Pediatric Overuse Injuries of the Lower Extremity

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Outline

- Knee pain
  - Tibial tubercle apophysitis, "Osgood-Schlatter disease"
  - Patellar apophysitis, "Sinding-Larsen-Johansson disease"
  - Patellar and quadriceps tendinitis/tendinopathy
  - ITBS – Iliotibial band syndrome
- Heel pain
  - Calcaneal apophysitis, "Sever's disease"
  - Plantar fasciitis
  - Painful heel pad syndrome
  - Achilles tendinitis/tendinopathy
  - Retrocalcaneal bursitis
  - Calcaneal stress fracture

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Osgood-Schlatter disease (tibial tubercle apophysitis)

1. Overuse injury caused by repetitive traction on the tibial tubercle apophysis
2. An apophysis is a growth plate that does not contribute to the linear growth of the bone
3. Occurs in active adolescents undergoing rapid growth
    - Boys 12-15
    - Girls 8-12
4. Pain is usually insidious in nature and worsened with trauma, running/jumping, kneeling
5. Physical exam (PE) - tenderness over the tibial tubercle with swelling and warmth over the apophysis
        - Exam otherwise normal

Osgood-Schlatter Disease (tibial tubercle apophysitis)

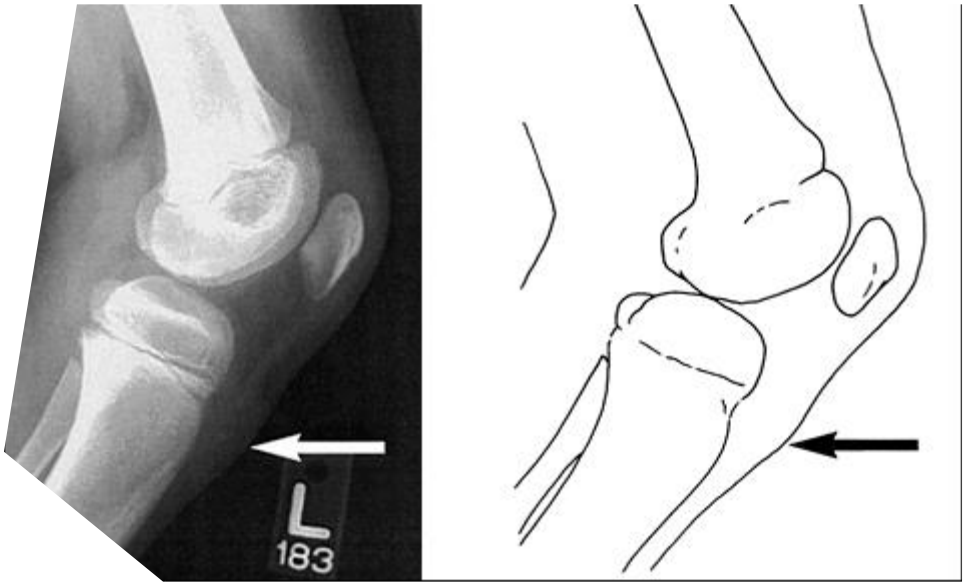
X-rays not needed unless:

- Red flag symptoms, e.g., systemic symptoms, night pain, pain unrelated to activity, acute onset pain
- Pain elsewhere and not over the tubercle as classically described
- Concern for tibial tubercle avulsion
  - Patient will not be able to ambulate more than several steps and have significant pain with quadriceps contraction

Osgood-Schlatter disease (tibial tubercle apophysitis)

- Treatment primarily conservative
- Benign and self–limited with resolution of symptoms once the growth plate closes, usually over 6-18 months
  - Symptoms can wax and wane
  - Pain and swelling can be treated with ice, acetaminophen, short course NSAIDs (3-5 days)
  - Protective pad over the tibial tubercle
  - PT focusing on quadriceps strengthening and hamstring/quadriceps and flexibility
  - Avoid steroid injections, immobilization, complete avoidance of sports

