

Dr. Chris Tucker:

Welcome to The Arthroscopy Journal Podcast. I'm Dr. Chris Tucker from the Walter Reed National Military Medical Center and founding editor of the podcast. Today we're discussing outcomes in return to sport rates for biceps tenodesis in overhead athletes. I'm honored to welcome back to the podcast for this discussion a good friend of mine, Dr. Brian Waterman, Professor of Orthopedic Surgery, Chief and Fellowship Director of Sports Medicine at Atrium Health Wake Forest Baptist in Winston-Salem, North Carolina, and current AANA Annual Meeting Program Chair. Dr. Waterman was a lead author on the article titled High Rate of Return to Sporting Activity Among Overhead Athletes with Subpectoral Biceps Tenodesis for Type II SLAP tear, which is in press for publication in the Arthroscopy Journal. His co-authors include John Newgren, Katherine Richardson, and Tony Romeo. Brian, congrats on your work. Welcome to the podcast.

Dr. Brian Waterman:

Chris, thank you so much for having me. This is officially my three peat, so I'm really honored to be back to discuss a topic that's very near and dear to my heart.

Dr. Chris Tucker:

Well, we're excited to have you back and I always enjoy talking to you about pretty much anything related to orthopedics. So, let's get underway with this, today's topic. Could you just start off by giving our listeners some background on your interest in this specific SLAP tear issue and your motivation for conducting this particular study?

Dr. Brian Waterman:

Sure. First off, I just want to acknowledge the efforts of my co-authors, John Newgren and Katherine, both of which were really instrumental in pulling this data together. And then obviously my mentor and thought leader, Dr. Romeo, for really sharing his body of work and allowing us to collate his patients and look at their outcome.

But outside of that, I went to fellowship after being several years in practice in the military and that's a background you and I both share. And we saw at that point in time in the late 2000s, a significant amount of SLAP tears. Some of which we probably were over diagnosing, and some of which were real and just didn't really have a good sense of how they should be treated. It was a fairly new surgical procedure and there's been a lot of innovation since. But at that point in time, I'd kind of concocted the idea of doing a randomized controlled trial. People under 30 looking at biceps tenodesis versus SLAP repair and really wanted to see how we could facilitate a better return to duty rate because very often we would see these individuals come back and that experience has been reflected in the work of Provencher and others. And so I was really interested in these small tears and how they could have such significant repercussions on form and function in kind of the warrior athletes. That has carried on as I've made the transition to the civilian side, and I think the overhead athlete is really the next frontier for figuring out how we can best optimize our clinical and functional outcomes when treating these SLAP lesions.

Dr. Chris Tucker:

So before we get into the actual study results, I was hoping you could do a brief overview for us on the pathophysiology of the shoulder in the overhead athlete. What makes these athletes different and what goes into your workup for the specific overhead athlete to account for these mechanisms of injury and any specialized requirements that they have for their recovery and their specific return to sporting?

Dr. Brian Waterman:

Yeah, great question. Obviously, first and foremost you must acknowledge there's a high degree of variability in normal and pathoanatomy within our overhead athlete patient. If you just look at the general population, there's upwards of 73% that have this sublabral sulcus, which is a normal kind of synovial rise, clean layer that extends further immediately. Additionally, you have a high preponderance of these anterior superior labral variance and that can include both the sublabral hole or foramen, as well as the Buford complex and some estimates that can approach up to one and four individual. So, when you take that into consideration, obviously it can be very hard to delineate what those labral variants are and then also the adaptive changes that occur within these apps. We know from the work of Dr. Verma and several of our team physicians within baseball that these adaptive changes both in the superior labral as well as the posterior superior rotator cuff can be quite prevalent and approach upward to 60 to 70%.

So, when we evaluate these athletes that have either unstable or symptomatic SLAP tears, I think it's really important to delineate the history. When you look at these individuals getting a sense for their position, often there's exposure to pitching and the duration of symptoms can be important, the types of symptoms where they're located, trying to define whether that's more deep-seated discomfort or does it extend down in the anterior biceps? If you can tease out whether it is associated cuff, subacromial, or AC joint pathology. And then really the type of SLAP lesions we see generally fall into one of three buckets. The first of which you and I have seen a lot of it's more of the degenerative type tears and those probably can be managed in very self limited fashion. There's also those acute traumatic lesions that occur when you fall into a semi abducted or forward flexed arm.

