[MUSIC PLAYING]

JOVY G. ANGELES: So talking about common sports-related hand and wrist injuries. Just a brief background here. In the United States, a paper published in the *American Journal of Sports Medicine* in 2012 estimated about two million sports-related injuries just in the high school level. And about 10% of all high school sports injuries are fractures that result in school absences, diagnostic procedures, and surgical procedures being requested, adding to cost and restricting physical activity and athletics participation in a lot of these kids.

If you look at the data there, a great number that will involve the hand, the finger, and the wrist. And they even found that 11 out of the 20 sports that they looked at, the hand/finger area was the most commonly fractured site. And about 22% of those fractures will require surgery involving the hand and the fingers.

So I want to go through the pathologies kind of like in the context of the sports that they most commonly occur. So baseball being the great American pastime, well start off with that. There's a lot of things that you do in baseball that would cause you to have a hand or wrist injury. The hands and the wrists are always exposed. That's the thing that you grab the ball with, you hold the ball with, protect yourself as you slide into the bases, and things like that.

So these are the things that can really predispose the athlete into getting hand and wrist injuries. So let's start with the classic what we call the baseball finger-- the mallet finger. This is basically a terminal disruption of the extensor tendon. It can either be just a soft tissue injury where the tendon gets [INAUDIBLE] from the distal phalanx. Or it can have what you see in here a bony component where the tendon's attached.

So typically the patient will present with pain, swelling, and contusion of the DIP, if you see them acutely. They can still have an intact passive range of motion at the DIP, but they will have absent active extension at that area. You'll also want to check these patients not only at the DIP-- if they have any hyperextension at the proximal interphalangeal joint-- which could tip you off to something else going on in the proximal portion of the finger.

But you should probably get x-rays just to assess obviously for the bony involvement, and whether the finger's properly aligned. But if it's just a regular mallet finger injury, you can treat these patients with full-time splinting, what we usually call a stack splint, that you see here at the bottom right corner. These can be custom made or can the off-the-shelf.

The object here is to keep the distal interphalangeal joint slightly hyperextended full-time. And if you're able to do that with four to six weeks, even if you have a bony involvement of less than 30% 40% of the articular surface, you stand a good chance of being able to heal the mallet finger. But if the patient is unable to tolerate the splint, or there is volar subluxation off the distal phalanx, you might start to think about treating these patients operatively.

So if you want to go back to 2011 NBA finals, Dirk Nowitzki has a mallet finger. And he wears a stack splint for the rest of the series. And they beat the Cavs. So they can still play at the top level if they have a mallet finger, and they wear a splint.

So another common injury in baseball or any other sport that involves a lot of gripping, forceful gripping and holding equipment, is a hook of the hamate fracture. There can be pain over the hook of the hamate as you palpate. And if it gets to the point where it's starting to encroach into the ulnar nerve, you can get these paresthesias over the ulnar nerve distribution.

So you could request x-rays to screen for these. But typically you don't see a lot of these, or it's very difficult to see them on the regular standard AP and lateral views of the hand. What you might want to request is what's called carpal tunnel view.

You see here on the bottom right, the arrow actually points to that fracture, the hook of the hamate as you're looking at it sort of on a cross-sectional axial view. And that's significantly displaced. And that will require treatment.

If it's an undisplaced hook fracture, you can treat these with cast immobilization for a couple weeks until they're pain-free. And then you can return to play. If it's an unstable hook there are two ways you can deal with it. You can treat it with open reduction internal fixation with or without the ulnar nerve decompression.

But if they're fairly small, you can actually choose to excise these if they're very symptomatic. Aside from the ulnar nerve problems that they can get, these patients can also be at risk for getting a flexor tendon rupture.

What you're seeing on the right upper hand corner there is a hook of the hamate pull test. That's just kind of to test whether the patient has-- if you're still trying to rule out the hook of the hamate fracture, have the patient kind of hook the ulnar two fingers, and against resistance to pull. And what will happen is that the tendons will kind of push against that hook of the hamate. And you feel pain or there is paresthesia, then that probably tells you that hook of the hamate is unstable and symptomatic, and you need to do something about it.