Osgood-Schlatter disease (tibial tubercle apophysitis)



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Osgood-Schlatter disease (tibial tubercle apophysitis)

- Athletes are permitted to play provided pain is tolerated and resolves after participation
- Consider change in position for athletes who require prolonged squatting, kneeling, etc.
- Educate parents and patient that varying degrees of tibial tubercle prominence may persist
- Patients can follow-up if symptoms persist, worsen or change
- Surgical referral rare and reserved for refractory symptoms
  - Typically done after the proximal tibial growth plate fuses

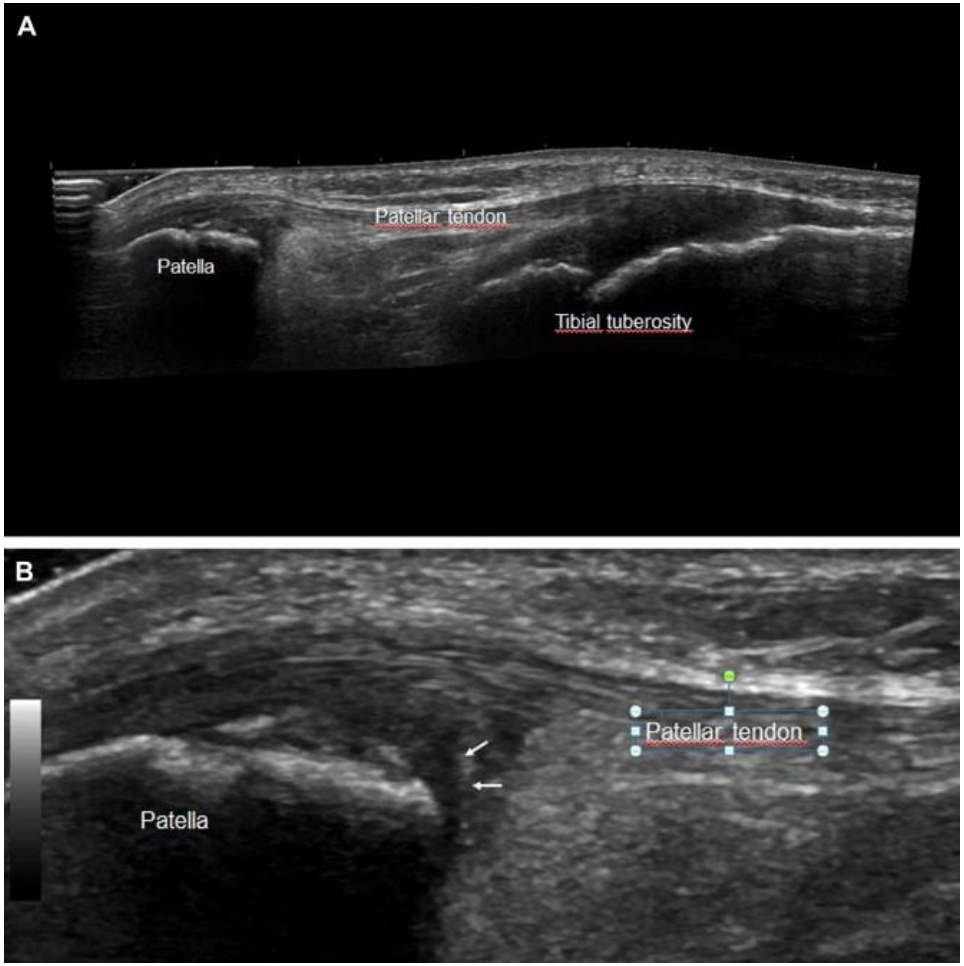
Sinding-Larsen-Johansson disease (patellar apophysitis)

