

Dr. Justin Arner:

Welcome, everyone. I'm Dr. Justin Arner from the University of Pittsburgh Medical Center in Pittsburgh, Pennsylvania. Today, I have the pleasure of speaking with Dr. Michael Ciccotti, Chief of Sports Medicine and endowed professor at the Rothman Institute in Thomas Jefferson University in Philadelphia, Pennsylvania. Dr. Ciccotti was the senior author of the two-part paper titled, Disabled Throwing Shoulder 2021 Update with part one being Anatomy and Mechanics, and part two being Pathomechanics and Treatment, both of which are published in the May 2022 edition of The Arthroscopy Journal. This is going to be a two-part podcast series. Today, we'll be discussing part two, which is the pathomechanics and treatment of the throwing athlete. Welcome, Dr. Ciccotti, and thank you so much for joining me.

Dr. Michael Ciccotti:

Justin, it's great. It's an honor to be here. So thank you for having me.

Dr. Justin Arner:

Getting more into the pathologic conditions, specifically, that we start focusing on, one thing I think is difficult sometimes is to really determine what's the pain generator between internal impingement, as you mentioned, in rotator cuff inflammation or fraying, versus a pathologic SLAP tear that's causing symptoms. Can you tell us a little bit how clinically you differentiate that, and do you use injections sometimes in your practice, or is there examine history? Help us folks with less experience figure out how to separate all these out.

Dr. Michael Ciccotti:

Yeah, so, I mean, that's a great question, Justin, and I think that it's a gestalt that you get as you put pieces of a puzzle together. The athlete that's describing more anterior pain and that has bicipital tests and tenderness over the anterior aspect of the shoulder in the bicipital groove, where you're thinking more biceps, maybe extra-articular biceps, maybe AC joint. If they describe to you deep or posterior pain and cooking or catching, and they have positive label testing where you're thinking, again, labral pathology. And I do believe that selective injections can be very helpful.

So to use either of a local anesthetic and/or a corticosteroid, a combination with a corticosteroid in the subacromial space, and we'll do that, we'll give them an injection in the subacromial space and give them a few minutes and come back and see if they have significant relief in their pain, and if they do, then, obviously, their pathology is more in the subacromial space and not interarticular. If there's minimal relief, then we can give them an interarticular injection. We've used ultrasound guidance as well to ensure that we're in the joint and see what happens in terms of their pain relief. So I think selective injections can be very helpful, not only diagnostically for us, but therapeutically, when they're combined with a corticosteroid.

Dr. Justin Arner:

Are you sometimes doing a corticosteroid in your throwing athletes in that circumstance, interarticularly?

Dr. Michael Ciccotti:

Yes. Yes, we are. But when we're doing that, we actually will hold them off from any type of throwing. And we explain that to them. We say, "If we're going to do a corticosteroid injection, we're going to take

several days off from throwing, three to five days, and if you're in season, that is a conversation you have to have beforehand with the athlete, with the coach, which management so they know that. But if an athlete has particular shoulder pathology that you think will be benefited by a corticosteroid, then it's appropriate to do it. You just have to make sure they realize that they're not going to be able to throw for several days. And if they're a pitcher, they may need to go on the IL, the injured list, or they may have to at least miss a start. And again, it's important to discuss that before you do it.

Dr. Justin Arner:

Great advice, for sure. So you mentioned certain labral testing. Can you tell us your physical exam maneuvers that you found in your vast experience with SLAP tears, and you mentioned clinically significant SLAP tears and how to discern those changes and what you find to be most helpful on exam?

Dr. Michael Ciccotti:

That's a great question, too. And Justin, as you know, there are just a host of tests that have been defined for, particularly, superior labral pathology, but for labral pathology, and there are studies that have suggested that there's no single tests or combination of tests that reliably defines clinically significant superior labral pathology, and yet there are combinations of tests that have been shown in various studies to be effective. Ben Kibbler published in 2009 a large group of patients, 300 plus patients, correlating specific labral testing with clinical symptoms, and then ultimately pathology that was identified operatively and found that for clinically significant superior labral pathology, the combination of an active compression test or the O'Brien's test and a modified dynamic labral shear test, those two tests in combination were the most sensitive and specific and had the highest accuracy with respect to clinically significant superior and posterior superior labral pathology.

