PedsCases Podcast Scripts

This podcast can be accessed at www.pedscases.com, Apple Podcasts, Spotify, or your favourite podcasting app.

APROACH TO KNEE PAIN

Developed by Calla Isaac, Dr. Erika Persson and Dr. Karen Forbes for PedsCases.com.
November 1, 2023

Introduction:

Hello, my name is Calla Isaac and I'm a fourth-year medical student at the University of Alberta. This podcast was produced in collaboration with Dr. Erika Persson, a Pediatric Sports Medicine Physician, and Dr. Karen Forbes, professor of pediatrics and medical educator in the Department of Pediatrics at the University of Alberta. Our goal today is to provide a comprehensive approach to the diagnosis and management of knee injuries in young athletes.

After listening to this podcast, the learner should be able to:

1. Describe the anatomy of the knee joint and learn key differences between the pediatric and adult knee.
2. Identify the key elements of history and physical exam when assessing pediatric knee injuries.
3. Discuss the differential diagnosis of common pediatric knee injuries.
4. Outline an approach to diagnosis and management of pediatric knee injuries.

The focus of this podcast will be on distinguishing injuries that can be managed conservatively, those that need referral to orthopedic surgery or sports medicine, and conditions that require urgent assessment and treatment at the emergency room. This podcast will not go into the detailed management of knee injuries.

During this podcast, we will focus on knee injuries of children older than 5 years of age. Knee injuries in children below 5 years are relatively uncommon compared to older age groups, primarily due to limited motor skills and lower levels of physical activity. When examining a young child for knee pain it is important to consider referred pain from pathology of neighboring joints, especially the hip. A pediatrician should be consulted for thorough evaluation of suspected knee pain in children less than 5 years of age to rule out systemic causes of pain including juvenile idiopathic arthritis.[6] Injuries in this age group can still occur, often in the context of falls, non-accidental injury, or developmental concerns.[7,8]

Anatomy:

First, lets' start by discussing the anatomy of the knee. For those of you following along with the script, I have included a diagram of the knee joint from a website called TeachMeAnatomy along

with a link to the website in the references. The TeachMeAnatomy site has many more knee anatomy diagrams to refer to if you are curious. [1]

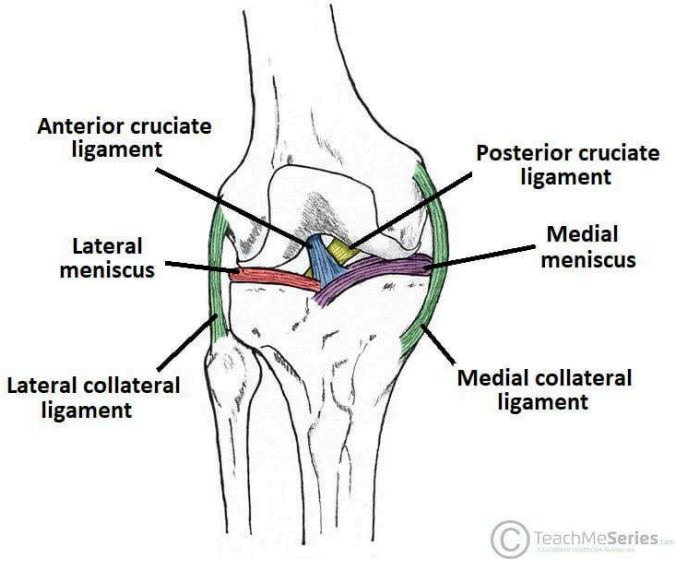

Figure 1: Anterior view of the knee joint. The patella and patellar ligament are situated on the anterior aspect of the knee joint and are not visible is this diagram.[1]

