

## PedsCases Podcast Scripts

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### **APPROACH TO SHOULDER PAIN**

Developed by Cassie Walmsley and Dr. Erika Persson for PedsCases.com.  
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#### **Introduction:**

Hello, my name is Cassie Walmsley and I'm a third-year medical student at the University of Alberta. This podcast was produced in collaboration with Dr. Erika Persson, a Pediatric Sports Medicine Specialist at the University of Alberta.

The goal of this podcast is to develop an approach to the diagnosis and management of pediatric sports injuries of the shoulder. Shoulder injuries are common in young athletes, so it is important to have a good approach.

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

1. Discuss some key differences between the pediatric and adult shoulder
2. Identify the key components of history and physical exam when assessing a pediatric shoulder injury
3. Discuss the differential diagnosis of common pediatric sports injuries of the shoulder
4. Explore an approach to diagnosis and management of pediatric sports injuries of the shoulder
5. Review two detailed case presentations of pediatric sports injuries of the shoulder

We will not be going into detailed management of each shoulder condition in this podcast, but our focus will instead be on being able to identify which injuries can be managed conservatively, which require referral to an orthopedic surgeon, and which require urgent assessment in the emergency department.

#### **Clinical Cases:**

Let's start with our two clinical cases. Imagine you are a fourth-year medical student working in the emergency department and you meet Jane, a 15-year-old girl with right shoulder pain.

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A couple of weeks later, you finish your ER rotation and are working in a family medicine clinic where you meet Ben, a 12-year-old boy also presenting with right shoulder pain.

What are the important questions you will ask on history, and what will you look for on physical examination to narrow down your differential diagnosis?

### **Anatomy:**

Before we dig into that, let's briefly talk about our first learning objective, that is, the relevant anatomy of the pediatric shoulder. The shoulder is made up of three bones (the clavicle, scapula, and humerus), and four joints (the sternoclavicular, acromioclavicular, glenohumeral, and scapulothoracic joints), all of which can be injured and must be considered in the differential diagnosis for a shoulder injury. So, what makes shoulder injuries in children and adolescents different from those in adults? Individuals often do not reach skeletal maturity in their upper extremities until around age 25, meaning that before this age, many of their growth plates are not yet closed. Since open growth plates are much weaker than their surrounding structures, youth are much more susceptible to injuries involving the physis. Shoulder instability is also common in pediatric patients, as youth tend to be more mobile and flexible than adults. On the other hand, conditions such as rotator cuff tears, osteoarthritis, and frozen shoulder, all of which are very common shoulder conditions in adults, are rarely encountered in youth.

### **Clinical Presentation:**

Now let's discuss our second learning objective, where we'll talk about some key components of the history and physical exam. We'll start with history.

- 1) First: **What is the clinical presentation?** For example: If there is pain, when did it start? Where is the pain located, and what is the quality of the pain? Is the pain continuous, or only present with certain movements? Is there any numbness or tingling? Instability? Loss of mobility?
- 2) Second: **What was the mechanism of injury?** For example: What happened? When did the injury or pain occur? Was it gradual, or sudden? Was there a precipitating event such as a direct blow, a throw, or a fall? Has this happened before, or were there any prior symptoms in the shoulder? Were they able to keep participating in their sport or activity at the time of injury?
- 3) Third: **Who is the patient?** For example: What is their age, gender, sport, and activity level? Do they have any medical conditions? Are there any conditions that run in the family?

Now let's put these history-taking tools to use with our two cases.

Jane tells you that she was playing a rugby game when she injured her shoulder. She was running with the ball when she was tackled and landed on her right shoulder, with

her arms still at her sides holding the ball. When asked about the pain, she says it hurts all over but is worst on the top of her shoulder and mentions that it is painful all the time but gets worse when she reaches across her body or lays on her injured arm. She reports no numbness, tingling, instability, or other associated symptoms.

Ben tells you that he started feeling shoulder pain about 6 weeks ago, but it has become progressively worse since then. He tells you the pain is diffuse, but mostly around the outside of his shoulder and his upper arm. There was no traumatic event that precipitated the pain, but the pain is there whenever he throws a baseball. He is a pitcher on two different baseball teams, and has been practicing over 20 hours a week. He reports no numbness, tingling, instability, or other associated symptoms, however he reports that his pitching speed and accuracy has decreased since the pain began.