- Repetitive patellar tendon traction to the apophysis at the inferior pole of the patella from activities such as jumping
- Age bracket 10-13 years old
- Pain, swelling and possible patella tendon thickening over the inferior pole of the patella on exam
  - Ligament laxity or effusion will not be present
- Clinical diagnosis; imaging reserved for atypical symptoms, e.g., patella sleeve fracture
  - Athletes with more serious injuries will not be able to ambulate several steps or have significant pain with quadriceps contraction

Sinding-Larsen-Johansson disease (patellar apophysitis)

- Imaging
  - X-rays show irregular calcification and fragmentation at the inferior pole of the patella
  - Ultrasound may show irregular fragmentation of the inferior pole with patellar tendon thickening and infrapatellar bursitis
- Typically resolves in 12-18 months
- Treatment includes rest with activity as tolerated, rehab, ice, short course of NSAIDs
- Athletes can return to play once pain and swelling controlled
  - May need to reduce activity level
  - Patellar sleeve may help with symptoms

Sinding-Larsen-Johansson disease (patellar apophysitis)



Quadriceps and Patellar tendinopathy

- Commonly referred to as "jumper's knee" - common in running and jumping sports such as volleyball
- Usually presents as chronic anterior knee pain that is worsened with prolonged sitting or going up and down stairs
- Patellar tendinitis more common than quadriceps tendinitis in skeletally immature patients and may be seen with Sinding-Larsen-Johansson disease
  - More common in males
- Tendinopathy occurs over weeks / months from repetitive use without sufficient recovery
  - Results in poor healing, degeneration at the myotendinous junction and chronic pain
  - Calcific tendinopathy or tendon tears may result from untreated tendinopathy

