Management of Chronic Conditions

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Disclosure

• I have no financial disclosures
Objectives

- Summarize the differential diagnosis for cough in the athlete
- Explain the initial treatment of exercise induced asthma
- Explain the up to date treatment strategies for concussion
- Identify the 3 main systems affected in female athlete triad
- Evaluate female athletes based on risk stratifications symptoms
- Explain the basic treatment of female athlete triad
- Identify the radiographic classification of spondylolysis
- Summarize the treatment of spondylolysis
- Define chronic exertional compartment syndrome (CECS)
- Explain how to assess and diagnosis CECS
- Explain non surgical options for CECS
Management of Medical Conditions

- Asthma
- Diabetes
- Concussion
- Sickle Cell Trait
- Hypertension
- Relative Energy Deficiency
Principles

- Type of Athlete
  - High School, Collegiate, professional
- Medical home
  - ATC, PMD, Sub-specialist

- Precautions
  - Special Medicines
  - Environment
  - Emergency Action Plan
- Optimizing performance
Case 1: Cough in a Swimmer

- Division 1 Collegiate Swimmer
- History of Asthma
- Currently using Albuterol pre exercise
- Complains of Cough, dyspnea, chest tightness with swimming
Exercise Induced Asthma (EIA)

- Epidemiology
  - Affects ~5 Million children and adolescents
  - 75-80% of asthmatics with EIA
- Presentation
  - Dyspnea, wheezing, cough, chest tightness
  - Symptoms peaking 5-10 min after exercise
  - Gradually resolves over several hours

Fitch KD et al. Asthma and the elite athlete: Summary of the IOC’s Consensus Conference: Amer Academy of Allergy, Asthma, and Immunology. 2008;122(2):254-60
Exercise Induced Asthma (EIA)

- Differential
  - Vocal cord dysfunction
  - Anxiety
  - Cardiac
- Diagnosis
  - Bronchodialator trial
  - Exercise challenge
  - Bronchial provocation
EIA Treatment

EIA Symptoms

Basic Asthma management

Beta agonists
Leukotriene modifier
Adequate warm up

Add Leukotriene modifier daily
Add Cromolyn Sodium

Reconsider diagnosis
Consider another sport

Chronic Concussion

• Case 2:
  • 21 year old division 1 soccer player
  • Complains of headache and dizziness with heading
  • History concussion 6 months prior
Epidemiology

• High School Statistics
  • Total Estimated Concussions 1.6 to 3.8 million annually
  • Represents 8% to 13% of all injuries
  • 80% recover in 10-21 days
• NCAA Statistics
  • ~2,000 concussions annually
  • 5.5 concussions per 10,000 AE
  • 90% RTP in 7 to 14 days
    • 35% RTP in 1 week

<table>
<thead>
<tr>
<th>Sport</th>
<th>Rate per 10,000 AE</th>
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<tbody>
<tr>
<td>Football</td>
<td>6.4</td>
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<tr>
<td>Ice Hockey (M)</td>
<td>5.4</td>
</tr>
<tr>
<td>Lacrosse (M)</td>
<td>4.0</td>
</tr>
<tr>
<td>Soccer (F)</td>
<td>3.4</td>
</tr>
<tr>
<td>Lacrosse (F)</td>
<td>3.4</td>
</tr>
<tr>
<td>Wrestling</td>
<td>2.2</td>
</tr>
<tr>
<td>Basketball (F)</td>
<td>2.1</td>
</tr>
<tr>
<td>Soccer (M)</td>
<td>1.9</td>
</tr>
<tr>
<td>Basketball (M)</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Chronic Concussion

- No set definition
  - Not healing in expected time
  - >4 weeks of symptoms

- Risk Factors
  - Migraines
  - Previous concussions
  - Mood disorders
  - ADHD
  - Softball
Treatment strategies

• Rest
• Early return to activity
• Trajectories
• Graded exercise
Strict Rest

- Historical Opinion
  - Rest is Best

- Research Supports
  - Limited rest
  - Early return to ADLs, School, physical activity
Trajectories

Vestibular

Anxiety/mood

Ocular-motor

Cervical

cognitive

Post-traumatic migraine

concussion
Cognitive/Fatigue

- Symptoms
  - Fatigue
  - Decreased energy
  - Non-specific headache
  - Sleep disruption
  - Difficulty concentration
- Neuropsychn testing
  - Memory
  - Processing speed
  - Reaction

- Targeted approach
  - Reducing demands
  - Sleep hygiene
  - Pharmacologic
    - Amantadine
    - Melatonin
    - Zolpidem
  - Physical Activity
    - Daily walks

Post Traumatic Migraine

- Symptoms
  - Migraines
    - Unilateral
    - Pulsating
    - Moderate to severe
    - Nausea
    - Photo/phonophobia
- Exam
  - Normal
  - Neuropsych testing
  - Memory deficits

- Targeted approach
  - Pharmacologic
    - TCAs
    - CCBs
    - Triptans
  - Exercise
    - Supervised
  - Sleep hygiene

