Evaluation and Stabilization of the Athlete with Possible Spine Injury

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Introduction

Goals:

1. Recognize the athlete with the potential serious head or spine injury
2. Understand spinal immobilization/stabilization
3. Be able to provide pertinent information to EMS and hospital
4. Appreciate EMS and emergency department roles in diagnosing and stabilizing head and spine injuries
A Case Presentation

FIRST QUARTER SUMMARY

- Nova: 2 INT (4 in last 2 games)
- Jamison: 5 rush, 15 yards
- Brown: Rush TD (3rd for Louisville this season)
- Bridgewater: 4/6, 35 yards
Case presentation
Louisville University cornerback Anthony Conner, October 2011

• Injured neck on the tackle, also had brief loss of consciousness
• When he came to, he told trainers he thought he had a “cramp in his neck”
• C-spine precautions were taken, was transferred to ED
• Diagnosed with a high cervical spine fracture
• Surgery was required to decompress and stabilize the fracture
• He recovered without paralysis but it ended his football career
Prevalence of Head and Spine Injuries Among Collegiate and High School Athletes

• Concussions (Daneshevar et al., 2011):
  1. Womens’ Collegiate Soccer, 0.63 (per 1000 athlete exposures)
  2. Collegiate Football, 0.61
  3. Mens’ Collegiate Soccer, 0.49
  4. High School Football, 0.47
  5. Womens’ Collegiate Basketball, 0.43

• Spinal Cord Injuries (Chang et al., 2006)
  1. Estimate 1/100,000 significant injuries per year
  2. Approximately 10% of all SCIs are sports related
  3. Sports-related neck injuries second only to MVCs for ED visits
Evaluation of the Head Injured Athlete

Who needs to come to the ER?

• Any head injured athlete must be evaluated for spine injury and vice versa
• Sometimes it’s obvious
  – Obtundation or unconsciousness
  – Focal neurological deficits
  – Protracted vomiting with severely altered mental status
  – Skull fracture
• For others, use of decision rules may help you decide
  – Canadian Head CT Rules (Stiel et al 2001)
  – New Orleans Criteria (Haydel et al 2000)
  – NEXUS II (Mower et al 2005)
  – These are rules devised with the idea of avoiding unnecessarily exposing patients to radiation of the CT scan
Evaluation of Head Injured Athlete

Canadian Head CT Rules

• Uses high risk features to predict need for neurosurgical intervention
• Criteria:
  – GCS <15 2 hours after injury
  – Suspected open or depressed skull fracture
  – Signs of basal skull fracture (bruising behind ears, “Raccoons Eyes,” bleeding from inside ear, CSF leaking from nose
  – Vomiting 2 or more times
  – Age > 64 yrs
  – Amnesia of >29 minutes before impact
  – Dangerous mechanism (fall from > 3 feet)
• If athlete meets any of these criteria an ER visit is warranted emergently
Evaluation of Head Injured Athlete

Raccoon’s Eyes and Battle’s Sign
Evaluating the Head Injured Athlete

New Orleans Criteria

• Very sensitive (99%) but not as specific as the Canadian Head CT Rules
• Emergent ER visit warranted for CT imaging warranted for:
  – Headache
  – Vomiting
  – Concomitant use of drugs or alcohol (hopefully not)
  – Short term memory deficit
  – Visible signs of trauma above clavicles
  – Seizure
  – Age > 60
• This has poor specificity (many negative CT results) compared to CCHR
Evaluation of the Head Injured Athlete

Who should be sent to the ER?

- Err on utilizing the Canadian Head CT Rules
- Generally, the following signs/symptoms should make one favor sending an athlete to the ER:
  1. Persistent mental status change (even mild) up to 2 hours after
  2. Signs of skull fracture or basilar skull fracture
  3. Protracted vomiting
  4. Seizure
  5. Unconsciousness more than a couple of seconds
  6. Profound alteration of mental status
  7. Persistent amnesia
  8. Dangerous mechanism
  9. Anyone you don’t feel comfortable with
Evaluating the Potential Spine Injured Athlete

Which athletes should you worry about a spine injury?

- Anyone with a head injury
- Athlete with has neck and/or back pain
- Any athlete with an injury and has any neurological complaint (numbness, tingling, weakness)
- Any athlete with a mechanism of injury that is concerning and has another injury that could distract them from a spine injury
- Most injuries of the spine will be of the cervical spine
Evaluating the Potential Spine Injured Athlete

How did these guys do?
Evaluating the Potential Spine Injured Athlete

Initial evaluation and triage

• ABCs:
  – Make sure the patient is breathing and responsive
  – If unresponsive and/or breathing is shallow, follow BLS/ACLS/PALS guidelines (check for pulse, CPR, clear airway, etc.)

