

## **ATLS Spine Lecture Notes**

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**6/29/2005**

### **❖ Objectives:**

- **Evaluate for suspected injury**
- **Manage it**
- **Dispose of patient properly**

### **❖ Question:**

- **When to suspect?**
- **How do you tell?**
- **How to protect? (both evaluation and transport)**
- **What neuro exam to do?**
- **What to do with neurogenic and spinal shock?**
- **What treatment to minimize additional injury?**

### **❖ Suspect:**

- **Mechanism of injury:**
  - **NEXUS criteria:**
    - ◆ **the absence of tenderness at the posterior midline of the cervical spine,**
    - ◆ **the absence of a focal neurologic deficit,**
    - ◆ **a normal level of alertness,**
    - ◆ **no evidence of intoxication, and**
    - ◆ **absence of clinically apparent pain that might distract the patient from the pain of a cervical-spine injury.**

- **ATLS: no x-rays if**
  - ◆ (no neuro deficit)
  - ◆ Conscious
  - ◆ Cooperative
  - ◆ Able to concentrate on c-spine
  - ◆ If no neck or spine pain or tenderness
    - ◆ If still no pain or tenderness with voluntary movement (not needed with NEXUS)
- **ATLS: if altered sensorium, then**
  - ◆ X-ray the whole spine
  - ◆ CT areas can't see or suspicious (more and more CT neck with head, especially elderly)
    - ◆ Take off backboard (transport device only), but keep immobilized in cervical collar, and observe until sober
- **Trauma+Unconscious: assume spinal injury until proven otherwise**
- **Neuro deficit:**
  - assume spinal injury
  - look for bony injury (not always: **SCIWORA**)
    - consult spine service (?ortho, ? neurosurg) early
- **Pain or tenderness, no neuro deficit: consider CT, flex-ext**
- ❖ **Reading Spine X-rays**
- **AABBCDs:**

- **Adequacy, Alignment, Bony abnormality, Base of Skull, Cartilage, Contours, Disk space, Soft Tissue**
- **Cross-Table Lateral: 85% sensitive**
- **+ AP/Lat: 92% sensitive, excludes most fractures (obliques not standard for trauma)**
- **Swimmer's for C7-T1**
- **CT if scanning head or if ? X-rays or high suspicion**
- **Flex-ext (normal patient, voluntary movement) if films normal but high suspicion and significant pain (may be limited by spasm, usually send home in semirigid collar for 2-3 weeks and restudy)**
- **Trauma obliques if ? facet sublux**
- **MRI or CT meyel if ? SCIWORA, disk**
- **If find one, look for more: whole spine (10%)**
- ❖ **Spinal Injury Levels::**
- **Complete (may still have reflexes such as DTRs, bulbocavernosus, anal wink) vs.**
- **Incomplete (maybe just sacral sparing)**
- **Sensory:**
  - **T4: nipple level**
  - **T8: xiphoid**
  - **T10: umbilicus**
  - **T12: pubis**

- **Motor:** may be different than sensory:  
**Grade 0-5**
- **Bony**
- ❖ **Implications of SCI:**
  - **Can't breathe** (phrenic sparing: comes off high)
  - **Can't feel other injuries** (e.g., abdominal bleeding, compartment syndrome)
- ❖ **Deterioration**
  - **>5% of spine-injured get worse after arriving the ED**
  - **Progressive edema**
  - **Ischemia (role of hypotension)**
  - **inadequate immobilization per ATLS text ?**
- ❖ **Neurogenic vs. Spinal Shock**
  - **Neurogenic:**
    - **Cervical/high-thoracic (paraspinal sympathetic chain)**
    - **Hypotension, slow heart, better with tilting foot of bed up**
    - **Can use fluids, sometimes atropine or pressors**
  - **Spinal "Shock": not hemodynamic shock**
    - **Shortly after injury, variable duration**
    - **Flaccidity and loss of reflexes**

- Usually think of **hyperreflexia** from spinal injury but early, in spinal shock, **lack of reflexes.**
- ❖ **In-hospital Treatment:**
  - **Belligerent and ? spine injury**
    - talk down
    - sedate (short-acting)
    - (3 MF rule): paralyze and intubate
    - (If no bed for intubated patient, tie to backboard with lots of sheets)
  - **Neurogenic Shock:**
    - Fluids,
    - ? position,
    - ? pressors,
    - look: may be REAL shock!
    - Monitor urine output
  - **Steroids: blunt injury only**
    - Within 8 hours
    - 30 mg/kg over 15'
    - then 5.4 mg/kg over next
      - ◆ 23 hours if within 3 hours of injury
      - ◆ 48 hours if 3-8 hours after injury
  - **IF no spine service, transfer early!**
  - **Who to transfer to trauma center?**
    - Unstable fractures
    - Neuro deficit
- ❖ **Immobilization**
  - "As long as the patient's spine is protected, evaluation of the spine and

exclusion of spine injury may be safely deferred, especially in the presence of systemic instability.”

