# Sports-Related Elbow Injuries

Daniel J. Wordekemper
Avera McKennan School of Radiologic Technology

# Sports-Related Elbow Injuries

**Outline**

I. Introduce the topic of the paper to the audience

II. Soft Tissue Injuries

A. Tennis Elbow
B. Bicep and Tricep Tendon Pathologies
C. Cubital Tunnel Syndrome

III. Osseous Injuries
A. Medial Epicondyle Apophysitis
B. Sublime Tubercle Stress Fracture
C. Panner's Disease

IV. Summarize topic to the audience

**Learning Objectives**

1. Be able to understand the difference between soft tissue and osseous injuries.
2. Be able to understand the difference between different soft tissue injuries.

3. Be able to understand the difference between different osseous injuries.
4. Be able to understand how different injuries require different imaging modalities and techniques.
5. Be able to briefly explain how different injuries heal compared to similar injuries.

**Abstract**

The elbow is one of the easiest joints to hurt or injure in the body. It is an incredibly complex joint full of ligaments, tendons, bones, and bursae. The body is an incredible machine

that can oftentimes fix itself with time, but the elbow is extremely susceptible to injuries that might require more medical intervention. Depending on the type of injury or the severity; that intervention could be a pain medication, a steroid or cortisone shot, or even surgery. All of these interventions are ways that our bodies can be guided back to their natural state. Great athletes know their body's limits, but in certain circumstances they push their bodies past their limits creating pain and injury. Some injuries are small while some require more intervention and time. These injuries are setbacks in an athlete's life and are challenges athletes face on and off the field, the court, or the rink. There are two main categories of elbow injuries; soft tissue and osseous, both of which can be overcome by the amazing strength and ability of the human body.

## Introduction

Soft tissue and osseous injuries occur every day in sports and life. They can be subtle or obvious, painful or sore, restricting or just a nuisance. Because of the complex nature of the

elbow joint, there are many different injuries athletes of any age can receive. This paper will look deeper into just a few of those injuries, some being related to the soft tissue structures while others are bone related and will go in depth over several different soft tissue and osseous injuries including; what causes them, how they can be imaged, and how they are treated. Some of these are rarer than others, and some of them are known by most or all athletes.

**Soft Tissue Injuries**

Soft tissue injuries can be difficult to diagnose and many times they are able to heal themselves. They also can be very difficult and hard to find a one stop treatment. These injuries occur in the tendons, ligaments, and bursae. Some of the common injuries to the soft tissue structures of the elbow are tears, ruptures, and nerve entrapments. Osseous injuries to the elbow fall under a simpler category which is any injury to the bones of the elbow. Fractures, osteochondritis, and dislocations are some of the most common injuries under this category. Osseous injuries occur more often in contact sports or forceful traumas.

Soft tissue injuries are more common because if the elbow gets sore or begins to hurt after working out or practicing/playing a sport it is likely due to soft tissue injury or microtrauma. If the patient's elbow is just sore, more than likely the pain is due to a strained or slightly torn muscle; both of which can heal with time. If the patient's elbow is so painful that it can't be moved, the patient should see a doctor. The extent of the elbow injury should be examined and could be either a severe soft tissue injury that requires attention or it could be an osseous injury.

**Tennis Elbow**

Tennis elbow is the most common elbow injury that can occur, and affects the different tendons in the elbow.[1] Tennis elbow is a tendon pathology involving the common extensor tendon.[1] This injury is most common among people in their forties or fifties, but many of those don't even play tennis at all.[1] In the majority of cases imaging of this type of injury is not necessary. When imaging is performed, thinning, partial tearing or avulsion of the common extensor tendon's origin at the lateral epicondyle can be seen.[1] In more severe cases, where the elbow can't be moved at all, it is possible to see partial tears of the lateral ulnar collateral ligament in conjunction with the common extensor tendon pathologies.[1] Ultrasound and MRI are commonly used and are the preferred ways to image tennis elbow, but ultrasound is preferred over MRI due to cost and availability.[1] Tennis elbow is best seen with the elbow flexed and the

forearm up; this position gives best access to visualize the proximal common extensor tendon, which is the main site of interest when evaluating tennis elbow.[1]

Tennis elbow is an injury that builds up over time depending on the amount of use the joint receives, so it may be difficult to be aware that it is happening.[2] One of the biggest problems with tennis elbow is that the symptoms are so variable, an athlete might have a day their elbow is a bit more sore than normal, but by the end of the day it starts feeling better and might seem fine. These microtears to the tendon occur from activities where a firm grip is needed, such as DIY projects, sweeping the floor, or even opening a door. Builders and carpenters are very susceptible to microtears because of their constant use of tools, all of which require a firm grip.[2] Golfer's elbow, which is a close cousin to tennis elbow, is similar, but the main difference is that Golfer's Elbow involves the common flexor tendon on the medial side of the elbow where it connects to the medial epicondyle of the humerus.[2] These two are easily confused, especially when the elbow is labeled in anatomical position; which ends up flipping the medial and lateral sides of the elbow.

