

Chris Tucker:

Welcome to Arthroscopy Journal Podcast. I'm Dr. Chris Tucker from the Walter Reed National Military Medical Center and founding editor of the podcast. Today we continue the special series featuring selected articles from our open access online companion journal, Arthroscopy, Sports Medicine, and Rehabilitation, focusing on the rehabilitation aspect of patient care and orthopedics. Today, we are discussing rehabilitation prior to ACL surgery, or what many of us refer to as prehab.

I'm honored to be joined for today's episode by Drs. Jamie Cunha and Daniel Solomon. Dr. Cunha earned her doctorate in physical therapy from Columbia University and is an EXOS performance specialist and the clinical director of California Orthopedics and Spine Physical Therapy in Larkspur, California. Dr. Solomon is a shoulder and sports medicine surgeon in private practice, also at California Orthopedics and Spine. He is a fellow military veteran having done his residency training at the Naval Medical Center, San Diego, and several years of flight surgeon time with the Marine Corps. And he is also one of the associate editors of the Arthroscopy Journal. Drs. Cunha and Solomon were the lead and senior authors on the article titled ACL Prehabilitation Improves Postoperative Strength and Motion and Return to Sport in Athletes, which was published in the January, 2022 issue of ASMAR. Jamie and Daniel, congratulations on your work and welcome to the podcast.

Dr. Jamie Cunha:

Thank you for having us.

Dr. Daniel Solomon:

Thank you, Chris.

Chris Tucker:

As you highlighted in your article, successful ACL reconstruction surgery, combined with postoperative rehab can optimize patient satisfaction and restoration of knee stability and return to sport. Yet unfortunately, failure can still occur in 5%-25% of patients when taking into consideration both graft ruptures and ongoing laxity. Your article discusses the potential benefits of a physical therapy routine prior to ACL surgery to address the common deficit seen in the early postoperative period, and even suggest the potential for midterm improvements in various metrics, such as strength, range of motion, even return to sport.

So before we dive into the finer details of your article, can you give us some background on the larger topic of ACL injury and reconstruction and outline the context within which we should be thinking about the rehab of the ACL patient, both postoperatively and more importantly, preoperatively.

Dr. Daniel Solomon:

If clinical failures average about 10%, we can, and we should do better for our patients. I think there are a few factors which are controllable or modifiable with prehab that should decrease failures. For me, this became especially personal and poignant as we were writing this article because my daughter who is 19 tore her ACL in her last semester, last year of college and had her surgery in August of 2021. So as we were writing this article, she basically was going through her prehab with Jamie.

Chris Tucker:

Agree, that's pretty timely. Sorry to hear about your daughter. Hopefully she's recovering well.

Dr. Daniel Solomon:

She's doing very well at this point, now about nine months into the rehab.

Chris Tucker:

Excellent. So depending on the study, referenced, published ACL failure rates do vary taking into consideration the various factors that we can deem to be a failure such as ACL graft rupture, return to sport rate, the actual level of the post-op sport participation or even need for repeat surgery. You quoted multiple recent large systematic reviews and meta-analyses that have, to be honest, some pretty humbling numbers for success rates overall for ACL surgery. Can you speak to the factors that go into what may predispose patients to either more positive or negative outcomes and the factors that some studies have reported as helping to potentially predict those who may benefit from a pre-surgical rehab program?

Dr. Daniel Solomon:

Overall, I would say if I could summarize most of those articles, the emphasis was on a side to side difference between the injured leg and the normal leg. So for example, if you have weak quadriceps preoperatively, especially focus on a deficit greater than 20% of the opposite side or a limb symmetry index that was greater than 20% difference between the injured side and the normal side. I think that was really the predominant factor that was predicting a worse outcome with those ACL patients.

The other thing that I considered was long wait times. So rather than have someone just waiting around for their surgery, there's this opportunity time of four to six weeks for most of us in terms of the wait time that can be better used and that's a perfect time for prehab. And then lastly, I think there's this time for athletes that they get really demotivated. They're not doing their sport. They're not progressing. There is time in between seasons that's being whittled away waiting for surgery, and any time period between an injury and the surgery can be a really demotivating period. And I think we all know that time period, if the athlete remains a little bit active with an ACL deficit, there's a risk of a meniscus tear or cartilage injury during that time if they're staying active.

