Adolescent Sports Injuries

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POFPS
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Disclosures

• Dr. Leary has provided no disclosures.
Objectives

- Identify and Treat Growth Injuries
- Diagnose and Treat Back Pain
- Differentiate Knee Pain
- New Treatment options for Shin Splints
- Discuss Burnout, Bullying, and Mental Health
- Incorporate nutrition (Obesity) hydration and sleep
- Discuss Diagnostics and Treatment
- Prevention of Overuse Injuries

Osteopathic Medicine

1. The body is a unit.
2. The body possesses self regulatory mechanisms.
3. Structure and function are reciprocally interrelated.
4. Rational therapy is based upon an understanding of body unity, self regulatory mechanisms, and the inter-relationship of structure and function.

Issues

- Osteochondrosis (Apophysitis) (hip, knee, foot, elbow, back shoulder)
- ACL Injury
- Concussion
- Alignment/Posture
- Neuromuscular imbalance
- Patella Femoral Pain
- Stress Fractures
- Female Triad
- Low Back Pain
- Osgood-Schlatter, SLJ
- MTSS/shin splints
- Ankle Sprains
- Over usage, Coach & Parental Abuse
- Substance Abuse
- Sleep and Rest
- Bullying
- Suicide
- Obesity
- State of Mind

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“Adolescent Sports Injuries”
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Suicide

• 1965-1987 tripled in teens
• 1980-1996 >105% AA 15-19

SYMPTOMS:
• EXTREME PERSONALITY CHANGES
• Loss of interest in activities that used to be enjoyable
• Significant loss or gain in appetite
• Difficulty falling asleep or wanting to sleep all day
• Fatigue or loss of energy
• Feelings of worthlessness or guilt
• Withdrawal from family and friends
• Neglect of personal appearance or hygiene
• Sadness, irritability, or indifference

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Rise in teen suicide, social media coincide; is there link?

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Drug Use

More teens using HGH and steroids

Use of human growth hormone by American teens more than doubled last year, according to a confidential national survey.

10 percent

10 percent

10 percent

11 percent

Source: Partnership for Drug-Free Kids

Epidemiology of Children in Sports

- 20-30 million kids in organized sports today
- >3 million will be injured this year
- 750,000 will need to go to the E.R.
- 21% of traumatic brain injuries in children related to sports

Odds of Making It in the NFL

- Invited to Combine: 350
- Players drafted by NFL: 256
- Rookies making a Team: 300
- % of players NCAA to NFL: 1.6%
- NFL players reaching YR 4: 150
- 2014 NFL Min Salary: $420,000
- Income after Taxes (est.): $252,000

What's going to be for you and your family after football is over?
Why Are Kids Getting Injured More Often?

- Glamorization of professional sports
- Overall decrease in physical fitness among children
- Increasing popularity of extreme sports
- Often less parental and coaching supervision

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Child or Adolescent?

- **Children** (Tanner stage 1-2)
  - Boys up to 13 y.o.
  - Girls up to 11 y.o.
- **Adolescents** (Tanner Stage 3-5)
  - Boys 14-18 y.o.
  - Girls 12-18 y.o.

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Development

• Equal playing field
• Tanner Staging

Kids Are Not Miniature Adults

• Physical Differences
  – less coordinated
  – slower reaction times
  – kids mature at different rates
  – growth plates (physes) are susceptible to stress
**Psychological Differences**

- Still developing self-esteem, identity, and relationships
- Motivation may come from others
- “Losing” vs “Loser”
- “Winning isn’t everything”

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**Will it damage growth plates?**

“Total of 1109 children and adolescents lifting at national meets over a 4 year period showed:

A) No growth plates injuries
B) No serious injuries requiring hospitalization or surgery**

Minor injuries such as muscle strains are common among children and adolescents as in their adult counterparts that do strength training.*

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*Reed, MP. Injury patterns of preadolescent and adolescent weightlifters: a five-year retrospective study. Masters of Science

---

**Total of 1109 children and adolescents lifting at national meets over a 4 year period showed:

A) No growth plates injuries
B) No serious injuries requiring hospitalization or surgery**

Minor injuries such as muscle strains are common among children and adolescents as in their adult counterparts that do strength training.*
A few growth plate fractures have been reported in children who lifted weights, but further investigation of these cases resulted in findings of excessive loading and improper supervision.


