SPINAL CORD CONCUSSION

Stephan du Plessis MD
CASE PRESENTATION

• 23 yo Varsity Defensive Back
• Tackled with neck in extension
• Unable to walk from field

• No movement in arms or legs
• No sensation below neck
CASE PRESENTATION

2 hours later

• Reports mild neck stiffness
• Denies weakness, mild parasthesias left in fingers and toes

O/E

• Tone, power, coordination, reflexes normal
• Sensation and gait normal, full neck ROM
CASE PRESENTATION

- Honors student – 4.0 grade point average
- Excellent athlete – pro football career likely
- Desperately wants to play football

- Coach and team bring him in for an opinion
Spinal Cord Concussion

• Aka Cervical Cord Neurapraxia, Transient quadra- or para-plegia

Clinical Presentation

• Neck injury in an athlete
• Abrupt onset of transient neurological deficit localized to the spinal cord
Spinal Cord Concussion

Clinical Presentation

- Symptoms may involve:
  - both arms
  - both legs
  - all four extremities
  - ipsilateral arm and leg
Spinal Cord Concussion

Clinical Presentation

• Sensory symptoms
  burning pain
  numbness
  tingling

• Motor changes (+/-)
  weakness
  paralysis

• Duration
  most < 15 minutes
  some < 48 hours
Spinal Cord Concussion

KEY FEATURE

• Complete return of motor function, resolution of sensory symptoms, and full, pain-free spinal range of motion
Spinal Cord Concussion

CLASSIFICATION

Pattern
• Quadri-
• Para-
• Hemi –

Grade
• I  <15 minutes
• II  15 minutes – 24 hours
• III  >24 hours

Type
• Plegic > Paresthetic > Paretic
Spinal Cord Concussion

PATHOPHYSIOLOGY
### Spinal Cord Concussion

#### PATHOPHYSIOLOGY - mechanical

<table>
<thead>
<tr>
<th></th>
<th>Clinical</th>
<th>Structural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Deceleration</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Shear</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Distraction</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Laceration</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Contusion</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Cervical cord neurapraxia: classification, pathomechanics, morbidity, and management guidelines

Joseph S. Torg, M.D., Thomas A. Corcoran, M.D., Lawrence E. Thibault, Sc.D., Helen Pavlov, M.D., Brian J. Sennett, M.D., R. John Naranja, Jr., M.D., and Steven Priano, M.D.

Departments of Orthopedic Surgery and Neurosurgery, Allegheny University for the Health Sciences, Philadelphia, Pennsylvania; and Department of Radiology, The Hospital for Special Surgery, New York, New York

Key words: cervical spine, neurapraxia, transient quadriplegia, spinal stenosis
Materials and Methods

Study Population

- 110 patients (1 female)
- Average Age 21 (13-33)
- All injuries during sports related activities

Sports Activities

- 87% football
- 5% basketball
- 2% hockey
- 2% wrestling
- 4% other

Torg et al., J Neurosurg 87:843-850, 1997
Materials and Methods

Follow-Up

• 105 of 110 patients (95%)
• Range 12 months – 19 years
  for those returning to sports
  (including min 1 athletic season)

Torg et al., J Neurosurg 87:843-850, 1997
Results

Patient Outcome

• No permanent or catastrophic neurological injuries

• 1 Patient suffered a neurological deficit as a result of surgical intervention

Torg et al., J Neurosurg 87:843-850, 1997
Results

Radiographic Workup – Plain X-Rays

- Cervical Stenosis 86%
- Osteophyte Ridging 50%
- Degenerative Disc(s) 28%
- Loss of Lordosis 21%
- Normal 7%

104/110 patients
Age 13-33, mean 21

Torg et al., J Neurosurg 87:843-850, 1997
Results

Radiographic Workup – MRI (53/110)

- Disc Bulge 81%
- Osteophyte Ridging 55%
- Foraminal Compromise 47%
- Disc Protrusion 36%
- Normal 8%

53/110 patients
Age 13-33, mean 21

Torg et al., J Neurosurg 87:843-850, 1997
Spinal Cord Concussion - Presentation

Incidence (%)

- All Four Limbs
- Arms
- Legs
- Ipsilateral Arm + Leg

Torg et al., *J Neurosurg* 87:843-850, 1997
Torg et al.,
J Neurosurg 87:
843-850, 1997
RETURN TO PLAY

- 38% retired after 1\textsuperscript{st} episode (42/110)
- 15% retired after 2\textsuperscript{nd} episode (17/110)
- 23% returned with no recurrence (25/110 – mean f/u 43 mo)
- 14% continued despite recurrence (15/110 – mean f/u 35 mo)

- 57% returned to contact activities (63/110)
- 56% experienced a recurrent episode (35/63)

Torg et al., *J Neurosurg* 87:843-850, 1997
PREDICTORS OF RECURRENCE

• Return to Football
• Narrow Spinal Canal (SC/VB ratio and MRI Space Available for Cord)

Non-Predictive

• Age, level of participation, radiographic and MRI pathology, clinical presentation
CONCLUSIONS

SPINAL CORD CONCUSSION

• By definition Spinal Cord Concussion is a completely reversible neurological event

• SCC tends to happen in athletes, particularly those involved with high impact sports

• SCC correlates with radiographic canal stenosis
CONCLUSIONS

RETURN TO PLAY

• Decision based on individual circumstances and best available (Class III) evidence
• Approximate 56% incidence of SCC recurrence
• No known incidence of permanent neurological deficit