- **Backboard severe discomfort (45') and ischemia (90') and decubiti**
- **Backboard is a transport device, not an immobilization device.**
- **Remove from backboard within two hours; if still not cleared, log roll Q2H to prevent decubiti.**

❖ **Prehospital:**

- **Backboard, c-collar that fits, and CID**
- **(Long-transport: vacuum mattress)**

❖ **Transfer:**

- **Back on backboard ONLY for transport**

❖ **Summary:**

- **Treat other bad stuff before worrying about spine**
- **Immobilize patient appropriately**
- **Get the right x-rays or CTs**
- **Document the exam**
- **Spine consult if available**
- **Transfer if no spine service and unstable fracture or neuro deficit**

Information from previous editions:

❖ **Statistics**

- **Injury above clavicle: 15% have C-spine injury**
- **Distribution:**

- **55% C-spine (more than half)**
- **15% T-spine (1/3 each)**
- **15% T-L junction**
- **15% Lumbar spine**
- **Head Injury: 5% spine injury**
- **Spine Injury: 25% have head injury**

❖ **Anatomy**

❖ **Taxonomy of SCI**

- **Level**
- **Severity**
  - **Central Cord Syndrome: proximal sparing**
  - **Anterior Cord Syndrome: Anterior Radicular Artery of Adamkiewicz; paraplegia but sparing of posterior column (pressure and proprioception), poor prognosis**
  - **Brown-Sequard (cord hemisection) Syndrome: rare, ipsilateral motor and sensory**
  - **SCIWORA: kids, drunks (story)**

❖ **Famous Fractures I Have Known**

- **Atlanto-occipital dislocation:**
  - **Big trauma**
  - **No traction**
  - **Usually a postmortem finding**
- **C1 ("Atlas") fracture**
  - **Jefferson (burst) fracture of ring: spread on odontoid view: axial loading (dive onto bottom of pool)**

- **Rotary Sublux:** kids, from trauma, URI, RA. Persistent head rotation.
- **C2 (“Axis”) fractures (1/5 of all)**
  - **Odontoid (2/3):**
    - ◆ **Type 1:** tip (“show me the tip”)
    - ◆ **Type 2:** base, most common
  - (don’t confuse unfused epiphysis in kids <6)
  - ◆ **Type 3:** base into body
  - **Posterior: Hangman’s:** bilateral pars interarticularis, lateral mass or pedicle
  - **C3-C7:**
    - ◆ **C5 fracture or C5-6 sublux most common (in middle)**
    - ◆ **May be body fracture or sublux (i.e., unilateral or bilateral facet sublux)**
    - ◆ **Facet sublux likely to have associated neuro injury: unilateral 80% (<1/3 root only, >1/3 incomplete, <1/3 complete); bilateral >3/4 complete and <1/4 incomplete)**
    - ◆ **May have ligamentous disruption without fracture (high index of suspicion, role of flex-ext views)**
  - **T-spine:**
    - ◆ **Anterior wedge: axial loading/flexion, usually stable (same as compression fracture)**



- ◆ **Burst:** precise axial loading, may have “retropulsed fragments”
- ◆ **Chance:**
- ◆ **Fracture-dislocations:**
- **T-L junction (falls, lap belts only):** cauda equina syndrome
- **Lumbar:** Chance fractures, burst fractures, compression fractures
- ❖ **Screening Patients:**
- **Conscious:**
  - **Paraplegia/Quad -> Presume Instability, keep immobile, get films, call spine surgeon**
- **Alert, Sober, neuro normal:** If no spine pain or tenderness, no distracting injury, then check ROM; if painless, no x-rays (NEXUS says no need for ROM)
  - **If any above “no” then put collar (back) on, get films (NB: OK to put in collar if walkin, don’t need backboard) (? Stupid)**
- **Comatose:** get films, but regardless of what they show, let spine surgeon decide on removing later (**DON’T leave on backboard!**)
  - **(drunks: film, leave in collar until sober)**