Once your history is complete, it is important to do a thorough physical examination. As always, note whether the patient appears well or unwell, and assess vital signs. There are a few potentially life-threatening injuries that can present as shoulder pain, so your first job is to rule these out. A medial clavicular fracture with posterior displacement can result in life-threatening internal injuries to adjacent structures, while serious injuries to the neck, abdomen, or myocardium may also present as referred pain to the shoulder. To assess for a life-threatening injury, begin with your ABCs – assess airway, breathing, and circulation. Perform a cervical spine exam, and if there is focal neck tenderness, a step-off on palpation of the C Spine, or neurologic deficits, immobilize the cervical spine. Perform a neurovascular assessment, ensuring that the patient has preserved motor function, sensation, and blood flow, and no neurological pain or paresthesia. If there are any concerning findings with any of these assessments, do not proceed with an examination for an isolated shoulder injury, and instead get the patient urgently assessed in the emergency department. Once you feel confident that you can proceed with your isolated shoulder exam, approach the physical exam using the Look, Feel, Move, and Special Tests approach that can be used for most musculoskeletal presentations. Remember to always compare the injured shoulder to the uninjured shoulder, and make sure you are assessing all of the bones, joints, and soft tissues. Keep in mind that your physical exam may be limited by the patient's pain. So first, **look**. Inspect the shoulder using the SEADS acronym - assess for Swelling, Erythema, Atrophy, Deformity, and Skin Changes or Scars. Next, **feel**. Palpate the shoulder for any tenderness, warmth, crepitus, deformities, or atrophy. Next, **move**. Assess active and passive range of motion in all directions, noting any discrepancies between the injured and uninjured shoulder, as well as any disparities between active and passive range of motion. Assess strength only if it will not cause the patient too much pain. Finally, **special tests**. We will talk about some special tests that may be useful for certain presentations later in the podcast.

With these techniques in mind, let's go back to the cases:

On physical exam, you begin with inspection of Jane's shoulder and identify some swelling, as well as a small bump superiorly on the shoulder. On palpation, Jane reports significant tenderness when you palpate directly over the AC joint, and you feel a bump

where it appears the distal clavicle is elevated. You are unable to complete full active and passive range of motion testing, as Jane's movement is limited by pain. You do a cross-arm A-D-duction test, a shear test, and an active compression test, all of which increase Jane's pain. Turning to Ben, you find nothing abnormal on inspection of his shoulder. On palpation Ben reports point tenderness of the lateral proximal humerus at the area of the physis, but you feel no deformity or other significant findings. Ben's active and passive range of motion are mostly preserved, with a slight decrease of internal rotation of his affected shoulder.

### **Differential Diagnosis:**

Now that we've discussed a broad approach to history and physical exam, let's dive into our third learning objective, the differential diagnosis of pediatric sports injuries of the shoulder.

Most pediatric shoulder injuries can be immediately classified as either acute or chronic. Acute injuries usually result from one traumatic episode, whereas a chronic injury develops gradually over time, and is often the result of overuse. Let's start with acute. The differential diagnosis of common acute injuries of the pediatric shoulder includes: Clavicle fracture, acromioclavicular joint injury, burner syndrome, glenohumeral joint dislocation, proximal humerus fracture, and superficial contusion. Now, let's talk about each of these in more detail, paying attention to key findings on history and physical exam.

- Midshaft and distal clavicle fractures are common in sport, often resulting from a direct hit or a fall onto the shoulder. Midshaft fractures are the most common type in young athletes, and typically present with well-localized pain in the middle third of the clavicle, which is made worse with arm movement, especially A-B-duction. On history, the patient may talk about feeling a crack or a snap at the time of injury. They will often be supporting the injured arm with their other arm. On physical exam, there will typically be point tenderness along with localized swelling and bruising, or a visible bulge due to a hematoma or the fracture itself. Crepitus may also be felt. Distal clavicle fractures present very similarly to, and are easily confused with, AC joint injuries, which we will talk about next. A typical clinical presentation includes pain, tenderness, swelling, and bruising around the distal clavicle, and a positive cross-arm A-D-duction test (or increased pain when the arm is A-D-ducted across the chest). If there is any concern for a clavicle fracture, X-rays are indicated. Management of uncomplicated clavicular fractures is typically conservative and involves a sling for comfort, as needed ice and analgesics for pain and early range of motion as pain allows. Referral to an orthopedic surgeon is required in the case of an open fracture, neurovascular impairment, tenting of the skin, or significant deformity, and if there is any respiratory impairment or hemodynamic compromise the patient should be urgently assessed in the emergency department.