• Stabilize the spine
  – Don’t allow the athlete to move
  – Maintain inline c-spine immobilization
    • Manually with head in neutral position
    • Consider applying a semi-rigid cervical collar (leave to EMS if not trained to put this on)
    • There is controversy on whether or not this should be routinely used
Evaluating the Potential Spine Injured Athlete

Initial evaluation/stabilization
Evaluation of the Potential Spine Injured Athlete

Stabilizing the helmeted athlete

• If the injured patient is helmeted, should the helmet be removed?
• NATA position:
  – “…removal of helmet and shoulder pads should be deferred until the athlete has been transported to an emergency medical facility.”
• NATA’s position has two exceptions:
  – If the helmet does not fit appropriately to secure the head in neutral position, it may be removed
  – If the helmet’s design impedes the ability to access the patient’s airway or impedes the ability to maintain the head in neutral position
• If the helmet has a facemask, remove it if there is time
• When in doubt, leave the helmet in place!!
Evaluating the Potential Spine Injured Athlete

Video demonstrating football helmet removal
Assessing the Potentially Spine Injured Patient
From the field to EMS

• Should maintain in-line c-spine stabilization until EMS assumes care
• Most importantly, remind patient not to move head. Collar can be applied as a reminder (even soft)
• Continually assess ABCs, especially if there is a head injury associated with the potential spine injury
• EMS
  – Will need a brief history from the AT (mechanism, complaint, your assessment, etc.)
  – Will perform their own assessment and some jurisdictions are permitted to clear cervical spines in the field
Evaluating the Potentially Spine Injured Patient

EMS’s role

• If a spine injury is in question, EMS may clear based on NEXUS criteria (Hoffman et al, 2000)

• NEXUS:
  – Cervical spine may be cleared if:
    1. No posterior midline cervical spine tenderness
    2. Normal level of consciousness/alertness
    3. No focal neurological deficit
    4. No painful distracting injury
    5. No intoxication

• EMS should trust your suspicion and will generally err on side maintaining c-spine precautions
Evaluating the Potentially Spine Injured Patient

EMS to Emergency Department

• EMS will assess, monitor and treat ABCs as necessary
• Will apply semi-rigid cervical collar
• Spine/long boards
  – Many fire departments are steering away from using these
  – 100% spine immobilization is impossible even with use of all available equipment
  – Spine boards can be detrimental to the patient
    • May cause respiratory compromise/airway restriction and promote aspiration
    • Promotes tissue ischemia (prolonged time)
    • Promotes elevation of intracranial pressure
    • Promotes increased use of diagnostic imaging
Evaluating the Potentially Spine Injured Patient

EMS to ED and spine board use

• American College of Emergency Physicians (ACEP) Policy Statement
  – “Backboards should not be used as a therapeutic intervention or as a precautionary measure either inside or outside the hospital or for inter-facility transfers.”
  – Do not be alarmed if EMS crew in your municipality does not utilize spine boards
  – Overall the goal is spine motion restriction as complete spinal immobilization is impossible and attempts to do so are likely to cause more harm
Evaluation of the Potentially Spine Injured Patient

Emergency Department evaluation

• Upon arrival, typically RN (hopefully physician) will get direct EMS report as ED assumes care
• If there is something about the patient/case the AT feels is markedly pertinent, a direct phone call to ER charge RN or physician on duty can be very helpful
  – Mechanism of injury
  – Initial presentation or complaint
  – Anything that may not have been communicated to EMS that is pertinent
• ER physician will reassess the athlete
  – ABCs
  – History and physical
  – Apply NEXUS criteria or Canadian C-spine Rules
Evaluation of the Potentially Spine Injured Patient

ED evaluation

- Canadian C-spine Rules (Stiel et al 2001)
  - Another acceptable decision rule to evaluate a potentially spine injured patient
    1. Determine if athlete is high risk
      a. Age over 65
      b. Mechanism considered dangerous (fall from 3 feet, axial load injury)
      c. Numbness or tingling in extremities
    2. If any of these is positive, patient should have imaging
    3. Determine if there are LOW risk factors that indicate safe assessment of ROM
      a. Patient ambulatory after injury at any time
      b. Delayed onset of neck pain
      c. Patient is sitting up in the department
      d. Absence of midline c-spine tenderness
    4. If none of these are present, patient needs imaging
    5. Can patient actively rotate neck to 45 degrees left and right? If not, then imaging is warranted
Evaluation of the Potentially Spine Injured Patient

ED evaluation and treatment

• If it is determined that imaging is needed, patient will undergo x-rays and/or CT scan

• Often x-rays are utilized if the patient is considered low risk (mechanism, etc.) or if it is a multi-injured patient and cross-table lateral films will be done in the trauma bay

• CT is the initial study of choice if there is significant suspicion for injury
  – Higher sensitivity and specificity
  – Often there are head injuries warranting CT imaging so easy to complete both at the same time in the same department
  – CT does not diagnose ligamentous injury
    • If there is still some suspicion for injury, flexion/extension x-rays or MRI performed if CT is negative for a fracture
Evaluation of the Potentially Spine Injured Patient

ED evaluation and treatment

• If the ED physician is highly suspicious for injury (paresthesias or especially paresis) the on call spine surgeon will be notified early in patient’s course
• Consultation with spine surgeon obtained when injury is identified or if injury is still suspected with negative imaging results
• High dose corticosteroids:
  – Used to be mainstay of initial treatment
  – Multiple studies have demonstrated no benefit and are no longer routinely utilized
• Patients with unstable injuries often are transferred to Level I trauma/spine centers, depending on treating hospital’s resources
• Stable fractures (non-displaced transverse process fractures, etc.) can often be treated with cervical collar and discharged with spine surgery follow up
Conclusion
Take home points

• Have a high index for suspicion for cervical spine injury in any head injured athlete
• Consider Canadian CT rules for your head injured athletes if any doubt
• Consider NEXUS and Canadian CT rules if you are on the fence of sending a patient to the ED/calling EMS
• Expect changes in EMS transport techniques (no spine boards and maybe no universal cervical collars?)
• CT scan is most often utilized diagnostic modality for suspected C-spine injury
“If you hang in there long enough, good things can happen in this world. I mean, look at me!” -Tom Smykowski