We did a survey study of Major League Baseball Team Physicians Association in 2019, and those were the two most common tests that were used by Major League Baseball physicians, and those are the tests that I feel really helped me to define clinically significant superior or posterior superior labral injury, and they were originally described as being done either standing or sitting. But I find to do those tests in a supine position where the scapula stabilize, I feel like they're most effective. So we have a little bit of a spin or a modification by doing them in a supine position. But there are other combinations of tests, too. I know where you're at, Pittsburgh, Jim Bradley has described the 3-Pack, the active compression test, or the O'Brien's test, a dynamic posterior instability test that you have developed there, and a Whipple test. So that combination, I think, in your hands has been really sensitive and specific for SLAP and posterior labral tears. So I think the bottom line is that a combination of tests help you better, as pieces of a puzzle, to define this on a physical examination.

Dr. Justin Arner:

Right. Certainly much more complicated than your ACL is torn or not torn.

Dr. Michael Ciccotti:

Right.

Dr. Justin Arner:

It's everything put together. You mentioned a lot about the history and things before. Are there any things that you find, an exam or history, that indicates, "Wow, this person might not do so great with non-operative treatments that he or she might end up in the operating room"?

Dr. Michael Ciccotti:

Yeah. I think certainly an athlete that has had prolonged symptoms and has had a thorough defined non-operative program, and if they have ongoing symptoms, then they're an athlete that likely is going to need to have something done operatively. If you see an athlete that, in your evaluation, they have very straightforward signs of a clinically significant labor injury with very minimal or no kinetic chain deficits, that's another athlete where you don't have a lot to work with beyond that can be corrected, and that's an athlete that ultimately may need to have something done surgically as well. And then thirdly, those athletes that have had, just functionally, they have a significant, as a pitcher, significant decrease in velocity or control, are athletes that may, again, be further down the road and maybe more likely to need something done surgically.

Dr. Justin Arner:

That's great. Jumping to imaging a little bit, which is always a difficult discussion with patients, and our understanding continues to evolve, but tell us how you're using MRIs in your patients. And are you performing arthrograms? When do you order them? As we all talk about, Dr. Andrews always mentions that if you want to operate on the thrower, then you get an MRI because you're going to find something. Tell us how you deal with MRI in these throwers.

Dr. Michael Ciccotti:

Yeah. Right. Exactly. And I would agree, of course, completely with Jim Andrews on that, too. And there are a variety of studies that we know of that have shown asymptomatic changes exist in certain populations, particularly the population we're talking about, throwing athletes, right? Superior labral degenerative changes or fraying, undersurface cuff fraying as well. And it's challenging to determine when those are adaptive changes that actually allow that athlete to perhaps be at the most elite level or when they are actually pathologic or bad type of changes.

And in terms of the MRIs, when we feel that an athlete has symptoms that are severe, we won't hesitate to order an MRI, but we'll preface it with the athletes to say that, "You need to understand that as someone that's thrown for a long period of time, you are going to have changes in various structures that the radiologists will identify, and those changes may not at all be related to your current symptoms. And our job is to correlate how you describe your pain, where your examination is abnormal with what we might find on the MRI. And there will likely be changes that will really have no clinical significance." And so we'll preface it with these athletes beforehand.

In terms of arthrogram enhancing the studies are not, there are certainly centers across the country that feel that you do not need to enhance these MRIs, but the large majority of physicians that take care of these throwing athletes will use an enhanced MRI. If we're going to get an MRI, we will enhance it. We'll use an arthrogram. And I think the things that are important, too, are your standard views, your coronal, your sagittal, your axillary views, but we'll also use an ABER view or abduction external rotation view, which I think really helps us to get a sense of what's happening on the undersurface of the posterior superior rotator cuff. Often, there's delamination that the standard views don't illustrate. I think it gives us a better view of the posterior labrum.