The knee joint is a complex hinge joint that is essential for ambulation and weight-bearing. It is made of four bones: the femur, tibia, fibula, and patella. These four bones form three compartments which allow for movement and shock absorption: the medial tibiofemoral, lateral tibiofemoral, and patellofemoral compartments. The knee is structurally supported by two intraarticular ligaments, the anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL). These ligaments provide support against anterior and posterior translation forces respectively. The knee also has two extraarticular ligaments that provide support against medial and lateral forces – the medial collateral ligament (MCL) and the lateral collateral ligament (LCL). Additionally, five bursae act as lubricating cushions, preventing friction between bones, tendons, and muscles during joint motion. Understanding the intricacies of these anatomical components is essential for recognizing injuries that may occur to the pediatric knee.[2,3]

Any of these structures can be injured, however, certain injuries are more common in pediatric knees. The pediatric knee differs significantly from its adult counterpart due to the ongoing process of growth and development. One crucial difference lies in the presence of growth plates, or physes. Physes are areas of developing cartilage at the ends of long bones where the bone grows from. These areas are a weak point in pediatric bones that can be prone to fractures or avulsions. Additionally, the tensile strength of bones in children is generally less than that of ligaments, making pediatric bones more susceptible to fractures. As a child matures and these growth plates close, ligamentous injuries become more prevalent. The timing of physis closure varies not only based on the anatomical region but it also varies depending on onset of puberty and the timing of individual growth and development of each child. Closure of physes associated with the knee joint typically occurs in late adolescence. The dynamic interplay between bone growth and maturation underscores the importance of recognizing and considering age-specific anatomical and biomechanical factors when assessing and managing knee injuries in the pediatric population.[4]

Developed by Calla Isaac, Dr. Erika Persson and Dr. Karen Forbes for PedsCases.com.
March 14th, 2024.

A fun fact to note is that the patella develops later than most people think. In fact, infants are not born with this bone, instead, it starts forming as cartilage in the knee joint between the ages of 3 to 6 years. Over the following years, the cartilage undergoes a process of ossification, where it gradually transforms into bone. By age 8 to 12 years, the patella becomes fully ossified, meaning it has turned into a bony structure.[4,5]

Clinical Cases:

Next, I will introduce two patient cases that we will discuss during this podcast.

Case 1:
For the first case, imagine that you are a third-year medical student on your pediatrics rotation working in a general pediatrics outpatient clinic. Sarah, a 13-year-old female, presents to the clinic with her parents, complaining of persistent knee pain. She is an avid soccer player and has recently noticed increasing discomfort, particularly during physical activities. Sarah's parents report no history of trauma or significant injuries, and she has been in good health overall.

Case 2:
For the second case, imagine you are a fourth-year medical student on your emergency medicine rotation when Jason, a 16-year-old male, is brought to the emergency department by his parents from a tennis match. Jason is in visible distress, holding his injured knee and reporting severe pain. There was no loss of consciousness, and he is unable to bear weight on the affected leg.

What important questions on history and physical exam will help you to narrow down your differential and help you to decide whether the presentation is an emergency or not?

Clinical Presentation:

This brings me to the next learning objective and topic of discussion – clinical presentation and strategies for taking a thorough history and performing an accurate physical exam.

History:

When gathering the patient's history, the OPQRST mnemonic can guide conversation, and ensure important questions are explored. OPQRST is often used to gather a pain history by prompting questions about the pain's: onset, provoking factors, quality, radiation, severity, and timing. For example, the following questions would cover this mnemonic:

1. When did the pain start? What was happening when it started? Was there an injury mechanism (i.e. fall, twist, collision)
2. What makes it worse? What makes it better? Have you taken any medications for the pain?
3. What does the pain feel like? (Sharp, dull, throbbing etc.)
4. Does the pain radiate or spread anywhere?
5. How severe is the pain? You can ask the patient to rank the pain out of 10 if they are old enough.

6. When do you feel the pain – what time of day?
7. Where do you feel the pain – point with one finger? Even small children can do this.

After using the mnemonic to characterize the pain, you should have a good idea of whether this is an acute or chronic presentation of knee pain.