Tennis elbow can be relieved with time and icing to reduce swelling. There are also numerous types of physical therapy and stretching programs that can be done to strengthen the elbow.[10] Alongside this, the patient can use a soft-sided elbow brace to help maintain the integrity of the elbow.[10] Over the counter medications such as Tylenol, Ibuprofen, and Advil can be taken to reduce swelling and alleviate pain.[10] This type of injury is more of a nuisance than anything for an athlete, but if it is managed appropriately; it will not significantly limit any daily activities.[10]

**Bicep and Tricep Injuries**

Bicep and tricep injuries are very common in activities that require forceful elbow flexion and extension as well as activities that require rotation of the arm.[3] Both the bicep and the tricep muscles start as tendons in the shoulder, then turn into muscles that connect to the elbow as tendons again.[3] The bicep controls major movements such as flexion, and the tricep controls the opposite being extension.[3] Injuries can happen in the shoulder, but are more commonly located near the elbow, occur during sudden movements requiring force such as catching a falling object or moving heavy objects.[3] Tears to either muscle are extremely painful right away, often times making it very difficult to move either your elbow or shoulder in one direction; depending on the

location of the injury and what muscle is involved. These tears are slightly less common, but at the same time they can often be more serious requiring more medical attention.[3]

Diagnostic X-ray imaging of the elbow will likely be the first procedure because of the similar symptoms these injuries can have with osseous injuries, with the most common being the inability to move the joint in one direction.[1] These images are used to rule out certain osseous pathologies; however, if effusions or swelling in the tissues can be noted it would be a very good clue that soft tissue damage has occurred.[1] This finding is what commonly continues the imaging process; moving to either ultrasound or MRI. It is these two imaging modalities that will most accurately demonstrate a tear or partial tear of the bicep or tricep muscles or tendons.[1] Common symptoms that will occur from a tear like this are: popping sounds near the elbow or shoulder injury, inability to flex or extend the elbow, bruising, swelling, and weakness.[3] An indication to which muscle is injured is the direction the elbow has trouble moving in. Difficulty moving the elbow during flexion is consistent with a tear to the bicep, while the opposite is true with the tricep.[3] Susceptibility to a bicep or tricep injury like this can be caused by smoking, past injury, family history, and the use of anabolic steroids.[3]

Timeline is very important when treating these injuries. Partial tears of either muscle/tendon group; physical therapy, activity adjustments such as taking a break, and bracing will greatly improve and heal these injuries.[3] For cases that have a complete tear surgery will be the most important course of action.[3] Timing is so important, when there is a complete tear, the best outcomes are seen in those that have surgery within two weeks from the time of injury.[3] Seeking intervention in this amount of time will greatly decrease the amount of weakness in the elbow post-surgery, as well as increase the probability of total recovery.[3]

**Cubital Tunnel Syndrome**

Cubital tunnel syndrome, not to be confused with carpal tunnel syndrome of the wrist, is another common soft tissue injury. This syndrome is associated with a lot of pain and discomfort of the medial side of the hand and arm, extending into the ring and pinky finger.[4] This injury is caused by the pinching of the ulnar nerve as it runs through a groove on the medial side of the elbow.[4] Ironically this nerve is more commonly known as the “funny bone,” which is actually not a bone at all.[4] All of these factors create a feeling that everyone has experienced at some time in their sports careers, or in everyday life. Everyone knows what it feels like to hit their “funny

bone," this burning, tingling, or weak feeling is all nerve pain originating for the ulnar nerve in the elbow.

