

ICSC06 Upper Extremity Module 6

Part 6 Elbow and Hand

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Video Lesson: 1:29 hour

This talk is titled Elbow, Wrist, and Hand: Looking at Injury Assessment and Management of orthopedic issues related to the elbow, wrist, and hands. Our objectives are pretty straightforward. We are going to review some of the anatomy for the elbow, wrist, and hand very, very briefly. We are going to spend the majority of our time exploring different orthopedic pathologies that affect the elbow, wrist, and hand. Of course, along similar lines are discussing the management strategies that we can utilize for these pathologies of the elbow, wrist, and hand. I do not need to tell you guys that the elbow is a pretty complex structure. We have a lot of musculature that crosses the elbow joint and that influences wrist and hand function, which we will get to a little bit later on more specifically, but I think we tend to forget sometimes the complexities of this anatomy. I want to point out a few things here that if you look at some of the soft tissue structures, the tendons, for example. The ligaments, specifically, they go in a lot of different directions, which can be problematic sometimes for a clinical evaluation, so we have to keep that in mind. Then, keeping in mind, too, that we have a lot of musculature that is occurring at the elbow joint, but does not necessarily influence the range of motion of the elbow joint as much as it influences wrist and hand.

If we were to look at the 10,000 foot view of what elbow assessment were to look like, components you want to look at, of course, starting with your usual history components, previous medical history, your family history, so on and so forth. We also want to look at, of course, the present condition in orthopedics. That is obviously the main thing that we really want to look at. We are going to look for the location, the onset of those signs and symptoms. We really want to figure out the mechanism injury, if at all possible. Sometimes, it is not possible to determine that. We also want to determine what are their activities of daily living or their sport that they are involved with that is influencing some of the pathology, the problems that they are having. One of the biggest things that we will see with the elbow specifically, especially when it comes to sports, is throwing and throwing mechanics.

If you are not as familiar with throwing mechanics, the phases of throwing, I would strongly encourage you to look this concept. I have put a reference to a great seminal article here from a publishing, Sports Health. It is a little dated, it is from 2010, but it has still got a lot of great pertinent information that is still valid today. Sports Health is an open access journal, so you should not really have any issues finding this article. After our history is complete, we know we can get into that more of that physical exam. We are looking from an inspection's perspective; we need to look at all four sides of the elbow. For an interior perspective, things that I would be looking at is their carrying, or how are they holding their elbows within a guarded position, or is it in a kind of relaxed neutral position.

We also want to look at the Cubital Fossa. From a medial perspective, we want to look for the Flexor Mass and as well as the Medial Epicondyle, because there is a handful of pathologies that specifically speak to these two structures that we will discuss a little bit. Then, similar from a lateral perspective, we want to look at the Cubital Recurvatum, and how is that position looking, as well as the Extensor Mass. We can even add in the Lateral Epicondyle there, as well.

What does the alignment of the forearm and the wrist look like from that lateral positioning? Is it in a neutral position? Or again, does it look like it is kind of guarded or malaligned? That could be influencing how we proceed with our physical exam there. From a posterior perspective, we want to look at bony alignments again. How does that humerus look as it articulates with the radius and the ulnar there? What does that olecranon process look like, and what does that olecranon bursa look like? If that is

inflamed, or irritated, or ruptured, that is going to really inhibit our ability to really visualize some of those posterior structures. When we palpate, of course, with orthopedics, we always want to start remote and then move our way towards any kind of suspected injury, as a means to protect the patient and build a trust and rapport with those patients. We do not want to go straight to any kind of sites of fracture or anything like that. Of course, we want to gradually build up our palpation towards the suspected area. We want to look from an anterior, medial, and a lateral perspective here.

Anterior speaking, we want to look at the biceps brachii. So, at the elbow, of course, we want to look at the attachment site, or the distal biceps attachment site, the cubital fossa again, that brachioradialis musculature, and then the wrist flexors. Specifically speaking, the pronator teres, our flexor carpi radialis and ulnaris, and then the palmaris longus. If the patient has a palmaris longus, we know that a percentage of the population does not have one present. One easy, quick way to tell if they do have a palmaris longus is to have them do resistive wrist flexion, and right at the wrist on the anterior side, if we are looking from an anatomically correct position of the anterior side of that wrist. If you see two tendons pop up, they have got a palmaris longus present. From a medial structures perspective, we want again to look at that medial epicondyle, the ulna, as well as the ulnar collateral ligament or UCL.

Then from a lateral perspective, we want to make sure that you are palpating the lateral epicondyle, the radial head, radial collateral ligament or RCL, the capitulum, annular ligament, and as well as any lateral aspects of that UCL. Remember that UCL has a very funky shape, so we really need to be really cognizant about how we palpate it and how we visualize it, if we are suspecting any kind of damage or trauma to that UCL. From a posterior perspective, again, that olecranon process, that olecranon fossa, the triceps brachii which is that distal attachment there. The anconeus, the ulnar nerves, especially because it is so superficial there, right at the elbow there. Our wrist extensors, extensor carpi ulnaris or extensor carpi radialis longus and brevis. Then, our finger extensors, as well here, the extensor digitorum and extensor digiti minimi. We even might want to even palpate all the way down into the musculature of the thumb, a little bit, since some of those have attachments close to the elbow, like the extensor pollicis longus and brevis, as well as the radial tunnel.

When we talk about our physical examination, we want to look at joint and muscular assessments. Goniometry is critical. It gives us a nice quantitative outcome measure that is nice for documentation purposes. It also gives the patient something that they can tangibly hold onto. Not to mention that insurance companies really like those quantitative values for reimbursement purposes. First, if we are able to, we can do goniometry. Then we move into active range of motion, then manual muscle testing, and then our passive range of motion. We do not really want to do those out of order because, again, if we pick up on something that could be potentially dangerous or harmful to the patient, we do not want to further cause harm to the patient by doing these out of order. So, active first, then manual muscle testing, and then passive range of motion.

For the elbow, we are looking at the four main cardinal movements there, which is flexion, extension. We must remember that pronation and supination, although we kind of visualize that at the wrist and hand, it is truly an elbow motion. We need to make sure that we are assessing pronation and supination of the elbow there. Joint stability testing. For the most part, it is limited for the elbow. It is just valgus and varus testing, which we can do for suspecting any kind of ligamentous problems. But more importantly, maybe, is the joint play and looking at articulations between the humerus, the radius, and the ulna, there.

Of course, our neurological screening can always involve an upper quadrant screening. We want to look at dermatomes and myotomes and then specifically to those upper extremities. It is going to be those

deep tendon reflexes with the biceps, triceps, and brachioradialis reflexes. Once we get into these specific pathologies, which we are about to hit here in a second, we will start talking about some regional-specific pathologies and with those selective specific stress test or special test that deal with those specific pathologies there. One of the more traumatic things that you could potentially see in sport is an elbow dislocation. Of course, this would be an acute onset. The mechanism of injury or MOI is an axial load to the forearm when the arm is placing some kind of load-bearing position. One acronym you might see a lot of times in orthopedic references is a FOOSH, or a falling on an outstretched hand, very common injury for elbow, wrist, hand injuries there.

But with an elbow dislocation, not only would we see some axial load. Probably a FOOSH is also with some supination occurring. Pain is going to be localized to the elbow. There is going to be radicular symptoms that may be described down to the forearm and the wrist, especially if we are concerned about some neurological involvement. Predisposing conditions could involve things, like, if they have got a history of elbow instability, they are significantly at a higher risk for re-injury dislocation. Even in our patients that we have seen surgical interventions here, we kind of see they are just a little bit more stable than non-surgical patients here. If patients have a shallow olecranon fossa, especially if that olecranon tip is prominent, it is just a kind of an anatomical variant that predisposes them to more of an elbow dislocation. We did tend to see these a little bit more in children from an incidence perspective.

We will look at a functional assessment. In this case, just how is the patient presenting and what are they able to do? Are they guarding? They are obviously going to be very limited in what they can do with the elbow, wrist, hand. They are going to be guarding; they are not going to want to use it. They are going to be protecting it, probably holding it pretty close to the core of the body there. From an inspection and palpation perspective, there is going to be an obvious deformity. There is probably going to be edema and there is probably going to be tenderness to palpation on a lot of those structures.