Associated symptoms should be explored next. Pertinent associated symptoms to ask about are edema/swelling, popping, locking or clicking, instability, warmth, redness, skin changes, rashes, fevers, night sweats, weight loss, and changes to sensation on the affected limb. The presence of significant swelling within 1-2 hours of symptom onset or injury is suggestive of potential hemarthrosis, contusion, fracture, or tendon rupture. While a slower onset of swelling may indicate meniscal involvement or injuries to the MCL or LCL. The presence of popping, locking, or clicking sensations, indicate potential joint surface issues including osteochondral or meniscal injuries.[4] The presence of fever along with edema, erythema, and increased temperature around the joint is a red flag for septic arthritis which is a medical emergency and "can't miss" diagnosis[9]. Nocturnal pain, especially when accompanied by constitutional symptoms such as fever, night sweats and weight loss raise concern for malignancy. Finally, changes to sensation on affected limb could suggest nerve injury or compression.[4,5]

Another important part of the history is the patient's past medical history, family history, and social/sports history. In the patient's past medical history, a focus should be placed on previous knee injuries, pain or surgeries, and involvement of contralateral and neighboring joints. When asking about family history ensure to ask about autoimmune and rheumatologic conditions as these could be affecting your patients with joint pain. Social and sports history delves into the patient's level of play, position, and changes in training routines, offering valuable insights into the potential mechanisms of injury and contributing factors to the current knee symptoms.

Thinking back to the two patients we discussed before, here are the histories we gathered:

Case 1:
Sarah does not know when the pain started, when asked, she replies, "maybe at the beginning of the school year?". She says that the pain intensifies during running, jumping, or any activity that involves bending her knee. Sarah describes aching pain and tenderness just below her knee, specifically at the top of her shinbone (tibia). The pain does not radiate anywhere, and she does not feel it at night. She says the pain is not bothering her right now, but when she is at soccer practice, it is a 4-5/10. This year, she started participating in a soccer program at school in addition to her club team which allows her to practice her sport every day during school. She denies any previous knee injuries, constitutional symptoms, family history, or past medical history.[10]

Case 2:
Jason reveals that the accident occurred approximately 3 hours ago. He describes playing tennis with his father when he planted his right knee to change directions quickly. He was trying to reach his dad's cross court shot. As he planted his foot and turned, he felt a pop followed by intense pain. He has sharp, throbbing pain over his entire knee area, including inside the knee joint. He was unable to walk right after the accident and reports immediate pain, swelling, and the sensation of instability in his right knee. He denies any previous knee injuries, constitutional symptoms, family history, or past medical history.[8,11]

Developed by Calla Isaac, Dr. Erika Persson and Dr. Karen Forbes for PedsCases.com.
March 14th, 2024.

Physical Exam:

Next, a thorough physical exam should be completed to assess the knee joint. As in any physical exam, it is important to gather vital signs and note whether the patient looks well or unwell. While there aren't many life-threatening injuries to the knee specifically, remember the ABC approach (airway, breathing, circulation). If you suspect there may be something else going on, it should be addressed before moving on to the assessment of the knee joint specifically.[2–4]

After other medical emergencies have been ruled out, the knee exam can be completed. The knee physical exam is a comprehensive assessment that involves a systematic approach to evaluate the structure and function of the knee joint. The examination typically follows the "look, move, feel, special tests" format, a format that includes observing the patient's knee, palpating specific anatomical landmarks, assessing the range of motion, and performing special tests.

Using this strategy, the "look" section comes first. In this section of the exam, the SEADS acronym proves useful for a structured observation. This acronym stands for swelling, ecchymosis, atrophy, deformity, and scars/skin changes.[2–4] Observe the patient's gait if you have the chance and they are able. It is often useful to watch them walk into the room prior to meeting them. Are they able to weight bear? Do they have an antalgic gait? Next, carefully inspect the knee for signs of swelling, such as joint effusion or bursitis, note any erythema or ecchymosis/bruising, assess for muscle atrophy, observe any obvious deformities or malalignments, and identify scars that may indicate previous trauma or surgical intervention.[2–4]

The "feel" component involves palpation of various knee structures, such as the bony and soft tissue landmarks including growth plates of the distal femur and proximal tibia, patella, quadriceps tendon, patellar tendon, and collateral ligaments. Through palpation, you should identify areas tenderness, warmth, or any other irregularities. [2–4]

