Overuse

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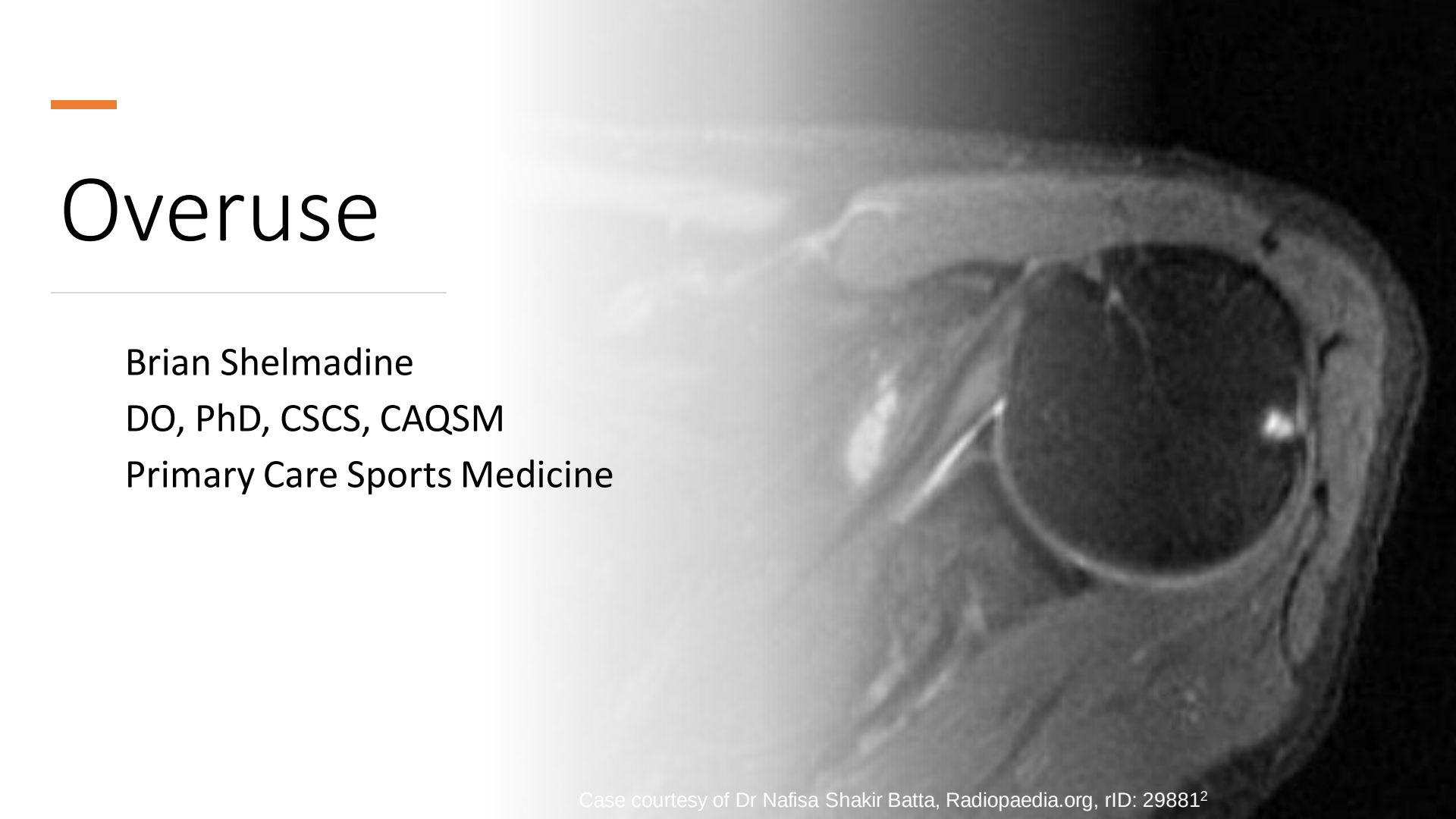


Case courtesy of Dr Nafisa Shakir Batta, Radiopaedia.org, rID: 29881[2]