And then there's the other one that we probably most commonly see in our overhead athlete population, which is kind of that attrition detachment that's more chronic in nature that occurs with overhead throwing or overhead lifting activity. When we look at this, we really need to distill in our minds what the role of the biceps and the labrum are. I think that this helps to create a sense of what our options are. At a baseline level, the biceps is really important for humeral head depression and probably centering the humeral head from A to P. There can also be some element of dynamization of the supra labrum with activation and the bicep. And so that really helps to inform your treatment strategy. When you see these athletes in clinic, it's really important to take a holistic evaluation of them. You want to have them take off their shirt to assess for scapular motion.

You want to look at overall motion arc as well as external internal rotation and compare it to their knob throwing side. You want to look at their core and hip strength and the mobility there specifically as it relates to their throwing motion. You want to look at hip shoulder separation, endurance, ground reactive forces if you have the biomechanical data available to you. And then obviously you really want to establish some sort of track record of how this has changed over time. That's just a brief overview of how we look at these individuals outside of the shoulder specific exam, which as you know, is an amalgamation of really a lot of different superior labor and bicep testing to try to tease out and limit the amount of false positives we get.

Dr. Chris Tucker:

Sure. This is definitely a wide spectrum of disease ideology as you describe eloquently, and it's a difficult clinical problem to sort through. So I think you laid out a really nice foundation for us to have this discussion. I was hoping we could move into treatment options. And if you could describe for us once we established the diagnosis of an unstable SLAP tear in the overhead athlete, could you tell us what the options for treatment are for those particular individuals and then why you decided to investigate the subpectoral biceps procedure for this study?

Dr. Brian Waterman:

Yeah, absolutely. So one of the things that we need to really lay out up front here is there's a distinct difference between the managements of our recreational athletes, our weekend warriors, and just our general population in terms of bicep labral pathology and the overhead athlete, particularly the elite or competitive overhead athlete with a focus on predominantly baseball but other sports such as volleyball, tennis, et cetera. These individuals require unique consideration because as it stands, probably the rates of failure and that can mean a number of different things. Persistent pain, limitations in range of motion, inability to return to function, can be quite high. If you look at the data, it suggests that maybe at least three to four out of 10 will not return despite our best efforts surgically or non-surgically. And so when you look at the options, very often you're looking at non-operative management as your first line treatment, and we really needed to figure out what's been done in advance of their evaluation with us, and then make a determination of where we might intervene. By a period of rest to calm down the implementation, use of anti-inflammatories injections, and then implementing some element of return to throwing or batting or other activity as that painful symptoms subside.

I really think there's a lot of value in ultrasound guided injections and evaluations, so I use that quite liberally. As you get to failure of conservative measures and inability to move the needle and progress, then you start looking at getting advanced imaging such as an MRI and really laying out front, again, the high preponderance of pathoanatomy that occurs in elite level thrower or overhead athlete. And from there, obviously you think about the three main categories of treat. It's the more limited labral debridement approach if it is a true symptomatic tear, there's the SLAP repair, which is undergone a lot of evolution in our techniques over time and hopefully we can get to that, and then talk about primary treatment of the biceps tendon along the way. I think that in this patient population, historically it has been a discussion about superior labral debridement and repair, but there's been a growing body of both low level evidence data as well as other thought leaders that have considered is there a role for treatment of these lesions and particularly those with biceps provocative symptoms. Treating those individuals with a bicep tenodesis with good rates of success. And so what we wanted to do is really look critically at our data in a carefully selected patient subset and to see if we could get reproducible success.

Dr. Chris Tucker:

It was a wonderful segue into what I wanted to discuss next, which was the stated purpose of your study, which was to investigate the functional and athletic outcomes after these primary subpectoral biceps tenodesis in these overhead athletes. Can you just review your study for us now? How many patients were involved, what sports did they play, and then what were your key findings?

