Get Your Coffee and Get Comfy. We’ll Start in Just A Few!

Mike Cendoma, MS, ATC
Sports Medicine Concepts, Inc
Sports Emergency Care and Concussion Management Solutions Since 1995
• Founder, Program Director
• In-field and in-arena Sports Emergency Care Training and Self Development
• TeamSafe® Sports Emergency Care Application
• InfieldFace® Emergency Face Mask Removal
• Concussion Management Specialist
• Sports-EmergencyCare.com

Athletic Trainer
• All of us at Sports Medicine Concepts practice what we preach every day!
• Everything we do comes directly from experiences and observations from the field of play!
• We want to know that your sideline is as prepared as ours are!
The CMS Program
A serious educational undertaking: take you beyond entry level:
• 15 EBP CEUs are earned
  - Live sessions;
  - Recorded lectures;
  - Live sessions;
  - Recorded sessions;
  - Seminar readings;
  - Concussion project;
  - Case study;
  - CPR
  - Request for credential

Evidence-Based Practice
We are fully committed to ALL 3 phases of evidence-based practice:
• Peer-reviewed literature
• Expert Opinion
  - Situation scenario simulation testing
  - Field evaluations
• Pragmatic Application

Pragmatic Application
How does it actually happen Friday night?
How to Participate Today

• Open and close your Panel
• View, Select, and Test your audio
• Submit text questions
• Q&A addressed at the end of today's session
• Everyone will receive a follow-up email within 24 hours with an evaluation link as well as CE statement

Mechanism of and Pathophysiology of Injury

Injury Mechanisms, Protection, and Injury Cascade as a foundation for assessment, rehab, and return to play

Mechanism of Injury

“What happened” isn’t good enough

Coup Injury
Forceful blow to the resting, movable head produces maximal injury beneath the point of impact
- Direct transmission of force to underlying tissue
- No brain lag or disproportionate distribution of CSP

Contra-Coup
A moving head collides with a stationary object
- Minimal injury on side of brain opposite blow
- Brain lags toward trailing surface
- CSP squeezed away from trailing surface and thickens under point of impact


“What happened” isn’t good enough
Coup/Contra-Coup Combined

Many sports-related concussions result from combined mechanisms:
- Injury on the side of impact and opposite side due to brain lag
- Managed the same

Focal Intra-cerebral Trauma

Uncommon in helmeted Sports:
- Post-traumatic intra-cranial mass lesions
- Hematoma or cerebral contusions
- Clinical deterioration
- LOC
- CNII deficits
- Lucid interval
- Widened pulse-pressure

Diffuse Intra-Cerebral Trauma

Widespread disruption of neurological function:
- Involve acceleration-deceleration motion
- Linear plane or rotation or both
- Lesions result from brain being shaken within skull
Diffuse Axonal Injury

Most severe diffuse brain injury
- Caused by rotational accelo-deceleration
- Cognitive function
- Concentration
- Memory
- Brain-stem centers
- Breathing, HR, wakefulness

Cerebral Concussions

Most often associated with sports
Mild diffuse injury termed MTBI
- Acute mechanism resulting in 1 or more of the following
  - Headache, nausea, vomiting, dizziness, balance problems, feeling slowed down
  - Fatigue, trouble sleeping, drowsiness, sensitivity to light or noise, LOC, blurred vision, difficulty remembering, or difficulty concentrating.

Parietal Lobe

general sensory function
- temperature
- pressure
- pain
- proprioception
- speech
Temporal Lobe

Organization of sensory input

Frontal Lobe

motor control of voluntary skeletal muscles
personality
concentration
complex problem solving

Occipital Lobe

vision and integration of vision with other sensory experiences
Other Cool
Clinically Relevant Anatomy

SCALP
- Skin
- Connective tissue
- Aponeurosis
- Loose areolar tissue
- Periosteum

Skull

Bones of the face
- limited protective role

Bones of the cranium
- primary role of protection and support

Temporal Region

Most often associated with concussion injury
Middle Meningeal aa.
Middle Meningeal Artery

Branch of the first part of the maxillary and is the largest of the meningeal arteries.

Once inside the skull, it follows a groove on the temporal bone.

The Meninges

Enclose the spinal cord and brain.
- Channel forces away from vital structures.
- Provide passageway for blood vessels, lymphatic vessels, and nerves.

Ventricles

- Lateral ventricles
  - First/second
  - Right/left
- Third ventricle
- Fourth ventricle
  - Absorb external forces
Neurometabolic Injury Cascade

Mild cases
- few seconds of unresponsiveness
- no histological damage
- Cells may eventually recover or degenerate and die

Spreading Depression
- Potassium
- Ionic flux and spreading depression
- Wide area of brain affected simultaneously
- LOC, amnesia, cognitive impairment
- Hyperglycolysis and HLA production

Metabolic Cascade
- Potassium Efflux and Hyperglycolysis
- Uncoupling of Cerebral Blood Flow and Glucose Metabolism
Calcium Cascade

Traumatic brain injury and calcium influx
Inhibition of oxidative metabolism
Delayed cell death and secondary degeneration

Magnesium Cascade

Mg⁺ influx
• dec. mitochondrial function
• dec. oxidation

Cascade Implications for RTP

On average athletes require 7-10 d to fully recover
Same season repeat injuries occur 7-10 days after initial injury
Increased vulnerability of blood flow changes
RTP should be a progression that starts after the athlete is symptom free for 7-10 days – Really? Hmmm

Return-to-Play

70% of HS and college FB players returned same day
70% averaged 5 days.
Most RTP guidelines suggest athletes be symptom free for a minimum of 7-10 days.

7-10 day waiting period can minimize risk of recurrent injury
Neurocascade review may tell us why

30% of HS and college FB players returned same day
70% averaged 5 days.
Most RTP guidelines suggest athletes be symptom free for a minimum of 7-10 days.

Return-to-Play

Conclusion
Mechanism of injury
Neurometabolic cascade

Focal vs. Diffuse
Coup vs. Contrecoup
Protection of the Brain

Foundation for LOC via Spreading depression
Uncoupling of CBF
Foundation for RTP criteria
Second Impact Syndrome and Post-Concussion Syndrome

For Tomorrow
Session Review
- Recording posted shortly
- Power Point link

Readings
- Neurocascade Article
- Hematoma vs. Concussion for tomorrow
Cool Stuff

Informational Fridays at Sports Medicine Concepts

- 10 min video segments that provide product, protocol, and technique reviews using our new RPSH index
- Subscribe on YouTube today!

Sports Emergency Care White Paper Sessions
- We address issues and burning questions that arise during our most recent In 2 Min or Less training sessions
- Get CE hours for athletic trainers
- Check out links in materials section for details

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