SUBAXIAL CERVICAL TRAUMA

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OVERVIEW

- Introduction
- Clinical evaluation
- Anatomy
- Neurology
- Classification systems
- Decision-making
- Case examples
INTRODUCTION

- Cervical spine injury 4-5%
- Spinal cord injury 1%
- Bimodal age distribution
  - 15 - 24 years
  - Over 50 years

INTRODUCTION

- Treating more
  - larger and more active older population
  - advances in emergency medical services
- Men in the 30s
- MVC
CLINICAL EVALUATION

- Scene of injury
- **EVERYONE**
- Spine board, rigid cervical collar or sandbags

CLINICAL EVALUATION

- History
- Physical examination
  - mental status
  - palpation/tenderness
  - inspection
  - neurologic exam
    - cranial nerves
    - rectal exam
    - bulbocavernosus reflex
### ASIA IMPAIRMENT SCALE

**A** = Complete: No motor or sensory function is preserved in the sacral segments S4-S5.

**B** = Incomplete: Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.

**C** = Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.

**D** = Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.

**E** = Normal: Motor and sensory function are normal.

### CLINICAL SYNDROMES (OPTIONAL)

- Central Cord
- Brown-Squard
- Anterior Cord
- Conus Medullaris
- Cauda Equina
CLINICAL EVALUATION

- High correlation
  - severe head injury
  - high energy mechanism
  - focal neurologic deficit

CLINICAL EVALUATION

- ABCs
- Diastolic pressure > 70mm
  - autoregulation of spinal cord
CLINICAL EVALUATION

- Cervical spine injury sequelae
  - airway obstruction
  - diaphragmatic and chest wall paralysis
  - neurogenic shock
    - hypotension and bradycardia

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CLINICAL EVALUATION

- Details of mechanism
- Inspection and palpation
- Noncontiguous spinal injury

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CLINICAL EVALUATION

- Investigations
  - CT scan
    - defines bony injury
  - MRI
    - neuro injury
    - clearance

ANATOMY

- Less complex (than occ - C2)
- Columns
- Bony and ligamentous restraints
NEUROLOGY

- Spinal cord injury
  - Edwin Smith, 2800 BC
    - “a disease not to treat”
  - Albucasis, 1000 AD
    - “his case is hopeless, so do not concern yourself with his treatment”
NEUROLOGY

- INTACT
- RADICULAR
- INCOMPLETE
- COMPLETE

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NEUROLOGY

- Pharmacologic treatment
  - Use of steroids controversial
  - Literature does not support use

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CLASSIFICATION SYSTEMS

- No accepted classification system


CLASSIFICATION SYSTEMS

- Allen and Ferguson
  - Most widely used
  - Mechanistic classification
  - Force vectors
  - No account of:
    - Stability
    - Neurologic injury
CLASSIFICATION SYSTEMS


CLASSIFICATION SYSTEMS

- Mirza defines classification system
  - Definition and terminology
  - Injury and treatment
  - Characterization
  - Neurologic
  - Gradation
  - Prognosis
CLASSIFICATION SYSTEMS

- Stability of motion segment

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CLASSIFICATION SYSTEMS

- White and Panjabi
  - “ability of the spine under physiologic loads to maintain a relationship between vertebral segments in such a way that there is neither damage nor subsequent irritation of the spinal cord or nerve roots, and, in addition, there is no development of incapacitating deformity or pain due to structural changes”.
SPINAL INJURIES of the Subaxial Cervical Spine

CLASSIFICATION SYSTEMS

- White and Panjabi
  - Based on cadaverae
  - No clinical validation
  - “Stability” is dirty “S” word in spine trauma surgery

1. Anterior elements destroyed/non-functional 2
2. Posterior elements destroyed/non-functional 2
3. Sagittal plane translation >3.5 degrees 2
4. Kyphosis >11 degrees 2
5. Posterior Stretch test 2
6. Cord injury 2
7. Root injury 1
8. Abnormal disc narrowing 1
9. Congenital Spinal Stenosis 1
10. Dangerous loading anticipated 1

CLINICAL INSTABILITY > 5
CLASSIFICATION SYSTEMS

- Extremely smart “spine traumatologists”
  - 3 factors
    - Stability of motion segment
    - Neurologic injury
    - Trauma consideration
CLASSIFICATION SYSTEMS

Ant – 3.5  
Post – 4.5

L Pillar – 0.5

R Pillar – 3.5

Total = 12
CLASSIFICATION SYSTEMS

- Neurologic injury
  - Frankel
  - ASIA
  - Cord syndromes
Most injuries treated with brace
- Rigid cervical collar
- Cervicothoracic brace
- Halo vest not effective

DECISION-MAKING

- **RATIONALE FOR SURGERY**
  - Protect spinal cord from further trauma
  - Reduce and stabilize fractures and dislocations
  - Decompress neurologic tissue
  - Stable, *painless* spine

DECISION-MAKING

- **Surgical approach**
  - Dictated by neuro injury
    - Usually ant for decompression
  - Prone positioning of unstable fxs

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DECISION-MAKING

- Surgical approach
  - What does the literature tell us?
    - A lot of surgeons are good at treating these injuries and writing about them.

DECISION-MAKING

- Surgical approach
  - Posterior more rigid than anterior
  - Stabilization alone, no difference
  - Brodke DS. Anderson PA. Newell DW. Grady MS. Chapman JR.
DECISION-MAKING

- Surgical approach
  - STRONGER

DECISION-MAKING

- Surgical approach
  - STRONGER POSTERIOR
DECISION-MAKING

- Surgical approach
  - STRONGER POSTERIOR
  - Pt MISERY

DECISION-MAKING

- Surgical approach
  - STRONGER POSTERIOR
  - Pt MISERY ANTERIOR
DECISION-MAKING

- Surgical approach
  - STRONGER POSTERIOR
  - Pt MISERY ANTERIOR
  - POSITIONING

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DECISION-MAKING

- Surgical approach
  - STRONGER POSTERIOR
  - Pt MISERY ANTERIOR
  - POSITIONING ANTERIOR
  - FUSION LEVELS ANTERIOR

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DECISION-MAKING

• Surgical approach

DECISION-MAKING

• Special cases
  • Ankylosis spondylitis
    • Pre-injury posture
    • Conventional bracing
DECISION-MAKING

- Special cases
  - Congenital stenosis
    - Minor trauma
    - No acute
  - “Central cord” (acute traumatic myelopathy)