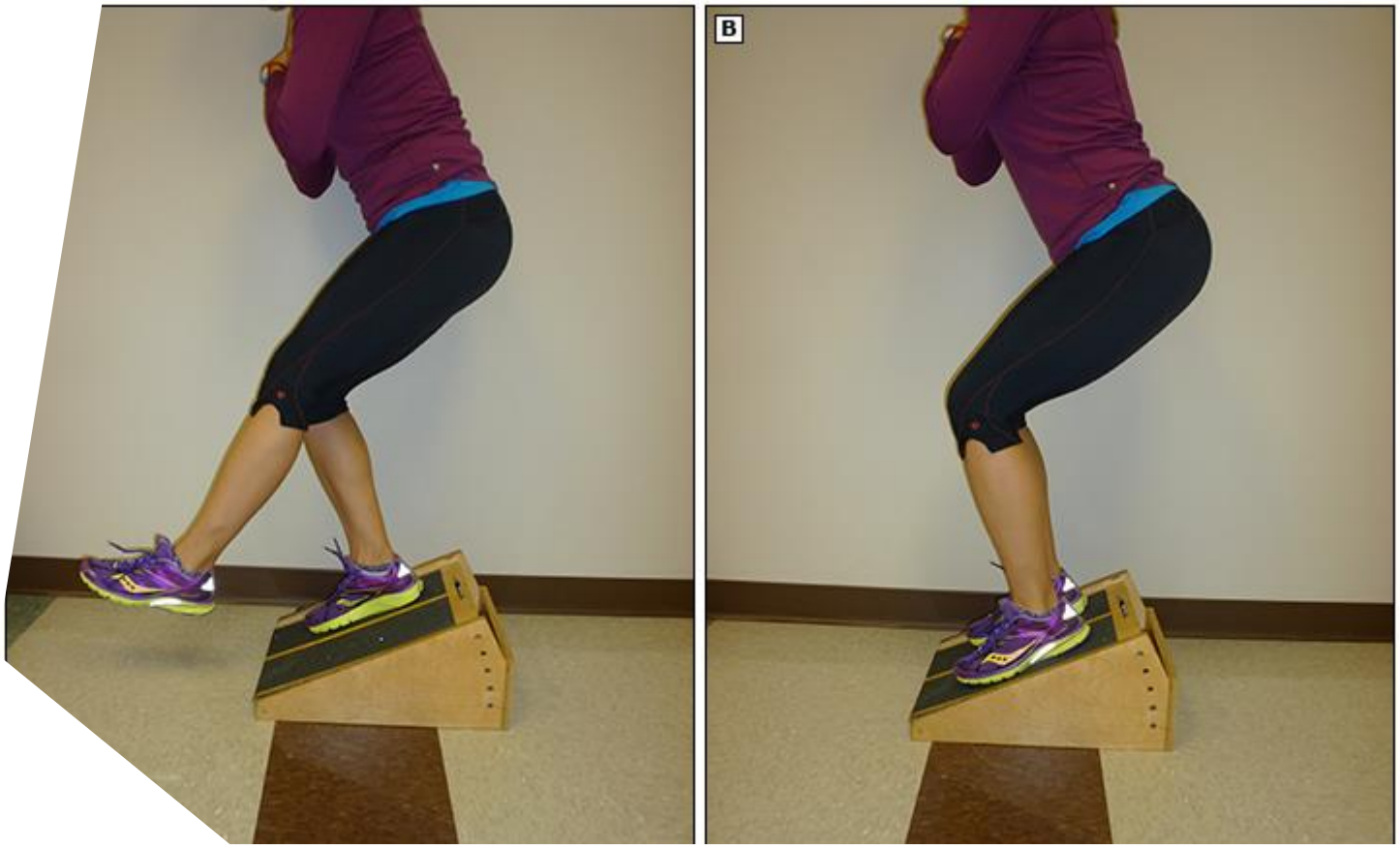
Quadriceps and Patellar tendinopathy

- With mild tendinopathy athletes usually only have pain with strenuous activities and have normal gait
- As tendinopathy advances, gait may become antalgic and range of motion becomes limited due to pain
- Pain with resisted knee extension on exam
- Pain may be present directly over the quad tendon or superior pole of the patella or over the patellar tendon/inferior pole of the patella for patellar tendinopathy

Quadriceps and Patellar tendinopathy

- Initial treatment with ice, patellar strap, short course oral or topical NSAIDs
- Injection therapy, e.g., platelet rich plasma (PRP), autologous blood, etc.
  - Lack high quality evidence but may be of benefit
- Topical Nitroglycerin patch
- Stretching and isometric exercises early in the course followed by progressive, heavy load exercises with eccentric exercises are the cornerstone of treatment
- Return to play when symmetric pain free ROM occurs and strength of quadriceps at least 85-90% of contralateral side

Quadriceps and Patellar tendinopathy



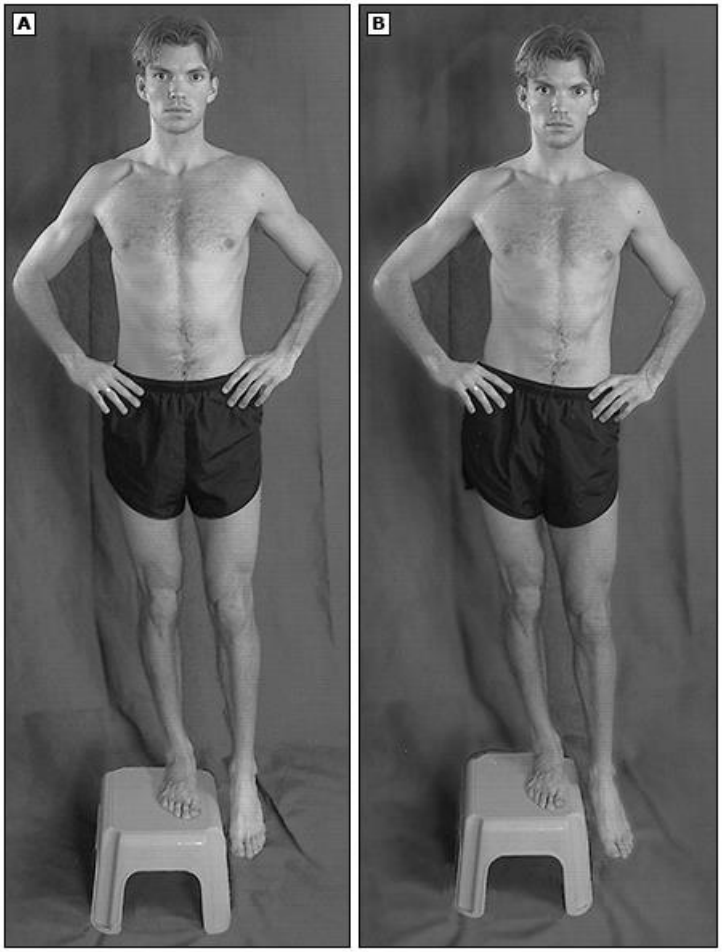
Iliotibial band syndrome (ITBS)