And then specifically on the studies, what things help us, well, if you have contrast undercutting the superior labrum either at or posterior to the biceps route for more than millimeter or two, if you have, certainly, detachment of the superior labrum. Any perilabral cyst formation, any irregular borders that are a reflection of any type of frame with any dye extravasation, those are the things that will clue us into some type of true clinically significant labor injury.

Dr. Justin Arner:

That's great. The point about patient education beforehand, I think this day and age, when people are getting on their phones immediately before you do, seeing a radiology read talking about, "This is torn, that's torn," on these folks going down a path of surgical intervention, trying to back-step that is difficult. One thing that I wanted to ask you about is that difficult scenario, exactly. I guess the best way to deal with that is if you have someone that shows up with an MRI and has those reads and changes, you just have to educate them and give experience scenarios regarding adaptive changes, and this is why you can be such a good baseball player. Is that how you approach those circumstances?

Dr. Michael Ciccotti:

Exactly, Justin. You're spot on. I would I agree with you completely. And when I address this with these athletes, again, I will get a thorough history, and then I will do a thorough examination, including their kinetic changes, we've already talked about, before I even look at the imaging studies. And then I'll say, "We're going to look at your imaging studies now, but you have to understand that there are likely going to be changes that may not at all correlate with what you've just told me and what your exam has shown us." And I'll say, "Ultimately, we put all these pieces of the puzzle together, but we treat you. We don't treat the MRI on the screen right now. We're treating you." And so I think that's really important before you jump into an MRI, and really, the risk is just reading a report. Not looking at the MRI itself, reading the report and then jumping to conclusions, but not putting all the pieces of the puzzle together.

Dr. Justin Arner:

Right. I think that advice about explaining that before you even look at it probably really gives a lot of weight to that father or patient that is nervous and has already seen that report. That's great advice. You mentioned a little bit about when you pull the trigger to perform surgery in these throwing athletes, but can you tell us a little bit about your progression, once you've worked on them, can they change and improved flexibility? How do you typically guide the physical therapists in a return-to-throwing protocol after a certain amount of rest? And what do you tell these patients, "Doc, how long is it going to take before my 13-year-old kid can go and pitch again?" How do you educate those people and get them through that progression?

Dr. Michael Ciccotti:

And you're talking about if we're treating them non-operatively? Is that what-

Dr. Justin Arner:

Right.

Dr. Michael Ciccotti:

Yeah, so usually we'll define it very thoroughly. And part of this is when I see a young athlete that's maybe already had some treatment, I mentioned this earlier, I'll really get granular. They say, "Yeah, we had some non-operative treatment, and it failed." And I'll say, "Well, let's talk," about it and I'll walk through it and say, "What exactly did you have?" And so often it's so incomplete. It's minimal. And the athlete, or the athlete's family or coach, feel it failed when they really didn't have a thorough non-operative program. So there's components to it that are really important. Number one, they have to stop throwing. I mean, it's shocking sometimes how they actually haven't really stopped throwing. They have to stop throwing and they have to stop throwing three to six weeks.

We usually will supplement them if their medical history allows, and these are healthy people for the most part, but with a nonsteroidal anti-inflammatory for two to four weeks, and we may do selective injections for not just diagnostic, but for therapeutic purposes, but they're not going to throw. So we're comfortable doing that. And then we'll start them on a kinetic chain program, so we'll identify any deficits, and then we will really focus on a kinetic chain program, legs, hips, core, cardio. And then when they're pain-free or relatively pain-free, meaning full or near-full range of motion, knowing they're going to have differences from side to side, as we've talked about, when they have full painless strength, when their provocative tests are negative, that might be at three weeks, it might be at five weeks, it might be at six weeks, then we'll start return-to-play-progression.