Conflicts of Interest

None to declare

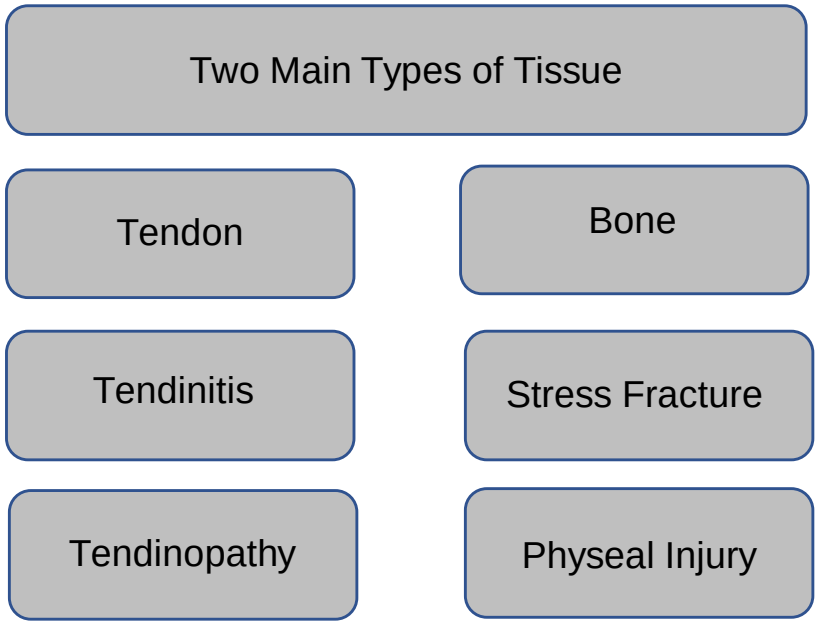
Objectives

Identify	Identify the pathophysiology of overuse injuries
Discuss	Discuss the symptoms of overuse injuries
Describe	Describe the treatment of overuse injuries

Overuse Injury

- Injury
  - Absence of a single, identifiable traumatic cause
  - Repeated microtrauma accumulates over time
- Imbalance
  - Between load vs rest/recovery

Overuse Injury



Overuse Injury

- Predisposition
  - Intrinsic vs extrinsic
    - Intrinsic
      - Malalignment of limbs, muscular imbalance, other anatomic factors
    - Extrinsic
      - Training errors, faulty techniques, incorrect surfaces and equipment, poor environmental conditions

Overuse Injury

- Degenerative process
  - Normal process
    - Aging
  - May add to likelihood of certain injuries
    - Rotator cuff
    - Achilles tendon

Tendinitis vs Tendinopathy

A 38-year-old male runner presents to your office complaining of right sided Achilles tendon that started nagging him about 7 months ago. He tried to take some time off, buts states he "needs to run because it keeps him sane" as he has a stressful job. He has also been planning to run a virtual half marathon in November and has been trying to increase his mileage lately though his pain has been worse over the past four weeks. He has had more and more difficulty performing his longer runs, but now cannot run at all. Which of the following is true regarding Achilles tendinopathy?[8]

A. Most patients fail non-operative measures, even if the condition is treated early
B. Achilles tendinopathy is a degenerative, as opposed to inflammatory, condition
C. Surgery is required in most cases involving decompression of the tendon by tenotomy and aggressive measures to improve the local circulation
D. Surgery is recommended after non-operative methods of management have been tried for at least three months