We know we do not want to continue on with a lot of these functional testings. We do not want to be testing a range of motion and then you are mostly testing any of these surrounding structures here. We certainly do not want to be doing any kind of stress test or special testing. I do want to make sure that I am keeping an eye on the neurovascularity of the upper extremity at this point in time, especially distally. I want to be kind of assessing any impairments to radial, median, and ulnar nerves, and we can do that pretty easily in the hand.

We know that the first and second finger are primarily radially innervated there. The middle finger there. The third finger is more of that median nerve and the last, fifth finger and part of the fourth finger, more of that ulnar nerve innervation route. It is easy to just do a sensation check there and then making sure that we do still have a quality radial pulse or capillary refill. If you are not familiar with capillary refill, all you are simply doing is you are just visualizing the nail bed, squeezing the nail. You should see the blood escape from that nail bed and then as you let go, the blood should return quickly.

This just may be challenging if they have got painted fingernails. A trick of the trade, I like to always keep some acetone or nail polish remover in my kit in case I need to do something like this. They make acetone wipes now that are just like alcohol prep pads. They come in little square packets that you can just keep and rip open quickly if you need to use it.

From an imaging perspective, we get your normal set of X-rays in AP and a lateral view there. But if I am concerned about any kind of ongoing or deeper soft tissue damage issues, things along those lines, that are probably not going to visualize on an X-ray, I am going to get a CT scan there. Then if we are really, really concerned about trauma, really concerned about vascularity, which is not something we would commonly see in sport, we could do an Angio there to visualize the vascularity.

Important thing here to note, though, is lots of times with these elbow dislocations, it is not common for them to be isolated. There is usually going to be some fracture associated with these as well, which is why we do not like to reduce them in the field, and it is really hard sometimes to definitively determine whether or not a fracture is present. Unless you are 110% sure that there is no fracture, you really should not be reducing these in the field or in the sport until after you get an X-ray to visualize, specifically the coronoid process there in the radial head and the olecranon process. How do we manage this? Well, this is going to be a referral to the ED. We will just splint it in place. We do not really want to move it. We do not want to run the risk of dislodging any kind of bony pieces that may act, essentially, as like a razor and cut neurovascularity there. So, we always just splint in place. We want to continue to assess and reassess neurovascular. If there is a loss, we definitely want to refer them to the ED right away, usually via ambulance.

Another trick of the trade, easy kind of splinting—if you have some vacuum splints and whatever, that is great and you can use them, that is awesome. What I have found in my own personal clinical experience is that those can still be tricky to get on sometimes even if the patient is kind of positioned in a nice 90-degree elbow flexion position. It is just to take a pillow, like a normal pillow that you have on your bed and just sandwich it between the underside and the outer side of the elbow and it just kind of conforms a nice little sandwich around the elbow.

Then, you can just use like a big, long ACE Wrap and go around the pillow, squeezing the pillow against their core. Then, you can use the ACE Wrap to go around the outside of the pillow and their whole body, their core. It is just a great, easy way and you can still have easy access, then, to continue to check radial pulse and/or capillary refill. There is a fair number of patients, too, that will go into shock with these injuries for whatever reason. As always, any time we have a patient with shock, we need to refer them immediately to the ED for further care. So that is an automatic 911 call there.

We talked about elbow fractures. If we are concerned about a fracture, they are probably going to have a FOOSH mechanism—that falling on an outstretched hand—with some kind of hyperextension of the elbow. Of course, this is an acute onset there, and the pain is going to be pretty much localized to the elbow, unless we have got other conditions going on with comorbidities. If they have got a shoulder dislocation or something along those lines, there could be radiating pain up and down.

The other thing I will say that is, again, if there is some kind of neural involvement with the elbow fracture, they may have radiating pain through the distribution of that nerve. That is something else to keep in mind. So, predisposing conditions specifically for elbow fractures, things like osteoporosis or skeletal immaturity, especially with children, obviously. Then, from a functional perspective, it is going to be very similar to an elbow dislocation. They just are not going to want to use the elbow, wrist, hand at all. They are going to have that elbow protected close by that inter-core stomach area. They are not going to want you to move it, touch it.

If we have got any kind of obvious deformity or edema, you know, that is pretty much the end of our evaluation. We are just going to go ahead and refer them. We will get X-rays, imaging, anything like that. We need in-clinic or whatever. But if we are not sure, we are still trying to rule this out, you may start to do some very basic range of motion, manual muscle testing, but you are going to find out really quickly that they are not a fan of you doing that. Obviously, we would not be doing range of motion and manual muscle testing with an injury like this. Same thing with our special or stress test. We would not be doing any kind of specific testing for this type of pathology. Neurovascular speaking, again, we are concerned about impairments of nerve distributions, radial, median, and ulnar nerves. We want to continue to assess those, as well as assessing either radial pulse and/or capillary refill.

From an imaging perspective, again, an AP lateral X-ray, you might see something, we will call a fat pad sign, which is indicative of bleeding into the joint space surrounding the elbow there. It is not always present, but it is something that if you note and you have kind of got a clinical correlation, that could be a pretty good sign that they have got some fracture going on that may be visualized on an X-ray. If it is not, then we need to think about probably doing a CT scan if that is the case. But most of the time, these are easy to visualize on an X-ray. What I am also concerned about, though, with these elbow fractures is a lot of times, if the distal humerus is fractured, or there is a fracture involvement there, it is going to be intra-articular. There is going to be bleeding inside of that joint there. If the fracture is open, I mean that any time there is a fracture that is open anywhere in the body, that is of course after a medical emergency and automatic referral, we must get that fixed. That is probably a surgical intervention as well as some antibiotics and a lot of other fun things going on there. We can probably see some elbow dislocation occurring in conjunction with a fracture. Here is that fat pad sign I was discussing here. If you look at the space, the kind of the darker soft tissue spaces surrounding the joint, there surrounded by these arrows, you can see that it is a little bit darker in those soft tissue spaces there. That is that fat pad sign, again, it is not always present, but if you have got a mechanism, if you have got a clinical correlation that is at least letting you think it is one of your differentials of an elbow fracture there, this is probably what you have got going on. That is a referral there. We want to splint this in place, do not move it around, or change anything so as not to run the risk of causing further damage or harm. Continue to assess and reassess neurovascular integrity there, if it is absence, we get them to the ED right away because that is a surgical intervention in there.

You can use that pillow elastic wrap technique there to really get them in a good, nice, stabilized position. If you do not have a pillow on the sidelines but you might have something like a heavy jacket or something, or a blanket. Something along those lines might be around, then you can always use as well. Then, of course, as with any kind of acute trauma, we want to monitor for shock and transport, if that is present.

Moving a little bit away from more of the traumatic elbow injuries into some of the more manageable orthopedic injuries that we can see. Ulnar collateral ligament sprains, or UCL sprains, these are commonly seen in sports. They can present in a lot of different ways; they can be very acute, or they can have this kind of insidious, almost elusive, onset. We are probably going to see this more times than not in a patient who has a throwing type of sport or mechanism. The mechanism of injury here from an acute perspective is going to be a valgus force. This could be seen in football, this could be acute trauma, especially if there is a pileup. Somebody rolls onto an arm, that is where you might see more of the acute version of this. But from a more insidious perspective, it is going to be repetitive activities with some valgus stress to that elbows that you see, so like a baseball pitcher, for example. The pain is pretty much localized to the medial elbow.

Predisposing conditions have internal rotation deficits, they are more likely to have a UCL sprain. This goes back to our throwing mechanics in our pitchers. That is why we tend to see this a lot more in baseball pitchers than probably any other groups out there. Functionally speaking, overhead throwing patients will describe a significant difference in how accurate they are with their throwing, or how faster the velocity, the endurance, or the number of pitches they are able to throw kind of a deal. That could be another one of those kind of subtle, but telling signs that there is some kind of UCL sprain going on. You have to remember, the shape of the UCL ligament is very unique. It has got a lot of different fiber orientation. Even just palpating the more superficial aspect is just one band of it, so we cannot just necessarily rule out that there is no UCL sprain just because we palpated the superficial aspects and

there was minimal to no pain, kind of a deal. We have got to have a high suspicion there to, maybe, some of those more inner bands might be the parts that have this sprain going on.