Vestibular

- Symptoms
  - Dizziness
  - Fogginess
  - Nausea
  - Anxiety
- Exam
  - VOMS
  - BESS
- Neuropsych testing
  - Processing speed
  - Reaction time
  - Intact memory

- Targeted approach
  - Vestibular therapy
  - Pharmacologic
  - Co-morbid symptoms
    - Anxiety
    - Migraines
    - Dysregulated sleep

Ocular Motor

- Symptoms
  - Headaches
  - Fatigue
  - Distractibility
  - Pressure behind eyes
  - Visual tasks
  - Focusing
- Exam
  - VOMS
    - Convergence
  - Neuropsych testing
    - Visual memory
    - Reaction time

- Targeted Approach
  - Vestibular therapy
  - Neuro-optometrist
    - Near point >20 cm
    - Symptoms longer than 2 to 4 weeks
  - School accommodations
  - Physical Activity
    - Sport specific activities
    - No contact
Anxiety/Mood

- Symptoms
  - Increased anxiety
  - Sleep disturbance
- Exam
  - Normal
  - VOMS
    - If vestibular component
- Neuropsych testing
  - Normal

- Targeted approach
  - Vestibular therapy*
  - Exertion
    - Emotional release
    - Decrease arousal levels
  - Sleep hygiene
  - Pharmacologic
    - Melatonin
    - Klonopin

Cervical

- **Symptoms**
  - Neck pain
  - Headache
- **Exam**
  - C-Spine
- **Neuropsych testing**
  - normal

- **Targeted approach**
  - **Rehab**
    - C-Spine
  - **Pharmacologic**
    - NSAIDs
    - Muscle relaxors
Graded exercise

• Uses
  • Diagnosis and classification
  • Prescribe exercise regime
  • Confirming recovery

• Benefits
  • Quicker return
  • Decreases mood disorders

Buffalo Algorithm

Case 3:
19 year old Division 1 Distance Runner
Recurrent bilateral lower extremity stress fractures
Risk Factors

- Menstrual Irregularities
- Stress fractures
- Eating or weight advice from peers, coaches, or parents
- Depression
- Dieting

- Personality
- Early sport specialization
- Overtraining
- Recurrent injuries
- Inappropriate coaching behavior
### Stratification

#### Risk Factors

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Low Risk = 0 points each</th>
<th>Moderate Risk = 1 point each</th>
<th>High Risk = 2 points each</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low EA with or without DE/ED</td>
<td>□ No dietary restriction</td>
<td>□ Some dietary restriction; current/past history of DE;</td>
<td>□ Meets DSM-V criteria for ED*</td>
</tr>
<tr>
<td>Low BMI</td>
<td>□ BMI ≥ 18.5 or ≥ 90% EW** or weight stable</td>
<td>□ BMI 17.5 &lt; 18.5 or &lt; 90% EW or &lt; 10% weight loss/month</td>
<td>□ BMI ≤ 17.5 or &lt; 85% EW or ≥ 10% weight loss/month</td>
</tr>
<tr>
<td>Delayed Menarche</td>
<td>□ Menarche &lt; 15 years</td>
<td>□ Menarche 15 to &lt; 16 years</td>
<td>□ Menarche ≥ 16 years</td>
</tr>
<tr>
<td>Oligomenorrhea and/or Amenorrhea</td>
<td>□ &gt; 9 menses in 12 months*</td>
<td>□ 6-9 menses in 12 months*</td>
<td>□ &lt; 6 menses in 12 months*</td>
</tr>
<tr>
<td>Low BMD</td>
<td>□ Z-score ≥ -1.0</td>
<td>□ Z-score -1.0*** &lt; -2.0</td>
<td>□ Z-score ≤ -2.0</td>
</tr>
<tr>
<td>Stress Reaction/Fracture</td>
<td>□ None</td>
<td>□ 1</td>
<td></td>
</tr>
</tbody>
</table>

### Magnitude of Risk

- **Cumulative Score**
  - 0-1: Full Clearance
  - 2-5: Provisional/limited clearance
  - >6: Restricted or Disqualification
Treatment

- Multidisciplinary Approach
  - Physician
  - Dietician
  - Psychology
  - Athletic Trainer
- Patient Education
  - Athlete Buy in
  - Treatment contract

- Goals
  - Increase Energy
    - Reversal of weight loss
    - Goal BMI >18.5 or 90% of ideal BW
  - Restore normal menses
    - Return to body weight associated with normal menses
  - Increase bone mineral density
    - Optimizing weight gain and normal menstruation
    - Evaluating Vitamin D and Calcium
Principles

- Maturity of the Athlete
- Level of play
- Time of season
- Risks of progression
- Risk of re-injury
- Long term consequences
Spondylolysis

Case Study

• 13 year old gymnast
• Pain is 8/10 currently during competition and practice
• Back pain for 6 mos.
• Worst in extension
Epidemiology: Low Back Pain

- Low Back Pain
  - 8-12% General Pediatrics
  - As high as 37% in competitive athletes
- Spondylolysis
  - 4-8% incidence in general population
  - High incidence in athletic population
    - Most Common Identifiable cause of back pain
    - Up to 47% of diagnosis