There are three common issues that can cause the pinching of this nerve: pressure, stretching, and anatomy.[4] Instances that could result in pressure on this nerve are: landing on it after getting hit in a contact sport, bumping it on a desk at work, or leaning on it for too long. All these activities put pressure on the nerve causing it to become trapped momentarily. This causes pain from the brief inability to move, or from the sudden compression of a blow created from hitting the nerve on something.[4] Stretching can come from simply keeping your elbow bent for extended amounts of time while sleeping or sitting at a computer all day.[4] Keeping the elbow bent causes the ulnar nerve to stretch out of its groove; making it not only painful, but more susceptible to being bumped.[4] Anatomy at first sounds like a strange reason to get nerve pain, but it is actually caused by one's nerve not staying in its groove; causing it to snap back and forth over the bone in the elbow.[4] Over time, this snapping motion can cause irritation to the nerve, resulting in pain. In some cases, patients may experience hardening of the soft tissue in the elbow, or may have an extra muscle in their elbow, which too will cause the nerve to move incorrectly causing irritation to the nerve.[4]

Nerve pain is very distinct when compared to osseous pain, and because of this X-rays are rarely ordered. Ultrasound is usually the first procedure ordered when attempting to rule out this type of injury. If the testing indicates the nerve has been impacted in any way, an MRI will then be ordered to evaluate the extent of the damage.[11] There are several ways to help prevent and treat this type of injury. There are less invasive treatments to treat these injuries, such as: restraining the elbow at night by loosely wrapping a pillow or splint around it when sleeping, avoiding leaning on the elbow, and seeing a hand therapist for exercises to avoid putting strain on the nerve.[4] Surgery might be required in cases that involve anatomy.[4] By "releasing" the nerve if it is trapped by an extra muscle, or by extracting a piece of bone to give the nerve more space.[4] After surgery, physical therapy will be required to rebuild strength in the hand and elbow due to the proximity to all the nerves and muscles traveling through the elbow to hand.[4] This type of injury very rarely requires surgery, but if it does the outcomes of a total recovery are very high and most people are back to active lives quickly.[4]

**Osseous Injuries**

When thinking of an elbow injury due to sports, it is very common to first think "broken elbow." Though it depends on the type of sport, what movement occurred, and what force was exerted and how osseous injuries are still less common. When bone injuries do occur, medical intervention is always required. Soft tissue has a much higher success rate of healing itself correctly than bone does. Bone will heal on its own with the help of osteoblasts, but often times realigning the bone with a splint or cast or reducing the fracture with plates and screws may be required. Recovery time for osseous injuries will take longer than that of soft tissue due to the amount of time bone regrowth takes, but in the end is highly successful.

**Medial Epicondylar Apophysitis**

Medial Epicondylar Apophysitis, also known as "Little League Elbow," is most common in children ages 9-14, and it is the most common sports related elbow injury in kids of this age group.[5] Little League Elbow is a widening or inflammation of the growth plate "epiphyseal plate" connecting the medial epicondyle of the humerus to the body of the humerus.[5] The nickname Little League Elbow, comes from the fact that the vast majority of these injuries arise from little league pitchers.[5] In addition, it can also come from other high volume throwing positions such as shortstop, and over the head sports like volleyball and football.[5]

Little League Elbow is caused by overexertion of the elbow during throwing type motions such as pitching, batting, and high over the head rotations. The muscles of the forearm used during a throwing movement are attached to the medial epicondyle as well as a ligament used to stabilize the elbow.[5] The repeated motion of throwing causes immense amounts of strain on the cartilage growth plate that connects the medial epicondyle to the main portion of the humerus.[5] It is important to understand this injury only occurs in kids because as adults, this growth plate is closed, making this injury impossible. Repeated stress can cause the growth plate to widen, and in severe cases break off part of the medial epicondyle of the humerus.[5] Symptoms of this injury are pain and throbbing when trying to throw a ball, or when fully extending the elbow.[5] Patients may also see or experience swelling or bruising on the medial side of the elbow.[5]

Imaging this injury will commonly begin with X-rays, and in extreme but ideal circumstances fragmented bone can be seen on either the medial oblique or lateral elbow projection.[6] If a break cannot be noted on plain films, an MRI will likely be the next procedure

ordered.[12] To create the best spatial resolution, the ideal process for MRI is to use the elbow coil, which wraps around the elbow in the scanner.[12]

Treatment of Little League Elbow is relatively simple and doesn't involve invasive measures. The most important and beneficial treatment is to rest the elbow from throwing or exertion. Icing the elbow can be extremely beneficial by reducing inflammation, and lowering the amount of pain in the joint.[5] Physical therapy can also be beneficial because it will safely strengthen and improve endurance of the elbow, which will protect the elbow from re-injury in the future.[5] Total recovery time to full activity is typically 4-6 weeks from the initial injury.[5] Prevention of this injury can be as easy as paying attention to a pitch count, not throwing breaking balls, such as curveballs, before age 14.[5] Though this is the most common injury in children playing sports, the recovery outcomes are very high, and after reaching ages of 17-18, the risks or chances of re-injury catastrophically decline.[5]

**Sublime Tubercle Stress Fracture**

Sublime tubercle stress fractures occur when part of the coronoid process of the elbow breaks off of the proximal ulna.[7] This is a rare injury, and results from extreme stress to the ligament that attaches to the tubercle, inevitably pulling this ligament attachment site free from the ulna.[7] This type of fracture is known as an avulsion fracture, meaning the bone pulls or breaks away completely into a separate piece.