From an inspection and palpation perspective, there might be an effusion, ecchymosis. There could be a potential for some scapular dyskinesis. This is probably developing from some throwing mechanics compensation. They have not been throwing the right way for some time, and as a result, moving up the kinetic chain, that shoulder, that scapula is not moving the same way that it should. That could also be another telling sign that extra stress is being transmitted through that UCL to compensate. There may also be some tenderness to palpation over that medial epicondyle or the coronoid process.

From a range of motion and manual muscle testing perspective, again, we are going to always start with the active range of motion. What can the patient do by themselves without assistance from an outside source? That range of motion might be limited secondary to pain, but they are able to go through usually a full range of motion there. Manual muscle testing: there might be some decreased strength with wrist flexors, there may also be some pain present but not necessarily.

Then, from a passive perspective, once we get to the end-range, especially with supination and extension with wrist extension, you will see some more pain pop up with that. We can do valgus testing. We want to do that both at 0 degrees full extension, and then, as well as at 15 to 25 degrees of elbow flexion. It just helps us to isolate different aspects of that UCL ligament when we are in full extension versus slightly flex. That is why we want to test both. From a neurovascular perspective, it is usually unremarkable. You do not see much issues there, then from an imaging perspective, we rarely need to get imaging done. If we are suspecting there might be a tear, especially with some of those more inner bands, then we are going to be looking at an MRI. But usually, we can treat this well and without having to get any imaging. What, if anything, I would recommend is, unless you think there is a tear going on, try some conservative therapies first, which we will talk about here on the next slide and before getting an MRI and going down that route. If we are worried about any kind of gapping with valgus testing, we could get an X-ray, especially if they are an overhead throwing patient with medial opening. Just if we are worried about any kind of avulsion, or fractures, or any kind of bony pathology, maybe because of the concurrently with a UCL sprain. The management, we can start with the conservatives: the R.I.C.E., the NSAIDs, manual therapies. In my own clinical practice, all test that dry needling has done, I would not say it cures the problem, but it does help to alleviate a lot of their symptomatology, which can help make their other therapies, like, therapeutic exercises, go a lot more smoothly. So, therapeutic exercises, even if there is a partial tear, depending on the level of competition that they are engaged in, they may do very well with therapeutic exercises and continue to function pretty well.

Rarely are they going to be done with exercise or rehab and then they do not ever have to visit rehab again. They do need to be on a continued maintenance program for as long as they continue to be on sport. But what we want to do here is, of course, is we want to examine and correct any poor mechanics, especially if it is throwing mechanics, we want to be able to visualize and correct. For me, my pitching coaches are phenomenal at this. They are great to help us with this and really break down. We can take some video if we want. If we take video, we want to make sure we are doing it from a head-on, as well as from a side view, and really slow it down and really be nit-picky with a lot of the different phases of throwing. If throwing is not your strong suit, I strongly recommend reviewing a lot of the throwing mechanics in the phases of throwing and what should be occurring throughout each throwing phase, because we can see a lot of different pathologies manifest throughout these different throwing phases. So anyways, going back to therapeutic exercises, the ultimate goal is that we want to strengthen elbow flexors and extensors. It is a lot of forearm work, in addition to upper arm, bicep, tricep work there.

Lateral epicondylalgia, or Tennis Elbow, have got this very insidious, nonspecific onset. It is usually from some kind of overuse with repetitive, forceful wrist extension, especially if there are these eccentric muscle contractions. Eccentric muscle contractions tend to be the source of a lot of different orthopedic issues, and this is certainly no exception to that. From a pain perspective, we could have tenderness over the lateral epicondyle, as well as into that common wrist extensor tendon mass. As you palpate, and even if you start to palpate the actual muscle bellies, or some of those extensors, you will start to notice that they light up easily, it is painful quick. Predisposing conditions here, we tend to see lateral epicondylalgia in patients that have rotator cuff pathology. Again, it is a compensation thing that is developed over time. DeQuervain's, which we will talk about a little bit later. Carpal tunnel syndrome, smoking, and oral corticosteroids: smoking and oral corticosteroids just degrade tendons over time, so that is where we tend to see that as a predisposing condition.

From a functional perspective, we have pain weakness or some compensation occurring with gripping activities. Anything that has got a repetitive elbow flexion, extension motion, which makes sense, like, it is called tennis elbow. If they are constantly flexing, extending the wrist and the elbow to hit the ball over the net and back and forth. Inspection and palpation, they will have that pain with palpation. There could be some crepitus, some swelling over that lateral epicondyle, and then a common extensor mass. But do not bet on it being there all the time. Some of these things may not always be present.

Range of motion. Actively speaking, pain with wrist extension and elbow flexion, as well as pronation, supination, might be limited secondary to the pain, but they are able to go through that full range of motion. From a manual muscle testing perspective, wrist extension with metacarpophalangeal joint extension, with elbow extension, is going to be painful. Passive range of motion: there is going to be pain or limited end-range of passive wrist extension and elbow extension occurring concurrently.

There is a tennis elbow test. There is also stress testing; for the most part, it is going to be unremarkable, so you can try the tennis elbow test. It is not the greatest test, but it does sometimes give you some direction as far as what is going on. From a neurovascular perspective, this is rather unremarkable, there is not much going on that is of concern there. From an imaging perspective, we do not see a lot of imaging done for this. You are not going to see anything on an X-ray or CT, probably. But if you do suspect that some of the soft tissues are degenerating, like the tendons from the common extensor mass, you could get an MRI. But even more easily, you could do it in a musculoskeletal ultrasound to help visualize some of that tendon thickening.

Before we talk about management strategies for lateral epicondylalgia, I want to talk about medial epicondylalgia because the management strategies are pretty much the same for both of these. Let us hit this first before we talk about treatment management strategies. So, medial epicondylalgia, or Little Leaguer's Elbow, has that insidious onset, it is from repetitive, forceful wrist extension or pronation occurring. We have pain at that medial epicondyle along that common wrist flexor mass and the pronator is there. Repetitive activities, or history of repetitive activities that eccentrically load that medial elbow musculature. Things where there is a club involved: the golf club, a baseball bat, or even sometimes, throwing would be an area where I would see this as a potential pathology. Functionally speaking, they are probably going to have decreased grip strength as secondary to that pain, again. They will probably have some compensatory patterns or motions that are going to require weird-looking gripping or motions, especially when they must perform elbow flexion and extension.

For my inspection and palpation perspective, it is very similar to the lateral epicondylalgia. There is pain with that potential for crepitus or swelling over that medial epicondyle and common flexor mass. All

range of motion speaking, actively, there is going to be pain with wrist extension, and elbow flexion. There is pronation, and supination might be limited secondary to pain, but not necessarily all the time.

Manually muscle testing pain with wrist extension, as well as MCP joint extension. The knuckles extend with the wrist extending, they are going to have some kind of pain shooting up towards that medial epicondyle. Then from a passive range of motion perspective, that pain is limited to their end-range or passive flexion with the elbow extended. There is not any great special testing or stress testing for this; that is always rather unremarkable. Then from a neurovascular perspective, for concern that there might be something else going on, we could potentially do an upper quarter screening to rule out any kind of cervical involvements, or cervical nerve outlet involvement. But that is usually unremarkable, unless there is something else going on cervically speaking.

Same thing with the imaging. It is rare we need to do any imaging, but we could do some X-ray if we wanted to rule out any kind of osteophytes arthritis, osteochondritis dissecans, or fractures. We can use the musculoskeletal ultrasound or an MRI to visualize any kind of tendon thickening or degeneration that might be occurring. How do we manage this? Well, we can try some of the more conservative things: the RICE, the NSAIDs, the manual therapy is, in my own personal clinical practice, I have seen some good results with dry needling. In addition to some of the other things, another thing could be the soft tissue mobilization in certain assisted soft tissue mobilizations that you could do, as well.