So the other thing that can happen because these patients who play baseball can have a lot of impact going on, especially on the ulnar side of the wrist, they can have what's called-- what we kind of put under the general heading of triangular fibrocartilage complex injury-- or TFCC injury. So this can be resulting from an ulnar axial load, ulnar deviation, or extremes of rotation. That's in the acute setting.

In the more chronic setting, these patients can be suffering from repetitive overuse. And you can sometimes have them present with ECU tendinitis and instability, or ulnar carpal abutment. So an example of ulnar carpal abutment here's on this-- this is a patient of mine.

She doesn't play baseball. This is actually a cheerleading patient. But this is a good example of what an ulnar carpal abutment would look like on x-ray. And you'll see the ulnar distal end here is relatively longer compared to the radius. It's actually starting to abut on the lunate there. Doesn't show very well here, but there's actually a cyst that's starting to form on the lunate because of the abutment of the ulna.

So it could look something like this in these patients with ulnar abutment syndrome. So the diagnosis as they present, they have ulnar-sided wrist pain, pain on ulnar deviation and axial loading. Pain on pronation, supination motion. And sometimes frank instability of the distal radial/ulnar joint.

So if you're thinking of these as part of your differential diagnosis, you want to work them up, you can start with plain radiographs. That's to kind of see where the alignment is and the relative lengths of the radius and ulna. And if you still want to work them up, and you have a very high index of suspicion, you can go to an MRI. And there is an option to do an arthrogram with the MRI to really bring out the details of the triangular fibrocartilage complex. Here you're seeing on the bottom right, the arrow is pointing to a high density signal on the insertion of the TFCC, which indicates a tear on that portion of the TFCC.

And then what do you do when you see these patients? If you see them acutely, that doesn't mean that you need to send them to the surgeon right away. You actually have the option to treat these patients non-surgically. And that's how I typically would start with them.

I don't even send them right away to get an MRI, unless this is an elite athlete, high-performing athlete. And again, as you would probably hear a lot during the talks in this workshop is that there's a lot of factors that come into play when you're making a decision whether to take the patient to surgery immediately or not.

So say this is a non-elite athlete, can take time off from the sport. And it's OK to put them in a cast that prevents pronation and supination for about four to six weeks. Come back. Reassess them after the immobilization, see if they're pain-free. Then you can release them back to play.

If despite that immobilization they continue to have pain, then that's when I start to work them up, get an MRI with an arthrogram, see what's going on there. If I find a pathology, I continue to chase it down with wrist arthroscopy.

And as I'm looking inside the wrist during arthroscopy, kind of like what you would do with the knee, I can repair or debris that as necessary. And then immobilize them again for maybe four to six weeks. And if they're doing better at the end of that, get them ready to return to play.

So you have to tell them if this is a real bad TFCC injury, they might expect being out for about six to eight weeks as far as downtime. And then slowly progress to return to play.

So basketball, again, a lot of exposure with the hand and the fingers. You see a lot of PIP and MCP joint sprains. About 90% of the injuries that we see in basketball involve PIP and MCP sprains. There are PIP dislocations. Again, mallet fingers, because patients are coming after that ball. And they get these injuries.

There is another one called Boutonniere Deformity, and then the Jersey Finger. So we'll go through some of these. Most of PIP and MCP joint sprains, they're very easily treated with splinting and taping. The key here is you want to start them doing range of motion exercises by not later than three weeks, because as you get longer immobilization, the chances of getting a stiff-- especially at the PIP joint, increases.

And then by four to six weeks, you're starting to look at strengthening exercises as part of the program. And then gradually return to play. There's even an option to actually have these patients return to play protected. That again, is going to be a sports-specific type of thing.

If the sport will allow this patient to wear some sort of orthosis that will maintain the reduction, then fine, you can return them to protected play. But typically we wait until they're clinically healed, and they have stable range of motion in their joints.

So I want to refer you to this figure in the bottom here. Sometimes you guys are somehow forced to make a judgment call in a situation when a patient has a fracture dislocation. What am I going to do here?

So think about breaking down that joint into 15%, 30%, 50% joint involvement as you see on a lateral x-ray. And as you get to a bigger number, the more unstable the joint becomes. And the more unstable it is, the greater the chance that you're gonna have to intervene with something more than just taping.