- Overuse syndrome of the lateral knee, common in runners and cyclists
- Slow onset of pain over the lateral knee, initially only with exercise
  - Sharp / burning pain, worse as the knee reaches terminal extension
- Tenderness over the IT band where it courses over the lateral femoral epicondyle

Iliotibial band syndrome (ITBS)

- Treatment
- Control symptoms
  - Avoid exacerbating activities, ice and short course of NSAIDs/acetaminophen if needed
- Address strength and mobility deficits
  - Physical therapy focusing on hip abductors – gluteus medius commonly weak, calf/iliopsoas flexibility
  - Activity as tolerated - avoid any inciting activities, particularly those with knee in 30 degrees flexion
  - May need to continue home plan for months to prevent recurrence
- Foam rolling
- Correct any underlying leg length discrepancy

Iliotibial band syndrome (ITBS)



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Iliotibial band syndrome (ITBS)

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Iliotibial band syndrome (ITBS)

- Glucocorticoid injection
  - Consider in patient with symptoms despite 6-12 weeks of therapy
  - Athletes who require quicker symptom relief for important race, etc.
- Iontophoresis with topical steroids
  - Transdermal drug delivery by use of voltage gradient on the skin

Iliotibial band syndrome (ITBS)

- Controversial therapies
- Percutaneous tenotomy – passage of needle into pathologic tissue to promote healing, +/- steroid or biologic
- Prolotherapy – injection of irritants to promote healing response
- Topical nitroglycerin – vasodilator used to promote healing and remodeling in chronic tendinopathies
- Autologous blood and platelet rich plasma (PRP) injections *into or deep to* the IT band

Iliotibial band syndrome (ITBS)

- Gradual return to activity after symptoms with daily activities resolves
  - e.g., start at 50% volume and increase 10% per week
- Reasons to stop running
  - More than 3/10 pain
  - Changes to gait
  - Limp with running
  - Paying for it later in the day
- Most athletes able to return in 6-8 weeks

Iliotibial band syndrome (ITBS)

- Decrease symptoms by increasing pace
  - Increases knee flexion angle at foot strike
- Avoid running downhill
- Decrease stride length and increase stride rate

Calcaneal Apophysitis

- Aka Sever's Disease
- Located centrally over the posterior inferior heel
- Develops around age 6 in girls and age 8 in boys
  - Present for 3-4 years
- Increased metabolic activity during periods of rapid growth increases risk of overuse injury
- Associated with running/jumping sports, abnormal heel strike and traction placed on area near achilles tendon

