

Dr. Clay Nuelle: Welcome to the Arthroscopy Association of North America's Arthroscopy Journal podcast. The views expressed in this podcast do not necessarily represent the views of the Arthroscopy Association of North America or the Arthroscopy Journal.

Welcome, everyone. I'm Dr. Clay Nuelle with TSAOG Orthopaedics in San Antonio. Tonight, I have the privilege of speaking with Dr. Michael Feldman. Dr. Feldman was the author on an editorial commentary entitled, Anterior Cruciate Ligament Hamstring Autografts Should Be Avoided in Patients Younger Than 25 Years Old: Autograft–Allograft Hybrids Remain Controversial, which was a commentary in response to the paper entitled Allograft Augmentation of Hamstring Autograft in Anterior Cruciate Ligament Reconstruction Results in Equivalent Outcomes to Autograft Alone. Dr. Feldman is a director of sports medicine at Banner University Medical Center and is an associate professor at the University of Arizona School of Medicine. Dr. Feldman, thank you for joining me today.

Dr. Michael Fel...: Clay, thanks for having me.

Dr. Clay Nuelle: Let's start for those that haven't maybe read the initial paper and then your editorial commentary possibly to just maybe give just a brief background of that paper and then kind of a brief summary of your commentary and thoughts on the paper itself.

Dr. Michael Fel...: Sure. So, Clay, this was a retrospective case study from OrthoCarolina looking at their series of hamstring autograft versus hybrid hamstring reconstructions for ACL. Basically they had an average of four-year follow-up, and the primary outcome was graft failure and revision surgery to include either secondary surgery or, more importantly, revision reconstruction.

The purpose of their study started because the literature has been very varied on whether hybrid autografts do worse or similar to hamstring grafts alone. The results of their study said that there was no significant difference between hamstring autograft and hybrid grafts in ACL reconstruction.

I felt compelled to review this article due to the varied literature and the changing thought processes in ACL reconstruction as we go forward. What I looked at in this study really was the methodology and the interesting things in that study that seemed to differ for me were two-fold.

Surprisingly in their standard ACL controls, which were autograft hamstrings alone, there were no college or elite athletes. So the only college or elite athletes were in the standard ACL reconstruction, but not in the hybrid cases. The hybrid cases seemed to have some selection bias towards lower demand for older patients, even though there was no significant difference in age.

Secondly, going to the autograft-

Dr. Clay Nuelle: No worries, yeah.

Dr. Michael Fel...: ... you have more interference screw fixation, whereas the hybrid grafts had more spiked washers screw fixations, which implied that maybe there was weaker fixation in the augmented grafts than in the autografts, which may affect their results.

Looking at that, there was selection bias between the patients that they chose for their hybrids, as well as their standard hamstring grafts. Additionally, they eliminated all patients who underwent BTB or quad grafts, which also may play some selection bias.

Looking at the results, even though there was no significant difference, we don't know really what the subset of patients were and whether these patients fit into the typical patients that we might see in our practice.

Also more significantly, which caught my attention, was what were the results in the under age 25 patients, and there was no significant difference in their study. However, we know that the current literature states that although there is no significant difference in patient-reported outcomes that there is increased [inaudible] grafts in the under-25 age population and a slightly higher incidence of reconstruction in the under-25 group. That was really important to look.

The biggest thing that changed to me is I think now with hamstring grafts, we're talking about putting a square peg in a round hole. If we look at the evolution of ACL reconstruction where, initially, we started with BTB grafts, but due to the complications of patella fracture, anterior knee pain and graft site donor morbidity, people are looking for a different graft source, so they went to hamstring grafts.

But we're trying to sort of change our fixation technique from aperture fixation, interference fixation, techniques have gotten better with regards to fixation, with cortical button fixation and all inside techniques. However, the issue of undersized hamstring grafts, which is not insignificant at surgery, became a problem. I think the people then had to go to an alternative solution inter-operatively, and that's where the hybrid grafts came into play.