This injury is most common in baseball and pitchers are at extremely high risk for this type of injury. Followed by pitchers, any sport that requires high velocity throwing or over the head movements are at risk for this type of injury. This injury is very painful, has a very lengthy recovery period, and does require surgery. Though the injury might not sound familiar, the surgery is something that all athletes have heard of, especially baseball players. The surgery performed to fix this is known as "Tommy John Surgery."[15] This surgery is known as one of the more difficult surgeries to recover from among athletes, often taking up to nine months before being eligible to start back to sports normally.[7] This surgery consists of anchoring the detached piece of bone back to its correct position, and oftentimes requires using a piece of grafted ligament and reattaching it to the bone.[7] Post surgery, the elbow is put into a very specific order of braces in different positions, and after weeks in a brace, physical therapy can begin.[7] Rethrowing begins at around four months post-surgery and will take up to nine months before the person is throwing full velocity again.[7] This injury is one that previously has had little

success, but within the past decade has made huge strides in success rates with new therapy methods which are improving the actual recovery rates.[7]

Imaging an injury like this can depend on the extent of the damage that has already occurred. Plain radiographs and an MRI scan are the two most common ways to evaluate this injury.[13] If the injury is extreme, a bone fragment detached from the ulna due to the forceful pull on the ligament will be demonstrated. If there is no clearly seen bone fragmentation on plain films, an MRI scan may be completed. This scan will best demonstrate the ulnar collateral ligament or any bony fragment on the coronal images.[13] It is still recommended that an elbow coil be used to provide improved spatial resolution when viewing the ligament.[13]

**Panner's Disease**

Panner's Disease, a very rare injury resulting from overuse of the elbow, occurs in children.[8] It is called a disease, but is a bony condition caused by overuse, that once fixed has little to no effect on the person when they grow up.[8] Panner's Disease is a condition in which the blood supply to the growth plates in the elbow, specifically the capitulum of the humerus, decreases or stops.[8] As a result of this lack of blood flow, the growth plate begins to necrose and die.[8] It can only occur in children because of the growth plate's role in bone growth. This inevitably causes the bones of the elbow to prematurely stop growing.[8] This injury is very similar to osteochondritis dissecans because both are due to the lack of blood supply to the bone.[9] The main difference is that osteochondritis dissecans occurs after the growth plates are closed causing it to occur in adults as well.[9]

Panner's Disease can be seen on plain radiographs of the elbow.[14] These images can show flattening of the capitulum of the humerus, which is a clear indicator of this injury.[14] In some cases an MRI scan may be ordered to evaluate the bone in more detail, or to evaluate the extent of the swelling in the soft tissue surrounding the joint.[14] Visualizing the soft tissue with MRI is beneficial if there are other injuries hiding within the swelling that might have occurred during the progression of the Panner's Disease.[14]

Doctors believe this disease is hereditary, but are unsure if there are other causes that contribute to the disease.[8] It is thought that overuse of the arm in activities such as pitching and gymnastics increase the risk for this injury.[8] Symptoms that occur with this injury are swelling, stiffness, inability to fully extend the elbow, and inability to fully pronate or supinate the arm.[8] Thankfully the body's process of breaking down old bone and replacing it with new, most often

fixes this problem on its own.[8] Other treatment options include: ice and heat to relieve swelling and pain, physical therapy to regain full movement, especially if movement is limited due to pain, and over the counter anti-inflammatory medications.[8] The body is capable of healing itself from this injury, but other interventions greatly improve the speed and success of this recovery.

**Conclusion**

Sports related injuries occur every day, whether in the middle of a game, or in the off season preparing for the coming year ahead. They can occur for several reasons such as poor body mechanics, genetics, and by not knowing safe limits. Injuries can occur to any athlete playing a sport, whether it's a pulled muscle or it is cut off blood supply to part of the bone. Some injuries being more serious than others require medical attention, while others are better after a few days. It's the drive in an athlete's mind that pushes their bodies to their limits, suffering through the recovery just to be able to play that one more snap, throw that one last pitch, or spike that one last ball. It is the athlete in everyone that pushes their body to heal faster.

Injury diagnosis is the first step in the journey to recovery and radiology is a vital component to diagnosis. It helps to understand if braces are needed, if physical therapy will help, or if surgery may be required. The human body is an amazing and resilient machine that will try to heal itself the best way it knows how so that it can get back to doing what it loves, but sometimes it just needs a little help. It is with the assistance of radiology that we can see and understand what assistance can be given.