So I don't know if you guys are able to see this. But if it's less than 30% involvement of the articular surface, that means that joint is likely going to be stable. And then the next thing you're going to have to decide whether this is reducible or irreducible. If the fracture dislocation is reducible, fine, go ahead and reduce it. Then you just buddy tape or splint it. You'll be OK.

But if it's not reducible, probably some tissue like a collateral ligament or Volar plate is interposed. Or even the fragment's interposed that's keeping you from reducing the joint. And you're gonna have to do something surgical to take care of that problem.

As you get higher and higher in terms of articular involvement, as you go into 30% to 50% joint involvement, again, you can go ahead and do the reduction and check if this is a stable or an unstable reduction. So how do you determine that?

Try to see under, say, maybe a digital block, if the patient can go to 30% degree of flexion and not dislocate. If they can't do that, and maintain their reduction, then that means that's an unstable joint. And that's going to go into the unstable surgical arm of the algorithm. And then obviously, more than 50% involvement of the joint, that will need to be dealt with and fixed.

So what is a Boutonniere Deformity? Again, this involves the extensor mechanism of the finger, also commonly seen in basketball. This involves the disruption of the central slip of the extensor tendon.

So classically-- I guess some of you might have encountered this during your studies-- the Boutonniere presents as flexion at the PIP joint with hyperextension of the DIP, because of the disruption of the extensor mechanism at the DIP. So what happens is the lateral bands of the extensor starts to go volarly, and pulls the distal interphalangeal joint into extension. But at the same time, it's pushing the PIP joint into flexion.

So one way of doing a test to actually check this is what's called an Elson Test. The figure you're seeing in the middle here is actually the picture from Doctor Elson's original article in 1986. You have the patient curl the finger that you're testing over the edge of say a table. And then you have them actively try to extend the finger while you're putting resistance against that middle phalanx.

And while they're doing that, you try to test how firm or how flail is the DIP. And what's going to happen, if the extensor mechanism is intact, meaning the central slip is still attached here, these lateral bands won't be able to pull the distal interphalangeal joint back. So that DIP is going to be flail if you have an intact central slip.

Now if the central slip has been disrupted, what's going to happen is the lateral band, when that patient is trying to extend, will start to pull back because there's nothing that's restraining them. So it's going to end up with a firm DIP as that patient is attempting to extend the finger. So it's very subtle. But if you know the biomechanics of the extensor mechanism, you'll understand why this test works.

So what do you do with these patients? If you see them acutely, again, you don't need to do surgery right away if you have time. You can actually put them in an extension splint about four to six weeks, and then wean them to nighttime splinting after that.

So it will look something like what you have on the bottom right-hand corner here. So the splint goes all the way dorsally, and then has these Velcro straps. The distal Velcro strap can actually be taken out to allow the patient to exercise the distal interphalangeal joint while maintaining extension on the PIP joint to allow that central slip to heal.

And you can even tweak this so it's much more lower profile. Say, if you really want the patient to go back and play. And you think it's going to be OK.

So the key here is like in the mallet finger is full-time splinting. Because at any point that the PIP joint flexes and stretches out the central slip, then it's not going to heal. You sort of go back to day zero of the healing process.

OK. Jersey finger. You folks might hear of this every now and then. The patient playing football, basketball, whatever, tries to grab a player with forceful flexion at the DIP. At the same time, there's this force that's trying to pull the finger into extension. And what happens is the flexor digitorum profundus pulls off from the distal phalanx.

And there are a couple variations to this. One is where it just pulls off all the way to the palm of the patient. Second is where it pulls off with a piece of bone and gets entrapped in the middle of the finger. And second is another variation is where it pulls off just soft tissue injury, but still gets stuck in the middle of the finger.

And that's important if we're treating the patient surgically, because we're going to have to decide where we're going to open that finger to repair that tendon. So these cases, unfortunately when you see them and you're able to catch them early enough, these are surgical cases that we need to get to them as soon as possible.

Unfortunately, probably the last three or four patients I've seen the past year didn't get to me until they're about over a month out. So that's when you have these delayed presentations, because the acute ones are easy to think through. You see the tendon, dig them out, put them back where they're supposed to be, and sew them to the distal phalanx, give them about four to six weeks to heal, and then go through hand therapy.

