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How The Tommy John Surgery Revolutionized Elbow Injury Rehabilitation

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Narrator:

Welcome to **Medical Breakthroughs** from Penn Medicine, advancing medicine through precision diagnostics and novel therapies.

Dr. Caudle:

This is ReachMD and I'm your host, Dr. Jennifer Caudle, and with me today is Dr. G. Russell Huffman, Associate Professor and Director of the Shoulder and Elbow Fellowship at the University of Pennsylvania. We will be discussing the Tommy John surgery.

Dr. Huffman, welcome to the program.

Dr. Huffman:

Thank you. Thanks for having me.

Dr. Caudle:

First of all, can you start by discussing the types of elbow injuries that you see in overhead athletes?

Dr. Huffman:

We see two types of injuries in general. One would be an acute injury, so if someone were to fall or have an abrupt ligamentous or tendon injury. The other would be a chronic overuse-type syndrome, and both are important and both can ultimately be the same anatomic structures, but in general, we will see two different patterns. So when we talk about different sports, so baseball pitcher is prone to having an injury to the ligament on the inner aspect of their elbow, the medial collateral ligament. Many people know that, in lay terms, as the Tommy John injury, from a baseball pitcher that was treated in the 1970s with an injury or tear to his ulnar collateral ligament. So in baseball pitchers we'll see that typically as a chronic overuse injury or an attenuation of that ligament, but also associated with that spectrum of pathology can be loose bodies in the elbow, so pieces of bone or cartilage that float around and create mechanical symptoms in the elbow, tendon overuse injuries such as a flexor pronator strain or medial epicondylitis; you also see ulnar nerve irritation/irritability. Those are the most common things we see in overhead athletes such as pitchers, but also sometimes in volleyball players, tennis players who are serving a lot or practicing their serve perhaps too often or too strenuously, in adults. In younger adolescent patients we'll see a whole host of other injuries that I won't get into in this interview.

Dr. Caudle:

So there are a number of injuries that you mention. Can you discuss the spectrum of treatment options available for these?

Dr. Huffman:

If one's treating athletes, whether it be recreational or an intercollegiate or professional athlete or someone who's on a high school team who's very serious about their sport, the treatment is very different than someone who's an occasional or recreational athlete. So we want to treat the symptoms and make a correct diagnosis. The first thing to do is to do careful history and ascertain whether the incident happened abruptly or whether it's been going on over a period of time and just worsening. Additionally, one wants to do a careful physical examination and look at all of the anatomic structures that could be involved. Now, if we're talking about a baseball player who's had persistent pain in their elbow, the first thing I'll do is ask the onset. Has it been going on for the past week or several months? Often they'll complain about a lack of performance, in the athletic population, and that, more than pain or any other symptom, is what drives them to present to us. It's almost always lack of performance because that's the outcome of interest in this population.

Dr. Caudle:

Can you talk a little bit about which injuries require surgical intervention and what those interventions might be?

Dr. Huffman:

Again, if we're talking about elbow pathology in an athlete, for athletes that are unable to participate in their sport of interest, it's the injuries that just don't get better with rest and the usual recovery period and physical therapy and other kind of noninvasive treatment. There are some racket players who will develop loose bodies in their joint on occasion from pieces of cartilage that may break off from the outer aspect of their elbow, from an area called the capitellum or the radiocapitellar joint. Those individuals will present with swelling, a lack of motion, and intermittent mechanical clicking, catching, and a loss of motion. In those patients, if there is a clear loose body or something that's mechanically deranged in the joint, then typically we'll do something like an arthroscopy to remove the offending agent or piece of cartilage that's creating the symptoms. When we talk about more insidious kind of presentations like medial-sided elbow pain, say in a thrower or a pitcher, then it's really important to make the correct diagnosis. If we look at the Tommy John ligament or the ulnar collateral ligament, the pain typically will be present with throwing, typically when they try to release the ball. They'll complain of a lack of velocity or slower speed on their pitches than they're used to or than they want, and a lack or loss of control. So, they're not placing the ball where they want to. The pain will present in the forearm portion of the medial aspect of the elbow in an area called the sublime tubercle, as opposed to pain that presents on the medial epicondyle which is more common with medial epicondylitis or a flexor-pronator mass strain. So, it's really important to differentiate those. A tennis player hitting a lot of top spin, while they can irritate their ulnar collateral ligament, they're more often to get inflammation in the flexor-pronator mass. In a pitcher with overuse, you're more often to see pain in the forearm and the area of the sublime tubercle with tenderness to palpation there, difficulty throwing, and pain with certain physical exam findings. And the most useful test, I find, is the moving valgus stress test where one passively takes the elbow through a range of motion with a constant valgus stress applied. The pain will then be localized directly in the forearm at the sublime tubercle. If a pitcher has not been able to rest and then returns to pitching and has had adequate diagnostic workup with history, physical exam, and MRI as well as radiographs, that starts to become the point where we talk about surgical intervention and that kind of overuse. Now again, I'm only touching on a couple of diagnoses, but it's like, we could go in different directions, but if we talk more about the ligamentous injuries in overhead athletes and the Tommy John-type surgery, then that's really the criteria. And, inability to return to sport after an appropriate diagnosis is made, based on physical exam findings, imaging, and that we've tried nonsurgical or noninvasive modalities such as rest, physical therapy, and an interval throwing program.