References

1. O'Dell C, Urena J, Fursevich D, Sanchez E, LiMarzi G, Bancroft L. Imaging sports-related elbow injuries. *Applied Radiology*. March 2015. https://appliedradiology.com/articles/imaging-sports-related-elbow-injuries. Accessed 3 Sep. 2019.

2. Buxton Osteopathy Clinic (2019). Common Tendon and Soft Tissue Injuries in the Elbow. *The Buxton Osteopathy Clinic*. https://www.buxtonosteopathy.co.uk/elbow-pain-symptoms/common-tendon-soft-tissue-injuries-elbow/ Accessed 3 Sep. 2019.

3. Mayo Clinic. Biceps/Triceps tendon injuries - Sports Medicine. *Mayo Clinic*. Mayo Foundation for Medical Education and Research https://sportsmedicine.mayoclinic.org/condition/biceps-triceps-tendon-injuries/ Accessed 3 Sep. 2019.

4. Hand Surgeon members of The American Society for Surgery of the Hand. Cubital Tunnel Syndrome. *The American Society for Surgery of the Hand*. https://www.assh.org/handcare/hand-arm-conditions/cubital-tunnel. Copyright 2015. Accessed 4 Sep. 2019.

5. Little League Elbow (Medial Epicondylar Apophysitis). *Ann & Robert H. Lurie Children's Hospital of Chicago.* https://www.luriechildrens.org/en/specialties-conditions/little-league-elbow-medial-epicondylar-apophysitis/. Copyright 2019. Accessed 04 Sep. 2019.

6. Jones J, Bronson R. Medial Epicondyle Fracture. *Radiopaedia*. https://radiopaedia.org/articles/medial-epicondyle-fracture-1?lang=us. Copyright 2019. Accessed 04 Sep. 2019.

7. Salvo J, Rizio L. III, Zvijac J, Uribe J, Hechtman K. Avulsion Fracture of the Ulnar Sublime Tubercle in Overhead Throwing Athletes. *The American Journal of Sports Medicine.* May, 2002; 30(3): 426-431. https://www.researchgate.net/publication/11355774_Avulsion_fracture_of_the_ulnar_sublime_tubercle_in_overhead_throwing_athletes. Accessed date 04 Sep. 2019.

8. Panner's Disease. *Johns Hopkins All Children's Hospital.* https://www.hopkinsallchildrens.org/Patients-Families/Health-Library/HealthDocNew/Panner-s-Disease. Copyright 2019. Accessed 04 Sep. 2019.

9. Mayo Clinic Staff. Osteochondritis dissecans. *Mayo Clinic*. https://www.mayoclinic.org/diseases-conditions/osteochondritis-dissecans/symptoms-causes/syc-20375887. Copyright 2019. Accessed 04 Sep. 2019.

10. Cadman B, Morrison W. 8 exercises for easing tennis elbow plus prevention tips. Medical News Today. https://www.medicalnewstoday.com/articles/322746.php. Published August 13, 2018. Accessed November 4, 2019.

11. Draghi F, Bortolotto C. Importance of the ultrasound in cubital tunnel syndrome. Surgical and radiologic anatomy : SRA. https://www.ncbi.nlm.nih.gov/pubmed/26246343. Published March 2016. Accessed November 6, 2019.

12. Rezaee A, Bell DJ. Medial epicondyle apophysitis: Radiology Reference Article. Radiopaedia Blog RSS. https://radiopaedia.org/articles/medial-epicondyle-apophysitis-2?lang=us. Published 2019. Accessed November 6, 2019.

13. Roentgenol AJ. Tags. PRIME PubMed | Avulsion fracture of the sublime tubercle of the ulna: a newly recognized injury in the throwing athlete. https://www.unboundmedicine.com/medline/citation/9490942/Avulsion_fracture_of_the_sublime_tubercle_of_the_ulna:_a_newly_recognized_injury_in_the_throwing_athlete_. Published 1998. Accessed November 6, 2019.

14. Atanda A. Bones & Muscles. Rady Children's Hospital-San Diego. https://www.rchsd.org/health-articles/panners-disease/. Published June 2013. Accessed November 6, 2019.

15. Tommy John Surgery (Ulnar Collateral Ligament Reconstruction). Johns Hopkins Medicine. https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/tommy-john-surgery-ulnar-collateral-ligament-reconstruction. Published 2019. Accessed November 6, 2019.

If my paper is chosen for presentation, I will need PowerPoint, an LCD projector, and a laser pointer (if possible).