If they're delayed, there's going to be significant amount of reconstructive effort and therapy that's going to go into fixing these kids, because now that fibro-osseous pulley system has been collapsed and scarred in. So I got to take that down, reconstruct the whole thing with a graph, put in a silicon rod for about three months, have the patients go through three months of therapy, and then put in the graph, and then another six to eight weeks of therapy. And even then, their function is not as good as what it would have been if they had been acutely repaired.

So another sport-- I don't know how many of you are familiar with bowling-- bowler's thumb can happen where the patient presents with irritation of the ulnar digital nerve of the thumb. So they have paresthesia, hyperesthesia, over the ulnar thumb. So there could be changes in the two-point discrimination. You can actually sometimes palpate the thickened digital nerve.

So if you can treat these patients initially with conservative treatment where you can coach them into changing their grip, maybe drilling a bigger hole on the ball so that it doesn't compress on the nerve. If none of these conservative measures work, then you have to do neurolysis, or nerve transposition.

So the next sport is boxing. I don't know if you know this guy. So boxer's knuckle is basically a sagittal band disruption on the MP joint. As you know, these boxers will tend to punch the punching bag or this consistent trauma to the MP joint causes a lot of attenuation of the extensor mechanism.

But boxers are also prone to developing CMC joint instability. They can have what's called a CMC carpal boss. Metacarpal fractures can also be part of their problem, and as well as scaphoid fractures.

So quickly, sagittal band disruption. These are caused by blunt trauma. If you look at the bottom picture here, this is a dissection of the extensor tendon, and just illustrates how on the left is an intact extensor tendon.

And if you cut that band to the radial side of it as you flex the MP joint, the extensor tendon is going to sublux or dislocate ulnarly. That's what's happening on the hand above. Obviously, that's not a boxer's hand. But just the same, it kind of illustrates what happens when you lose that centralizing mechanism on the extensor.

So you can treat these acutely non-surgically if you get them early enough. Again, the key is just to prevent them from flexing at the MP joint, so that the extensor can stay centered on the MP joint, and give that little band on the radial side some time to heal. If they're presenting chronically, or they continue to have pain in subluxation, then you can go ahead and do surgical repair or even reconstruction.

A CMC boss basically is a manifestation of osteoarthritis at the carpal joint. You have some spurs that can rub against the extensor tendon. So what we would do if these patients continue to have symptoms is to basically excise that. And there might even be an associated ganglion cyst.

So metacarpal fractures again, most of these are stable amenable to splinting, and can be treated non-surgically. But again, you have to tailor the treatment to the athlete. The immobilization ideally should not exceed three to four weeks.

A lot of the ERs there will give these patients as they come and see them in the ER slings. They actually end up pulling the hand into a dependent position, and does not contribute to the recovery of these patients. So they actually should be elevating the hand and actually trying to mobilize this as much as possible.

So indications for surgery for these patients. One is if you have malrotation, and how do you judge that? If at all possible, you can have the patient try to make a fist or clench their fingers, and see if any of the fingers overlap. If there's overlap, that tells you that there's malrotation, and that needs to be corrected either by reduction or most likely with surgery.

If it's an unstable fracture, and these tend to be more of what you call the border metacarpals, the one that is on the ulnar or the radial side of the hand, because they don't have the other restraints that say the central digits have. But these are the parameters that you might want to look at on the x-ray. More than 5 to 6 millimeters of shortening, excessive angulation typically on the lateral view.

You see these. More than 50 degrees on the fourth and fifth metacarpal, more than 20 degrees on the second and third metacarpals. And then again, if this patient just needs to go back to the field, or for some reason is unable to maintain your splint, then you have to think about doing some surgical stabilization.

Scaphoid fractures. Fairly common in a lot of sports. But we can also see them in boxing. So you'd like to think of the scaphoid in terms of thirds. The distal third, the middle third, and the proximal third, because these areas will have some sort of different prognosis when they fracture in these places.

The distal third and the middle third, if they're non-displaced, and they're fairly stable, those can actually be treated non-surgically, conservatively in a cast. Unfortunately, the casting for scaphoid fractures lasts anywhere from eight to sometimes 12 weeks, in the worst cases, sometimes six months.

So an athlete who's really raring to go back to the field will usually get some fixation, even if they're fractured in the middle third and distal third of the scaphoid. The ones that will really have it done almost right away, as soon as you see it on the x-ray, are the ones that have what we call proximal pull fractures, because the vascular supply is not as good on the proximal pull. And you got to get that stabilized and fixed sooner so that you can get better chances of healing.