Chris Tucker:

I think those factors are excellent to keep in mind as you said. Some of the other points I gleaned from your article was the relationship of the level of the athletes, such as elite athletes versus amateur recreational athletes. And also something that's very clear to us is the gender disparities between female and males, with the females, having a higher risk of injuring their ACL in the first place and having a more difficult time returning afterwards or having re-injury. I love the point you brought up about the psychological component of the athlete between seasons, and I look forward to bringing that up a little bit later in our interview.

So to continue on now that we know these risk factors for a poorer outcome, what are the goals of a presurgical rehab program and how does one address those previously mentioned deficits in order to better set up our patients for success on the back end in the postoperative period?

Dr. Jamie Cunha:

At minimum, our goal is to get as close as possible to full range of motions and focus on strengthening, especially the quads, but also the hamstrings, the hips, the ankle, and the core. We also want to restore neuromuscular control and balance, joint position sense or proprioception, decrease pain and swelling and prepare patients psychologically for surgery, recovery, and rehab. Getting a sense of what is normal is a huge help in post-op recovery and there is a whole other topic of pain neuroscience education that

addresses this issue and shows better outcomes within education of what is to be expected and what is, quote, normal.

It's also helpful for patients to have a general sense just of the exercises that they'll see on the back end and to have a comfort level with their physical therapist. I think what Dr. Solomon said about the wait time between injury and surgery, it's a great filler. You might as well be starting your physical therapy and using that time versus just sitting there idly.

Chris Tucker:

Sure. I think that's a great summary of a recipe for success. So let's get into that into a little more detail. Your stated purpose of the study was to review the current literature for ACL prehabilitation therapy, and you concluded that you found good support for optimizing patients knee flexibility, strength, and proprioception preoperatively. I'm hoping you can dive a little deeper into the components of the prehab now and outline for us some of the specifics of a good evidence based ACL prehab program, including things like the goals, the timing, and the duration.

Dr. Jamie Cunha:

Sure. The evidence that we found supports the goals of a prehabilitation program to include normalizing knee range of motion, decreasing swelling and inflammation, increasing strength and improving balance and proprioception through exercises, manual therapy, blood flow restriction, and patient education. We also like to consider proximal and distal joint restrictions, such as range of motion and strength of the hip, the ankle, the lumbar spine. And we also want to measure the unaffected limb open kinetic chain, knee extension strength for postoperative measurements of limb symmetry index.

The timeline can be as little as three weeks, but every everything that we read seemed to lean towards four to six weeks as being the optimal timeframe, broken up into two phases. The first of which focuses on range of motion, pain and swelling, and sort of lower level strength, balance, and proprioception exercises. Whereas the second half you can progress to higher level exercises to increase strength, balance, proprioception, but also confidence in the affected limb.

Chris Tucker:

Yeah, it's outstanding. Okay. For those who still aren't convinced, or for those who want to perhaps do a little further reading on the literature that you were describing, could you just review for us some of the published literature that exists to support this concept of prehab and tell us just what does the data show?

Dr. Daniel Solomon:

Sure. So two of the best articles that we reviewed were by Shaarani in 2013, AJFM and they compared outcome measures between a group of subjects that completed six weeks of prehab versus a control group that did almost nothing prior to their ACL surgery. The prehab group performed both strength and balance exercises with a prescription doing three sets of 12 repetitions for each exercise, and that increased by 10%-15% of a volume load each week for each success of six weeks.

Those authors found that patients who underwent the prehab scored significantly higher on a single leg hop test, as well as a modified Cincinnati Knee Rating System. And those effects were sustained at 12 weeks postoperative. Additionally, they found that athletes who did the prehab were able to return to sport two months quicker than the control group.