The "move" section assesses the range of motion (ROM), checking for limitations, stiffness, or discomfort during flexion and extension. There are two parts to the ROM assessment. First, active ROM – to see what the ROM is like when the patient is actively moving the joint. Second, passive ROM – to see if there is a change in the ROM when the examiner moves the limb for the patient. This can help distinguish whether pain or weakness from muscle pathology is a limiting factor causing decreased ROM. Typically, decreased active ROM with good passive ROM signifies an extraarticular issue such as a hamstring or quadriceps tendon strain. Decreased passive ROM typically points to an intraarticular pathology such as a meniscal injury or fracture.[2–4]

The final part of the MSK exam is performing "special tests" which I will cover next.

These special tests assess injuries to the ACL, PCL, MCL, LCL, and menisci. A good video resource showing a full knee exam including special tests was created by Dr. Raj Carmona at McMaster and can be found on YouTube under *RheumTutor MSK Examination Videos*.[12] The link is available in the references for this podcast.

Now, I will briefly describe some of the special tests.

1. **Anterior Cruciate Ligament (ACL) Tests:**

- **Lachman Test:** This involves the examiner stabilizing the femur and moving the tibia forward. The examiner performs these movements on both knees.
- Positive test: Increased anterior translation compared to the uninjured knee suggests an ACL injury.[2,3]
- Negative test: Similar anterior translation and palpable endpoint of anterior translation on both knees.
- **Anterior Drawer Test:** With the patient lying supine with the knee flexed at 90 degrees, the examiner stabilizes the distal thigh with one hand while grasping the proximal tibia with the other. The examiner then applies an anterior force to the tibia, attempting to translate it forward on the femur.[2,3]
- Positive Test: Excessive anterior displacement of the tibia compared to the uninjured knee suggests an ACL injury.[2,3]
- Negative Test: Minimal or no anterior displacement suggests the ACL is intact.

The Lachman test is favoured over the anterior drawer test as it is more sensitive and specific for detecting ACL sprains and ruptures.[13]

2. **Posterior Cruciate Ligament (PCL) Tests:**
    - **Posterior Drawer Test:** Patient is positioned lying on their back with knee flexed at 90 degrees. Examiner stabilizes distal thigh with one hand while grasping proximal tibia with the other. Examiner applies posterior force to the tibia attempting to translate it backward on the femur.
    - Positive test: excessive posterior displacement of tibia compared to uninjured knee – potential PCL injury.
    - Negative test: minimal to no posterior displacement suggests intact PCL[2,3]
    - **Posterior Sag Test (Godfrey's Test):** The patient lies flat with the knee flexed at 90 degrees. The examiner looks for posterior “sagging” of the tibia.
    - Positive test: tibia sagging posteriorly compared to contralateral side suggests a PCL injury.
    - Negative test: tibia does not sag posteriorly and looks equivalent to contralateral side.

The Posterior drawer test is very sensitive and specific, and sensitivity and specificity is enhanced by posterior sag sign, but posterior sag sign should not be performed alone as it is not very sensitive or specific by itself.[13]

3. **Medial Collateral Ligament (MCL) Tests:**
    - **Valgus Stress Test:** The examiner applies a valgus (inward) force to the knee while the opposite hand stabilizes the lateral aspect. The injured knee is compared to the contralateral side to assess MCL integrity.[2,3]
    - Positive test: Pain over the MCL along with laxity of the ligament compared to the contralateral knee suggests MCL sprain or rupture.
    - Negative test: Minimal pain and laxity of MCL compared to contralateral side suggests intact MCL.
4. **Lateral Collateral Ligament (LCL) Tests:**
    - **Varus Stress Test:** Like the valgus stress test, but in this case, a varus (outward) force is applied to assess LCL integrity.[2,3]
    - Positive test: Pain over the LCL along with laxity of the ligament compared to the contralateral knee suggests LCL sprain or rupture.
    - Negative test: Minimal pain and laxity of LCL compared to contralateral side suggests intact LCL.
5. **Meniscus Tests:**