So these patients, you can image them with the regular x-rays. And I've had a lot of patients that will come to the primary care physician complaining of wrist pain anatomic snuff box tenderness, which is specific to this injury. And they get a thumb spica, even if the x-rays are negative.

For me as a hand surgeon, I like that, because you never know if there is a non-displaced scaphoid fracture that's just not showing up for that first x-ray. Have that patient come back in one week, get another x-ray, and check again. And sometimes if you really have doubts, and this patient is persistently painful, you can get either an MRI or a CT scan for a more detailed view of the scaphoid. Because the sooner you determine the diagnosis, the sooner you can make that decision. And what's been found is that if we're able to intervene early with our fixation, the chances of healing and returning to play is actually better for these athletes.

So this is kind of how I do my scaphoid fractures. I try to do a minimally invasive approach as much as possible. I have a fluoroscan in there to visualize the fracture. At the same time, I'm doing a wrist arthroscopy to look at the fracture directly, seeing is I'm lining it up. And it would look something like the picture on the middle with a screw in the middle of the scaphoid, if you fix it right.

So cycling has also picked up the last couple years. You can see the lycra-bound crowd out there riding. Every now and then you have someone come in complaining of some numbness and tingling, especially on the ulnar two digits. And this is because they spend a lot of time pressing on their hand with the handlebar.

So the ulnar gets entrapped in this area that we call Guyon's canal. It's between the hook of the hamate and the pisiform and the ligaments around there. So things that you can do again conservatively, they can get pads on their bike gloves. They can even try to see if they can change the geometry of their bikes so they're not leaning as much on their handlebars. But I don't know is the speed or aerodynamics is a big concern for them.

But if the conservative measures fail, then you can talk to them about decompressing the ulnar nerve. And interestingly enough, we go through the same incision that we go through for carpal tunnel release for these cases.

So football, rugby are kind of related. About 50% of hand injuries in the NFL are metacarpal fractures. And there's also a good number of jersey fingers out there. One thing that we see also in these sports are these scaphoid lunate interposes ligament injury.

So basically you've got the scaphoid on one side, you've got the lunate on the other side. There's a ligament that goes between them that keeps them in sync as you're moving your wrist. Once you disrupt this ligament, practically your wrist falls apart over time. And then you have a patient who starts to get wrist pain and has problems maintaining a strong grip.

So what it would look like on x-ray is something like this. This is a patient of mine actually from this morning, interestingly enough. When you get an AP, and you have the patient clench the fist, it will drive the capitate in between the scaphoid and the lunate. And if that ligament is somehow incompetent, the scaphoid and the lunate will start to separate. And that's what you're seeing on the x-ray here.

So the mechanism usually in these patients is that they'll usually fall on an outstretched hand. The problem is if we don't pick up on these injuries, and the patients just keep on playing, you know, nobody's checking on their wrist, they come to a hand surgeon having these terrible wrist pain with swelling. And they have an instability pattern that's called a SLAC wrist-- that's S-L-A-C-- meaning scapholunate advanced collapse.

And by then they already have secondary adapted instability patterns. And some of them might even have arthritic changes. So you don't want them to get to that point. You want to pick up on these injuries as soon as you become aware of it.

So the patient can present with tenderness distal to [INAUDIBLE]. There's a provocative test that you can do that's called Watson's test, or a scaphoid shift test. So you palpate your hand bony prominence here, which is the tubercle of your scaphoid, and if you ulnarly deviate, and at the same time apply a force that's directed dorsally on that tubercle, if you have a scapholunate instability, the scaphoid is going to start sliding back over the dorsal lip of the distal radius. And you'll feel that. Sometimes it's a clunk. Sometimes the patient will tell you they have that specific pain over the snuff box when you're doing these provocative tests. So that is indicative of a scapholunate instability.

So patients can get x-rays, AP, and even the scaphoid views, or the clenched fist views. If you just have a regular AP view, and you're not quite sure whether that widening is significant, you can even compare it to the other side with another x-ray. But typically the normal interval between the scaphoid and the lunate on an AP view should be less than three millimeters.