The other study that was really important for us was one that compared the MOON Group to the Delaware-Oslo ACL Cohort, and that group led by Failla identified better IKDC and KOOS scores as well as higher return to sport rates two years after ACL reconstruction in patients who underwent prehab. Delaying surgery, interestingly, in those patients for 10 sessions of prehab improved functional knee scores by 12%-15%. So overall I think prehab seems to be a very positive alternative to passive waiting periods between injury and reconstruction as those studies suggest.

Chris Tucker:

You know, I agree with you, Dan. I think that's super exciting and I'm not a big fan of quoting numbers or certainly specific papers to patients. I think the forest gets lost for the trees sometimes when doing that, but I am a big fan of kind of counseling them and trying to guide them in their decision making. And I think anybody who treats adolescent athletes and has to also counsel their parents realizes that probably one of the biggest challenges is the misconception that if surgery's postponed, you're not helping their child athlete as quickly as the next surgeon down the road might, and also the frustration of an adolescent athlete in having to wait to get back to their sport or missing the next season. And I think having some science like this to support intentional waiting, if you can convince them.

Now. The knee rating system scores, that's going to fly right over their head and they're not going to care, but if you can quote them numbers on returning to sport earlier or quicker with a good prehab program, I think that information's invaluable. Do you use the same sort of approach when counseling your patients?

Dr. Daniel Solomon:

I do. And I like the concept of... The period in between diagnosis and surgery is an active period of number one, I try to get their pain down, I try to get their swelling down and get their mobility up, so they get their flexibility. And of course, partnering with our physical therapist has been invaluable for me. Being in a practice where I can pick up the phone and talk to Jamie or one of her partners to coordinate that physical therapy really is key. And I think the patients really appreciate that communication between physical therapist and surgeon and patient that... I always quote the parents and the athlete that this is a team approach and they are a key component of the team and they have to be engaged.

Chris Tucker:

I couldn't agree more. Just the fact that both of you clearly work well together based on the article you wrote, and also just the conversation for this podcast. It's clear that you've established that kind of team to care for patients, and I'm blessed to have a wonderful physical therapy team at Walter Reed, but even in my other duty stations in the military, it seems to be just a really excellent kind of two way street of communication and teamwork helping to take care of the patients holistically.

So let's dig a little deeper into the literature here. I know that you quoted a few excellent studies, but there is a relative paucity that exists on this topic to help guide our development of prehab programs. So just how do we define success when it comes to evaluating a patient's response to prehab?

Dr. Jamie Cunha:

So I think you guys really hit it on the head in the last question that you discussed, because we saw in the research anywhere from 80%-90% of limb symmetry index measured, usually for quad hamstring strength and or single leg hop test for distance or any other hop test that you want to select. But I think

the most important measure of success is arguably postop return to sport rates. So after post-op rehab. Several of the studies that you just mentioned showed quicker return to sport times and higher return to sport rates. And I think that's the most valuable measure of success since our goal is always to get patients back to their prior level of function.

Chris Tucker:

So there seems to be fairly convincing evidence to support the institution of a presurgical rehab program for four to six weeks prior to an ACL reconstruction surgery. But I wonder, where do you think we draw the line optimizing their function pre-op? Would you consider counseling a patient who has a market asymmetry in any of their range of motion, strength, or other various objective measures, even after completion of a program, say six weeks of prehab to further delay their reconstructive surgery, to better improve those factors? Do you think the evidence is there for that yet?

Dr. Daniel Solomon:

I'm not sure that we can support doing a longer period of prehab yet. So there was nothing in the literature that suggested that 12 weeks is better than six weeks. I think more importantly, it really is a conversation with the patient and determining if they're making progress, if they feel like they're going backwards. I wouldn't necessarily keep delaying a surgery to try to get them better. And I really do want to see engagement. So if they're not really engaged with the physical therapy program and the prehab exercises, then it really doesn't make a lot of sense to continue doing that program. However, I think if they feel like they are getting something out of it and they're making headway and they want to wait that might be supported.

Chris Tucker:

So one intriguing aspect of the return to sport that we touched on earlier, but I really wanted to get into is the psychological component of recovery. And you reported, what many of us in sports medicine are familiar with in that many athletes are limited or delayed in their return to sports, not because of any physical limitations or surgical complications, but rather the fact that they're just not mentally ready and they haven't achieved the confidence to do so.