Therapeutic exercises are important here. Though, for long-term management, you want to examine and correct any kind of poor mechanics. Then you want to work on strengthening forearm, upper arm, as well as rotator cuff to help correct any kind of imbalances that might be going on there. You also can try something called a tennis elbow strap. These are things that you can get from, gosh, and you can get these online, you can get these from big-box stores. You can get these from pharmacies. These are everywhere. They probably run you about \$20, give or take, they are not that expensive. But what they do is they compress the flexors and extensors of the wrist close to their origin site, with the idea that they compress the muscle belly. It slightly alters the angle of pull of the tendons at the attachment sites there. It helps to pay to essentially try to alleviate some of that pain that could be caused by that.

In some people, this is all that they need, and they do well. They continue playing sport with ease. These are not usually banned in sports; they can continue to be playing with them. In other people, it does not do anything for them. You have to explore some of these other options there. It is just an easy thing to try. It is quick. It is not really going to harm anything. It is like \$20 out of the pocket. If it does not work, not a big deal, but it is something out there that is a tool.

Distal biceps tendon rupture, this is a little bit more of a concern, although it can sometimes be a little alluding to diagnose. This has an acute onset; it is usually from some eccentric loading of the biceps brachii with the elbow flexed. They will have pain at the cubital fossa that, at first, will be a moderate to severe pain but will decrease over time. We primarily see this in individuals who are 40 years of age or plus, and/or a history of smoking, anabolic steroid use, or cholesterol statin drug use. They are going to have a visible difficulty with lifting-type of activities, especially when they are trying to lift anything in front of the body, where they might be in a kind of already slightly flexed, double-flexed position there. But any kind of lifting activity is going to be challenging for them.

You might be able to feel a palpable defect at the distal biceps tendon insertion. It is a little bit challenging. Sometimes, it is just based upon a little bit of individual anatomy, how long they may have waited, as well as what other things they might have happened on there first. For example, they have some swelling, it may be difficult to palpate where you would anticipate that attachment being.

So, what you can do is you can do something called the Hook Test. Essentially, what that is, is where you can have the patient put their arm out in front of them and you can have them make a closed fist grip, and you can take your hand as the examiner and try to hook your thumb into what would be the bicep, the distal biceps tendon. They should be pretty easy to find if it is attached. If it is not easy to find, it is probably detached and it is probably retracted a little bit there. So that is a really easy test that you can do really quick to just determine if it is still intact.

All range of motion speaking, actively, this could be normal because there are, of course, there is other musculature that help to do flexion/extension on the elbow, as well as pronation and supination. Manual muscle testing is going to be decreased strength for the elbow flexion and forearm supination. Remember, that is the primary motion of the biceps. It is not just an elbow flexor; it is primarily more of a supinator, if anything else. So, those are the two things that I am really going to be looking for from a muscular perspective, what does the quality of their supination and their elbow flexion look like there?

Passively speaking, it probably will be normal. It might be a little bit painful if there is a partial tear, since there is more stress now going through less fibers, but that potentially could even be normal as well. The Hook Test, I already explained that to you. In the neurovascular speaking, it is usually unremarkable. If I am concerned about any kind of ongoing swelling that might be pressing on some of that neurovasculature, we might have some secondary trauma going on. Then from an imaging perspective, you know, we can start with an X-ray to visualize some of the bony anatomy, especially if we are worried about any avulsion, fractures, anything like that. But then, we can also use either an MRI or CT could be ordered to rule out some of the other bonier things like coming into fracture, things like that.

You can try conservative management. If it is successful, that is great, but it is probably they will not have the greatest quality of life from that. Surgical intervention is more preferred. What that looks like is after that is performed, it is a rehab process. It takes about eight weeks, after that surgery is complete, for the full range of motion to come back. Those first eight weeks are really focusing on regaining range of motion. Then you can progressively go through strengthening elbow flexors and extensors once that full range of motion has returned.

Neuropathies of the elbow, this can be a little challenging to identify sometimes. Other times it is straightforward, just because we have three distinct nerve root distributions here. But anyways, this is an insidious onset with nerve compression traction, or inflammation occurring there. Think about the anatomy and the distribution of the three main nerves coming through here. The ulnar nerve is going to be more that medial aspect of the elbow, forearm down into that fifth and part of the fourth finger there. The median nerve is that anterior forearm with going down to the hand and into the more lateral aspect of that fourth finger and the entire third finger. Then, that radial nerve is that more dorsal forearm, wrist extensor region down into the hand and the thumb, and index or second finger there.

Predisposing conditions here, diabetes, circulatory impairments, fractures, the normal things that you would be concerned about with a neuropathy in a patient are still going to play here. Functionally speaking, the hand/elbow may have atrophied, there may be some visualization of the atrophy, especially in the thenar, hypothenar region. They also may have some weakened strength or movement. There might be some swelling present, there may not. There might be some pain present or there may not. There might be some paresthesia present, or not. We just must examine each distribution of the nerves there. Active range of motion: it might be limited; it might be normal. Manual muscle testing: there is probably going to be some weakness, especially when we think about the musculature that is innervated by the specific nerve that we are suspecting.

Then from a passive range of motion, this could be normal, but there might be some increased signs or symptoms with the nerve involvement when the nerve is maximally tensioned. For most of these nerves, it involves wrist extension, finger extension. Then we can move them into radial or ulnar deviation, whichever direction we are trying to go there. Tinel's Sign. If you are not familiar with Tinel's Sign, it is a sign that we can use for a lot of different points along the body. But what we are doing here is we are just tapping on superficial aspects of the nerve and what we are trying to do is elicit neurological response. Here with Tinel's Sign, we could do it at the carpal tunnel. We could also do this up at the elbow with the ulnar nerve being so superficial there. We just tap back and forth over the nerve, and you start gently, and then you can get progressively a little bit more forceful and faster if you want, if they start to not get it. What you are looking for is, again, any kind of neurological symptomology. So, shooting pain, sharp pain, numbness, tingling, things along those lines. That might be indicative that there is compression occurring along that nerve's distribution.

We can also do an upper quarter screening, again, if you want to rule out cervical involvement. If we really are concerned, if we really cannot get to the bottom of it, we can always do some electrodiagnostics, like a Nerve Conduction Study. But these are not fun for the patient. These are not pleasant tests to go through. These are not something that should be willy-nilly ordered off the bat. These are things that you have tried a few other things, you have tried to diffuse different routes of diagnosis, you have tried some therapy before ordering some of these tests, because these are not fun tests for the patient.

Imaging, we can do an AP lateral and an oblique view of X-rays which may visualize some bony involvement. But if we are not expecting any kind of bony involvement, there is not much imaging we can do. Just keep in mind that, of course, this nerve could be compressed or have trauma at several points along the distribution. We do not want to rely just strictly on one site. If we treat it, we think it is going to go away. There is probably going to be multiple sites that need to be addressed. It really depends on etiology as far as how we are going to approach the management. We can always start with some of the more conservative therapies: NSAIDs, RICE, again, dry needling tends to do well. If we are concerned about some other soft tissues like musculature, spasming, pressing against some of the nerves, we can always do some therapeutic exercises working on trying to shift or offload pressure from one area of the form to another that might be contributing to some pain or pressure along the nerve distribution.

If there is entrapment and you are not getting success with some of these more conservative therapies, then look at a surgical intervention if we really need to. But again, these surgical interventions are not always the greatest, they do not always provide the most amount of relief and in some instances, they can end up causing more problems than they resolve. It is really a balancing of options there. Wrapping up the elbow here from some of the more common and more traumatic things that we would see, obviously, we are talking about Sports and Sports Medicine here. So, how do we evaluate the elbow on the field? With any on-field evaluation, it is always wanting to rule out any life- or limb-threatening injury, and then are we able to move the athlete or move the patient off the field safely. Since we are talking about elbow, wrist, and hand movement, ambulation, probably, is not really going to be too much of an issue.