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Chronic Conditions
Repetitive Microtrauma Overuse 60%

- Shin Splints (MTSS)
- Sever’s Disease
- Osgood-Schlatter, SLJ
- Patellofemoral Pain Syndrome
- Little League Elbow and Shoulder
- Stress Fractures
- Low Back pain, Spondylolisthesis
- Burn Out, State of Mind

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"A fit player is better than an injured star"

Age 17-68

Reduction Programs

- FIFA 11
- Sportsmetrics Hewitt
- PEP Mendelbaum
- ACL Jump Movement Patterns Beutler
- 10 minute injury prevention
ACL Injury

- Pivot and twisting movement at less than 21 degrees of flexion.
- 66-90% non-contact
- Anterior Cruciate Ligament prevents anterior translation and rotation of tibia and prevents hyperextension
- Lateral meniscus = acute ACL
- Medial meniscus = chronic ACL
- 250,000 per year in USA
- 100,000 ACL repairs
- 28,000 female repairs
- Sixth most common orthopedic surgery
- $25,000
- Muscle Imbalance: Quadriceps > Hamstrings
- Rapid growth in skeletal immaturity
- Neuromuscular imbalance
- Side to side disparity

ACL Injury

- Notch size and ligament size controversial (Barrett)

http://www.aafp.org/afp/2006/0315/afp20060315p1014-f7.jpg

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CONCUSSION
Journal of Pediatrics
ER Concussion Study August 2010

- 14-19 yo 3x 7,000-22,000 1997-2007
- 8-13 yo 2x 3800-8,000 1997-2007
- 3 million pre high school participants
- 1.5 million high school participants
- 64,000 NCAA
  1200 schools
  19000 teams
  490,000 student athletes
- 1592 Pro Football #POFPS43
Zak Lysted Law

- Education
- Symptomatic – NO RETURN
- Qualified Physicians??
  Primary Care Sports Medicine
  Orthopedic Surgeons
  Neurologists
  Psychologists
HB301 Briggs of Pennsylvania

Sentinel Issues
- More Concussions than we know about
- Under Reporting and Over Diagnosing
- Anecdotal and Unreliable Literature
- Women and Children Suffer
- Multiple concussions have consequences
- Early RTP can be catastrophic
- Ocular and Vestibular Involvement
- Long term deficits can result from repetitive head injury
- Holistic treatments may help

RTP per Physician
- Serial Physical Exams
  Visual Acuity
- Concussion History
  Diagnostics CT/MRI
- NeuroPsych Testing
  SAC, SCAT 5, Computer
- Balance Testing
- Family Observations
- School Work
- Social
- Sleep
- Appetite
- Exertion Testing/Graded Aerobic Protocol
- Enthusiasm to Return
- ATC/Coaches Opinion
- Age/Gender/Tanner /Sport/Position
- Parents Expectations
- Prevention Counseling
- Equipment / helmet fit/ mouthguard
- EDUCATION
- Strength and Fitness

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Future

- Better Education
- Accurate and Honest Reporting
- Better Fitting Equipment
- Better Enforcement “recidivist violators”
- Less Contact during practice
- Fewer practices
- Shorter Field
- PPE with neuropsych vestibular/ocular base line testing
- Systemic Markers
- No RTP with symptoms at rest or exertion
- Age and Gender Considerations
- Intelligent Sports options based upon access, physique, talent and desire.
- Zak Lysted Laws
- Liability

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Case 1
17 y/o Caucasian male presents to your office

- concerns of ‘the flu’
- nausea, headache, and dizziness for the past three days.
- Football teammates with similar symptoms
- Further questioning indicates ‘bell rung’ at practice
- Played through it, felt fine, and ran back an interception

Supervised RTP Protocol
(Return to Learn)

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No activity</td>
<td>Physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling keeping intensity 70% maximum predicted heart rate. No resistance training</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>Sport-specific exercise</td>
<td>Skating drills in ice hockey, running skills in soccer. No head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>Non-contact training drills</td>
<td>Progression to more complex training drills, eg passing drills in football and ice hockey. May start progressive resistance training</td>
<td>Exercise, coordination, and cognitive load</td>
</tr>
<tr>
<td>Full contact practice</td>
<td>Following medical clearance participates in normal training activities</td>
<td>Restore confidence and access functional skills by coaching staff</td>
</tr>
<tr>
<td>Return to play</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

Education

STOP SPORTS INJURIES
SAFE KIDS ONE AREA

Heads Up

For Physicians About Mild Traumatic Brain Injury (MTBI)
Future

- Better Education
- Better Fitting Equipment
- Better Enforcement “recidivist violators”
- Less Contact during practice
- Fewer practices
- Shorter Field
- PPE with neuropsych/balance/visual base-line testing
- When in doubt hold them out
- No RTP with symptoms absent or minimal
- Age and Gender Considerations
- Intelligent Sports options based upon access, physique, talent and desire.
- Zak Lysted
- Liability