Overuse injury: Tendon

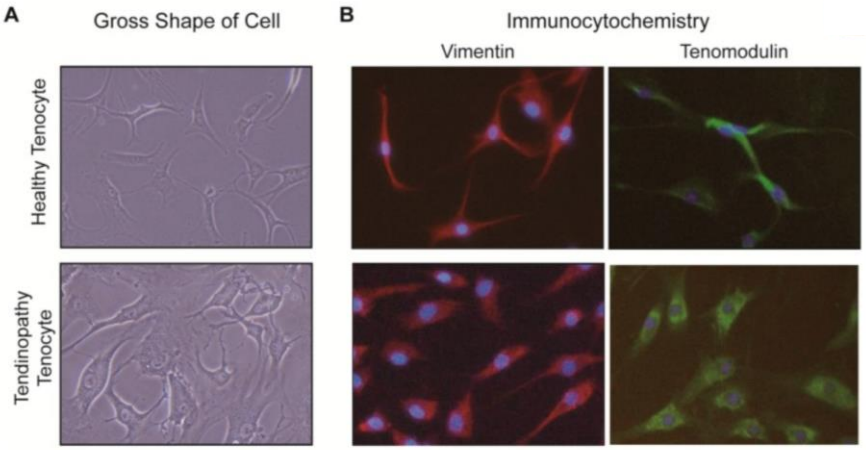
Considerations

- Tendon healing is a delicate and prolonged process
- Minor disruptions to any stage of healing can prolong this process
- If several disruptions occur healing is not likely to ever be complete
- Various types of tendon degeneration have been described by electron microscope
    - Hypoxic, hyaline, mucoid/myxoid, fibrinoid, lipoid, calcific, fibrocartilaginous

Overuse injury: Tendon

- Essence of tendinopathy is a failed healing response.
  - Hypothesized to result from inflammatory changes in the tendon
  - Secondary to frequent or excessive use
- There is a question of how much inflammation actually plays a role as NSAIDs are frequently ineffective in treatment.

Overuse injury: Tendon



Healthy vs Tendinopathic tenocytes under light microscopy. [4]

- First few days after tendon injury are marked by migration of inflammatory cells
  - Macrophages
  - Monocytes
- Failed healing
  - Change in tenocytes
  - Evidence of matrix disorganization
  - Increased ground substance
  - Separation between collagen fibers

Overuse injuries: Tendon

Risk factors

- Increased low grade inflammatory state
- High volume mechanical load
- Increase rate of load relative to current trained state
- Biomechanics/poor technique
- Also “underloading” or detraining may paradoxically increase
    - Result in imbalance between matrix metalloproteinases and inhibitors
    - Results in tendon degradation

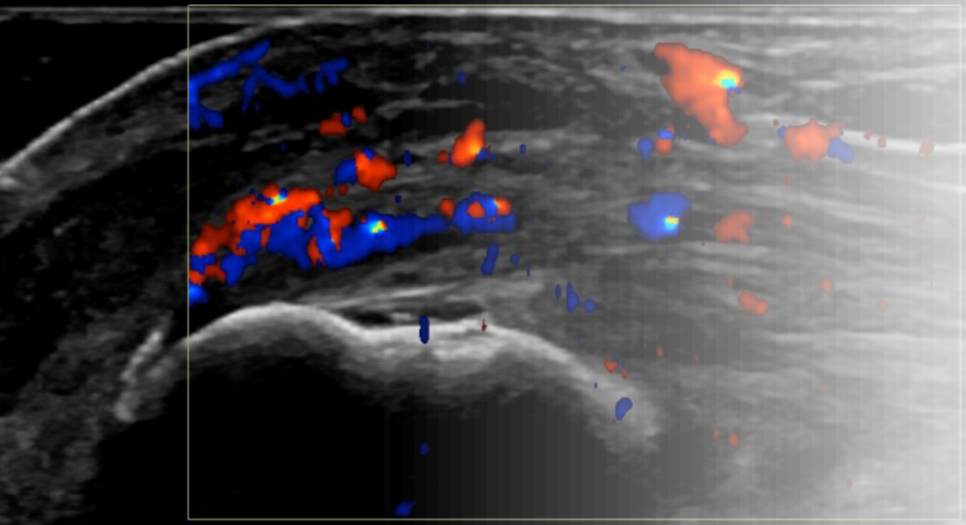
Overuse injuries: Tendon

Histology

- A spectrum of this disorder
  - Initial stages could be more inflammatory based
    - If inflammation is present in biopsies it is rare and associated more with partial rupture
  - End stages
    - Disorganized fibers with loss of parallel orientation
    - Decrease in collagen fiber diameter and density
    - Increase in Type III fibers
    - Increase in vascularity

Overuse Injury: Tendon

- Presentation
  - Pain
  - Swelling
  - Diffuse or localized
  - Impaired performance



Case courtesy of Dr Henry Knipe, Radiopaedia.org, rID: 65665[5]