- As previously mentioned, acromioclavicular joint injuries, also known as AC joint injuries or shoulder separations, present quite similarly to distal clavicle fractures. AC joint injuries usually result from a fall or direct hit to the lateral shoulder, with the arm A-D-ducted at the side. Patients with AC injuries will typically complain of pain, swelling, and tenderness directly over the AC joint, which can be exacerbated with physical exam tests such as the cross-body A-D-duction test, the AC shear test, and the active compression test. There may or may not be deformity, depending on the severity of the injury. A plain X-ray comparing the affected AC joint to the unaffected AC joint can be used to help diagnose and classify an AC joint injury. For mild injuries, management is usually non-operative and involves rest, ice, analgesics, protection with an arm sling, and physiotherapy. For more severe injuries, a referral to an orthopedic surgeon should be made as surgery may be required.
- Burner syndrome is a type of peripheral nerve injury usually resulting from a direct blow to the neck or shoulder, such as a helmet hitting the neck in football. The resulting injury is usually damage to the brachial plexus, which presents as immediate burning pain in the supraclavicular region that radiates down the arm. The burning quality of the pain as well as its radiation helps to differentiate it from other, non-neurological causes of shoulder pain. There is often associated numbness, tingling, or weakness in the arm. Diagnosis of a burner can usually be made with a good history and physical exam. Burner syndrome is often transient and symptoms usually resolve on their own, but if the pain persists, physiotherapy can help. The athlete should not return to play until the symptoms completely resolve. Protective equipment for the neck while participating in contact sports is helpful to reduce the incidence of burners.
- A shoulder dislocation occurs when the head of the humerus dislocates from the glenoid fossa. Anterior dislocations are the most common, and usually result from a force applied to the arm when it is A-B-ducted, externally rotated, and extended; for example, arm tackling in football or rugby, or sometimes, falling on an outstretched hand. Patients will generally present with severe poorly localized shoulder pain, and deformity if the joint has not been reduced. They will avoid moving their arm. The patient should be evaluated for loss of sensation over their lateral deltoid, which can indicate damage to the axillary nerve, a common complication of an anterior shoulder dislocation. Dislocated shoulders should undergo urgent reduction by a trained clinician, along with pre- AND post-reduction X-rays to confirm the diagnosis, identify any associated injuries, and ensure successful reduction. Reduction attempted on field may, however, be completed by an experienced provider before obtaining X-ray's. After reduction of the dislocated shoulder, the shoulder should be immobilized temporarily and the patient may be referred to an orthopedic surgeon for consideration of surgery. However, many traumatic shoulder dislocations are able to be successfully treated non-operatively. Physiotherapy to regain range of motion and strength is recommended before returning to play.
- A fracture of the proximal humerus is another injury that can cause shoulder pain in youth. Proximal humerus fractures most commonly result from a fall on an

outstretched hand, or from a direct hit to the lateral shoulder. Patients will usually complain of severe poorly localized shoulder pain worse with arm movement, and on physical exam, there will usually be tenderness and swelling. If the fracture is displaced, there may also be deformity or the arm may be shortened. As with all fractures, X-rays are indicated if a proximal humerus fracture is suspected. If there are no findings on the X-rays but the patient has tenderness at the physis, a Salter-Harris I fracture should still be considered. Management is usually non-operative, and involves temporary immobilization, analgesics, and physiotherapy to maintain range-of-motion. Surgery may be indicated and referral to an orthopedic specialist should be made if the fracture is intra-articular, open, or completely displaced, or there is any neurovascular involvement.