Anterior Knee Pain

- Tibial tubercle-OSD
- Inferior pole-SLJ
- Peri-patellar pain PFS

Osgood Schlatter
Osgood-Schlatter Disease

- Common in ages 10-14
- Occurs after repeated strenuous activities
- Causes pain over ant. Tibial tubercle
- Treated with “relative rest,” knee strap, ice
- Most have no long term problems

Osgood Schlatter

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Frieberg’s Infraction

- Osteochondrosis of 2nd Met head (3rd met)
  - D/t: avascular necrosis of 2nd met. epiphysis
  - Suspect: Morton’s foot shape w/ poor shoe fit
- Seen in adolescents, 3:1 female/male ratio
- Sx/ Signs: Pain under met head w/ activity
  - X-ray: Early- osteosclerosis (2-3wk process)
  - Late- Osteolysis and met head collapse
  - Bone scan- see osteochondrosis early

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Sever’s Disease

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8mm lesion medial subtalar dome
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13 yo Pitcher

Pitch Counts
- Sliders  86% increased risk of elbow injury
- Curveballs  52% increased risk of shoulder injury
- 5 x Age
- 75 pitches/game
- 600 pitches/season

Case # 1
- 15 year old white male  three sport athlete from Florida three weeks of exertional lower leg pain
- Compartment Syndrome?
- Stress Fracture?
- Medial Tibial Stress Syndrome?
Shin Splints

- MTSS
- ATSS
- PTSS

Shin Splints (MTSS)

- An overuse injury, often in untrained athletes
- Causes pain along medial aspect of lower leg (tibia)
- Treated with “relative rest”, stretching, PT, Foam Roller
- Biomechanical exam
- Prolotherapy

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• Referred knee pain
• @13yoa
• Surgery
• Bilateral

Legg-Calve-Perthes Disease
• Boys 4-8
• 4x more likely than girls
• Atraumatic limp
• Referred knee pain
• Leg length
• Abnormal birthing

Tensegrity // Postural Decompensation
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Muscle Imbalance

Scapulothoracic Dysfunction

- Deep Squat.
- Hurdle Step
- In-line Lunge
- Shoulder Mobility
- Active Straight Leg Raise
- Trunk Stability Push-up
- Rotary Stability

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Stress Fracture

- Too Much
- Too Often
- Too Hard
- Too Fast
- Too Soon
- Grow
- Repair
- Play

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Posterior Proximal Tibial Compression

- Tanner Stage
- Nutrition
- Overuse

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Incidence

- Track and field 31%
- Crew 8%
- Basketball 4%
- Lacrosse 3%
- Soccer 3%
- 15% of athletic injuries

Stress Fractures

- Year around athlete with repetitive mechanical loading
- California, Florida
- 3.5 times women>men
- White > black 2x
- Age???
- Tibia 50%
- Metatarsals 14%
- Fibula 7%
- Tarsal 3%
- 1/4 exercise induced leg pain.

Stress Fractures Pathophysiology

- Histological changes resulting from bone stress occur along a continuum, beginning with vascular congestion and thrombosis
- This is followed by osteoclastic and osteoblastic activity, leading to rarefaction, weakened trabeculae and microfracture
- Ends in complete fracture
Stress Fractures

- Tibia
- Pars
- Navicular
- Jones
- 5th metatarsal
- Insufficiency vs. fatigue
- Too much!
- Too often!
- Too soon!

Metatarsal Stress Fractures
Case 2
13 y/o female gymnast

- Low back discomfort and spasm for past 7 months
  - Intermittent without injury or mechanism
- Plays volleyball, basketball, and track for school
- Ankle injury two years ago and otherwise healthy
  - Functional Low Back Strain
  - Pars Interarticularis
  - Idiopathic Scoliosis

Low Back Pain

AGE GROUP:  ETIOLOGY:
- Prepubescent  trauma, infection
- Adolescent  spondylolysis 48%
- Adult  OA, HNP
- Elderly  OA, Stenosis

85-90% Lifetime Incidence

Diagnostics

- Oblique plain films
- Spect scan
- MRI
- Reverse angle CAT Scan
- Vitamin D3
- Dexa
Recommendations

- Injury Surveillance
- PPE
- Risk Factors
- Coach Education and Medical Supervision
- Sport Alterations
- Training and Conditioning and Prevention
- Delayed Specialization

Injury Prevention

- Body Map
- Functional Movement Screen
- ACL Prevention
- Concussion Center
- Education (Coaching Clinic)
- Seasonal Overuse
- Footwear
- Nutrition
- Supplements