And then if you want to really document that, you could go and request for an MR arthrogram. So that will again bring out the details of the ligament.

And then if I want to keep chasing this-- and sometimes this is already part of what I do as a surgeon-- I look into the wrist with the diagnostic arthroscopy. And based on that, I can make a decision what to do with the problem.

If we see the patients acutely, we can actually-- and then say it's a partial injury-- we can actually splint or cast these patients. And it has to be a thumb spike, a splint, or a cast for about four to six weeks. And when they're completely pain-free, gradually return to play.

If there is a complete and acute tear, what we can do is open the wrist on the dorsal side and take some of the excess capsule, and use that to augment the actual repair of the ligament. If they've been gone and had the tear for some time-- meaning there's not much of that ligament left for me to repair-- I would take a tendon graft, typically the palmaris, and weave it between the scaphoid and the lunate, and secure it with some anchors, and then immobilize the patient typically for about six weeks, then rehabilitate to return to play if at all possible.

The thing is when they're getting something like this big reconstruction, I can't assure them that their wrist is going to be completely pain-free at the end of it. That's just the nature of that procedure.

Let's turn to golf. A lot of the golf players out there have this ulnar-sided wrist pain that will refer usually to the extensor carpi ulnaris tendon. There are two possibilities going on there. Either that tendon is so inflamed-- meaning the patient's getting an ECU tendinitis, or that tendon is unstable. So it's starting to kind of go all over the place as this golfer is trying to swing the club.

So if it's tendinitis, that just means there's a lot of irritation, maybe even abrasion on the tendon. But if it's an instability, there is an acute injury that's exacerbated by the repetitive movements of the sport. And the tendon sheet has been disrupted.

So these patients can present with pain in the dorsoulnar wrist. They can be palpable or sometimes an audible snapping or clicking on the wrist as these patients even pronate and supinate. X-rays usually won't show you anything unless this is associated say with an ulnar styloid fracture.

So recently some folks have been using dynamic ultrasound just to kind of see where that tendon's going as this patient is going through the motions of pronation, supination, radioulnar deviation. Then you can really document the instability there.

So if it's just tendinitis, usually we can get away with immobilizing them, giving them some NSAIDS. But if they continue to have pain, I have taken patients to surgery to debris and decompress the extensor carpi ulnaris. And if they have instability, those will usually require some sort of stabilization procedure. And what we would do is to take a slip of the extensor reticulum and kind of weave that over the ECU, and use that to stabilize the ECU tendon down.

So this is something we see fairly often. And Dr. Benjamin's actually sent me a couple of these patients with gymnast wrist. Very competitive, highly motivated gymnast comes to the clinic with wrist pain. No definite injury as far as falls and anything like that. But you get an x-ray, typically you'll see widening of the physis usually on the distal radius.

So what's happening is because of the repetitive loading of the wrists, these patients get an epiphysitis of the distal radius. And this is where unfortunately I get to play the bad guy, because a lot of these patients-- it's always happened to me that they are scheduled to go to some regional meet in the next week or so. And I got to tell them they got a gymnast wrist, which means they gotta stop. And it's a big problem because they spent all their lives preparing for these events. And then you're telling them that they can't do it anymore.

But that's probably another topic. But what you would do typically is to shut down the wrist and then immobilize them, put them on NSAIDS, and then get them to a point when they're completely pain-free. And then you'll have a discussion whether they still want to pursue gymnastics or change to a different sport that doesn't load the wrist as much.

So depending on what they do. But for me, after they're done with that pain control, and they're OK, I still want to follow them, at least every six months to a year, because what could happen is something that happened with this girl here.

Although she's not a gymnast, she's doing a lot of tumbling runs and handstands in cheerleading. So I saw her one year ago. She had a little bit of wrist pain, but her x-rays looked different from what she's got right now here at the bottom center.

As you see, the ulna and the radius were actually even when she presented about a year ago. But now she was actually lost to followup, and then presented with worsening ulnar-sided wrist pain. What's happened is that the growth rate that the distal radius on the ulnar side somehow shut down, or is slowed down in terms of growth.

She's growing so much more faster on ulna relative to the radius, so she ends up abutting the distal ulna to the lunate. And she has a lot of ulnar-sided wrist pain.

