Dr. Andrea Spiker:

Welcome, everyone, to the Arthroscopy Association's Arthroscopy Journal Podcast. I'm Dr. Andrea Spiker from the University of Wisconsin. Today I have the pleasure of being joined by Dr. Stephanie Wong, who is a sports medicine surgeon at the University of California, San Francisco. Dr. Wong was the first author of the article titled "Patients With a High Femoral Epiphyseal Roof with Concomitant Borderline Hip Dysplasia and Femoral Acetabular Impingement Syndrome Do Not Demonstrate Inferior Outcomes Following Arthroscopic Hip Surgery," which was published in the May, 2022 edition of the Arthroscopy Journal. Dr. Wong's co-authors included Alexander Newhouse, Daniel Wichman, Felipe Bessa, Joel Williams, and Shane Nho. Welcome, Dr. Wong, and thank you so much for joining me.

Dr. Stephanie Wong:

Thanks so much for having me. I'm an avid listener of the podcast, so it's wonderful to be invited on as a guest.

Dr. Andrea Spiker:

We're so glad to have you. Stephanie, can you begin by telling us a little bit more about you and your current practice?

Dr. Stephanie Wong:

Yeah, absolutely. Currently, I'm a sports medicine surgeon at UCSF, as you mentioned. My practice involves general sports medicine as well as a focus on hip. I do both endoscopic, arthroscopic and some limited open hip procedures, so I probably would estimate my practice involves about 30 to 40% of hip. I do not do open hip surgeries for dysplasia such as PAOs or total hip arthroplasty, but my practice does involve a significant proportion hip, hip arthroscopy for FAI, as well as treatment of borderline hip dysplasia.

And then we also have a hip preservation center where I collaborate with one of my colleagues who treats pediatric and adult patients with hip dysplasia, so we do combine hip arthroscopy procedures with periacetabular osteotomy as a part of that center.

Dr. Andrea Spiker:

Wonderful. The paper we're discussing today looked specifically at that group of patients that you mentioned undergoing hip arthroscopy, and in particular the borderline dysplastic group, which most of us define as a center edge angle between 18 and 25 degrees. Can you discuss with us why this is such an important group to study?

Dr. Stephanie Wong:

Yeah, absolutely. I think that it's well accepted that patients that are clearly dysplastic, so those that have a lateral center edge angle in the teens or in the tens range clearly do not qualify for an isolated arthroscopic hip procedure. And then those that have more of a femoroacetabular impingement picture with a lateral center edge angle above 25, I think many of us are comfortable treating those patients as straightforward FAI.

But then we have this group that's kind of in this gray zone in between, which we've termed borderline dysplastic, where they sometimes have some mixed features, and I find that some of those patients, and again, we classify this borderline group primarily based on lateral center edge, but I'm sure we'll get into what other measures we look at when we consider this condition, but some of them are clearly more of

an FAI picture and some of them are maybe FAI mixed with dysplasia and some are more kind of pure dysplasia type pictures, and so I think that we're trying to understand which of these patients would benefit from which of our surgical procedures or a combination of both arthroscopic and open hip procedures.

And the studies have been really interesting, because some studies show no significant difference when treating these borderline patients with FAI syndrome clinical picture with a classic hip arthroscopy approach, and then some show worse outcomes, and some authors suggest more of an open surgical procedure with a hip arthroscopy combined instead, and so we have these two different schools of thought. The hip preservation world with the sports medicine world colliding here in the middle, so I think really we'd just like to be able to understand how to counsel patients and how to talk to them about which procedures they'd benefit from.

Dr. Andrea Spiker:

Excellent. Yeah, I think you've really clearly described the problem with this group of patients is there's a lot of conflicting information, and we really don't know the right answer in a lot of instances, and so more and more of studies like the one we are discussing today are so important to help us clarify that question a little bit more and perhaps make that gray area a little bit more black and white for us in the future.

Dr. Stephanie Wong:

Exactly.

Dr. Andrea Spiker:

Let's talk a little more about the specific research question that you asked in this study related to the femoral epiphyseal roof or fear index. First, can you describe for the listeners how this is measured on radiographs and then discuss why you decided to look at this specific radiographic measurement?

Dr. Stephanie Wong:

Absolutely. The FEAR index was first described by Wyatt et al in their paper out of core 2017, and they described this novel radiographic measurement as an additional measurement that you could consider an addition to the lateral center edge, which we've been discussing, and this measurement is based on the theory that during development that the femoral epiphysis orientation is perpendicular to the joint reactive force, so the angle that would change depending on the depth of the acetabulum and the force vector for the hip, so this measurement basically is the angle between the epiphyseal plate in a skeletally mature individual and the acetabular index angle or the angle of the sorcil.

And this vector would indicate then the stability of the hip, so if it was more open laterally, then that would be considered an unstable hip. And then if it was kind of closed and open medially, then it would indicate a stable hip. In the past few years, other authors have been looking into the FEAR index as another measurement to try to assess these borderline dysplastic hips, because the thought is that the lateral center edge, well, good, it's really just kind of one dimension of a three-dimensional problem.

Most of us are using primarily radiographs initially to try to understand this complex three-dimensional problem, and so this would be a measurement that's taken off of an AP pelvis, and so based on existing imaging and just another piece of a puzzle, I think.