- Superficial contusions, or bruising in the shoulder area is common, and generally results from a direct blow to the shoulder. It can cause significant pain, but is otherwise not concerning. Patients will generally demonstrate full active ROM and no localized bony tenderness. Further investigations are usually not warranted and the pain should improve with rest and ice.

Now, let's talk about our other category: chronic overuse injuries of the pediatric shoulder. These injuries are more common in sports with repetitive overhead motions such as baseball, swimming, and tennis. The differential diagnosis for common overuse injuries of the pediatric shoulder includes: Little league shoulder, impingement syndrome, and chronic atraumatic glenohumeral joint instability.

- Little League shoulder, or proximal humeral epiphysiolysis, refers to injury and inflammation around the growth plate in the proximal humerus due to repetitive stress. As we know, the pediatric patient is skeletally immature, meaning that their growth plates are weak and susceptible to injury from overuse. This generally occurs in young athletes who do a lot of overhead activity such as baseball pitchers, volleyball players, and swimmers. Little League shoulder most commonly occurs in adolescent boys, and patients will typically complain of gradual onset shoulder or upper arm pain experienced during throwing or other overhead activities, that improves with rest. Physical exam will often reveal tenderness on the proximal humerus, but active and passive range of motion are usually preserved, with possible decrease in internal rotation if the presentation is severe. If the diagnosis is in question, plain X-rays can be obtained where classic findings of proximal humeral epiphysiolysis will confirm the diagnosis. Management of Little League shoulder is conservative, and involves rest from throwing or other overhead activities for around 6 weeks, and gradual return to play with physiotherapy, technique training, and counseling on avoiding future overuse.
- Another overuse injury commonly experienced by young athletes involved in sports with a lot of overhead activity is Shoulder Impingement Syndrome, also known as rotator cuff tendonitis, or Swimmer's Shoulder. Shoulder impingement syndrome usually results from repetitive stress due to overhead activities causing inflammation of the supraspinatous tendon in the subacromial space. Patients with shoulder impingement syndrome will typically present with progressive,

gradual onset shoulder pain. The pain will be worse with overhead activity, and is usually poorly localized. On physical exam, there may be tenderness under the acromion process. On special tests, you may be able to elicit pain and weakness with the empty can test, the painful arc test, Hawkins-Kennedy test, and Neer test. Range of motion is usually preserved early on, but there may be limited A-B-duction and internal rotation in severe cases. Imaging is usually NOT indicated in cases of suspected impingement syndrome, as X-rays will be normal.

Management is conservative, including rest and pain management, physiotherapy, and proper training technique for a gradual return to play.

Complete recovery may take weeks to months, but prognosis is good.

- Chronic atraumatic glenohumeral joint instability stands out from the other chronic conditions, as the chief complaint is usually not pain, but instability. It manifests as excess movement of the glenohumeral joint due to laxity of the shoulder stabilizers, and is most commonly seen in young female athletes involved in sports with repetitive overhead movements. Individuals with multidirectional instability are often otherwise asymptomatic, but may experience pain or weakness with overhead movements, and may have a family history of shoulder instability. On physical exam, excessive movement can be appreciated on the load and shift test. The patient may feel apprehension or pain with the arm A-B-ducted and externally rotated in the apprehension test, and will usually feel relieved with it pushed posteriorly in the relocation test. A positive sulcus sign may also be appreciated as the arm is pulled inferiorly. If an athlete presents with shoulder instability, they should also be assessed for generalized ligamentous laxity in other joints. Imaging is generally not indicated, as the diagnosis is rarely in question. Management involves long-term physiotherapy, and surgery is not usually considered unless non-operative treatment is unsuccessful.

### **Diagnosis & Management:**

With our differential diagnosis in mind, let's talk about our final learning objective and summarize a general approach to diagnosis and management of pediatric sports injuries of the shoulder, which we can then apply to our two clinical cases.

First, let's talk about a broad approach to diagnosis. Keep in mind the key components of the history that we talked about, and the general approach for the physical exam as well as some of the findings that might be unique to a specific diagnosis. After your history and physical exam, you should either have a fairly confident diagnosis, or need to consider imaging to come to the diagnosis. Most chronic overuse shoulder injuries can be diagnosed with a thorough history and physical exam and imaging is NOT recommended. Little League shoulder is the exception as it does have characteristic findings on X-rays, however X-rays are still not always needed unless the diagnosis is in question. On the other hand, for most acute traumatic shoulder injuries, plain X-rays are indicated and can help you confirm your diagnosis and decide on management. It is always necessary to get at least 2 views, and imaging of the unaffected shoulder should be considered for comparison.