In your article, you mentioned the potential use of visualization techniques, or even virtual reality training as adjuncts for post-op rehab to boost confidence and mental preparedness for returning to sport. I'd love to hear more on this, if you could expand a little bit on the psychological aspect of athlete recovery.

Dr. Jamie Cunha:

So we found mentioned really only in one or two studies that what seemed to be holding some people back from returning to their prior level of activity was not the physical, but was actually more of a mental block or a fear of returning to sport or a fear of re-injury. And I think that's a really important topic to address that really doesn't get addressed enough at the moment. Behavioral therapists can work with these patients and do visualization therapy and just kind of help mentally restore confidence. And I think that's been growing in popularity more recently, as we've seen with professional athletes, having some very public discussions about this topic.

But also in the PT world I've seen over the past few years, we've had a couple of different companies come to us with these virtual reality devices where you put on goggles and you're seeing a recreation of the activity. And I believe what they're proposing is that if you use the uninjured limb to do an activity in the virtual reality device, you see the injured limb doing the activity, and this is what you

used to be doing. And it starts to help the brain reprogram itself or remap itself into proper motor activation and control of movement, and also build confidence mentally because you're seeing yourself as able with that injured limb.

Chris Tucker:

Yeah, that's pretty cutting edge and exciting stuff. I admit, I do discuss this with other interviewees and other colleagues, as far as the psychological recovery of the athlete and all of our discussions, at least as far as I can recall, do focus on the postoperative period. But it's interesting because your article obviously focuses on pre rehabilitation and I think the best articles generate more questions than answers. And I think one question that yours has generated is, is there any benefit in actually instituting some psychological conditioning programs, preoperatively? Just as you've quoted a bunch of data to support physical prehab, I wonder if there's some mental prehab that could help. It seems like a really ripe area of opportunity for further research.

And so I guess that's probably a leading question, but to follow on in general, what do you think is currently the most important unanswered question with respect to the topic of preoperative rehabilitation for the ACL injured athlete, or maybe phrase in a different way, what do you see as the most important next step for advancement in this particular field?

Dr. Daniel Solomon:

I think it's convincing people that it's worthwhile and we know that it's out there, and we know that there's value to it, but convincing ironically, the insurance companies to say, oh, we're going to approve some prehab, becomes really important. So if we have a limited number of rehabilitation visits available for ACL reconstruction, and we're using six to 12 visits in prehab, are we cutting down on the number of visits that are available afterwards? So it's clear that prehab is good in many patients. We definitely have to figure out which ones gain the most value from it. And I think we also have to be the advocates for our patients to say that it's so valuable that they will decrease the risk postoperatively and they should have the ability to do this prehab regardless of what the insurance companies believe to be true.

Chris Tucker:

Excellent point. Do either of you have any other closing thoughts or comments before we conclude?

Dr. Daniel Solomon:

Yeah, I think prehab can be very simple and focusing on where the athlete has deficits is key. It's a really valuable time to engage the patient. And I think enhancing the physical therapist patient bond has value with that trust beyond just strengthening and jumping. I think the engagement between therapist and patient leads to that mental preparedness and that confidence to move to the next step as they're going through the rehab process. So engaging early helps the communication to an almost invaluable extent.

Dr. Jamie Cunha:

Yeah, I was just going to say that our goal as a team is to do whatever we can do to get the patient back to where they were pre-injury with respect to function and activity level.

Chris Tucker:

Drs. Cunha and Solomon, I want to congratulate you again on your important work and thank you for sharing your time and your thoughts with us.

Dr. Jamie Cunha:

Thank you so much for having...

Dr. Daniel Solomon:

Thanks, Chris.

Chris Tucker:

Drs. Cunha and Solomon's article titled ACL Prehabilitation Improves Postoperative Strength and Range of Motion and Return to Sport and Athletes can be found in the January, 2022 issue of the Arthroscopy, Sports Medicine, and Rehabilitation Journal, which is available online at www.arthroscopysportsmedicineandrehabilitation.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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