- **McMurray Test:** With the patient lies supine, the examiner holds the patient's foot by grasping the heel while supporting the knee and palpating the joint line with the other hand. The examiner fully flexes the knee, then rotates the leg and foot on the thigh while the knee remains in full flexion. The examiner then transitions the leg from full flexion to full extension while maintaining the foot first in full internal rotation and then in full external rotation. [2,3,13]
- Positive test: A palpable click or pop is associated with a torn meniscus. The patient sometimes describes the sensation as similar to what they experienced when the knee was injured.
- Negative test: No clicks or pops and no unusual sensation described by the patient makes meniscal pathology less likely.
- **Joint Line Tenderness:** With the patent lying supine and knee flexed to 90 degrees, the examiner palpates the medial and lateral joint line looking for meniscal tenderness. The medial meniscus becomes more prominent with internal rotation of the tibia while external rotation enhances the palpation of the lateral meniscus.[13]
- Positive test: Pain on the joint line suggests meniscal pathology.
- Negative test: Lack of pain on the joint line makes meniscal pathology less likely.

The McMurray test exhibits high specificity but low sensitivity, whereas joint line tenderness demonstrates relatively good sensitivity but lacks specificity.[13]

Overall, the "look, move, feel, special tests" approach ensures a thorough examination of the knee, aiding in the accurate diagnosis and treatment of various musculoskeletal conditions.[2,3] These tests are crucial in the clinical assessment of knee injuries, helping healthcare professionals identify the specific structures involved and guide appropriate management strategies. However, it's important to note that no single test is definitive, and a combination of clinical evaluation, imaging studies, and patient history is often necessary for accurate diagnosis.

Now, let's consider our cases with the new information we've learned.

Case 1:
Physical Examination: Upon examination, Sarah walks normally, with no antalgic gait. There are no scars, skin changes or obvious deformities. The tibial tuberosity, the bony prominence where the patellar tendon attaches to the shinbone, looks more pronounced on the right side. Palpation elicits localized pain, and a mild bony prominence is felt at the tibial tuberosity. Passive and active ROM is normal in the knee and hip. There is no instability of any ligaments with the special tests.[10]

Case 2:
Physical Examination: On examination, Jason is unable to weight bear, he describes a feeling of "the knee giving out" when he attempts to ambulate. His right knee is notably swollen, but there is no obvious deformity. The skin is intact other than a small abrasion on the anterior knee. Palpation reveals tenderness over the patella and the lateral joint line. Both active and passive ROM are limited due to pain, and edema. Ligamentous stability testing is challenging due to pain, but there is increased anterior translation of the tibia compared to the femur with both the Lachman's test and the Anterior Drawer test when compared to the uninjured knee. The knee is stable to both varus and valgus forces and as well as posterior translation. McMurray's test is negative, but Jason does have lateral joint line tenderness.[8,11]

Developed by Calla Isaac, Dr. Erika Persson and Dr. Karen Forbes for PedsCases.com.
March 14th, 2024.

Differential Diagnosis:

Moving on to the third learning objective, we will discuss the differential diagnosis of knee injuries. Knee injuries are typically separated into two categories: acute or chronic. Acute injuries include fractures, strains, sprains, and contusions, while chronic injuries can be categorised into injury types based on the type of force applied to the joint – compression, tension/traction or shear force. We'll discuss key findings on history and physical exam for each.[4]

We'll start by discussing acute knee injuries. Remember, these injuries are often traumatic, and children can usually describe the incident that caused the injury.

