Thoraco-Lumbar fracture

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T-L Spine injuries

- General consideration
- Anatomy
- Patient evaluation
- Classification
- Treatment
- Complications
Incidence

- Male predominance
- Age: 2nd to 4th decade
- Associated injury up to 50%
- 10% associate with calcaneus Fx

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1-T10</td>
<td>16%</td>
</tr>
<tr>
<td>T11-L2</td>
<td>52%</td>
</tr>
<tr>
<td>L3-L5</td>
<td>32%</td>
</tr>
</tbody>
</table>
Anatomy

3 anatomic-biomechanic segments

• Upper Thoracic  T1-T10
• T-L junction    T11 – L2
• Lumbar         L3 – L5
Anatomy

T1-T10, kyphotic segment

- Smallest canal size at T6-T8
- Cord occupied almost canal size
- Complete: Incomplete injury = 6:1
- Rib cage increase stability and immobility
Thoracic
Anatomy

T11-L2, transitional zone

- Zone between stiff and motion
- Change kyphosis to lordosis
- Neural elements: cord, conus, cauda equina
T-L junction
Anatomy

L3-L5, lordotic segment

- Relative mobility of lumbar spine
- Larger canal size, pedicle
- Neural elements: cauda equina (nerve root)
Lumbar
Spinal cord

- Medulla oblongata to conus medullaris
- C 5-T1
- Brachial plexus
- L 2-S4
- Lumbosacral plexus
• Conus medullaris lower L1
• Cauda equina root injury
Physical examination

- vital sign
  neurogenic shock → less common in T-L Fx
- look, feel, move
- neurological exam
  motor, sensory, reflex
Physical examination
Physical examination
Physical Examination

• Spinal Cord Injury
  – Spinal shock 24-48 HRS.
  – Bulbocavernosus reflex
  – Incomplete cord lesion
  – Sacral sparing
  – Complete cord lesion
Sensory evaluation

Dermatome
### Motor Evaluation

#### Motor Impairment Related to Level of Spinal Cord Injury

<table>
<thead>
<tr>
<th>Function</th>
<th>Muscles</th>
<th>Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspiration</td>
<td>Diaphragm</td>
<td>C3, 4, 5</td>
</tr>
<tr>
<td>Shoulder abductors</td>
<td>Deltoid, biceps brachii, brachialis</td>
<td>C5, 6</td>
</tr>
<tr>
<td>Elbow flexors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist extensors</td>
<td>Extensor carpi radialis longus and brevis</td>
<td>C6, 7</td>
</tr>
<tr>
<td>Elbow extensor</td>
<td>Triceps brachii</td>
<td>C6, 7, 8</td>
</tr>
<tr>
<td>Hand intrinsics</td>
<td>Interossei, Thenar group</td>
<td>C8, T1</td>
</tr>
<tr>
<td>Hand adductors</td>
<td>Adductor longus and brevis</td>
<td>L2, 3</td>
</tr>
<tr>
<td>Knee extensors</td>
<td>Quadriceps</td>
<td>L3, 4</td>
</tr>
<tr>
<td>Ankle dorsiflexors</td>
<td>Tibialis anterior</td>
<td>L4, 5</td>
</tr>
<tr>
<td>Great toe extensor</td>
<td>Extensor hallucis longus</td>
<td>L5, S1</td>
</tr>
<tr>
<td>Ankle plantarflexors</td>
<td>Gastrocnemius, Soleus</td>
<td>S1, 2</td>
</tr>
<tr>
<td>Anal sphincter</td>
<td>Sphincter ani externus</td>
<td>S2, 3, 4</td>
</tr>
</tbody>
</table>
Bulbocarvernosus reflex S 2,3,4
Diagnostic Imaging

- Plain radiography
- CT
- MRI
Diagnostic Imaging

- **CT Scan**: best for bony lesion
- **3-D reconstruction**
- **MRI**: spinal cord injury, HNP or ligamentous injury
- **Myelogram**: less used
Radiographic measurement
Kyphotic angle & vertebral height
Interpedicular distance
Classifications

Which one is the best?

- Simple
- Easy to remember
- Facilitate communication
Three Column Concept

- Anterior column
- Middle column
- Posterior column
Denis (Three Column) 1983

- Compression Fractures
- Burst Fractures: 5 subtypes
- Seat-Belt injury (Chance Fracture)
- Fracture dislocations
Denis
Denis

Seat belt-type

Fracture-dislocation
Compression Fracture
Compression Fracture
Compression Fracture
Burst Fracture
Burst Fracture
Burst Fracture
Seat-Belt Injury
Fracture Dislocation
Fracture Dislocation
Flexion distraction injury
center of rotation
Flexion distraction
Goals of Treatment

- Restore stability
- Correction deformity
- Decompression neural elements (when indicated)
Goals of Treatment

- Avoid further neurological injury
- Early mobilization
- Decrease pain
- Minimize cost of treatment
Decision making

• Stable injuries $\rightarrow$ conservative Rx
  70-80 % of T-L spine Fx
  Hyperextension cast after pt. stable
  Brace or orthosis 2-4 weeks after injury
Decision making

- Unstable injuries → required operative Rx

1. Three column disruption
2. > 50% collapse of anterior cortex
3. > 25 degree kyphosis
4. Fx with any neurological deficit
Conservative Rx

• Neurologic intact
• Most compression Fx
• Stable burst Fx

long term results = operative Rx
Conservative Treatment

- Bed rest 6 weeks
- Postural reduction
- Casting & Orthosis
- Prevention of pressure sores and skin problems
- Exercise of lower and upper extremities
Conservative treatment

Body jacket
Conservative treatment

Jewett brace
Surgical treatment

- Neural Decompression
- Surgical Stabilization
Principle of treatment

- Mechanical unstable
  
  reduction + stabilization

- Neurological unstable
  
  Canal compromise $\rightarrow$ decompression

  No canal compromise $\rightarrow$ only stabilization
Surgical Treatment

Stabilization

• Harrington hook and rod construct

  Long rod, short fuse

• Pedicular screw system

• Anterior instrumentation
Harrington distraction rod
Harrington distraction rod
Segmental Sublaminar Instrumentation
Segmental instrumentation + wiring
Pedicular Screw System

- Most commonly used
- 3 column fixation
- Stiffed construct
- Short segment fixation – possible
- Facilitate force apply for reduction
Pedicular Screw System
Pedicular Screw System
Anterior Instrumentation
Post op immobilization

- Individual decision
- Depend on
  - Fx pattern
  - Injury level
  - Type of instruments
Take home message

- Anatomy of T-L region
- Physical exam, X-ray evaluation
- Classification
- Method of Rx
Thank you for your attention