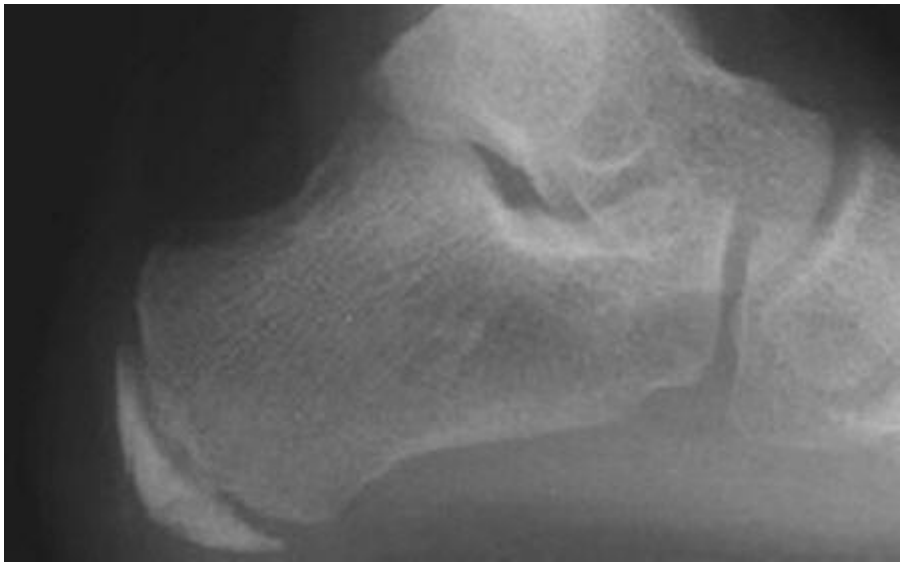
Calcaneal Apophysitis

- Up to 2/3 cases are bilateral, more common in boys
- Slow onset, worse with poor heel cushioning footwear, e.g., flip-flops, cleats
- Pain over the apophysis on exam, +/- pain with calcaneal squeeze
- Associated with foot pronation, poor calf flexibility and arch abnormalities
- Can be complicated by plantar fasciitis or achilles tendinitis

Calcaneal Apophysitis

- Imaging not required to make diagnosis
  - Unless --> systemic symptoms, atypical pain, inability to bear weight, acute onset
  - No improvement after 4-8 weeks
- X-rays will show widening and sclerosis over the growth plate
  - Common in asymptomatic patients
  - More consistent with normal growth than pathologic process
- MRI if severe symptoms at presentation with normal x-rays, no improvement with initial conservative care
    - Rule out calcaneal stress fracture

Calcaneal Apophysitis



Calcaneal Apophysitis

- Treatment
  - Bilateral use of heel cup or lift, 0.25 in or 5mm, e.g., Tuli's or KidsZerts
  - Ice, calf stretching / eccentric strengthening exercises
  - Short course of NSAIDs, acetaminophen
  - Activity modification with gradual return

Calcaneal Apophysitis

- Differential diagnosis
  - Plantar fasciitis
  - Painful heel pad syndrome
  - Achilles tendinitis
  - Retrocalcaneal bursitis
  - Calcaneal stress fracture

Plantar fasciitis

- More common in adults but does occur in adolescents
- Runners, dancers and sedentary obese kids
- Prolonged foot pronation a risk factor
- "Pain with first steps in the morning", improves and then sometimes worse again throughout the day
- May complain of 'rock in my shoe" or walk on outside of foot to relieve symptoms
- First step symptoms can be associated with inflammatory conditions

Plantar fasciitis

- Pain over the medial calcaneal tuberosity vs. posterior heel in Sever's disease
  - Worse with passive dorsiflexion of the foot
  - Evaluate for calf tightness and pes planus

Plantar fasciitis

- Treatment
- Calf and plantar fascia stretching, foot intrinsics and doming
  - Continue for at least 6-9 months after symptoms start to improve
- Avoid flat shoes and barefoot walking
- Arch supports and/or heel cups
- Activity modification
- Short course of NSAIDs, acetaminophen

Plantar fasciitis

- Treatment
- Walking boot, night splints, orthotics
- Injection therapy: autologous blood, steroid, PRP
- Tenotomy
- Surgical release
- Counsel patients that symptoms can persist for 6-12 months