But we could still be concerned about a limb-threatening injury. We want to go through a quick history. If we were not able to visualize what occurred, we did not see the mechanism of injury, which sometimes happens, there is a thousand things going on during a sporting event. Sometimes, I am not looking at just the right person at the right time, you miss it. You need to either look at video tape, or you can have the patient describe it, or maybe a coach or another player saw it. You can collect

information from other people. But most importantly is, how are they positioning that upper extremity at the time of the mechanism of injury, and how are they presenting to you after the fact?

Look at forearm and wrist alignment, look at that posterior triangle of the elbow, making sure that it looks kind of normal and well-aligned. If not, that might be indicative of fracture or displacement going on. You can do a quick palpation of some of the bony structures. We do not want to work away from, but work towards, so we can do mid-shaft of the humerus down into the distal aspect of this humerus. Then from the distal aspect of the radius and ulna, more towards the proximal end, we can do a quick range of motion assessment, active, and manual muscle testing quick if we really needed to.

More times than not, when I am on the field, I am going to have them do in a quick active range of motion. If that is problematic, I am going to stop everything there and just take them off the field. I can continue to do the rest of this evaluation on the sideline. The other thing I would want them to rule out quick, is to make sure there is no neurovascular trauma going on there.

Wrist and hand anatomy

Just remember that the hand is pretty complex when it comes to anatomy. Here, we have got many, different bones going on here, with phalanges at the most distal ends, then the metacarpals, and then the carpals more proximally here. From a muscular perspective, we have got several different layers and lengths of muscles going from the elbow down into the most distal aspects, the fingertips of the fingers and everything in between. We have got intrinsic, as well as extrinsic, we have got a lot of anatomy, lot of soft tissue. Sometimes we have to be very meticulous about our evaluation and sometimes it takes some time to really dive through some of the anatomy that we have to go through and review. The 10,000 foot view here, we are talking about what does a wrist and a hand assessment look like. It is going to be fairly similar to the elbow in some respects, but very different in other respects. You always want to start with previous medical history, family history, anything along those lines. Then of course, history of the present condition at hand. What is the location, the onset of that injury? What is the mechanism of injury, and have they had any results in changes in activity because of it? This is probably more important if this is more of a sub-acute or chronic condition.

If this is acute and we were there, we witnessed the injury, for example, we may not have an ability to really assess any changes in activity because they have not done much since the injury. But, if they notice that they have got slightly decreased grip like when they go to turn a doorknob or something along those lines, those subtle changes could be big key players in a clinical assessment.

For the functional assessment, you can always ask them what activities make the signs and symptoms worse. I am specifically looking at ADLs, activities of daily living, as well as throwing mechanics, since we are talking specifically about sports medicine here. General inspection: again, what was the hand and wrist posture? Are there any gross deformities? Looking at the palmar creases, is there any swelling, or redness, or any bumps, or anything along those lines? Lacerations or scars, something you can look for, not so much necessarily specific to sports medicine, but something that you might potentially see, because of just the nature of sport is something called Russell's Sign. Russell's Sign is when you start to see scarring along the knuckles from individuals who purge, after either binge eating or eating disorder. There starts to be scarring from the teeth hitting the knuckles during the gag reflex. That could be a sign, especially in your sports where body image is important, gymnastics, dance, even some combat sports like wrestling. That might be something that you could potentially see.

Inspection of the wrist and the hand: so, what does the continuation of the radius and the ulna look like? Is it parallel? Is it uniform? Or are there any kind of abnormal jumps, bumps, things along those lines? The same thing with the carpals and metacarpals. We want to look at the alignment of the MCP in

the IP joints, the metacarpal phalangeal, and the interphalangeal joints there. Does the patient have a ganglion cyst? Ganglion cysts are extremely common in the hand. More times than not, they are not harmful or problematic. But occasionally, they do lead us to two problems. Or they can be indicative of what people at slightly increased risk for some pathologies. We will talk about a few of those here in a few minutes.

Of course, we want to inspect the fingers and the thumb. What does the quality of the skin look like, especially at the fingernails? Do they have a kind of any sub-ungual hematoma, or blood underneath the fingernails itself? Any kind of finger bed infections? Their fingernail alignment? One of the things that we can do, too, is we can have the patient curl their fingers like this. If their fingers are rotated or switched, or they are not uniform across the hand, that can be indicative of either of certain types of hand fractures or of misalignment, non-union recovery from certain hand fractures. Then, we want to look at finger posture, of course, as well. From a palpation perspective, we have a lot to palpate here. Tons of structures, from the palmar side of the wrist: the radius, the flexor carpi radialis, the palmaris longus, again, if they have one, the carpal tunnel, the ulna, the flexor carpi ulnaris, the TFCC or triangular fibrocartilage and its complex. We will talk about that in depth a little bit. The pisiform, the hamate.

From the dorsal side, or the back side of the wrist and the hand: there are the ulna, ulnar styloid process, that ulnar collateral ligament, extensor carpi ulnaris. Lister's tubercle, we tend to forget sometimes about lister's tubercle that runs along that dorsal side of the wrist there, as well, along the radius there. That distal radius/styloid process, the radial collateral ligament, and all of your carpals there, especially the scaphoid, lunate, and hamate.

We are going to talk about a few, unique pathologies to those carpals there as well today, and then of course, the extensor carpi radialis longus and brevis. There is a lot of musculatures going on through the forearm and down into the hand. It is important to have a good understanding of origins, insertions, innervations, and actions for these musculatures. It is because it can really be the information that you need to really be meticulous during a clinical exam. Then finally, from a palpation perspective: we want to look at the hand, as well, so that thenar eminence, the hypothenar compartment or eminence as well, as well as that central compartment, the metacarpals, the phalanges, the metacarpophalangeal or MCP collateral ligaments, the IP or interphalangeal collateral ligaments, extensor digitorum, the extensor pollicis longus, and the abductor pollicis longus and brevis.

From a functional perspective, there is a handful of tools that we can utilize. Goniometry is really great. We are going to do active, then manual muscle testing, then passive range of motion testing. For the wrist and hand, we want to look at flexion/extension of the wrist and of the MCPs and the IP joints, as well as radial and ulnar deviation. Remember, that while the word deviation implies otherwise, radial deviation is when we sideways tilt the hand towards the radius; ulnar is sideways towards the ulna.

From a thumb perspective, thumb has a few additional movements because being a saddle joint. Goniometry, still, we want to use that. Active, manual muscle testing, passive range of motion, and we want to look at flexion/extension, as well as abduction, adduction, and opposition. Remember, opposition is when we take the thumb and bring it across the palmar aspect of the hand towards that fifth finger. Same thing with the fingers here, we want to look at flexion/extension, abduction and adduction, or AB- and AD-duction, as well as IP flexion there. We can assess grip dynamometry, if we feel so. There are tons of different grip dynamometers out there. I just gave you two examples that are out there. There are tons on the market. I am not aware of any research that says that any one is better than the other. I think it is just kind of more personal preference.

In my own clinic, I have got more so that red dynamometer there on the left. It does have an adjustable grip depth, those little notches in the silver pole sticking out there. You can change how far back or forward that is based upon the person's hand size, which just helps give you a better idea of true grip strength there. Our joint stability tests, it is so important here to compare bilaterally because these are not necessarily the strongest movements as it is. We want to make sure that we are comparing bilaterally. We want to be looking at radial and ulnar collateral ligaments at the wrist. We want to be looking at radial and ulnar collateral ligament in all the fingers, along those PIP and DIP joints, as well as the thumb IP joint.

Wrist joint play. How much translation or movement is there with movement at the radius, ulna, the dorsal, and palmar glides there. You can even do inter-carpal glides there, as well, although it can be a little painful sometimes for the patient. We want to be a little bit aware of that. Neurological screening is not always necessary here, but we could do an upper quarter screening if we are concerned about, again, radiating discomfort down into the hand, as well as a Tinel's Sign. That is that tapping over a superficial nerve. They try to elicit some kind of neurological symptomology. Finger deformities, you will see these. Some are more concerning than others. The first one being a Jersey Finger. This is when we have an avulsion of the flexor digitorum profundus tendon down into that DIP. Their distal interphalangeal joint of anyone of fingers two through five is ruptured, and so they cannot flex the fingertips, is essentially what is happening. This is a problematic thing. This is an automatic referral to a hand specialist. They need to get in to see a hand specialist within 24 hours. I would say 48 hours is really pushing it because the tendon can start to retract.