Overuse Injury: Tendon

- Diagnosis
  - Largely Clinical
  - Imaging
    - US
    - MRI

Overuse injuries: Tendon

General Classification

- Stage I
  - Pain after activity only
- Stage II
  - Pain during activity, does not restrict performance
- Stage III
  - Pain during activity, restricts performance
- Stage IV
  - Chronic, unremitting pain, even at rest

Overuse injuries: Tendon

Management

- 1st line is conservative
  - Anti-inflammatories
  - PT
    - Eccentric contractions
    - Shockwave therapy
    - Cryo vs Heat
    - US
- Injections
  - CSI
  - Orthobiologics
  - HVIGI

Overuse injuries: Tendon

Management

- If 1st line fails
    - Consider more invasive options
        - Tenotomy
        - Tenex
        - Surgical Referral
- Pain
    - Primary source of pain
        - May be altered peripheral neuronal phenotype

Stress Reaction and Stress Fracture

A 20-year-old female thrower is scheduled in your injury clinic. She indicates that for the past several weeks she has developed pain on the lateral part of her left foot. There was not an acute injury. She has had an increase in training volume lately over all but has really been focusing on transitioning from gliding to spinning for the shot put but has also started to throw the hammer. Her ankle exam is normal, but her left foot has mild swelling and is tender at the base of the left 5th metatarsal.
She is has also lost 15 pounds over the last 8 weeks. She was found to have a stress reaction of the base of the 5th metatarsal. Which of the following are risk factors for lower limb stress fractures in general?

A. New shoes, increased frequency or duration of workload, hard training surfaces
B. Shoes older than 6 months old, increased frequency or duration of workload, soft training surfaces training surfaces
C. New shoes, dec frequency or duration of workload, soft training surfaces
D. Increased frequency or duration of workload, hard training surfaces, shoes older than 6 months old

Overuse injuries: Stress reaction/stress fracture

D) Increased frequency or duration of workload, hard training surfaces, shoes older than 6 months old

Additional risk factors

- Poor training technique
- Runners, gymnasts, female athletes
    - Exhibit higher rates

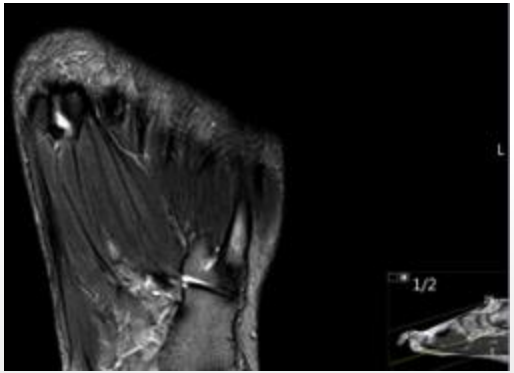
Overuse injuries: Stress reaction/stress fracture

Stress Reaction

- Possible precursor to stress fracture
  - Cause is unclear
- MRI
  - Shows up as change in signal intensity from rest of the surrounding bone

Stress Fracture

- Microfractures
  - Cortical bone
- MRI
  - distinct fracture line but this may not be visible on radiograph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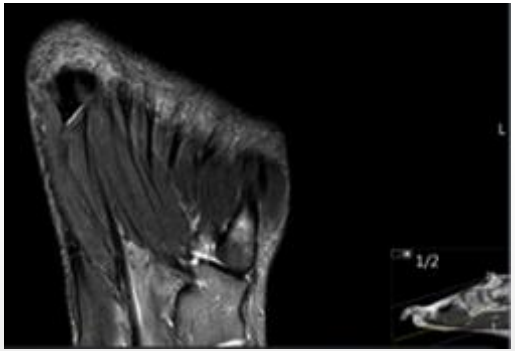
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Overuse injuries: Stress management/stress fracture

- Presentation
  - Insidious onset
  - Localized pain
  - Progression of pain
    - Early phases only hurts at end of activity
    - Later phases hurts with all activity

Overuse injuries: Stress management/stress fracture

Exam

- Focal bony tenderness
- Swelling
- Erythema
- Warmth
- Less Sensitive tests
  - Tuning fork, fulcrum, hop