Dr. Caudle:

Can you talk a little bit about the Tommy John surgery and, specifically, why is it unique and how has the technique evolved over time?

Dr. Huffman:

Some of my mentors are on the west coast, in Los Angeles, and that really is where the procedure had its inception. It's unique in multiple ways. At the time that it was first performed by Frank Jobe, Dr. Jobe did it as kind of an experimental surgery based on his knowledge of the anatomy and by the mechanics of the elbow, to treat a pitcher who was disabled, Tommy John. It's unique because he took such a leap of faith in his own understanding of the anatomy and his own surgical ability and designed a procedure to recreate the ligamentous restraint of the ulnar collateral ligament. In that initial surgery, the exposure was quite wide and the flexor-pronator mass was attached and the ulnar nerve transposed so it was a kind of big procedure at the time. Since the 1970s, when that initial surgery was done, and by the way Tommy John went on to win over 300 baseball games and win many awards after the ligament reconstruction whereas prior to that date, that was it; a pitcher with that diagnosis was done. So it really was as revolutionary procedure and it took a lot of courage for Dr. Jobe to do that. Since that time, when they did such a large exposure and routinely moved the ulnar nerve, we've gotten to smaller and smaller incisions and we don't routinely treat the ulnar nerve unless it's symptomatic at the time of surgery, or if it is at risk because it's unstable and the cubital tunnel or subluxates with elbow flexion. So, our surgery has gotten smaller in terms of the size of the incision. We now kind of split or divide the muscle fibers of the flexor-pronator mass, and at Penn, we've actually now created a surgery that's even less invasive, in terms of the length of the incision, and we're using cortical button fixation to create single tunnels as opposed to the 5 tunnels that Dr. Jobe originally, and by tunnels I mean bone tunnels or tunnels through which the tendon passes in the fixation of the ligament with a graft that's used to replace the ligament. So, we now just use 2 tunnels and cortical button fixation which is extremely strong and can make an even smaller incision than we could, say 5 years ago or 6 years ago.

Dr. Caudle:

If you're just tuning in, you're listening to Medical Breakthroughs from Penn Medicine on ReachMD. I'm your host, Dr. Jennifer Caudle, and joining me is Dr. G. Russell Huffman, Associate Professor and Director of the Shoulder and Elbow Fellowship at the University of Pennsylvania.

So, going back to the Tommy John surgery, which is what we're discussing, can you talk a little bit about the advantages of the surgery?

Dr. Huffman:

The biggest advantages for an individual who is no longer able to participate or able to throw because of ligament damage or insufficiency, the advantage is that it gives them about an 85% chance of returning to the same level, or even progressing on beyond their current level of throwing, whereas the alternative is that their career is finished. So that's really the advantage. Again, before the initial surgery on Tommy John, that was a career-ending injury and so you just stopped playing baseball, or throwing a javelin, or doing whatever sport required stress to be placed on that ligament.

Dr. Caudle:

And that speaks very well, obviously, to the advantage of being able to get back to the sport that the patient has been practicing or been playing. So that speaks a little bit to the success rate because you mentioned how successful it can be. Can you talk about the recovery process and maybe speak a little bit about that?

Dr. Huffman:

The recovery is a little different depending on the athlete and specifically what they do. Like in the most common athlete that requires this procedure is a baseball pitcher. Also, baseball catchers, outfielders, and players in the kind of left side of the field, so short stop, third baseman can also be prone to this injury. Now, if you're what's called a position player, outfield, catcher, anything that's not the pitcher, the recovery is much faster than if you are a pitcher. The reason for that is that the pitcher is the only one that is expected to throw at maximal velocity, or with maximal force, dozens, sometimes more than a hundred times during a game. So, if we're talking about a position player, they may be able to return to full participation at a very high level, or their maximum level, within a half a year. If we're talking about a pitcher, while they may be throwing as early as 5 to 6 months, it's uncommon that they reach their peak performance before a year to a year and a half after the surgery. I've had other wrestlers, gymnasts, and people like that, and their return is similar to, say, a baseball position player, depending on what they do, but it's really the pitchers where you look at the longest