And as baseball players, they do three things, essentially. They throw a ball. They bat, not as much if they're a pitcher at the most elite levels, but they do bat, and they field. So you progress them on those three activities. So with respect to throwing, you start them with short toss, usually somewhere around 30 feet or so, progressing to long toss. We could debate how long, how far out, but the standard major league baseball programs are 180 to 200 feet. So you progress them from short toss to long toss, and then a position player is done, but a pitcher goes to the mound. And the pitcher then starts a mound program, which is basically fastballs first with increasing effort, followed then by off speed pitches, and watching them all along the way in terms of their technique. And then secondly, they bat. So they just do dry swings with the bat, and then they hit off a tee, and then gentle front toss, and then live hitting and batting practice. And then they field.

And so they field where the balls are hit directly to them, and then progressing to their full position, fielding their full position. So the whole idea is progressing them along in those three activities. And you can do them in parallel or overlapping, but I think maybe one of the most important things is giving them a sense of timing. And you asked this so appropriately in your question, and the general dictum is that if you hold a thrower off for a period of time, say three or four weeks, if they're a pitcher, it will take them roughly the same amount of time to be game ready. So they didn't throw for six weeks, it's likely going to be another six weeks before they're ready to compete in the game. And so that's three months. So it's really important to set expectations right off the bat for that athlete, for that athlete's parents, for coaches or management or agents. And that's a really important part of it.

Dr. Justin Arner:

Yeah. That seems like it's the first thing they ask. So that's a great rule of thumb to use. That's great. So jumping into the surgical part of this, if you indicated someone for surgery, can you tell us about how you make your decision intraoperatively or based on the MRI regarding SLAP debridement versus repair, and does it depend on the age and the level of thrower? Tell us about your inoperative decision making.

Dr. Michael Ciccotti:

Yeah. So, I mean, those are all really important questions, and I think that our indications for surgical treatment in general are that overhead throwing athlete that has persistent symptoms that affect, obviously, their sport, sleep, their daily activities. They have a history that we've just thoroughly discussed and a physical exam that we've just thoroughly discussed, and the imaging that we've just talked about that's consistent with a clinically significant labral injury or CSLI, and they've failed non-operative treatment. We could debate how long, six weeks, 12 weeks, perhaps longer for a younger or a more recreational athlete. We tend to pull the trigger more quickly, sometimes, with the more elite or professional athletes. So those are the general indications that we would have for surgical intervention.

And then in terms of what we would do once we're in the operating room, so much of it is looking visually at it, feeling it, so the tactile aspect as well of the labrum. What is the tissue like? Is there

good quality tissue? Is there hemorrhage or granulation tissue at the interface, suggesting some type of more recent injury? Is there exposed non-articular glenoid beneath the superior or the posterior labrum? Is there any lift-off? So my preference is to do it in a lateral decubitus position so we can take the arm out of the arm holder and put the arm in an abducted, externally rotated position and see if there's any lift-off of that superior or posterior labrum and/or peel back, and then looking very closely at extension into the posterior labrum. So we'll flip the scope around and look from the front and see, "Does that labral tear, we've identified as the labral tear, extend into the posterior labrum?" And I do believe that in the past we have underestimated how often this pathology does extend into the posterior labrum.

Dr. Justin Arner:

Right. You continue to learn more and more. Can you tell us a little bit about the outcomes haven't been ideal, no matter our surgical technique seems to improve, but can you tell us some of your surgical pearls to try to improve the return-to-play and how you educate people that undergo surgery first day of SLAP repair, what their odds are? Do you think we're getting better, or what's the key here in fixing these surgically?

Dr. Michael Ciccotti:

That, too, is a great question, Justin. And I think this follows the ebbs and flows of enthusiasm for SLAP repair, formally torn SLAP repair, now, clinically significant labral injury. I would say early on, there was a great enthusiasm to fix it. And then as we followed out those results, gosh, the percentages that returned to play and more precisely returned to prior performance were much lower than we thought, and persistent pain, recurrent injury. I mean, those were really sobering intermediate-term results that maybe discouraged us from thinking about repairing the superior labrum and the posterior labrum in these overhead throwing athletes. And I think it goes back to the things that we talked about earlier, that we were diagnostically uncertain that our indications across the board, they were equivocal, and our early surgical techniques were very constraining.