Overuse injuries: Stress management/stress fracture

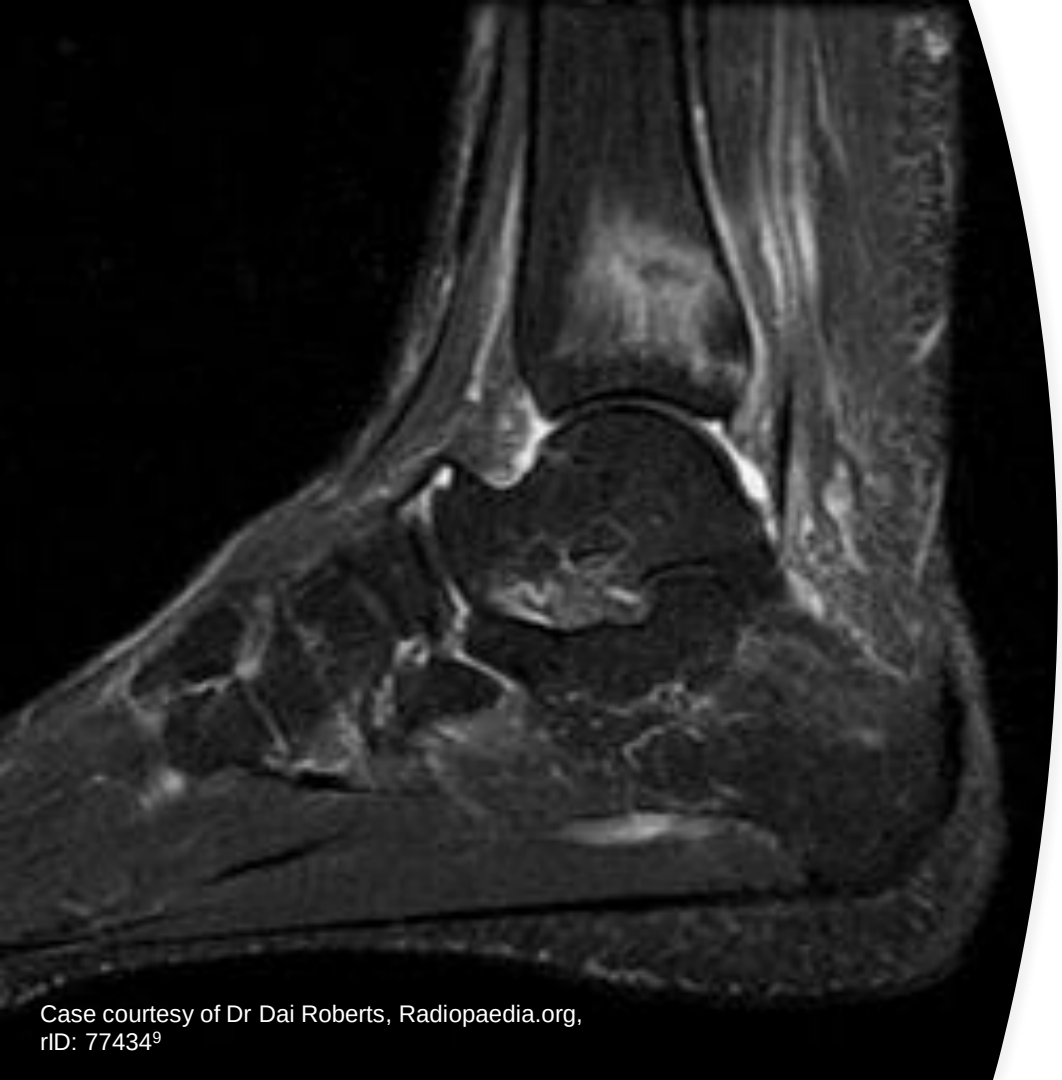
Exam

- Functional Assessment
- Biomechanical abnormalities
- Muscular imbalance
- Foot mechanics, genu varum, femoral anteversion, leg length discrepancies

Overuse injuries: Stress management/stress fracture

Imaging

- MRI study of choice
- Bone scan
- CT
  - Differentiate lesions seen on bone scan
  - Osteoid osteoma
  - Osteomyelitis
  - Malignancy