Dr. Miller out of Virginia was one of the first to study this and basically said that there is a difference in maturity between the hybrid or the allograft versus the autograft component and the hybrid grafts. Because of that, there was some resorption or the allograft, which then affects fixation and tunnel widening and did not recommend it. Since then, there've been multiple studies to try and compare. That's where I think the impetus for this editorial commentary came.

Dr. Clay Nuelle: That's a terrific summary. Thank you for that. Yeah, I think you hit on so many points there, and we can take them one by one.

I think the last one that you just mentioned with Dr. Miller studies and reviews is one that I've always found interesting. So to me, at least a little bit, if you're augmenting a graft with an allograft, number one, those are not cohesive and those don't function in concert because you have an autograft and an allograft. And it's not quite a double-bundle ACL, as you alluded to at the beginning, where one of the off-cited reasons for failure from some of the double bundles is that you didn't have one ACL functioning concurrently, you had two separate ACLs. So if you had a six millimeter and a seven millimeter grafts for your separate double bundles, you didn't have a 13 millimeter in diameter graft. You had a six millimeter and a seven millimeter bundle. That's one of the reasons sometimes people discuss at least for why those didn't do as well.

See, to me, the concept is somewhat similar with the autograft and allograft. Obviously, they're not independently tensioned or independently fixated, and you incorporate the grafts together and for most techniques. But it still seems, like you said, kind of trying to add onto something that's not exactly the same type of properties. What do you think about that?

Dr. Michael Fel...: I totally agree. I think the hard part is that when you put allograft with an autograft and fixation technique, and we see that in their article with the increase incidence of basically post-fixation or spiked washer fixation, that their interference screw fixation appeared maybe not to be as satisfactory so that they went to increase post-fixation to go through.

The absorption of the allograft, I think, affects the tension. To avoid allografts, people have gone to triple bundle or five strands and to try to find that. But I think there's, as you alluded to, differential tension on those grafts, so you're really not tensioning all strands equally, which I think affects the reconstruction and maybe there's increased laxity.

Dr. Clay Nuelle: Yeah, that makes sense. To me, at least inherently, if somebody's adding an allograft or trying to add something to it, it's obviously because they're worried that the native autograft, or what the autograft that they have, is not going to be sufficient, or is going to fail. So that concept, to me, is an interesting one and certainly an interesting idea. And as you stated, there's been multiple studies that show varying type of results and this particular study showed that the outcomes were equivalent. But, to me, if you're worried about the autograft that you're choosing failing because in most cases, in this case, it's because it's too small or the diameter is not enough, then it seems to me that maybe the choice should be a different choice from the outset, potentially to a graft or something else that has a less likelihood of being too small or less likelihood of worry about failure.

Why do you think people keep doing these studies? I mean, obviously, this study, I think, was all the way back from 2005 or 2015. So I don't know if they're still doing these hybrid grafts routinely at OrthoCarolina or not, or if this is just data that they're reporting from 10 to 15 years ago. But it seems like these

studies keep coming out in the literature and so people are still doing it a lot. Why do you think that is?

Dr. Michael Fel...: Yeah, I think, obviously, at the time before other soft tissue grafts like quad tendon came into favor, people are using hamstrings for the reason of avoiding graft morbidity, anterior knee pain, patella fracture, and they were looking for a solution to a problem. Although I think now in 2021, this is the least beneficial solution if you want to use a soft tissue graft.

Quad tendon has proven that it is certainly at least comparable to hamstrings and certainly has the advantages of not worrying about insufficient diameter or insufficient length. Good harvest will get to appropriate soft tissue graft. Our fixation techniques have improved such that for those that choose to use soft tissue fixation, that you can have excellent cortical fixation, which provides stability.

Still bone-tendon-bone is thought to be the gold standard and is, in my opinion, my go-to graft of choice. I think you have bone-to-bone healing. That's an advantage over tendon-to-bone healing. You can get aperture fixation. The patellar tendon, although it's a tendon acts more like a ligament, it's stiffer than hamstrings, and certainly the results over time have borne that out.