We would put an implant immediately anterior and immediately posterior to the bicipital root and pull the biceps down, and everyone in the OR would clap because we really oppose that superior labrum to the glenoid. But we were, in retrospect, over constraining the biceps. We were also very narrow in our post-op rehab. We were just focused right on the glenohumeral joint. We weren't thinking about the entire kinetic chain, and we were evaluating these athletes early on by scoring systems that were not precise. Certain scoring systems for upper extremity are focused more for arthritic patients or rotator cuff patients where it's, "Can you comb your hair? Can you brush your teeth?" Well, these athletes are doing things so much more vigorous, and as we've evolved into scoring systems, now, that are activity specific, we're getting a much better sense of our techniques.

So I think now that we really focus on those areas, we're much more precise diagnostically. Our indications are more precise. Our surgical techniques are not constraining where we avoid the capsule and we don't over constrain the biceps, where our rehab is broad, a whole kinetic chain, and where we're scoring them in a granular way. I actually think the results are improving. And just my anecdotal perspective, it's important to describe to these athletes the difference between returning to play like, "Will they just pick up a ball and throw maybe once in a game, or will they return to their prior performance?" And I'm sure you would agree, Justin, those are different things, right? And getting more granular and looking at sport specific metrics to say, "How is this athlete really performing? Did this athlete return to his prior performance level? pre-injury?"

I think those are the things that allow us to really be better at this. And so when I counsel athletes, now that I really believe would be benefited by this procedure, I will say to them that in the past, the outcomes were not as promising in 60, 70% return-to-play and return-to-prior-performance, but as we are more precise in all the ways that we've just discussed, those percentages, anecdotally, are in the high 80s. And I think that is something that you can hang your hat on right now. But longer term studies in being more precise with all the diagnostic precision and precise indications and non-constraining techniques and kinetic chain rehab. I think that's what will tell us, ultimately, the percentages that we can hang our hats on for these athletes.

Dr. Justin Arner:

Right. Certainly sobering for 60 to 70%. But like you said, these studies have really been different techniques than what we're using now. So we're getting better. It's great to know that. So you mentioned a little bit about the rehab and how you've gotten better at that. Can you talk to us about your postoperative rehab after fixing a SLAP repair and your typical return-to-play for different positions? I'm sure it's different and different levels matter as well.

Dr. Michael Ciccotti:

So we use a protocol that's, I would say, very standard across major league baseball and professional baseball. So we'll have the athlete in the abduction pillow sling for upwards of three weeks or so, but they'll be doing, early on, active hand, wrist, elbow, and active assisted range of motion of their shoulder, but avoiding any extremes of abduction and external rotation. The sling is usually removed at about the third week or so, fourth week. During that timeframe, they've already started on their legs, their hips, their core. They can be doing some low-impact cardio like recumbent bike or stationary bike.

So we're already beginning their kinetic chain program. Usually at three to four weeks, they're starting some isometric exercises for strengthening, and at six weeks progressing with simple cuff and scapular strengthening exercises from, again, kinetic chain throughout this time. And then from a progression standpoint, with respect to hitting, that begins somewhere between three and four months from the surgery. That progression that I already mentioned to you, non-operatively, applies postoperatively as well. Tossing, that tossing progression begins somewhere between four and six months, but it's important that the athletes start plyometrics beforehand and be comfortable with plyometrics. And there's a variety of plyometrics that the athletic training staff and physical therapists can put them through.

But if they're comfortable with plyometrics, usually between the fourth and six month, they can start short toss, progressing to long toss, and then the earliest the pitcher would go to the mound is somewhere between six and eight months. But return-to-play for a position player, then, can be eight, 10 months, whereas for a pitcher, on average, it's 12 or more months return-to-play. And that's really important to talk to these athletes about beforehand, before you do any surgical procedure. So once again, their family, their coaches, their agents have a sense of the time commitment.