Case courtesy of Dr Dai Roberts, Radiopaedia.org, rID: 77434[9]

Overuse injuries: Stress management/stress fracture

Work up

- Imaging
  - Used if uncertainty persists in Dx
  - To grade severity
  - Guide Tx

Overuse injuries: Stress management/stress fracture

- Adjunctive Treatment
  - Ultrasound
    - Acute tibial shaft
    - Distal radius
    - Navicular
  - Bone Stimulator
    - Not good RCT for stress fractures

Pediatric Overuse Injuries in Sport

An 8-year-old female is brought into your office by her mother who states her daughter has begun to complain of pain in the back of her heel lately. She first started complaining of the pain about 2 weeks ago. Since that time the pain has only increased. The pain now is present with walking in tennis shoes and is worse at night. She is on the competitive cheer team, dances ballet, and dances tap. Mom has not given any oral medications. She has tried heel lifts and purchased new shoes at the local running store, but nothing has helped. Which of the following does this child most likely have?

A. Iselin
B. Sever
C. Sinding-Larsen-Johansson
D. Freiberg


NWB
R
GM

Pediatric Overuse Injuries:
Apophyseal stress injury

- Apophysis
  - the weakest part of the bone
  - highly prone to injury in youth athletes
- Injury
  - most often sustained during athletic practice or competition
  - develops in response to excess stress placed on immature bony and soft tissue structures.

Pediatric Overuse Injuries:
Apophyseal stress injury

Apophyseal Stress Injuries

- Upper Extremity
  - Little league Shoulder
  - Little League Elbow
  - Gymnast Wrist
- Lower extremity
  - Osgood-Schlatter
  - Sever disease
  - Sinding-Larsen Johansson Disease
  - Iselin Disease

Pediatric Overuse Injuries:
Apophyseal stress injury

Risk factors

- Modifiable
  - Flexibility
  - Strength
  - Training volume & Load
  - Coaching styles
- Nonmodifiable
  - Accelerated growth phase
  - Age
  - Body size
  - History of previous injury

Risk Factors

- Constant loading during growth spurt
- Anthropometric measures
    - increased height and weight
        - development of elbow pathology
- Pitch type and selection
    - breaking pitches
        - more at risk to develop shoulder and elbow pain when compared with those who did not
- Pitch count
- Competing while fatigued

Pediatric Overuse Injuries: Apophyseal stress injury

Presentation

- Pain in area of apophysis in immature athletes
- Increased with activity
- Pain with use or stretching of muscles attaching to the area

Pediatric Overuse Injuries: Apophyseal stress injury

Physical Exam

- Tender to palpation over apophysis or physis
- Often tight musculature surrounding the site
- Possible that warmth, erythema, swelling

Case courtesy of Dr Mohammad Taghi Niknejad, Radiopaedia.org, rID: 20861[7]

Pediatric Overuse Injuries: Apophyseal stress injury

Imaging

- Radiograph
  - Often find sclerosis, but can be present regardless of pain
  - Fragmentation
  - Often used for rule out other causes
  - comparisons
- MRI
  - Rule out stress fracture, lytic lesions, infection

Pediatric Overuse Injuries: Apophyseal stress injury

Treatment

- Activity modification
- 3 to 5 months of active rest with complete cessation of sports[2]
- Others modify based on symptom presentation[2]
- Severe cases
  - Immobilize vs Surgical Case
- Know the patient
  - will they comply
  - will the parent comply

Pediatric Overuse Injuries: Apophyseal stress injury

Prevention Strategies

- Correction
  - modifiable risk factors
  - Deficits in trunk and LE flexibility Attributed to rapid changes in growth
  - biomechanical errors
- Increase CV fitness

Pediatric Overuse Injuries: Apophyseal stress injury

Prevention Strategies

- Gradual progression and variation of training loads
- Parents should be cognizant of rapid changes in growth
- USA Baseball
    - implemented yearly, seasonal, and game pitch count limitations based on an athlete's age at the time of competition
    - Designed to decrease an athlete's risk for injury by limiting excessive stress and fatigue during sports participation

Summary

Take a break, vary the sport/activity, eat well & allow rest.

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