Evaluation and Management of Acute Back Pain

A comprehensive and Evidence-based Approach

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Overview

• Understanding Pain of Spinal Origin
  – Anatomic and Physiologic Considerations in Pain Generation
• Common Causes of Acute Pain
  – Trauma
  – Degenerative Etiologies
  – Infection
  – Tumor
  – Non-spinal etiologies
• Imaging of the Spine
• Treatment of Spinal Disorders
  – Non-operative and Operative

Anatomic and Physiologic Considerations

• Pain Sources:
  – Discogenic
  – Facet
  – Spondylogenic/Referred
  – Radicular
  – Myofascial
  – Vascular
  – Retroperitoneal/Visceral

Innervation of the Lumbar Spine:

1) Zygoapophyseal Joints:
   Medial Branch of Dorsal Primary Ramus

2) Structures within Spinal Canal:
   Sinuvertebral Nerve

3) Lateral Disc, ALL:
   Branches of Grey Rami Communicantes and Ventral Primary Ramus

Pain: Anatomy

Pain: Molecular Biology

• TNF- alpha
• IL-1
• Substance P
• Calcitonin-gene Related Peptide
• Vasoactive Intestinal Peptide
Pathophysiology of Spinal Pain

Nociceptive Pain Patterns
  – Somatic Referred Pain
  – Radicular Pain

Differentiate by character and distribution of pain

<table>
<thead>
<tr>
<th>Pain</th>
<th>Yes</th>
<th>Limited</th>
<th>Flex</th>
<th>Back</th>
<th>Const</th>
<th>&gt;50</th>
<th>Neoplasia</th>
<th>No Pain</th>
<th>No Limit</th>
<th>Ext</th>
<th>Both</th>
<th>Stand</th>
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<tr>
<td>Intervertebral Disc Herniation</td>
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<td>Discogenic Pain/Instability</td>
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<td>Back</td>
<td>Flex</td>
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<td>No</td>
<td>Pain</td>
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<td>Ext</td>
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<td></td>
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<td>Infection</td>
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<td>Flex</td>
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<td>Yes</td>
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Physical Exam: Provocative Testing

- Lumbar Radiculopathy: Lasage
- Cervical Radiculopathy: Spurlings
- Cervical Myelopathy: L’hermitte’s
- Spinal Stenosis: Stand in Extension
- SI Joint Pain: FABER
- Hip Osteoarthritis: Injection Arthrogram

Radiographic Evaluation

Plain Radiography
MRI
Myelography
SPECT
Provocative Testing Techniques

• Discography
• Facet Joint Injection
• Epidural Steroid Injection
• Selective Nerve Root Blocks

Spectrum of Disorders of the Spine

• Neural compromise
  – IVDH, spinal stenosis, trauma
• Instability
  – Trauma, Deformity
• Infection
• Tumor
• Axial Pain

SPORT Trial

• Randomization of patients with degenerative spondylolisthesis/spinal stenosis to operative vs. non-operative care
• Observation cohort
• Operative care:
  – Limited decompression
  – Open or Endoscopic
• Non-operative care
  – PT, ESI, Pain medications
  – Journal to track care

Surgical Care for Lumbar Intervertebral Disc Herniation

• SPORT study

Metastatic Tumors and the Spine

• Metastatic carcinoma accounts for 40X more skeletal lesions than all other forms of bone cancer combined.
• 70% of patients with metastatic carcinoma develop skeletal metastasis before death
  – Up to 85% in patients with breast cancer.
  – Spine is the 4th most common site of cancer metastasis, and the most common skeletal site

Clinical Presentation of Patient with Spinal Tumor

• Pain
• Neural Impairment
• Spinal Instability
• Deformity
Treatment Options

• Stable Spine:
  – Radiation Therapy
  • Reliable for pain relief in responsive tumors
    – Myeloma/Solitary Plasma Cell Myeloma, Lymphoma, Breast, Lung
  – Regional selectivity with Cyberknife
  – Pre-treatment neurologic status is predictive of post-treatment neural function

• Unstable Spine:
  – Fracture
  – Deformity
  – Progressive Neural Compromise

• Operative Stabilization may be the most reliable methods for restoring stability to the spine and correcting deformity due to pathologic fracture.

Indications for Operative Care

• Progressive neural deterioration
• Progressive deformity of the spine
• Osseous impingement of neural elements
• Radioresistant tumor
• Diagnosis
• Intractable pain despite nonoperative care

Evaluation of Acute Back Pain due to Trauma/Fracture

Injuries to the Spinal Column

• Fractures
  – Compression
  – Burst
  – Fracture-Dislocation
• Flexion-distraction injuries
• SCIWORA

Spinal Cord Injury

• Incidence of spinal cord injury in the U.S.
  7600 to 12,000 SCI per year
• Location
  55% cervical, 30% thoracic, 15% lumbar
**Introduction**

- Devastating injury
- Mortality rate of 90% at beginning of twentieth century
- Mortality rate decreased from 20% to 9% with establishment of regional spinal cord injury unit

**Etiology**

- Motor vehicle accidents 45%
- Falls 20%
- Violent assaults 15-20%
- Sports and recreational activities 15-20%

**Sports related SCI**

- Diving and surfing 69%
- Football 6%
- Snow skiing / winter sports 6%
- Gymnastics 5%
- Wrestling 2%
- Horseback riding 2%

**Initial Management of the Spine Trauma Patient**

- Evaluation
- Resuscitation
- Immobilization
- Extrication
- Transport

**History**

- Nature of the accident
- Patient position / Head position
- Consciousness
- Movement
- Seat belt
- Initial treatment at the scene