Painful heel pad syndrome (contusion)

- Common in runners with poor heel cushioning
- Subcalcaneal fat pad has fibrous septae that function as shock absorbers and compartmentalize the fat pad to protect the weight bearing portion of the calcaneus
- Chronic disruption of the fibrous septae
- No pain with passive dorsiflexion of the foot or over the medial calcaneal tuberosity
- Treatment
  - Proper cushioning, heel pad, taping of the fat pad
  - Activity modification, ice, OTC medications
  - Imaging if no improvement in symptoms in one week

Retrocalcaneal bursitis

- Pain, erythema, warmth and swelling between the calcaneus and Achilles
- Skeletally immature patients are often runners or soccer players with poorly fitting shoes
- Can occur with Achilles tendonitis
- Treatment
  - Modify activities and footwear
  - Ice, NSAIDs, therapy, pad Achilles
  - Avoid injection due to risk of Achilles rupture
  - Surgical excision of bursa rarely indicated

Calcaneal stress fracture

- Due to repetitive stress, changing to harder surface, increase in training load
- Pain with first few steps in the morning or after sitting for a period of time
- Primarily occurs in the posterior calcaneus
- Common in runners, military recruits, female athlete triad
- Initial x-rays usually normal but may show stress reaction and callus formation
  - MRI more sensitive
  - Beware of false positives and correlate with exam

Calcaneal stress fracture

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Calcaneal stress fracture

- Activity restriction +/- heel inserts for mild symptoms
- Crutches and non-weightbearing if needed for symptom control
- Acetaminophen
- Sx typically subside in 1-2 weeks with rest
- 4-6 weeks until patient back to pounding activities

Achilles tendinitis/tendinopathy

- More common in adults, rare in skeletally immature patients
- Classically causes pain ~2cm from the achilles insertion on the calcaneus
- Worse with running and jumping
- Associated with calf tightness and prior ankle injuries without appropriate rehab
- Insertional pain may be due to enthesitis (inflammation of the tendon at insertion on bone) and should trigger clinician to consider inflammatory conditions, e.g. juvenile idiopathic arthritis

Achilles tendinitis/tendinopathy

- Activity modification, ice, NSAIDs, taping, physical therapy
- Rehab is the cornerstone of chronic tendinopathy (3+ months) treatment
  - Heavy slow resistance training
  - Eccentric exercises (muscle lengthening against a load)
  - Long term surveillance with US showed normalization of tendon architecture with both types of exercises
  - Case reports of tendon rupture after steroid injection

Achilles tendinitis/tendinopathy

- Other interventions
  - PRP, autologous blood injections
  - Nitro patch
  - Percutaneous tenotomy

A 10 year old male soccer player presents with bilateral heel pain near the end of summer soccer. His sx are worse with cleats. On exam his pain is located centrally over the bottom of the heels. He has tight calves and flat feet. His dx is:

- A. Sever's Disease
- B. Achilles tendinitis
- C. Freiberg Disease
- D. Navicular osteochondrosis

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- D. Navicular osteochondrosis

A 12yo female volleyball player presents with knee pain without injury. Her pain is worse with jumping and on exam she has pain over the inferior pole of the patella. After discussing your dx, you discuss the tx:

- A. Short leg walking cast for 4-6 weeks
- B. 2 weeks of complete rest followed by 2 weeks cross training and then return to volleyball
- C. Rest with activity as tolerated, rehab, ice, short course of NSAIDs
- D. No sports for 12-18 months after which the condition generally resolves

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A 15yo male basketball player presents with anterior knee pain without injury. He grew three inches over the summer. He has pain over the tibial tubercle with mild warmth and swelling. You explain that symptoms may wax and wane over the time period:

- A. Until he is in his early twenties
- B. Until the end of the current season
- C. Two weeks
- D. 6-18 months until the growth plates close

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References

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