Then it can be an involved surgery, and it can cause a lot more problems there. Immediately speaking, what we do is we want to splint that DIP into a joint flexion there. We are concerned about vascularity supply, so we want to get them referred to this right away and get this figured out. It is probably a surgical intervention that is going to occur for them.

A mallet finger is similar, in that we have an avulsion of the extensor digitorum tendon, but it is at that DIP joint as opposed to that PIP joint. The DIP here is postured at approximately 25 degrees, 35 degrees, give or take, of forced flexion. They cannot actively extend this. You, as the clinician, could come in and move this up. It probably would not feel too great to the patient, but you could do it. How do we treat this? Well, we want to splint that DIP into extension, and that needs to stay splinted for about three to four weeks. It is critical that you educate the patient that they do not remove that splint at all. It has got to stay on. Even for a second or two, if they let that splint come off, and that finger starts to move, it can basically have to restart the whole process of that another three or four weeks. It has got to stay on 24/7.

Stack splints are these plastic slide-over splints that work really great for this kind of thing. You do have to be a little cognizant, though, because we are keeping the splint on for three, four weeks straight. If they are doing things like showering or washing their hands, you do not want to have skin maceration occurring or anything like that. We want to be cognizant about making sure that the skin tissue integrity is okay. We really do not necessarily need to see a hand specialist for this, for surgery, but we do want them to be seen, just to get eyes on it and make sure that, again, we are not missing anything or mis-visualizing anything here. We do want to refer, but surgery is rarely required for a mallet finger.

Boutonnière deformity, is where we have an avulsion of the extensor digitorum tendon. There is something called a pseudo-boutonnière deformity, which is where the volar plate itself becomes ruptured. So how do we treat this? Well, we essentially, again, it is a stack splint kind of a deal. We can splint the PIP and the DIP into extension. They need to be in that splint for three to six weeks. Afterwards, we can start to do therapeutic exercises. specifically for a lot of the wrist-hand

strengthening, and some finger-hand intrinsic strengthening, just to get that hand moving again. Surgery is not the most common thing we need for this. It is rare that we would need surgery, but we do want to have a hand specialist get eyes on this again, just to make sure that everything is progressing accordingly. Another thing that we could potentially see here is arthritic responses, rheumatoid arthritis and things. We might see these boutonnière deformities if arthritis or autoimmune is a cause for this. This is something we would want to refer to a hand specialist because normal orthopedic interventions that we would do in sports medicine is not necessarily going to have the same outcomes. So, we would want them to be seen by a hand specialist for that, specifically.

Distal forearm fractures, these can come in a couple different shapes, sizes, and varieties. But by and large, they kind of present the same way. This is going to be an acute onset, and have hyper-extension of the wrist with possible tendon rotation, including a FOOSH. The patient might also have some immediate, sharp, or other distal forearm or proximal wrist pain. Predisposing conditions can include osteoporosis. Thinking about that weakening of it. Another group that we might see it with is prepubescent or pubescent children, teenage children, especially at the growth plates, the distal growth plates there, along the radius, the ulna. Functional assessments, not really much to see there. From an inspection and palpation perspective, there is potential for gross deformity. Although it is not going to be necessarily a given, it could be a non-displaced fracture. For example, if we do have an open fracture and that is readily evident, that is an automatic referral to the ED because that is going to require some kind of fixation, as well as antibiotics

Bony palpation is probably going to be omitted. If we are suspecting a fracture, it is going to be omitted. If there is a form of gross deformity present, we do not want to be, again, dislodging or causing any further trauma or problems to the bone there. There might be discontinuation along the bone. There might also be tenderness to palpation along those long bones. There may not be.

Range of motion: if you are suspecting a fracture, we do not want to do anything. Manual muscle testing: if you are suspecting a fracture, we do not want to do anything. Same thing with special testing. Neurovascular speaking, we just want to ensure that, again, the nerve distributions appear normal, that they have good quality sensation, that they have got good distal refill. If I am concerned about a distal forearm fracture, I do not want to be doing a radial pulse. I want to be doing more of a capillary refill so as not to risk causing further problems, pain, trauma, to the distal fracture, if that is the case, I will probably do more of a capillary refill.

Imaging: of course, we will start with an X-ray. Sometimes, depending on visualization issues or complexity of a fracture, we may order more than that, but we would just start with an X-ray from there. Then treatment. Splints, we want to monitor them for shock, and of course, refer them to the ED or to Ortho for splinting and casting and determining if there is surgical intervention that might need to occur. There is something called a Colles Fracture. This is where the radius will displace here. Anteriorly, there is something called a reverse Colles fracture where, instead of anteriorly, it just displaces posteriorly, it is a common fracture that we see.

Scaphoid fractures are really interesting, to be completely honest. A lot of times, these have an acute onset, a lot of times, they have some sort of forceful wrist extension, and they fall on it. This is falling on an outstretched hand, where there is compression that goes through the scaphoid. So, they not only fall in that outstretched hand, but maybe they fell over more on that thumb side of the hand as they fell, and it just happened to be just enough force and direction to fracture that scaphoid. Patients, a lot of times, would not seek care for this or they will delay care, because it just feels like a very subtle, very minor type of pain. Forceful hyperextension of the wrist, again, here, is what we are looking for, though, from that mechanism.

From the pain perspective, that lateral wrist into the anatomical snuffbox is really what I am looking for. If I have got any kind of tenderness to palpation in the anatomical snuffbox, I am going to have a high suspicion of some kind of scaphoid fracture going on. Who do we see this with mostly is under 40 years old males who play sports. Functionally speaking, they might have some reduced grip strength, pain with gripping, or activities that require ulnar deviation. Just because the tendons are then stretched over the scaphoid, and it pushes extra pressure along the top of that scaphoid. So that is why we see it there. There might be swelling, there might not. There might be a little bit of an increase in tenderness to palpation in the anatomical snuffbox. There might be a lot of increase in tenderness to palpation over the anatomical snuffbox. But if there is point tenderness in that anatomical snuffbox, I am instantly thinking, as one of my differentials, is being a scaphoid fracture. Active range of motion is pain at the terminal wrist range of motion, specifically with wrist extension and ulnar deviation. It is going to be probably unremarkable from a manual muscle testing. The scaphoid does not really have a whole lot of say with muscular attachments. We are not going to probably see a lot there. From passive range of motion, as we put over pressure into wrist extension and ulnar deviation, we could probably see a slight increase in pain there.

Radial collateral ligament stresses will increase lateral wrist pain due to the compression there. Pain might also increase with radio-carpal joint play in that scaphoid area. You can also take the first metacarpal and axial load it into the scaphoid and see if that processes any pain, which could also kind of be an indication that there is pathology affecting the scaphoid there. From a neurovascular perspective, the screening is going to look normal in an X-ray. We are going to do a PA X-ray. But I will tell you what, the sensitivity and specificity are poor in the few days following the trauma. You will have a better sensitivity and specificity the longer you wait. But the problem with waiting is that we are concerned about necrosis and vascular compromise. The scaphoid already does not have a great vascularization as it is. If we fracture it over, we disrupt any further neurovascular supply to it, we could have the scaphoid die. This is where the CT would come into play. We would want to get this evaluated by a hand specialist to really make sure that we do not have any of that kind of compromise going on.

A hamate fracture is an acute onset. We are looking at, again, a FOOSH mechanism with force being transmitted via long modality: so, a golf club, a baseball, bat, or racquet. What we see a lot of times, is that, if it is not a FOOSH, the force is transmitted up that instrument. Pick up a baseball bat, for example, or golf club, and there is just enough vibration that is generated into that hamate that causes it to fracture. There could also just be a direct blow to the hamate, like a crush type of injury, for example. The ulnar side of the hand has pain adjacent to that fifth metacarpal and over time, that pain becomes less specific and more diffused in the general hand area. You are going to see a reduced grip strength and pain with gripping with possible swelling and tenderness to palpation over the hamate.