Next, let's summarize what we learned about management of these shoulder conditions.

Overuse injuries are the most common type of shoulder injury in young athletes. Most overuse shoulder injuries can be managed conservatively, and referral to an orthopedic specialist should be reserved for cases where there is persistent or recurrent pain after conservative treatment. Conservative treatment generally consists of rest, physiotherapy, sport-specific technique training, and education about prevention of overuse injuries. A good rule of thumb for prevention of overuse injuries is that a child should engage in no more hours of organized sport per week than their age. Proper sport technique is also key.

Many acute traumatic shoulder injuries, however, require referral to an orthopedic specialist for consideration of surgery. This includes most shoulder dislocations, complicated fractures, and severe AC joint injuries. Non-operative management is usually sufficient for uncomplicated fractures and shoulder dislocations and mild AC joint injuries, and includes ice, rest, analgesics, temporary immobilization, and physiotherapy. In all shoulder injuries, if there is nerve or vessel involvement, urgent treatment is needed to reduce the risk of long-term complications.

### **Cases Wrap-Up:**

Now that we've covered all of our learning objectives, let's wrap up by applying what we've learned to our clinical cases.

After your thorough history and physical exam, you suspect that Jane has an AC joint injury. However, knowing that this injury presents very similarly to a distal clavicle fracture, you are still considering that in your differential. You decide to send Jane for X-rays, and the results confirm your diagnosis of an AC joint injury. You know that while most AC joint injuries are managed non-operatively, surgery may be recommended in severe cases, so you decide to refer her to an orthopedic surgeon. Together, they decide to stick with non-operative treatment, and Jane heals up with a sling, rest, ice, and pain medication for the next few weeks. Once the pain is tolerable she begins physiotherapy to help regain her strength and range of motion, and is back on the rugby field with her team 12 weeks later.

Turning back to Ben, you determine that his injury is an overuse injury. After your history and physical exam, you are suspicious of proximal humeral epiphysiolysis, or Little League shoulder. You get X-rays which show a characteristic widened proximal humeral physis of the injured shoulder compared to the uninjured shoulder. You make the diagnosis of Little League shoulder. Ben is disappointed when you advise him to stop pitching for 6 weeks, but with some rest, physiotherapy, and pitching technique practice, he is thrilled that when he returns to practice, he feels like his old self again. He asks you how he can prevent something like this from happening again, and after a discussion about overuse injuries in young athletes, he agrees that it might be best to commit to just one baseball team to reduce his hours of pitching.



## **Take-Home Points**

That concludes our two cases, and with it, our podcast on pediatric sports injuries of the shoulder. Before we finish, let's review the take-home points:

- #1: The pediatric shoulder differs from the adult shoulder mainly due to open growth plates and increased mobility
- #2: When taking a history of a pediatric patient with a shoulder injury, it is important to first determine whether it is acute or chronic. Then, find out more about the clinical presentation, the mechanism of injury, and consider the patient characteristics.
- #3: When doing a physical exam on a pediatric patient with a shoulder injury, it is important to first assess for potential life-threatening injuries, and ensure that there is no c-spine injury or neurovascular compromise. Then, you can move onto your shoulder exam using the Look, Feel, Move and Special Tests approach.
- #4: The differential diagnosis for common injuries of the pediatric shoulder is split into acute and overuse injuries. Acute injuries include clavicle fractures, AC joint injuries, burner syndrome, shoulder dislocations, proximal humerus fractures, and superficial contusions. Overuse injuries include Little League shoulder, impingement syndrome, and chronic atraumatic glenohumeral joint instability.
- #5: A thorough history and physical exam is usually sufficient to diagnose overuse injuries, where plain X-rays are often helpful in acute injuries.
- #6: Management of overuse injuries is usually conservative. Acute injuries are sometimes managed conservatively, but in some circumstances can require referral to an orthopedic specialist.

Thanks for listening!

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