Dr. Brian Waterman:

It's amazing to look at how prevalent SLAP repairs were when you and I were in training and how common they are now. I can assure you that less than five to 10 of my patients a year are an isolated SLAP tear. It's just a very, very uncommon case. It's kind of like the unicorn of our arthroscopy cases. And so what I really wanted to do is to look at a cleaner body of data and those individuals that didn't have associated pathology such as rotator cuff repair, subacromial decompression, AC joint pathology, and I also wanted to look at a high functioning patient subset. Those involved with elite competitive athletics and that includes competition at a collegiate level, semi-professional level, professional. And thankfully Dr. Romeo was gracious enough to allow us to use his patient subset. And despite looking at patients over an eight to nine year timeframe during which he was I would say a distinct leader in the

field on this treatment, both SLAP repair and tenodesis, we were only able to generate about 22 individuals for this study.

We obviously had a consistent surgical technique and that was a subpectoral by biceps tenodesis with a peak interference crew, and we had a very uniform rehabilitation protocol. And then what we obtained and compared ultimately over time was to look at both self-reported pain and patient satisfaction by way of the SANE score. And then looking at postoperative Kerlan-Jobe orthopedic clinic scores in order to assess patient satisfaction and performance. We looked at several different clinical variables to include range of motion both at the side and in a throwing position. And then ultimately the biggest litmus test in all this is their ability to return to their prior level play and any limiting factors that were included there in.

Dr. Chris Tucker:

When I read studies, particularly ones like yours, I'm always interested when I'm looking at the inclusion and the exclusion criteria. And I acknowledge that your group decided to have really strict criteria investigating, as you said, only these elite level overhead athletes. Interestingly, you specifically excluded even recreational intramural or club level sporting involvement. So, like you said, the strictness of your inclusion criteria was reflected by the fact that over a nine year study period for Dr. Romeo who like you said, was probably a fairly prominent referral practice only generated 22 patients which only 16 of which completed your study. I'm just curious to hear what your thoughts are on focusing on the elite athlete, and this is truly elite athletes. And how that translates into external validity of the study findings. And I'm curious to hear your thoughts on caring for that subset of that high level of athlete when in reality, the majority of our patients aren't elite level athletes.

Dr. Brian Waterman:

Yeah, and absolutely. Great question. Just to lend a little bit more description to the actual demographic of this study as well as the findings, these were overhead athletes from a fair amount of different sports subsets and we made a determination individually based on whether we would consider these individuals overhead athletes based on their position, their sporting involvement and level of activity. And a broader majority upwards of 56% were baseball or softball athletes. The average age was 21 years and upwards of 94% had involvement of their dominant extremity, which are all important variables for you to consider. Additionally, we looked at over a four and a half year timeframe with some variability based on the patient population. And of these, what we found was is that the average VAS pain score significantly reduced from an average of 4.4 at the time of surgery to 1.7 at final postoperative follow up.

And that did include two individuals that had some element of persistent pain. We also were able to show vast improvements clinically significant outcomes in the same score, which improved from about 55 to 76. And then we looked at the final K Jock score, which is relevant to that elite throwing overhead patient population and that average was 74, which is pretty consistent with what you see in the injured shoulder or postoperative shoulder thinking that anything greater than 90 is generally considered what is normal for a healthy overhead pitching athlete. Probably the biggest finding of this study was that at an average of 4.1 months postoperatively, we were able to get about 81.3% of our patients back to their previous level of activities. That's an important characteristics. Obviously you think about return to playing, which is just getting back from one game or one competition and then returning back to their prior level of activity, which is no small feat when you're dealing with superior labral injuries.

Some additional context is we also looked at range of motion just to make sure that there weren't any negative attributes to motion. And what we showed us is that there was generally no difference in

external rotation or internal rotation. There was a small, probably not clinically significant difference in overall abduction, but it did not seem to affect overhead activity. Now to your original question is, how does this affect our external validity? Well, it's really hard to tease out what's going on with these athletes in our treatment if we don't really cold this high performing subset of patients. Very often we're considering individuals that have very modest functional demand. One of the initial studies that got me interested in this topic in general was Pascal Boyle's discussion about SLAP repair versus tenodesis in his patient population, but the average age was about somewhere around the late thirties and then the early fifties for SLAP repair and tenodesis.

