensitive, but not specific for cervical myleopathy
- **Lhermitte Sign**: specific but not sensitive for cervical cord compression and myelopathy
Imaging Considerations

- X-ray (AP/lateral/odontoid view, flexion/extension?) *
  C1-T1
- CT Scan vs MRI
- MR or CT angiography
- EMG after 3 weeks
Transient Brachial Plexus Neuropraxia (Stinger/Burner)

- Traction Injury/Compression Injury / Direct Blow
- Common in collision sports
- PE findings/Sxs
- Imaging considerations
- RTP criteria
- Prevention
Cervical Strain/Whiplash

- acceleration/deceleration injuries
- non radicular, axial pain
- located in paraspinal regions or more lateral
- normal neuro exam
Acute Disc Herniation

- dermatomal distribution
- abnormal neuro exam
- central vs paracentral disc herniation
- contraindication to returning to sport
- Imaging Considerations
Cervical Fractures/Dislocations

- hyperflexion: most common mechanism
- PE: bony tenderness, step-off
- CT scan test of choice
- Stable vs unstable
  - stable: wedge, clay-shovelers, transverse process
  - unstable: C1-C2 fractures, hangman’s fracture,
- **neurosurgery consult**
Transient Quadriplegia

- extension injury with axial load
- typically co-existant spinal stenosis or disc protrusison
- resolves within 15 minutes to 36 hours
- bilateral sensory and motor changes, severity on spectrum
- neck pain usually absent
- needs MRI and work-up before being cleared
Developmental stenosis from repetitive incorrect tackling

Reversal of normal lordosis

Pavlov’s/Torg ratio (spinal canal to vertebral body) <0.8 is indicative of stenosis—low predictive value

Canal diameter less than 13mm

Predisposes to axial loading and severe injury

Absolute contraindication if has hx of recurrent/severe sxs
Return To Play Guidelines

Decision Tree:

1. Cleared for participation
2. Relative Contraindications
3. Absolute Contraindications
No Contraindication to Participation

- Resolved Burner
- Spina Bifida Occulta
- Healed Intervertebral Disc Bulge/Sprain
- Type 2 Klippel-Feil One Level Fusion
- Developmental Stenosis (Canal/Vertebral Body Ratio <0.8) in asymptomatic patients
- Healed Clay Shovelers Fracture/Stable Vertebral Body Compression Fracture/Stable End Plate Fracture
- Stable One Level Cervical Fusion
Relative Contraindications To Play

- Recurrent Acute and Chronic Burners
- Healed Intervertebral Disc Herniation
- Ligamentous Sprain with mild Laxity (<3.5 mm of AP displacement)
- Developmental Canal Stenosis with
  - Disc Disease
  - Cord Compression on MRI
  - episode of cord neuropraxia
- Healed stable neural ring fractures,
- Stable 2 level anterior or posterior cervical fusion
- Healed non-displaced Jefferson fracture
Absolute
Contraindications to Play

- Spear Tacklers Spine
- Acute disc herniation/cervical fracture/dislocation
- Atlanto-axial Instability (Downs?)
- Atlanto-occipital Fusion
- Type 1 Klippel-Feil Mass Fusion
- Unstable Healed Cervical Fractures
- A/P Cervical Fusion of 3 or more levels
Cervical Spine Injury Prevention

- Injuries in football reduced 270% with prohibition of spear tackling (1976) and clotheslining.
- Stopping collapse of the scrum decreased injuries in rugby.
- No hitting or checking from behind in ice hockey in 1985 led to fewer catastrophic injuries.
- Also tougher rule enforcement in general (no horse tackling/hits on defenseless receiver), stricter penalties, and educational programs have decreased incidence.
Injury Prevention

Fig. 4
The effect of the 1976 rule changes banning spearing and head-impact playing techniques was dramatic, with a sustained decrease in the number of players who sustained permanent cervical quadriplegia.

Emerging Trends

- “When appropriate, protective athletic equipment (helmets and shoulder pads) should be removed prior to emergency transport for an athlete-patient with suspected cervical spine instability” - NATA Consensus Statement

- 8 person lift technique favored over log roll to minimize cervical motion, unless prone on ground

- New cervical collars for minimizing flexion/extension and lateral movement to prevent injuries
Summary

- An EAP is essential for on-field management of an injured athlete
- Always stabilize the cervical spine first and rule out co-existing head trauma
- Bilateral sx/sx, recurrent stingers/persistent weakness all require additional work-up
- Educational programs and prevention talks are hallmarks to decreasing cervical spine injuries amongst our youth athletes
References

Thank you!!