Dr. Justin Arner:

Yeah. It's certainly more involved than, say, a four to six-month Bankart repair. These people are just using so much different velocities and motions and everything. It's such an important, like anything, like you mentioned education, so essential. As we wrap up here, I wanted to ask a little bit about some things that seem to be becoming more of an issue in our young athletes with injury prevention and pitch count and resting. Can you just give us your overall gestalt about that process and if you've seen single

sports specialization and how we keep these athletes out of our office and keep these young arms especially healthy? How do you think we should go about that or we can be successful at that?

Dr. Michael Ciccotti:

So you are just so spot on, Justin, with this. I think that we live in this world now where it's almost as if athletes have to decide the moment they exit the womb what sport they're going to play, and play that single sport for their entire career. And there's study, after study, after study that shows that a large majority of elite-level athletes played multiple sports much later in life. And the idea of focusing on one sport comes from this concept of 10,000 hours, and if you do something for an extended period of time, that you will increase your performance in that activity and increase the likelihood of moving on to a higher level. And that has just not been shown in sports with early single-sports specialization. And actually, the opposite has been shown, that in certain sports there's a higher risk of recurrent musculoskeletal injury and then psychosocial injury like burnout and all that comes with an athlete not achieving his or her goals or expectations with sport.

So we live in this world where we have to turn the tide on that, right? And that's challenging. And I think that, number one, educating young athletes, educating the people who love them, their parents, people who guide them, their coaches are really important on the risks in early single-sport specialization. And there are a variety of ways of evaluating these young athletes early on when they begin a sport program, identifying, "Do they have any musculoskeletal aspects that might put them at risk? Do they have techniques of playing their sport that might be considered a high risk or injurious?" And then defining those things and then helping, through conditioning, through technique programs, unwinding them from those at-risk activities or helping them, and then all along, and this is probably the most important thing, monitoring their workload.

How much are they exposing themselves? And a young athlete needs to take a season off. Shouldn't be playing 12 months of the year baseball. They should be taking at least four months or so off. Number two, they should be playing multiple sports. Number three, they shouldn't be playing on overlapping teams or leagues. They shouldn't be a pitcher one day of the week and then alternating as a catcher the next day or two days later, and then pitcher again. And in their minds, they only pitch twice that week, but they caught for the three or four other days of the week. And those are the kind of things.

So monitoring workload really unwind them from that, I think is going to be important as well. And professional leagues have focused on this. Certainly, baseball has with its Pitch Smart program, defining pitch counts, and really, again, educating them on not participating in multiple leagues. So just talking about it and making them more aware is the first step, and then enlisting elite-level athletes that these younger athletes look up to, to deliver that message is important and powerful as well.

Dr. Justin Arner:

Yeah, it's certainly such a difficult conversation, but so essential to keep these kids out of our office. So I just want to thank you, Dr. Ciccotti, for your knowledge. This study is certainly a lot of coordinated efforts over just decades and decades of work from your illustrious colleagues. So thanks so much for spending the time talking with us about this. I know you're so busy and I can't show you enough appreciation for doing that for us.

Dr. Michael Ciccotti:

Well, Justin, as I said, it's an honor and a pleasure for me to be here and talking to you about this, and absolutely an honor for me to participate in this two-part series on The Stable Throwing Shoulder, that

once again, really, Ben Kibbler is the one who focused this whole group together. And with Aaron Sasha and JT Tokish, John Kelly, Steve Thomas, Mike Reinhold, and Jim Bradley, just a wonderful, great, brilliant group of people that I'm honored to work with.

Dr. Justin Arner:

Great. Thank you so much, Dr. Ciccotti. Dr. Ciccotti's article titled, Disabled Throwing Shoulder 2022 Update is two parts with part one being anatomy and mechanics, and part two being pathomechanics and treatment, both of which are published under 2022 edition of the arthroscopy journal in May and is available online at arthroscopyjournal.org. Thanks so much for joining us.

Speaker 3:

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