So, I think that in this patient population we have a little bit more equi poise when it comes to what is the ideal treatment. With most of our population I think of colleague surgeons leaning more towards debridement versus repair. So I think that this is just another small patient series that falls along that of the folks from NYU and Vail and letting credence to the potential merits of bicep tenodesis. Now it's up to you and I and the broader community to try to figure out who is ideally suited for this preferentially over SLAP repair. And hopefully we can talk about that a little bit further.

Dr. Chris Tucker:

Yeah, absolutely. Let's talk about that right now. So what is your current preferred surgical technique for treating SLAP tears in overhead athletes, whether they be elite or recreational? And has this study and your work changed your approach at all in your own practice or did it simply confirm what you're already doing? And like you've mentioned a few times, I know the evolution of this treatment has changed since you and I were residents, as you said. I remember ABOS frequency study showing the rates of SLAP repairs. I think back when we were doing our boards it was at the peak and now it's regressed significantly. So, has your practice kind of evolved with the times and does this cohort kind of fall in line with that or has it changed your practice at all?

Dr. Brian Waterman:

What it's shown I think to me is that this is a reasonable and serviceable option for some patients that are going to be more ideally suited for a SLAP tear, or I'm sorry, for a biceps tenodesis. In this patient population, we chose to isolate those individuals with a type two A, which is suggesting an more anteriorly based SLAP tear with involvement of the biceps anchor. In this patient population, we also found individuals with high preponderance of provocative bicep symptoms. And the discussion there is kind of difficult to tease out because it's hard to sometimes find out whether that's the primary problem or is that a secondary finding due to superior labral hyper mobility. But in this patient population, I really want to identify what they come in with in terms of symptomatic pain constellations, but then also structural pathology including longitudinal splits, hypertrophy, hourglass deformity, that arthroscopic lipstick sign, which is somewhat variable in its correlation with symptoms, any adjacent cuff pathology.

Where it's possible, I do think debridement is probably your more safe approach to management in the elite athlete. Less motion constraining interventions are ideal. With that said, if you start to see hyper mobility particularly involving the post year superior aspect, you see excursion, kind of that peel back type of dynamic movement at the time of arthroscopy, you see fibrillations underneath it and it's more post yearly based and it extends post yearly kind of down into the equator past that 10 o'clock position, that's still a group where I would consider preferentially performing a primary superior labral repair. As it relates to those more bad SLAP type of configuration. So those with poor tissue quality, those with splits extending into the bicep tendon, those that have really pronounced positive O'Brien's dynamic label shear and unstructured abnormalities into the sheet, I would probably lead more preferentially towards a bicep tenodesis on them with some heavy amount of crepe being laid down.

Now in terms of the SLAP repairs, what we've seen is a vast move away from the knotted constructs and more towards knotless configurations. And then in my practice specifically, it's moved from a hard suture anchor to a soft all suture anchor. It occupies much more limited surface area, it allows some ability to be dynamic in being able to retention, and then also you can use smaller percutaneous trans muscular anchor placement in order to really get to a very precise area on the glenoid and instrument without encompassing either the SGHL or some of the adjacent capsule. I still do some of these in the beach share and lateral cubist position, but I think it's really important to get the right diagnosis and to try to repair it anatomically without over constraining it. And then rehab is going to be critically important moving forward in the postoperative period.

Dr. Chris Tucker:

Yeah, absolutely. I think those are wonderful pearls for approaching the broad and challenging topic of the SLAP tear in general. So I was hoping we could maybe diverge a little bit from the SLAP tear and on the topic of the overhead athlete, I was hoping, Brian, you could speak to the work you're doing at your program with your pitching lab since it's related. I follow your updates I see on social media. I was hoping you could maybe give us a little peek behind the curtain and share some insights into what your team's doing and what you're learning.

Dr. Brian Waterman:

Yeah, thanks for your interest on that, Chris. It's certainly a passion of ours and I'm uniquely positioned to be with a group that is so much more talented than me in this space. We have a PhD biomechanist, Kristen Nicholson, who's just a huge asset and helps to drive forward the initiatives of our lab. We have our pitching lab coordinator and Mike McFaren. We've got a strength and conditioning coach, our athletic trainer and the entire Wake Forest baseball team that's behind our mission. And then we've also got big data scientists and thought leaders like Garrett Bullock who's one of our PhDs on staff that helps to hone some of our areas of research inquiry. Within this, we've really kind of targeted what they have been able to do down in ASMI and done with great success. And what we see is this epidemic of youth and adolescent baseball injuries, and that carries forward into adulthood and the highest levels.