Beck NA, Miller R, Baldwin K. Do Oblique views add value in the diagnosis of spondylolysis in adolescents?
Epidemiology: Adult vs Adolescent

Spondylolysis: High Risk Sports
Spondylolysis: Presentation

- Low Back Pain
  - +/- Radiation to the buttocks
  - Several weeks to several months
- Activity related
- Insidious onset
- Worse with hyperextension
Stork Test

Table 3: Analysis of the one-legged hyperextension test for each side

<table>
<thead>
<tr>
<th></th>
<th>Left side</th>
<th>Right side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (%)</td>
<td>50</td>
<td>55.2</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>67.6</td>
<td>45.5</td>
</tr>
<tr>
<td>Negative predictive value (%)</td>
<td>41.3</td>
<td>46.9</td>
</tr>
<tr>
<td>Positive predictive value (%)</td>
<td>40.5</td>
<td>53.8</td>
</tr>
<tr>
<td>Pearson's $\chi^2$ p value</td>
<td>0.132</td>
<td>0.952</td>
</tr>
</tbody>
</table>

Masci L, Pike J et al. Use of the one-legged hyperextension test and MRI in the diagnosis of active spondylolysis. BJSM. 2006;40:940-6
Conservative Treatment

• Retrospective Review
• 67 patients
  • Age 7-32 (16)
• Conservative treatment
  • Boston Brace
    • 23 hrs of the day for 6 months
    • 6 month wean
  • Stretching and Strengthening exercises

Outcomes
• Radiographic
  • 18% showed bony healing on x-ray
• Clinical Outcomes
  • Excellent: 52/67 (87%)
  • Fair: 9/67 (13%)
  • Poor: 6/67 (9%)
  • Required fusion

Steiner ME, Micheli LJ. Treatment of symptomatic spondylolysis and spondylolisthesis with the modified Boston Brace. Spine. 1985;10(10):937-43
Is Bracing Necessary

- Meta-analysis of 665 patients
  - Adolescent to young adults
  - Spondylolysis up to grade 1 listhesis
- 84% had successful clinical outcomes
  - Bracing: 89%
  - No Bracing: 86%

Steiner ME, Micheli LJ. Treatment of symptomatic spondylolysis and spondylolisthesis with the modified Boston Brace. Spine. 1985;10(10):937-43
My Approach to Spondylolysis

• Diagnosis
  • X-Ray: AP and Lateral Only
  • Adv Imaging
    • Prefer MRI
      • Limits ionizing radiation
      • Just as sensitive as Bone Spect
      • Able to Grade Lesions
      • Evaluates for other pathology
  • Repeat Imaging
    • X-Ray: Only if Listhesis
      • Single Lateral View only
Treatment

• Rest
  • Definition:
    • Removal from all athletics
    • Avoiding non athletic activities that increases pain
    • ADL’s Only
  • Duration depending on Staging
    • Early to Progressive: 3 months
    • Terminal: Until Asymptomatic

• Bracing
  • Pain during ADL’s
  • May sleep in brace if needed

• Therapy
  • Start when Pain Free
Chronic Exertional Compartment Syndrome (CECS)

Case

- 17 year old female cross country runner
- Complains of bilateral calf pain with running x 2 months
- Previous varsity soccer player with no issues
What is CECS

- Definition
  - Increase stretch and tension of the fascia
  - Compression of arteries and nerves
  - Reversible ischemia
  - Pain that is relieved with rest
- 4 compartments
  - Anterior (45%)
  - Lateral (10%)
  - Superficial posterior (5%)
  - Deep posterior (40%)
Epidemiology

- 95% occurs in the lower extremity (LE)
- 2nd most common cause of LE pain
- 87% of patients are athletes
- Occurs bilaterally in up to 80% of cases
Signs and Symptoms

• Exertional calf pain
• Swelling in the affected compartment
• Parasthesias
• Nerve palsys
Differential

- Medial tibial stress syndrome
- Stress fracture
- Functional popliteal artery entrapment
- Nerve entrapment
Diagnosis

- Compartment testing
  - Pre Exercise > 15 mmhg
  - 1 minute post exercise >30 mmhg
  - 5 minute post exercise >20 mmhg
- MRI
- Ultrasound
Surgical Treatment

• Pros
  • Gold Standard
  • Successful
    • Ant. Compartment 80-100%
    • Return to full activity in 90% of patients

• Cons
  • Season ending
    • 8-12 week recovery time
  • Unsuccessful
    • Deep post. Compartment 50-65%
    • Up to 19% recurrence rate
  • High complication rate
    • up to 13%
Non-Surgical Treatment

- Activity Modification
  - Reduce mileage, practices, drills, etc.
- Running evaluation
- Physical therapy
  - Stretching
  - Manual therapy
- Change of sport
Botulinum Toxin

- Experimental
  - Case reports only
    - 94% success rate
    - 88% with normal compartment testing
    - Mild weakness but no functional limitations
- When to consider
  - In season athlete
  - Non surgical candidates
The Athlete Whose Not Getting Better

- Reasses
  - Right diagnosis
  - Right therapies
  - Surgical options

- Contributing factors
  - Compounding issues
  - Burnout
Questions