**Assessment of the patient**

- Primary assessment - ATLS protocol
- Life-threatening conditions identified and treated first
- Hypotension and hypoxemia deleterious to the injured spinal cord
- Protection of the spine during the initial assessment
Resuscitation

- Neurogenic shock: loss of autonomic regulation due to lack of sympathetics
- Hypotension and bradycardia
- Usually in high thoracic injuries above T7
- Use vasopressors: dopamine, dobutamine, and noradrenaline

Acute Medical Treatment of the SCI Patient

- Rationale directed at minimizing secondary cord injury caused by edema and ischemia
- Intravenous methylprednisolone administered in cases of blunt spinal cord injury
- Efficacy of corticosteroids has not been shown for root injuries

Methylprednisolone Therapy for the SCI Patient

<table>
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<tr>
<th>Time of Presentation</th>
<th>Initial Dose</th>
<th>Maintenance Infusion</th>
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</thead>
<tbody>
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<td>&lt; 3 hours after injury</td>
<td>30 mg/kg</td>
<td>5.4 mg/kg/hr for 24 hours</td>
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<tr>
<td>3 - 8 hours after injury</td>
<td>30 mg/kg</td>
<td>5.4 mg/kg/hr for 48 hours</td>
</tr>
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NASCIS III PROTOCOL

Bracken et al JAMA 1997

Physical Examination

Inspection

- Skull to the sacrum
- Abrasions, deep lacerations, or hematoma
- Abdomen for contusion

Palpation

- C-T1 Spine
- Interspinous widening
- Malrotation
- Step off deformity
- Tenderness
- Crepitus
Physical Examination

WIGGLES - THE - TOES - TEST

WNL

UNACCEPTABLE

Physical Examination

- Neurologic evaluation (ASIA principles)
- Motor exam with grading
- Reflexes (bulbocavernosus, clonus, Babinski)
- Sensory (pin prick, light touch and proprioception)
- Rectal exam

Standard Neurological Classification of Spinal Cord Injury

Spinal Shock

- Spinal shock is the loss of somatic motor, sensory, and sympathetic autonomic function after spinal cord injury
- Spinal cord shock present when sacral reflexes are absent (bulbocavernosus reflex)
- Prognosis uncertain until return of bulbocavernosus reflex
- Effect of spinal shock on motor and sensory exam usually resolved within 24 hours
- Autonomic dysfunction may last weeks

Bulbocavernosus Reflex

Resolution of spinal shock, return of bulbocavernosus reflex

ASIA Classification of SCI

- A complete no motor / sensory
- B incomplete sensory only
- C incomplete motor useless
- D incomplete motor useful
- E normal motor / sensory normal
Incomplete Spinal Cord Injury Syndromes

- Specific patterns of neurologic deficit based on anatomic location of the injury in the transverse section of the spinal cord
- Understanding of the mechanism of injury
- Early phase treatment
- Assessment of prognosis

Incomplete Spinal Cord Injury Syndromes

- Central cord syndrome
- Brown-Sequard syndrome
- Anterior cord syndrome
- Posterior cord syndrome
- Conus medullaris syndrome
- Cauda equina syndrome

Imaging of the Spine

- Plain x-ray
- CT scan
- Spiral CT (helical)
- MRI
- TC-99 bone scan

Plain x-rays

- Alignment of Spine
  - Segmental
  - Interspinous
  - Columns
- Clearance of spine
- Soft tissues

Indications for CT scan

- Any fracture / ligamentous injury
- Inability to visualize spine by plain films
- Unclear anatomy on radiographs
- Suspected occipitocervical trauma
- Unclear cervicothoracic junction
- Sacral fractures
- Unexplained neurologic deficit
- Date injury
- Post myelography

Indications for MRI

- All incomplete neurologic deficits
- Suspected spinal canal mass (HNP) prior to reduction
- Spinal Cord Injury Without Radiographic Abnormality (SCIWORA)
- Skeletal level of injury different than neurologic level
- Suspected neoplastic or infectious process
- Suspected primary cord pathology
- Assessment of ligament disruption (fat suppression T-2)
- Prediction of SCI severity and potential for neurologic recovery
MRI

Obtain MRI in obtunded patient when neuro exam unknown

Indications for TC - 99 bone scan

- Pediatric injury such as unclear physeal fracture
- R/O "occult fractures"

Treatment Considerations

- Stability of the spine is critical to the choice between operative and non-operative care

Spinal Stability

Clinical stability present when under normal physiologic loads spinal column is capable of maintaining alignment without displacement such that there is:
- no progression of neurologic deficit
- no major deformity
- no incapacitating pain

3 Column Spine

- Anterior
- Middle
- Posterior

Spinal Stability

- Mechanical instability defined as injury to 2 or more of the 3 columns
  - Stable
  - Unstable
Flexion - Distraction Injury
Various combination of injuries:
Treatment dependent on bony vs. ligamentous injury
1 level bone 1 level disc/ligamentous 2 level ligamentous

Fracture - Dislocations
Flexion - Rotation Fracture
Shear Fracture
3 column injuries
High incidence of neurologic deficits
Highly unstable
Majority require surgery
Long posterior neutralization construct with segmental fixation

Conclusions
• Acute Pain of Spinal Origin may be caused by a spectrum of disorders
• Accurate identification of the etiology of pain is critical for treatment success
• Assessment of spinal stability is important in the decision for admission/operative care and non-operative care
• Importance of diagnosing at the initial assessment any patient with spinal tumor, infection, or neural deficit

UCSF Center for Outcomes Research