Sports Medicine Update

- Cupping
- Concussion
- Tendinopathies
- PRP
- Spider Silk
- Musculoskeletal Ultrasound

Cupping

- Alternative medicine
  - Chinese
  - Egyptian
- Creates a vacuum
- Dry vs wet

Cupping

- Gaining publicity
  - Rio 2016
- Evidence
  - Pain – tentative
    - Lee, 2011
- Unclear how it works
  - Stagnant blood/lymph
  - Chi

Cupping

- Illustration from a medical textbook “Exercitationes practicae”
  - published in 1694

Concussion

- AMSSM position statement 2012
  - Clinical diagnosis
  - Symptom checklists
    - objective tool
  - Standardized assessment tools
    - Structure
  - Balance tests
  - Neuro exam
Concussion

IMAGING
  ▪ Reserved for suspected intracerebral bleeding
    ▪ deteriorating mental status
    ▪ focal neurological findings
    ▪ abnormal or unequal pupil reaction
    ▪ abnormalities with extraocular movements
    ▪ abnormalities on a screening motor/sensory exam
    ▪ worsening of symptoms

Epidural Hematoma
  ▪ Arterial origin (middle meningeal a.)
  ▪ CT: lenticular shape

Subdural Hematoma
  ▪ Venous origin
  ▪ CT: Crescent shape

Intracerebral Hematoma
  ▪ Brain laceration

Concussion
  ▪ Sideline management
    ▪ SCAT
    ▪ NFL Sideline assessment tool

SCAT2

Cognitive & Physical Evaluation

Symptom Evaluation

Motor/sensory exam

Sports concussion assessment tool

NFL Sideline assessment tool
Dizziness
- Greatest predictor of recovery > 21 days
Concussion

- No same day return

Concussion

- Return in a graded fashion

Return to play
Athletes should not be returned to play the same day of injury. When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:
1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific exercise
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)
Concussion

- Symptom resolution
  - If symptoms recur
    - Restrict
  - 24 hours for each stage

Concussion – Risk Factors

- History of prior concussion
  - 2-5.8 times higher risk
- A greater number, severity or duration of symptoms after a concussion
- Female gender
- Genetic predisposition
  - APOE e4 allele
  - Tau exon 6 Ser52Pro
- History of learning disorder & ADHD
  - Increased cognitive dysfunction
  - Migraines
  - Prolonged recovery
  - Mood disorder
  - Complicates dx
- Playing certain positions
  - FB “backs” – 3x greater
  - Kick offs – 4x greater

Concussion – Medication

- Recommended
  - Tylenol
  - Modalities
    - Ice/heat
    - A dim, quiet environment
- Avoid
  - NSAIDS
  - ASA
  - Drugs that alter mental status
    - Benzodiazepines
    - Sleep medications
  - Stimulants
  - Antidepressants
  - Antinausea medication

Concussion – Treatment

- Rest
  - Physical
  - Cognitive
- No optimal monitoring interval
- Neuropsych Testing
  - Computer
  - CogSport
  - Impact
  - Pen & paper
- No study has shown that use of these tests provides better short-term or long-term outcomes for athletes with concussions
Concussion

- Long Term Sequela
  - CTE
    - accumulation of t protein
    - postmortem diagnosis
- Not all athletes diagnosed with CTE postmortem reported concussions during play, raising the question if sub-concussive blows may contribute to the development of CTE.

Disqualification

- No absolute number

Prevention

- Education
- Rule enforcement
- Contact practices
- Protective equipment

Table 5 Concussion education websites

| NCAA Concussion programme | NCAA.rg/concussion | CDC Concussion Education/Head Up | http://www.cdc.gov/concussionin sports | NFL Health and Safety | NFLHealthAndSafety.com |

Scott Sterling

- Sports personality
- https://www.youtube.com/watch?v=8F9jX YOHzc0

Tendinopathies

![Tendon structure and images of healthy, normal, and degenerated tendons]

Figure 4 Schematic illustration of pain and tissue damage in various tendinopathy. Disease pathology may high-risk athletes. Severity may vary, but tendons are often in pain, creating risks for further tissue damage. Adapted from [Yasuda et al., 2011]
Tendinopathies