"50% of Overuse Injuries are preventable"

1993 Med Sci Sports Exerc
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Proper Supportive Footwear
Ground Reactive Forces

Table 1: Symptoms of Overtraining

<table>
<thead>
<tr>
<th>SYMPTOMS DURING TRAINING</th>
<th>PHYSICAL SYMPTOMS</th>
<th>NONPHYSICAL SYMPTOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal workouts feel more difficult</td>
<td>Persistent fatigue</td>
<td>Difficulty sleeping</td>
</tr>
<tr>
<td>Early fatigue during workouts</td>
<td>Ongoing muscle soreness</td>
<td>Feelings of irritation or anger</td>
</tr>
<tr>
<td>Faster heart rate with less effort</td>
<td>Loss of appetite</td>
<td>Feelings of depression</td>
</tr>
<tr>
<td>Decreased strength</td>
<td>Increased aches and pains</td>
<td>Lack of motivation</td>
</tr>
<tr>
<td>Decreased coordination</td>
<td>Increase in overuse injuries</td>
<td>Fear of competition</td>
</tr>
<tr>
<td>Physical challenges seem too hard</td>
<td>Frequent colds or infections</td>
<td>Difficulty concentrating</td>
</tr>
<tr>
<td>Decreased performance on strength, speed, or endurance testing</td>
<td>Lower resistance to common illnesses</td>
<td>Increased sensitivity to emotional stress</td>
</tr>
</tbody>
</table>

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Recent Literature

- Journal of Athletic Training. 2011
“Adolescent Sports Injuries”
Patrick F. Leary, DO, MS, FAOASM, FACSM, FACOFP, FAAFP

References

Overuse Injuries and Burnout in Youth Sports Can Have Long-Term Effects
The American Medical Society for Sports Medicine
Jan 2014

OSTEOCHONDROSIS: Common cause of pain in growing bones. Am Fam Physician Feb 2011

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Carlo Dimarco DO
1952-2014

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Recent Publication

- Considerations in the management of concussion with an illustrative case example

Craig Chappell, DO, Patrick F. Leary, DO, FAOASM, FACSM, FACOFP, FAAFP
Nicole Cerklewich, OMSIV

From the Lake Erie College of Osteopathic Medicine, Erie, PA.

Concussions are extremely common injuries, especially among student athletes. With emerging guidelines that will require physicians to make decisions regarding injured athletes’ return to physical activity, the family physician will soon be faced with more frequent questions from injured athletes and with new responsibilities to help ensure patients’ safety. Assessment tools such as Sport Concussion Assessment Tool and neurocognitive testing will assist with evaluation and return to play decisions, but ultimately, it is important for the physician to develop a strategy for comfortably and appropriately managing this frequently encountered and challenging problem.

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KEYWORDS: Concussion; Sport; Neurocognitive testing; Return to play; Student athlete

Concussion is a common injury among high school student athletes participating in high-energy sports. The Centers for Disease Control and Prevention reports that there are 2 million nonfatal sports-related concussions in the United States per year.1 The family physician has the greatest potential to impact the outcome of this condition both on the sidelines and in the office. As new information becomes increasingly available, it is imperative for the family physician to be comfortable with the diagnosis and management of the concussed athlete. There is no cure for concussion, so the most important consideration clinically is the safe and timely return of the athlete to activity after injury.2,3 This becomes even more important as emerging practice recommendations make the family physician responsible for return-to-play decisions.

Of the 2 million sports-related concussions occurring each year, more than 136,000 involve high school athletes.4 In the United States, there are currently 14,226 high schools with more than 7.6 million athletes. Of those, more than 1.1 million athletes participate in 11-player football.5 Recent information suggests that most high school concussions happen as a result of football (57%), followed by girls soccer (12%).2 Most concussion (69%) occurs during competition rather than during practice situations,2 but an overwhelmingly large number of high schools do not have a physician on staff to assess injured athletes. The American Osteopathic Association of Sports Medicine and the American Medical Society of Sports Medicine have roughly 2200 active members combined, according to their representatives. Compare this with the 7.6 million athletes and it becomes obvious that the majority do not have specialized Sports Medicine physicians readily available. According to the Center for Injury Research and Policy in Columbus, Ohio, less than 50% of the 14,226 US high schools are covered by a certified athletic trainer (ATC). This is in contrast to college and professional football coverage, where multiple physicians and ATCs are present during games and practice. Although professional football receives increased media coverage and attention, there are currently 32 teams with less than 1700 active professional football players on the rosters in the National Football League.