So we really see this as a tool for affecting change on the public health in the throwing community. It's a tool for, to a certain extent, performance enhancement for our team and then also our ability to conduct really peer reviewed research and look at some of the objective nitty gritty parameters that might predict the development or recurrence of injury. It can facilitate these longitudinal assessments of individuals that are returning from injury. And just like we use biotech testing and drop down testing in the lower extremity, this is just another tool that will have available to us is we try to objectify when is it safe to return to sport. And so those are the broad ambitions of our lab. We have about 400 athletes that we've processed through and we've got state of the art technology and have developed affiliation with upwards of 10 baseball clubs as well as several international contingent. And so I'm just very, very fortunate to be part of our team and looking at some of this data critically and figure out what our next steps is with our collaborators.

Dr. Chris Tucker:

Yeah, thanks for sharing that, Brian. It's exciting. It's cool to see some of the stuff that's put out there on your snippets and such. So I look forward to seeing more and continuing to learn from you all. You did reference a few limitations of your study in the paper. I wanted to recognize though how your work is helping to fill a knowledge gap in the management of SLAP tears, particularly in the overhead athlete. And along that train of thought, I was hoping you could share with us what you think is currently still the

most important unanswered question with respect to this topic and what do you see as the most important next step for advancement in managing this ongoing debate?

Dr. Brian Waterman:

Yeah, we've certainly alluded to some gaps in our logic and there's far from consensus on this topic. I think back to Pete Chalmers' study looking at the major league and minor league baseball athletes and looking at their rates of success after biceps tenodesis, and really they showed remarkably mediocre numbers. They reported 44% of individuals were able to return to play it an average of 10 months, and pitchers really encompassed a lot of the source of failure there. There are several other studies that have looked at this critically, and I think it's incumbent upon us and our community to really try to figure out which patients are ideally suited for superior labral repair, how we repair those developing consensus, is that a mattress? Is that a simple? Is that a not list configuration? Where are our anchors placed? Should we place them anterior to the biceps anchor? How we should rehab them?

Is that something where early range of motion would be advantageous? Are there any rules for biologic adjuncts to be placed at the interface given the hypo vascularity of the superior labrum? And then really how we better counsel our patients appropriately. As you know, one of the best offenses is a good defense. And so if we could head these off at the past, I think that's our goal and that's where the value of this biomechanical lab is helpful for assessing it in pitchers as well as other overhead athletes, which is softball, swim, volleyball, tennis, all of which have a high preponderance of SLAP tears. But those would be kind of some of the next steps as we continue to look at our data critically and being honest and reporting even these small clinical series like we have here today.

Dr. Chris Tucker:

Any other closing remarks before we close out?

Dr. Brian Waterman:

What I would hope that our study would bring to light is that for the very carefully selected patient with SLAP tear and unstable type two A SLAP tear, that bicep tenodesis can be a reasonable option. While we want treating surgeons to exercise caution when treating these types of injuries and the elite and competitive overhead athlete with a symptomatic SLAP tear, we also want them to have a balanced discussion about what the potential treatment options are from SLAP repair, to debris them, to biceps tenodesis. And then also just making sure that individuals have failed a rigorous course of conservative treatment before undertaking the surgical treatment and what is a very fragile situation in the overhead athlete.

Dr. Chris Tucker:

Brian, I wanted to congratulate you again on your important work and thank you for sharing your time and your thoughts with us this evening.

Dr. Brian Waterman:

Chris, it's truly an honor and long time listener of the podcast. Keep doing all the great work.

Dr. Chris Tucker:

Appreciate that. Dr. Waterman's article titled High Rate of Return to Sporting Activity Among Overhead Athletes with Subpectoral Biceps Tenodesis for Type Two SLAP Tear is currently impressed for the

Arthroscopy Journal, which is available online at [www.arthroscopyjournal.org](http://www.arthroscopyjournal.org). This concludes this edition of the Arthroscopy Journal podcast. The views expressed in this podcast do not necessarily represent the views of the Arthroscopy Association or the Arthroscopy Journal. Thank you for listening. Please join us again next time.

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