- Eccentric strengthening

Platelet Rich Plasma

- Concentration of platelets from whole blood
- Platelets are filled with growth factors
  - Platelet-derived growth factor (PDGF)
  - Transforming growth factor (TGF-B)
  - Insulin-like growth factor (IGF)
  - Epidermal growth factor (EGF)
  - Vascular endothelial growth factor (VEGF)
  - Fibroblast growth factor (FGF)

Platelet Rich Plasma Isolation Devices

<table>
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<tr>
<th>Device Name</th>
<th>Device Image</th>
<th>Technology Summary</th>
<th>Total Process Time</th>
<th>Disposable EPP</th>
<th>Disposable Cost of EPP</th>
<th>Hardware Unit Price</th>
<th>Increase %</th>
<th>Recovery %</th>
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<tr>
<td>Biomax</td>
<td></td>
<td>Floating Bag</td>
<td>15 min</td>
<td>1.5 ml</td>
<td>$75.00</td>
<td>$10.00</td>
<td>9.8%</td>
<td>78%</td>
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<tr>
<td>Biomet</td>
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<td>Floatation Bag</td>
<td>15 min</td>
<td>1.5 ml</td>
<td>$75.00</td>
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<td>9.8%</td>
<td>78%</td>
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<tr>
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<td>Standard Centrifuge</td>
<td>20 min</td>
<td>10 ml</td>
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<td>$20.00</td>
<td>6.0%</td>
<td>71%</td>
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<tr>
<td>Cytomedix/Angel</td>
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<td>Standard Centrifuge</td>
<td>20 min</td>
<td>10 ml</td>
<td>$150.00</td>
<td>$20.00</td>
<td>6.0%</td>
<td>71%</td>
</tr>
<tr>
<td>Cascade</td>
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<td>Standart Centrifuge</td>
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<td>6.0%</td>
<td>71%</td>
</tr>
</tbody>
</table>

Platelet Rich Plasma

- Biomet – GPS
- Harvest
- Arthrex
- Cytomedix/Angel

Leukocyte rich
Buffy coat based

- Cascade
- Arthrex / ACP
- RegenKit

Leukocyte poor
Plasma based

PRP – Leukocyte Poor

- Plasma + platelets
- WBCs
- RBCs + WBCs

PRP – Leukocyte Rich

- Platelet Poor
- Buffy Coat
- RBCs
**PRP – Activated**

Glass beads

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**PRP**

- **Platelet concentration**
  - 1.5-9x baseline
  - ? Optimal concentration

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**Platelet Concentration**

- Different uses may require different concentrations of platelets
- Optimal concentration in human tendon, muscle, joint is unknown
- Most commercial preparation kits produce PRP in the range of 500,000 µ to 1,500,000 µ
- Variability in platelet concentration is also highly dependent on variability in patient platelet count

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**Leucocytes**

- In acute muscle injuries leukocyte poor product may be better
- Because neutrophils are larger cells their concentration could be expected to be decreased compared to other fractions of WBCs in buffy coat products
- Leukocyte rich may be helpful in a chronic injury because of phagocytic properties

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**Spider Silk**

- Professor Fritz Vollrath
- Oxford
- Spider silk
- Biodegradable

https://www.theguardian.com/science/201

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**Spider Silk**
Musculoskeletal Ultrasound

**Advantages**
- Ready accessibility
- Portability
- Quick scan time
- Dynamic
- Better patient tolerability
- No Radiation, No Side Effects, No Contraindications
- Cost
- Guided procedure(s)
- Personal interaction with the patient
  - directed examination – extension of physical exam
  - specific for each individual
- Scanning technique is easily modified, as needed, to optimize the diagnostic effectiveness of the study
  - contralateral comparison

**Disadvantages**
- Training
  - highly operator-dependent
- Equipment
- Time

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**Musculoskeletal Ultrasound Physics**

- Transducer
  - Emits sound waves (1%) and detects returning echoes (99%)
  - Linear array (large footprint & obvious orientation)
  - Superficial > 10 MHz
  - Deep 5-7 MHz

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**Physics of Sound Waves**

- **Transducers**
  - Linear, (M/S)
  - Curvilinear (OB/ABD)

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**Musculoskeletal Ultrasound**

- Technological advances

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**Musculoskeletal Ultrasound**
Ultrasound Guided Injection

- AMSSM 2014 Position Statement
  - Ultrasound guided injections vs Landmark guided injections
  - 717% increase in outpatient diagnostic MSK US from 2000-2009

Ultrasound Guided Injection