1. **Fracture:** Fractures are breaks or cracks in the bones and are particularly prevalent among children and teens. These injuries often affect the physis or growth plate as it is not yet ossified. The onset is characterized by trauma followed by acute pain, swelling, and an inability to bear weight.[4]
2. **Strain:** Muscle and tendon injuries, known as strains, result from stretching beyond the tissue's limit or excessive force during contraction. Strains are graded by severity, mild (grade 1) strains exhibit minimal pain and strength loss without palpable defects. Grade 2 strains have noticeable strength loss and palpable defects, while Grade 3 strains have a complete tear with no contraction possible and a palpable defect.[4]
3. **Sprain:** Ligament injuries, or sprains, commonly occur with rapid changes in velocity. In children, where ligaments are stronger than bones, sprains are less frequent than fractures. In a sprain injury, an acute pop may be heard. These injuries are often followed by rapid onset of edema. Edema is usually obvious in sprains of intraarticular ligaments, such as the ACL, PCL and meniscus. Edema is usually less pronounced in injuries of extraarticular ligaments, such as the MCL and LCL. Pain and instability often hinder the ability to continue activities at the same level immediately after a sprain. Physical exam maneuvers such as the Lachman's, or varus and valgus stress tests will find laxity in affected ligaments. Sprains encompass complete ligament tears – also called ruptures. Ligament ruptures present in the same manner as sprain injuries, but more instability often follows these injuries.[4]
4. **Contusions:** Direct trauma or blunt force to muscles leads to contusions, commonly known as bruises. The quadriceps muscle is frequently affected, causing pain, significant swelling, and discolouration. Myositis ossificans, a delayed complication of contusions involves the ossification of a hematoma. Typically, contusions resolve on their own, but careful monitoring of contusions for features of myositis ossificans is important.[4]

To recap, fractures, tears/sprains, strains and contusions are the four main types of acute knee injuries. These injuries usually have a specific incident where the injury happened.

Next, we will discuss chronic injuries. These types of injuries often have an insidious onset and gradually become worse over time or are episodic in nature; children may not be able to describe when the injury happened.

1. **Repetitive compression:** Stress fractures are small fractures in the bone that stem from overuse due to repetitive compression or tensile forces on the bone. These forces exceed the rate at which the bone can adapt, resulting in insidious onset of low-grade pain. While uncommon at the knee, stress fractures can affect the distal femur and

proximal tibia. Pain tends to worsen with activity and weight-bearing, and although swelling is rare, focal pain at rest is a characteristic feature. This type of fracture is notable for its association with overuse and the demand placed on the affected bones.[4,5]

2. **Repetitive Shear Force:** Osteochondritis dissecans involves separation and fragmentation of articular cartilage from subchondral bone. It commonly occurs at the medial condyle of the femur in children and adolescents. Repetitive shear forces across the subchondral bone are believed to lead to stress reactions and microtrauma which eventually leads to this condition.[4,5]
3. **Repetitive Tension/Traction:** Injuries from repetitive tension or traction usually involve tendons and their insertion points, the apophyses. These injuries often occur during periods of rapid skeletal growth. Apophysitis is a condition where the apophysis becomes inflamed because the cartilage attachment site is weaker than the tendon itself. A notable example of apophysitis is Osgood-Schlatter disease (OSD) which impacts the patellar tendon and tibial tuberosity. Tendinosis is another common injury where the tendon itself becomes inflamed from repetitive stress. Individuals with tendinosis or apophysitis may experience painful motion and impaired function of the affected muscle groups, accompanied by pain during contraction and an antalgic gait. Swelling at the apophysis is a common feature, emphasizing the chronic nature of these tendon-related injuries.[4,5]

To recap, the main chronic injuries to the knee are stress fractures, tendinosis, apophysitis, and osteochondritis. These injuries have a slow progressing onset making it difficult for the patent to know when they started. They usually occur due to increased loads with not enough recovery time. Of the types of chronic injuries we've discussed, injuries caused by repetitive tension and traction such as apophysitis and tendinosis are the most common chronic injury of the knee in children and adolescents.

Diagnosis and Management:

Next, we will discuss diagnosis and management plans for pediatric knee injuries.