Last week we took her back to surgery. I scoped her wrist. At the same time, I shortened the ulna so that we just take away all that pressure of the abutment of the ulna to the lunate and the triquetral on that wrist. So it might look kind of benign at the outset, but you really want to stay on top of these kids, have them come back on a regular basis, because you never know if that distal radius growth plate completely shuts down, and the ulna is still growing, you could run into problems like this.

And it's something that I always tell the patients and the parents about. There might be growth problems. And we need to be following them.

So hockey can also have a hook of the hamate fracture. Rock climbing has picked up in terms of popularity the past couple years. And the most common injury as they're trying to come up with those weird grips is a disruption of the flexor pulley. So there's what's called the A2 and the A4 pulleys. And these can be involved.

But you can actually get away with trying to treat these patients conservatively again, with taping and splinting. And then when they're completely pain-free, gradually go back to climbing. But if they continue to have problems with excursion or weakness in that finger flexion, you might decide to reconstruct the flexor pulley as well.

Rowers can be at risk for what's called intersection syndrome. That's basically a tennis intervitis involving the APL and the ECRB. I mean the ECRB and ECRL. Sorry.

The [INAUDIBLE] is the first dorsal compartment, which is more radial. So these are patients that are presenting with radial-sided wrist pain. And again, you want to treat them conservatively. See if you can rest their hands with splints, NSAIDS, and immobilization. And again, if that doesn't respond, you can go onto the next step such as giving them steroid injection. And if that still doesn't work, then sometimes we're forced to do a release of these extensor compartments.

Ulnar collateral ligament injuries of the thumb is another common-- and sometimes can be a difficult-- injury to deal with if not caught early. One thing you need to be aware of here is that if you see on the right-hand side, the rightmost figure there is showing what's called a stener lesion. So when the ulnar collateral ligament tears, sometimes there's a gap there where the aponeurosis of the abductors can get into and prevent the collateral from healing properly.

So sometimes you've immobilized these patients already for six weeks, say you're in a thumb spike or brace. And they continue to have laxity on the thumb MP joint. So you have to think about a possible stener lesion. And then you would probably want to evaluate these patients sometimes acutely.

The bottom sort of algorithm just helps you determine what's involved as the actual ulnar collateral ligament, or the accessory collateral ligament. What you're looking for here is when you get a firm or a soft endpoint. When you get the soft endpoint, then it means that whatever ligament you're testing is probably ruptured. If it's a firm endpoint, then that ligament is intact. Then you're OK with not having to deal with preparing that.

So if you have an ulnar collateral, or even a radial collateral ligament injury, you want to grade these one and two tears of the UCL or RCL, or even sometimes the great three ulnar collateral ligaments. These are amenable to nonsurgical treatment.

And again, you have to take that in the context of what your athlete demands, whether this is somebody that needs to go back to play, or is it going towards the end of the season.

Now if the patients have a sterile lesion, then that would mean that that ligament is not gonna heal, and you probably need to go ahead and do surgical repair. Patients with partial tears don't need to have surgery. The patients who already have chronic tears and showing signs of post-traumatic arthritis on the MP joint probably will do better getting a fusion instead of a ligament repair.

So football, or soccer, they have phalangeal fractures, sprains, and PIP dislocations. So we discussed most of that. Tennis also, because of the almost similar movements with baseball will have ECU problems and ulnar-sided wrist problems. Again, volleyball, because you're going after the ball. Usually with your fingers extended even, you can get mallet fingers, radial, or ulnar collateral ligament sprains even.

So there's a big question about return to play after hand and wrist injuries. When you think about it, there's really no consensus as to when is it safe to have the patient return, and under what conditions would you do that. There's one paper that did this survey. And they published in June 2013 in the *Journal of Orthopedics*.

They surveyed 37 consultant hand surgeons in the professional leagues of the NBA, NFL, and Major League Baseball. There's just a significant variability in terms of their response in terms of initial management for these hand and wrist fractures, return to protected play, or return to unprotected play. The only thing that almost all of them would agree on is that a patient with a stable PIP joint dislocation can return to protected play immediately. That's the only one thing that they seem to agree on.

Most of the time they seem to tailor the decision to return to play on a case-by-case basis. So there's again, just kind of like the previous talk, there's no one good answer when you're asked when is it the best time to have these patients return to the field. Thank you.

[APPLAUSE]