Evaluation and Treatment of Spine Fractures

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Objectives:
• Identify the anatomical structures of the spine
• Describe most sensitive diagnostic modalities for identifying spinal fractures
• Summarize the treatment options for spinal fracture
Evaluation and Treatment of Spine Fractures

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Objective

*Increase familiarity with adult spine trauma, including common fracture nomenclature, injury overview and treatment options*
Fracture types

Compression Fractures

Burst fractures

Stable Fractures

Unstable Fractures
  • Compression
  • Burst
  • Distraction/dislocation
Thoracic Spine Evaluation

The thoracic spine is rigidly fixed, with ribs articulating with the respective transverse processes and sternum. Significant force is required to damage the thoracic spine of an otherwise healthy adult.
Thoracolumbar Region

90% of all thoracic and lumbar spine fractures occur in the region between T11 and L4

The most commonly injured region is the thoracolumbar (TL) junction, where the spinal column changes from a kyphotic to a lordotic curve
Cervical Spine Evaluation

Due to its exposed location above the torso and its inherent flexibility, the cervical spine is the most commonly injured part of the spinal column.
Mechanical Instability
Compression Fracture

Anterior compression, or ‘wedge’ fractures, account for 50 to 70 percent of all TL fractures

- Usually resulting from compressive failure of the anterior column under an axial load applied in flexion (e.g. riding on ATV, being bumped up and come down with force onto the seat)
- Compression fractures that exhibit between 10 and 40 percent compression are managed on a case-by-case basis
Unstable Compression Fractures

- Severe compression
  - >50 percent of vertebral height
- Kyphosis
  - >30 degrees
- Or Fractures at multiple levels, then the posterior ligamentous complex may fail and progress to involve the middle column, resulting in spinal instability
Burst fractures

*Burst fractures comprise approximately 14% of all TL injuries*

*Involves vertebral endplate and pressure from the nucleus pulposus upon the vertebral body*
Treatment of Burst Fracture

*Vast majority are stable in brace*

*Surgical options*

- Posterior Fusion
- Anterior Fusion
- Variations on both posterior and anterior
Stable Fracture gone bad
Unstable Burst Fractures

Surgery recommended for burst fx with any of the following:

- Anterior height loss >50%
- Residual canal diameter < 50%
- Kyphotic angulation >30
- When interpedicular distance widens on upright films in brace
- Neurologic Deficit
Posterior Fusion with Distraction
Anterior Fusion with Cage Placement
Flexion-distraction injuries

**Chance fractures**

- hyperflexion injuries in which there is distraction of posterior elements and impaction of the anterior components
- Compression component from hyperflexion is usually minor compared to distraction component
C1 (Atlas) fractures
Burst (Jefferson)

*Most common type of C1 fracture is the ‘Jefferson’ burst fracture*

- Named after Sir Geoffrey Jefferson who is credited for first describing and reporting of cases in 1920
- Highly unstable fracture that occurs when a vertical compression force is transmitted through the occipital condyles to the lateral masses of the atlas of C1
C1 (Atlas) fractures
Burst (Jefferson)
C1 (Atlas) fractures
Burst (Jefferson)
Jefferson Fracture Stability

Over 40% usually have associated C2 fracture

MRI to assess integrity of the transverse (TAL) ligament

- For isolated C1 with intact TAL fracture hard collar
- If disrupted TAL collar/fusion/Halo vest
C2 (Axis) pedicle fractures
Hangman’s Fracture

Injury that occurs when the cervicocranium is thrown into extreme hyperextension as a result of abrupt deceleration

Treatment is dependent on displacement, adjacent disc and ligament involvement
C2 (axis) Odontoid fractures

- **Type I**: avulsion fracture of the dens tip (alar ligament tear)
- **Type II**: fracture at base of dens (transverse ligament disruption)
- **Type III**: fracture of dens extends into C2 vertebral body
Surgical Management Severely Displaced Hangman’s Fracture

Figure 6. Lateral cervical spine showing C0 – C3 fusion in reduced position after one and half year.
Evaluation C-spine Below C₂

To assess the stability of cervical spinal column injuries below C₂, the spine is viewed as consisting of two columns:

- The **anterior column** is formed by alternating vertebral bodies and intervertebral disks held in alignment by the anterior and posterior longitudinal ligaments.

- The **posterior column**, which contains the spinal canal, is formed by pedicles, transverse processes, articulating facets, laminae, and spinous processes and is held in alignment by the nuchal ligament complex (supraspinous, interspinous, and infraspinous ligaments), capsular ligaments, and ligamentum flavum.
Spinous process fractures

The ‘clay shoveler's’ fracture, an isolated fracture of one of the spinous processes of the lower cervical vertebrae, is a stable injury
Facet Dislocation - Bilateral

This occurs when flexion forces extend anteriorly, causing disruption of the annulus fibrosis of the intervertebral disc and the anterior longitudinal ligament, resulting in extreme instability.
Facet Dislocation - Bilateral
Traction

To reduced fracture-dislocation (contraindicated with any atlanto-occipital dislocation or rostral injury)

In obtunded patients recommend MRI prior to placing traction
Posterior Fusion of Cervical Spine

*Procedure of choice for most flexion injuries*

*Useful with minimal anterior injury*
Anterior Fusion of Cervical Spine

*Fractured vertebral body with bone retropulsed into spinal canal*

*Can be augmented with corpectomy for structurally compromised bone*
Combined Anterior and Posterior Fusion
Transportation and Radiographic Assessment of Trauma

**Recommendation 2002**
A combination of a rigid cervical collar and supportive blocks on a backboard with straps is effective in limiting motion of the cervical spine and is recommended.

**Recommendation 2012**
Immobilization of trauma is no longer recommended for patients who are: awake, alert, and are not intoxicated, who are without neck pain or tenderness, who do not have an abnormal motor or sensory examination and who do not have any significant associated injury that might detract from their general evaluation is not recommended.
References


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Study Blue (August 2014) retrieved from http://www.studyblue.com/notes/n/sci/deck/3226048