So I think for those that want, or favor soft tissue grafts, either for donor site morbidity or for fixation technique, I think there are other grafts such as quad tendon, which people should consider and avoid the dilemma inter-operatively of what to do with an undersized graft.

Dr. Clay Nuelle: Yeah, I'm in complete agreement with you on that. So do you think over the next five to 10 years, we'll still be seeing some of these kind of hybrid allograft reconstruction studies done? Or do you think we may see a little bit less of it, and maybe more comparison studies between hamstrings and quads or more those types of studies? Or how do you think it's going to change or if you think it will over the next five to 10 years?

Dr. Michael Fel...: Yeah, I think more and more people will go to quad tendon for those that want to use a soft tissue graft, or maybe for failed BTBs as a secondary graft size.

The other thing to comment is that for hamstring grafts, there have been many studies that have tried to preoperatively determine whether you're going to have adequate diameter of your hamstrings, whether it's by MRI, whether it's by height and weight. And, really, I think this is not a problem with the six-foot-four basketball player who has large enough hamstring tendons.

Clearly, the literature says the smaller size, the smaller body weight patients are the ones that are going to have smaller grafts. So in those patients at the very least, maybe we should consider either BTB or quad tendon to avoid the issue of intraoperative decision-making for undersized grafts.

Dr. Clay Nuelle: Yeah, I think that's a great point. We published one of those studies actually a few years ago, a number of years ago, just as you alluded to, height was directly correlated to intraoperative graft size. And that was with doing quadrupled semitendinosus hamstring grafts. So, just based on that study alone, I stopped using hamstrings for people like our gymnast or our smaller females because I just knew it was going to be a small graft. Even if you took a gracilis, too, or you did, like you said, we did a quadruple technique where you could do quintupled or you can do, obviously, add gracilis or things like that. I stopped at that point doing hamstring grafts in small females in particular because I just knew that the likelihood of it being a small graft was going to be too high or too risky.

But even then from then, as quad has grown, I've moved away from hamstrings oftentimes and not just small females, but the majority of the population, if I'm going to do a soft tissue graft. I've started moving towards hamstring if I'm doing soft tissue or still BTB, I think, like you said, it's still a terrific option as well.

Is that where you've moved somewhat in your practice? I know you've done hamstrings in the past, but where have you shifted with your practice?

Dr. Michael Fel...: So I trained on BTB, as probably most people in my era. When double bundle came into favor, I switched to hamstring grafts as it's difficult to do a double bundle with patellar tendon. When double-bundle grafts did not show a superiority or efficacy clinically, even though biomechanically, it shows that it prevents rotation better than single-bundle grafts, I switched back to patellar tendon grafts for my primary graft and quad tendon for revision grafts.

What I have found with my bone-patellar tendon-bone, obviously taking a boat-shaped graft off the patella minimizes the risk of patella fracture. Also what I found is by bone grafting the patella mainly and the tibial defects, it's been a huge decrease in anterior knee pain. Although not proven, I really think not bone grafting that defect leaves a stress riser in the patella and was a major factor in anterior knee pain. And if that's bone grafted, either with autografts from your harvest or demineralized bone matrix or something that would fill in that defect so it would heal, I think it takes away that stress riser, which to me was the biggest cause of anterior knee pain.

Dr. Clay Nuelle: Absolutely. I think that's a great technical point for BTB in particular. Well, that's terrific information. Dr. Feldman's article, the editorial commentary entitled, Anterior Cruciate Ligament Hamstring Autograft Should Be Avoided In Patients Younger Than 25 Years Old: Autograft-Allograft Hybrids Remain Controversial can be found in the January, 2021 edition of the Arthroscopy Journal or at arthroscopyjournal.org. Dr. Feldman, thank you very much for joining me today.

Dr. Michael Fel...: Clay, my pleasure. Appreciate it.

Dr. Clay Nuelle:

That concludes this edition of the Arthroscopy Journal podcast. As always, if you enjoyed the podcast, please give us a five-star review on your podcast device, and please join us again next time.