recovery. So the recovery for a pitcher really starts day 1 after surgery. Obviously they can't work their arm out, but we do know that 60 to 70% of the velocity of a baseball pitch or throw actually comes from the player's trunk, so their legs and core strength is paramount to achieving effectiveness and high velocities and force with throwing. So, day one I have them start working on a leg press and riding a stationary bike and I think that's really important for a couple of reasons. One is that it makes them focus on the foundation and the fundamentals and, two; most athletes get a lot of their sense of well-being or self-worth from their participation. I'm not saying that's healthy, but it's natural as a human to be that way. We take pride in what we're good it and when that's stripped from us suddenly, it can be very discouraging. So, the fact that they can start working on some of the fundamentals that will actually help them be better pitchers on day one after surgery, I think, is crucial, both physically and psychologically. So, recovery starts day one, but it can be a long process, for sure.

Dr. Caudle:

I think it's also very interesting kind of what you just said about the importance of participation and staying involved and how your training recommendations kind of reflect that. I think that's very nice. You mentioned the recovery and how it's involved the success rates a little bit. Patient satisfaction, I would imagine that this would be related to their ability to get back and go and play their sport, but are patients typically satisfied with the procedure and the outcomes?

Dr. Huffman:

Typically, yes. It's a highly successful procedure. It's interesting, we at Penn, our team has looked at outcomes in athletes in various ways and say if your mother or your sister or cousin undergoes knee or hip replacement surgery, her procedure, the outcome of interest is usually the subjective form that gets mailed out or filled out in the office like, how far can you walk, how satisfied are you? What we found, pretty convincingly, and we've published a couple of articles on this, is that those outcomes don't really matter to athletes because athletes are, their expectations are so far above what we call normative values, for what most of the population expects. So, in other words, a baseball pitcher cares about one thing: Can I throw accurately and with the velocity I had before to be successful in my sport? So the outcome of interest for these athletes is their actual performance on the field, and that's really the only thing that matters. So, the patients or athletes that successfully return are very satisfied and those that aren't are less satisfied, even if they're completely normal in all other aspects of life. So it's definitely a different population than we typically treat outside of the performance athletes.

Dr. Caudle:

And finally, can you discuss the potential for re-injury and really what the best strategies are for prevention in this case?

Dr. Huffman:

The two actually go together. There are things that lead up to putting one at risk for tearing their ulnar collateral ligament. We, and others, have observed that it's really the best pitchers that are most at risk. So, it's the starting pitcher who has the lower ERA, or earned run average. They just tend to be used more and they're used for longer outings. So the potential for fatigue and poor mechanics as muscles start to fatigue gets higher, and there's very good literature suggesting that pathology in the shoulder blade and trunk can really alter the mechanics of throwing. And again, it's important to remember that the majority of the force is generated through one's legs and trunk, not through one's arm. So, the arm, shoulder, and elbow, as well as hand and forearm, are really for ball control, when we're talking about pitching, and not for force generation. So if we see an athlete with poor strength or a lack of hip rotation, especially in their lead leg, or subtle loss of motion in their shoulder, those are the individuals who are at highest risk for tearing their ulnar collateral ligament. So the best prevention is recognizing those things, getting adequate rest to athletes, and really working on the core strength, stretching of the shoulders, stretching of the hips, and really proper body mechanics. That's also the best way to prevent a reinjury and actually one of my criteria for doing a Tommy John surgery is making sure that the athlete has full shoulder motion and that we've already addressed core strength issues. If those issues are existent at the time of an injury and we think surgery is necessary, then it's really important for the provider to start to address those immediately, because if surgery's done and those aren't addressed, then the success rate is not as high and the failure rate or retear rate is much higher.

Dr. Caudle:

Well, this has been very, very interesting. Before we close, is there anything else that you would like to add?

Dr. Huffman:

There are many other injuries one can have in the elbow as an athlete. I think the Tommy John surgery takes the spotlight because of the importance of baseball in our society, as Americans, but certainly in Latin America and Japan and other countries as well. But I think really the fundamentals in prevention are probably the most important things I could say, because they are certainly athletes who come in with early elbow pain that could lead to the need for surgery and certainly that we've been able to address their shoulder issues, their trunk stabilization issues, and core strength, and their elbow pain goes away. So, I think it's really fundamental and paramount to address those underlying issues that are less sexy or attractive or don't garner all the headlines that a UCL reconstruction would, but those are really the foundation for preventing these injuries and also insuring successful rehab after surgery for these injuries.

Dr. Caudle:

Well, thank you very much, Dr. Huffman. We really appreciate you being with us today and sharing your insights on the Tommy John surgery.

Dr. Huffman:

Thanks Dr. Caudle.

Dr. Caudle:

I'm your host, Dr. Jennifer Caudle, and thank you for listening.

Narrator:

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