From a range of motion perspective, finger ab and adduction at the fifth finger might be painful. There might be pain during resistive flexion of the fourth and fifth fingers, with the wrist more in an ulnar deviation. Or with pain with resisted abduction of the fifth MCP. From a passive perspective, you might see some pain with passive extension of the wrist and the fifth MCP. You may see it, as well, with the fourth, but not as likely as you would see with the fifth.

From a special test perspective, there is not much that you are going to see there. It is going to look normal. From a neurovascular perspective, it is going to have potential paraesthesia from that fourth and fifth finger primarily from ulnar nerve trauma, or nerve compression because of the swelling in that area, or because of a comorbidity of just isolated nerve trauma, as well. You want to evaluate that, as well.

X-ray we would want to get a carpal tunnel view with the wrist supinated, but keep in mind that this does have a fair potential for a false negative. So even though the X-ray may come back normal, we still might want to order a CT scan just to double check and make sure. We do want this to get evaluated by a hand specialist, because these do have a fair amount of mal-union or non-union secondary to them being mistreated, or misdiagnosed, or under-treated, which can obviously cause hand impairment over the course of the lifespan if that is not addressed.

Perilunate, or lunate dislocations look similar, so, an acute onset. Mechanism of injury again is that FOOSH-ing, that falling on an outstretched hand. There might be ulnar deviation present with that perilunate dislocation, but the mechanisms can be one and the same a lot of times, as well. From a pain perspective, we are going to see something along the lateral wrist and hand, and again, they are going to have that reduced grip strength and pain with gripping. There is the potential for some swelling in that lunate region. It is also possible that the lunate will be very prominent with palpation if it is displaced. Range of motion, actively speaking, will be limited with wrist extension, and finger flexion might be painful. The manual muscle testing, there could be pain with weakness at the PIP and the DIP flexed. Possibly, this could be normal as well.

Then, from a passive perspective, there is limited wrist extension here that would be pain-free. Passive finger extensions probably can also produce some pain here, as well. Not a lot, in the realm of special testing or stress testing here. From a neurovascular perspective, I would just want to check the distribution of that median nerve, make sure that there is no impingement. Then, from an imaging perspective, we could start with an X-ray again, an AP and a PA, as well as a lateral view of the hand there and then a CT scan if we are still not 100% sure what is going on. What we do need to do again is to make sure that we get this referred to a hand specialist. Not so much for the lunate, per se, but I am, worried about that scaphoid getting fractured because of that lunate moving around, especially if it is partially displaced or there was a subluxation there, too, that could occur sometimes.

Scapholunate dislocations are acute, and there is tensile force that is placed on these ligaments as the joint is essentially forced past its normal range of motion. It emanates from the palmar and dorsal sides of the wrist from the joint line when we are looking at pain. Functionally speaking, again, decreased grip strength, increased pain with the grip, and the patient may want to protect the range of motion with their hand and with their wrist there. If this is acutely evaluated, we could see some swelling. But if this has gone on for a few days, we may not see as much swelling. But one of the tell-tale signs is just going to, of course, be that true tenderness to palpation of that scapholunate joint. Active range of motion might be decreased with wrist flexion/extension. If we passively move them, we might see some limited flexion/extension. If there is that bone sticking out, it acts as a boney block so we cannot get into that full range of motion. But it might be hard to tell, so this is a poor scenario when we want to compare this bilaterally.

Manual muscle testing is probably going to be unremarkable, though. There is a potential for hypermobility in that scapholunate joint where you can take it, and you can try to move it and push it around a little bit yourself. You just want to be cognizant that you are not applying enough pressure that you cause it to become further damaged, further dislocated, or something along those lines. By and large, neurovascular concerns are non-existent, it is going to be looking normal there. We can try to visualize this with an X-ray in a clenched fist view, or an AP view. But we are probably going to have to use an MRI over a CT. They just tend to be more specific in this case. To be honest, conservative treatment is successful with treating these. We do want to refer to a hand specialist for an evaluation, what would be the best course of action for that specific patient there.

All right, TFCC or triangular fibrocartilaginous complex injuries. These are interesting. They can be traumatic or degenerative. If it is acute, the patient may not report the injury for some time because it just might feel like they “sprained their wrist” or did something relatively minor. They tend to seek evaluation and help weeks, sometimes months, after the injury. A lot of times with these because it is just such a dull, nagging pain. It is not anything super concerning up to the patient usually affirms. FOOSH-ing, of course, is a mechanism, as well as repeated or forced wrist hyperextension. From a pain perspective, distal ulna along the medial half of the wrist. The wrist UCL ligament could be tender. There may also be an audible click present.

Functional assessment speaking, there is increased signs and symptoms with weight-bearing of the arm, or with activities where there it requires a lot of ulnar or radial deviation. We could see this a lot of time, say like, with gymnasts where what they are doing a lot is pushing up from their seated position, like on the horse, or something along those lines. Then there is a rotation component where they are putting them into this ulnar or radial deviation back and forth. From an inspection palpation perspective, we are talking about diffused swelling around the wrist, if possible, but it is not usually present, so do not go out of your way looking for it. Tenderness to palpation over that distal tip of the ulna, there, along the medial half of that wrist joint line. There might be some palm tenderness over that ulnar collateral ligament of the wrist there. Range of motion is going to be limited secondary to pain, especially with wrist extension and ulnar deviation. We are putting prime force onto that TFCC in that position. From a strength or manual muscle testing perspective, it is going to be unremarkable. They are going to have full strength there.

From a special test or stress test, again, we can try to force that UCL and stress that wrist UCL to see if we can elicit some pain. But there is not going to be any laxity seen with the UCL. From a neurovascular perspective, it is going to look normal. From an imaging perspective, I put an MRI up there, but really, it is going to have to be an MR arthrogram here. We are going to have to inject that dye. It is just a very difficult structure to see here. Even then with the MRI, it is not the greatest because it does not have the greatest vascularization occurring there, but I would recommend an MRA over an MRI there. You can try conservative therapies first; it is kind of hit-or-miss. It is a lot of grips strengthening, wrist strengthening. But ultimately, what will probably have to happen is a referral to a hand specialist for the potential exploration of some surgical intervention. I will say that if they do have a history of ganglion cyst, especially on that radial palmar side, because the root of those cysts tends to be very close to where a TFCC is, we tend to see TFCCs more commonly tearing with those patients.

Carpal tunnel syndrome, so, CTS. Sometimes you will see the abbreviate CTS. This is a very insidious onset. This is from repetitive wrist motion that involves a lot of wrist flexion/extension, primarily wrist extension, but it can be flexion, as well. We are going to have radiating pain along the median nerve distribution into the hand, and potentially up into the forearm. These patients will complain that they mostly experience this at night or with activities like typing. They are seated at a desk typing on a keyboard.

From a functional perspective, this is almost an ergonomic thing. What we are looking for, a lot of times, is these patients have a very forward head posture, their neck, their shoulder postures. Everything is very much forward faced. It is just very poor mechanics and starts to translate into poor mechanics down the kinetic chain into that wrist carpal tunnel area.

The palmar aspect of the wrist, especially over that carpal tunnel, might feel thickened. There could be some atrophy of that thenar eminence. So again, you can compare left to right. If they have got a bilateral case of CTS, this might be difficult to examine. Their tenderness to palpation or tenderness

even with sustained pressure over that palmar aspect of the wrist, especially close to that carpal tunnel, which could be problematic for the patient.

From an active range of motion perspective, they might be slightly limited due to the stiffness, although, there could be some normal-looking responses there. If there is manual muscle testing, we can look for chronic strength decreases that may be seen with the abductor pollicis brevis, the flexor pollicis brevis, as well as the opponens pollicis. From a passive perspective, the median nerve symptomology may increase with wrist flexion and extension range motion. We can use Tinel's Sign to examine that symptomology there. We can reproduce it there, so we can do just a nice little Tinel's tapping right over the palmar aspect of that carpal tunnel there and see if that elicits any pain. As well as Phalen's Test, which is where you just have the patient actively press the dorsal side of both of their hands together as hard as they can for 20 or 30 seconds. They might start to get some of that neurological sensation, that numbness, tingling pain that they feel with Phalen's Test there.