In the comprehensive evaluation of pediatric knee injuries, a strategic approach to diagnosis is crucial. Consideration of the key elements acquired through history-taking and physical examinations is extremely important. Many knee injuries can be diagnosed with history and physical exam alone. If the diagnosis is unclear after history and physical exam, clinicians may choose to image the joint using x-ray or MRI. While chronic overuse injuries often lend themselves to diagnosis through thorough assessment without imaging, acute traumatic knee injuries typically need X-ray evaluation to rule out fractures. Obtaining at least two views is standard practice and comparing images with the unaffected knee can aid in accurate assessments.

Moving on to general management strategies, conservative approaches are foundational for treating most chronic knee injuries. Conservative management has multiple components including active physiotherapy and rehab, rest and educational measures. Bracing and support may also be useful in certain diagnosis. Referral to a sports medicine physician is often useful for advice with respect to activity modification during the symptomatic period.

In contrast, acute knee injuries often warrant referral to an orthopedic specialist for surgical intervention such as in the case of an ACL rupture or significant fracture. Referral to a sports

medicine physician is an option for non-surgical issues or injuries such as patellar dislocations without a fracture or MCL strain.

Certain urgent diagnoses demand immediate attention at the emergency department. Cases involving nerve or vessel injuries, septic arthritis, dislocations and fractures must have prompt medical evaluation and intervention. Patients with these suspected conditions should be sent to the emergency department for investigations and management.

Cases Wrap-Up:

Now, let's go back to our cases to see what Sarah's and Jason's diagnoses and management plans look like.

Case 1:
Diagnosis: Based on the history and physical examination findings, Sarah is diagnosed with Osgood-Schlatter disease or OSD, a type of apophysitis. OSD is a common condition in adolescents, particularly those engaged in sports that involve running and jumping. It is characterized by traction and pain at the tibial tuberosity growth plate, where the patellar tendon inserts into the shinbone.[5,10]

Management: The primary focus of OSD management is conservative. Sarah is advised to temporarily modify her physical activities to avoid exacerbating the symptoms. The application of ice after activities, along with nonsteroidal anti-inflammatory drugs (NSAIDs), is recommended to alleviate pain. A targeted physical therapy program is initiated to strengthen the quadriceps and gluteal muscles and improve flexibility. Sarah's parents are educated about the self-limiting nature of OSD, assuring them that symptoms often resolve with the completion of the adolescent growth spurt.[5,10]

Follow-up: Sarah is scheduled for a follow-up appointment in six weeks to monitor her progress. At this time, adjustments to the management plan will be made as needed. It is emphasized to Sarah and her parents that patience and adherence to the prescribed measures are essential for optimal recovery. While most children with this condition have a full recovery with the closure of the tibial growth plate, a small proportion of adolescents have pain that persists into adulthood, especially with kneeling. Proper activity restriction and treatment by a sports medicine physician makes poor outcomes less likely. The family is encouraged to reach out if there are any concerns or if Sarah's symptoms persist beyond the expected timeframe.[5,10]

Case 2:
Diagnostic Testing: X-rays of the right knee are ordered for Jason to assess for bony injuries. The X-ray shows no acute fractures or dislocations.[4,8]

Diagnosis: Based on the initial assessment, Jason is provisionally diagnosed with an acute soft tissue injury of the knee. Based on the findings of the physical exam, an ACL rupture is suspected, and meniscal injury is not ruled out.[4,8]

Management: Jason's immediate management includes pain control with NSAIDs, elevation of the leg, and ice application to reduce swelling. Given the high suspicion of an ACL rupture, the orthopedic team is consulted for a more detailed outpatient assessment. Jason is provided with crutches to help him ambulate for the time being. He is instructed to weight bear as tolerated,

and continue moving the knee to maintain ROM. For comfort, he is given a compression sleeve to put over his injured knee. This will help reduce swelling and can give a sense of security for people with a feeling of instability. Jason is told that he will be contacted for follow up and to return to the hospital if his pain is unbearable, he has changes to sensation, the joint becomes red and hot, or he has any other concerns.[4,8]

Follow-up: As Jason's condition stabilizes, further imaging studies are ordered by an orthopedic surgeon to determine the extent of soft tissue damage and plan for surgery. The MRI shows a complete rupture of the right ACL with no meniscal injury. He is put on the wait list for surgical intervention to repair this ligament. In the meantime, he is referred to a physiotherapist to begin pre-op strengthening. [4,8,11]