From a neurovascular perspective, there could be some decreased sensation along that median nerve distribution. If you wanted to quantify it, you could do two-point discrimination to do that. From an imaging perspective, you want to rule out any kind of bony involvement. If there is bony overgrowth occurring that is causing the compression, then there would obviously have to be a surgical intervention to help correct that. But if it is more of a soft tissue compression component, we would need an MRI to visualize that. I would not necessarily jump to imaging right away. I think that you can get away with some of these conservative treatments first, and then if they consistently persist, then we can look at imaging and seeing if there is something else going on here. But from a treatment perspective, first and foremost is activity modification. We want to identify what is going on, making sure that they have got good posture when they are sitting at a desk or that they have got good posture when they are sleeping.

If we need to, we can always put them in a night splint, for example, or even in a splint during ADLs or sport if we need to. For bowling, for example, they do make bowling wrist splints. As well as making sure that they are taking breaks from activity, that they are not pushing through activities where they need to be resting. We talked splints already. Meds: you can try NSAIDs, you could try corticosteroid. Sometimes they provide some relief, sometimes they do not.

Manual therapy is hit-or-miss. Sometimes this does well, sometimes it does not. The biggest thing here is the activity modification, though, as well as these therapeutic exercises, where the goal here is to strengthen the wrist and the grip. But if this is ongoing, these conservative treatments are not successful, then we can refer to a hand specialist. They would do a surgical release of that tunnel, and that tends to have some pretty good outcomes there.

Metacarpal fractures, we are looking at any one of the five metacarpal fractures here. More times than not, we are going to see the fifth, more common than the fourth, more common than the third, second, and first metacarpals. So, this is an acute onset. There is longitudinal compression like a punch. They punch a wall, for example, that is a very common thing in sport. A crushed force where they get stepped on. Again, think about football, for example. They pile up and somebody gets up, or gets pushed onto somebody else, they could be stepped on and crush the hand there. Or sheer force with the finger being hyper-extended, so that the hand gets caught under something and causes it to get pulled in an abnormal direction. There is definitely going to be pain along that diaphysis of the metacarpal in question.

From a functional perspective is they really are just not going to want to do much of anything with that hand. It is going to be difficult with any kind of grip. Grip is going to be painful.

From inspection perspective, if there is any kind of gross deformity, it makes for an easy diagnosis and makes for an automatic referral to the ED, because that might need a quick surgical intervention. Fracture of the fifth and, sometimes, of the fourth may result in a shortening of the knuckles. As you visualize the hand, it will look like the knuckles have kind of shifted places and it looks like they are shortened. But that is not always necessarily present. Another thing, too, is you can do the abnormal finger rotation. You can have the patient hold out their fingers towards you, and if you see any kind of left-to-right comparison, if one is rotated more oddly than the other, that could be an indication that that metacarpal has not only been fractured, but there is rotation going on. We have got to, look at surgical intervention to correct that. We do not, obviously, want to palpate a gross deformity if it is present, especially with these more delicate bones like the metacarpals because we do not want to cause further damage. We do not want the bone to become an open fracture where it starts to protrude through the skin and things like that. We want to be cognizant about that. We want to be very gentle with our palpation skills in this area.

Something else we can visualize is this look like a false joint or sometimes we hear it called tenting, where the two ends of the bone might still be sort of connecting, but they are not connecting 100%. So, it will push up against the skin and it looks like a little tent under the skin. That is another clear sign that there is metacarpal fracture that is going to need some kind of surgical intervention there.

By no means should you be doing range of motion, manual muscle testing. If you do not have any of the gross deformities there, you are not 100% sure, you can do the long bone compression test, which is where you basically have the patient gently curl their hand down. You can gently tap down the length of the metacarpals and see if that lights up any pain there. Rarely do you need to get down that far because usually just even with just light palpation over it, you are going to let them up and they are going to know that there is something abnormal going on there.

From a neurovascular perspective, this is usually okay. I am concerned that if anything starts to shift, or we have any kind of bony fragments that we could have vascular disruption there, so we do want to check capillary refill. We do want to get an X-ray, and we do want to refer it to the ED because, again, this might need more of an immediate surgical intervention to correct.

DeQuervain's is a little odd. What we are seeing here with this is insidious onset of repetitive stress, that is usually involving radial deviation. The extensor pollicis brevis, and abductor pollicis longus, the radial styloid process, and the thenar eminence are all painful. That probably extends into the distal forearm a little bit, too, especially when they are moving from ulnar and radial deviation. There is increased symptomatology with activities involving radial deviation. This could be some types of racquet sports, for example. Video games could be another thing that we might see a lot of this with, as well. Inspection could be swelling over the radial styloid process and some of those surrounding tendons. From a range of motion perspective, actively speaking, there is pain with the ulnar, radial deviation. From a thumb perspective, we could see pain with flexion and extension, specifically at the MCP joint, but we could see with the IP as well, as well as with abduction and adduction.

Manual muscle testing, is going to be painful with that resistive radial deviation of the thumb. Pain with all of these motions, but primarily with extension and abduction of that CMC, that carpometacarpal joint. Then from a passive perspective, the wrist will have some pain towards the end-range of the ulnar deviation and the thumb, passively speaking, pain with flexion and adduction at that carpometacarpal joint again.

You can do Finkelstein's Test, which is basically where you just have the patient tuck the thumb into the hand, and they grasp the hand, and then they just radially deviate, and they will start to feel that pain sensation occurring in there in the hand, like what they were coming in and describing to you before.

Neurovascular perspective: it is usually normal. From an imaging perspective, I mean, there is just going to be an image there, so that is not going to be an issue. What do we do? We want to do some of the more conservative exercises, like the ice and the splinting. We want to do activity modifications. NSAIDs really do not do a lot. They have not been shown to be very successful with research. So, if you want, you can tell them that they can try NSAIDs, but that is not going to probably be their golden ticket there. If it continues to go on, we can do some surgery to release some of those tendon sheaths. This does have a high success rate with very few complications. So that is an option there.

Ulnar collateral ligaments can be acute or chronic. From a mechanism's perspective, we can have more of a hyper-extension or hyper-abduction of that first MCP joint if we are talking about finger UCLs there. Chronic might be just more of those repetitive type of motions of extension. We are going to get pain along the ulnar aspect of the first MCP. From a functional perspective, there can be pain or weakness with gripping-type tasks. Then from an inspection perspective, there could be some localized, potentially extensive, swelling occurring, just because of how easily the pockets of the hand, there, can work and allow for fluid movement. There could be some swelling in the adductor compartment, as well as into that thenar eminence, with some potential for possible ecchymosis.

Range of motions perspective, actively speaking, the pain does increase with extension, abduction, and opposition of that thumb. From a manual muscle testing perspective, weakness is experienced during that metacarpophalangeal flexion and carpometacarpal adduction, as well as the pinch grip might be decreased. From a passive perspective, there could be some pain at the end-range of the thumb in extension and abduction there.

Stress testing we can do those valgus stress tests. We can do it with any kind of ulnar collateral ligament. We can also just do ulnar collateral ligament stability testing, which is where we just try to open up and gap at different areas of flexion, extension, opposition. Try to rotate down and pull out towards the patient there.

Neurovascular speaking, usually this is normal. If we do have something abnormal, it is probably not going to be from the UCL. We have got something else going on there. If we are concerned about any kind of a bulging fracture, we could get an X-ray. Other than that, though, we are not going to need to visualize anything there. The treatment is going to depend on severity. Less severe really does do well with conservative therapies: your RICE, your NSAIDs, therapeutic exercises. Wanting to work on hand intrinsic and things like that. But if this is more severe, we are looking at a partial or even a complete thumb UCL tear, we are going to have to look at a surgical intervention.

[END]