Take-Home Points:

I hope this podcast equips you with a basic approach to diagnosis, and initial management of young athletes with knee pain. Before we finish, let's review the take-home points:

1. Knee pain in pediatric patients differs from that in adults primarily due to the presence of open growth plates or physes.
2. When gathering the history of a pediatric patient experiencing knee pain, it is crucial to initially discern whether the pain is acute or chronic.
3. During the physical examination of a pediatric patient with knee pain employ the Look, Feel, Move, and Special Tests approach to thoroughly assess the knee.
4. Diagnosing overuse injuries typically relies on a comprehensive history and physical examination, while plain X-rays often prove helpful in diagnosing acute injuries.
5. The management of overuse injuries in the pediatric knee is generally conservative, emphasizing rest, physical therapy, and activity modification. Acute injuries may also be managed conservatively, although certain situations may need a referral to a specialist for further evaluation and intervention.

Thanks for listening!

References:

1. TeachMeAnatomy. Published 2024. Accessed February 14, 2024. https://teachmeanatomy.info/lower-limb/joints/knee-joint/
2. Anthony Beutler MD, Karl Fields MD, Jonathan Gryzel MD FAAEM. Physical examination of the knee . *UpToDate*. Published online 2023.
3. Bickley L, Szilagyi P. *Bate's Guide to Physical Examination and History Taking*. 9th Edition.; 2007.
4. Coleman N. *Common Pediatric Knee Injuries: Best Practices in Evaluation and Management*. Springer International Publishing; 2021. doi:10.1007/978-3-030-55870-3
5. Hergenroeder ACM, Chorley JM, Bachur RGM, Grayzel JMF. Approach to chronic knee pain or injury in children or skeletally immature adolescents. *UpToDate*. Published online 2023.
6. Kimura YM, Schulert GMP, Klein-Gitelman MMM, Case SMM. Systemic juvenile idiopathic arthritis: Clinical manifestations and diagnosis Topic. *UpToDate*. Published online January 1, 2024. Accessed February 14, 2024.

Developed by Calla Isaac, Dr. Erika Persson and Dr. Karen Forbes for PedsCases.com.
March 14th, 2024.

https://www.uptodate.com/contents/systemic-juvenile-idiopathic-arthritis-clinical-manifestations-and-diagnosis?search=jia&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H2547555896
7. Nigrovic PM, Drutz JM, Phillips WM, Li SM, Blake DM. Approach to hip pain in childhood. *UpToDate*. Published online 2023. Accessed December 19, 2023. https://www.uptodate.com/contents/approach-to-hip-pain-in-childhood?search=hip%20issues%20in%20children&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H648832732
8. Hergenroeder ACM, Chorley JM, Bachur RGM, Grayzel JMF. Approach to acute knee pain and injury in children and skeletally immature adolescents. *UpToDate*. Published online 2023.
9. Le Saux N. Diagnosis and management of acute osteoarticular infections in children. *Paediatr Child Health*. 2018;23(5):336-343. doi:10.1093/pch/pxy049
10. Kienstra AJM, Macias CGMM, Phillips WAM, Singer JIM, Grayzel JMF. Osgood-Schlatter disease (tibial tuberosity avulsion). *UpToDate*. Published online 2022.
11. Friedberg RPM, d'Hemecourt PAM, Fields KBM, Grayzel JMF. Anterior cruciate ligament injury Topic. *UpToDate*. Published online 2023.
12. Carmona RM. Knee Exam - McMaster MSK Examination Series. Published November 2019. Accessed December 4, 2023. https://www.youtube.com/watch?v=TsN1QoSMZ_Q
13. Malanga GA, Andrus S, Nadler SF, McLean J. Physical examination of the knee: A review of the original test description and scientific validity of common orthopedic tests. *Arch Phys Med Rehabil*. 2003;84(4):592-603. doi:10.1053/apmr.2003.50026