Dr. Andrea Spiker:

Great. That was an excellent description of how to do this. Speaking of the FEAR index, how was the inter-reader reliability within your study when measuring this? How good are different surgeons or trainees at measuring this index?

Dr. Stephanie Wong:

Yeah. In this study we had two trained research assistants, as well as Dr. Bessa, who's an orthopedic surgeon, measure these indices. And then we also have them measure the lateral center edge angle and the Tönnis angle. Interestingly, the inner observer interclass correlation coefficient was actually better for the FEAR index than for the lateral center edge and Tönnis angle, which was a little bit surprising, especially because this is a newer measurement that maybe people aren't as used to doing.

But overall, in our study, in terms of correlation coefficient was 0.96, and greater than 0.9 is considered excellent. This has also been shown in some other studies on the FEAR index overall showing good to excellent reliability testing, so I think overall this measurement is relatively straightforward to do and it seems to be reproducible.

Dr. Andrea Spiker:

Great. And so you and your study used FEAR index of plus or minus two degrees to create your various patient cohorts, so how did your team decide to settle on this number of degrees as the differential between the different cohorts?

Dr. Stephanie Wong:

Yeah, that's a great question. I think anytime you have a new measurement, it's kind of like what is the threshold? Or what we should be defining as normal or abnormal? Actually, in the original Wyatt paper, they had actually used a threshold of five degrees, and then subsequent studies have used five degrees, and some had lowered that to two degrees, so we selected two degrees because we thought it would be a bit more sensitive and include a couple more of those patients that might be kind of in between the stable versus unstable groups.

I think that the studies that are on the FEAR index are just a couple in the literature at this point, so one of my thoughts was that actually we could consider trying to understand the threshold of the FEAR index a little bit more closely, because really, five degrees has been mentioned in most studies and then one or two other studies discussing considering two or five, and so I think that's how we've selected our thresholds are cut off in this study, but certainly, still in its early stages of research certainly in this topic.

Dr. Andrea Spiker:

Yeah. That's a great point about this being a newer index. Would you mind clarifying for us, when we talk about the two degrees or the five degrees, what we're talking about, it's whether the angle converges or diverges greater or less than that. Can you just describe that a little bit more?

Dr. Stephanie Wong:

Yes, yes, absolutely. As I mentioned before, essentially, this angle is the line between the center third of the femoral-epiphyseal scar and then the second line being connecting the lateral and medial aspects of the sorcil, so you do basically the Cobb angle between those two lines, and a line that opens laterally is defined as a positive angle, which would indicate an unstable hip, and then a line that's angled and opens medially would be defined as a negative value or a stable hip. A FEAR index in our study of less

than two degrees was considered to be a stable hip and a FEAR index of greater than or equal to two degrees was considered an unstable hip.

Dr. Andrea Spiker:

And I would argue that using that two degree threshold, you're actually being more selective, so you have a lower threshold to define what would be an unstable hip, so perhaps a little bit more stringent in looking at those borderlines and giving us a better idea of who might or might not do well with arthroscopy.

Dr. Stephanie Wong:

Exactly, exactly. In this study we took a cohort of patients who had already had surgery and had two year outcomes and then went back and analyzed their FEAR index, because the patients had surgery in the study, had surgery before the FEAR index was described and measured, but I think that the thought is, can we use this as a predictive tool or can we use this as a piece of information to guide patients prospectively in the future? Which has not yet been done, but would be definitely an idea for future study.

Dr. Andrea Spiker:

The study also concluded at the end of the findings that these patients with a FEAR index of greater than two degrees, so those that were defined as unstable hips, did not actually demonstrate inferior outcomes following hip arthroscopy, but you did note in the manuscript that there was one big limitation invalidating this conclusion in that the group of patients who did have that FEAR index greater than two was really a small number of patients when compared to the cohort which was considered to be stable.

And that makes sense. These patients were being indicated for arthroscopy only, and we wouldn't expect to find a high number of what we would consider dysplastic hips, because those would hopefully have gone on to have an open periosteal osteotomy surgery.

Dr. Stephanie Wong:

Right.

Dr. Andrea Spiker:

You mentioned in your paper the possibility, because there was an uneven balance between the unstable hips and the stable hips, that there might have been possible type one and or type two errors, and I'd just love to get your thoughts on that and what your team thought about what you think about the limitations of studies like this when we're looking to answer these questions.

Dr. Stephanie Wong:

Yeah, absolutely. As you mentioned, we had quite asymmetric groups. Out of 140 patients that met the inclusion criteria, we had 19 that we considered to be unstable based on the FEAR index threshold of greater than or equal to two, and then 121 patients who were considered stable, so of course you could say, "What if there were more patients in the unstable group, would we see a difference in the outcomes there?" And that is possible. I think that, of course, in our paper we concluded that there was no difference. It's possible that perhaps we just didn't have the numbers to show that.

One thing is in the hip literature we see a lot of studies done, like for example, one of my fellowship mentors, single surgeon, large volume surgeon study, which is fantastic, but I think this is one area where perhaps if we were able to combine high volume centers, multi-center studies with multiple surgeons, we could reach the end needed to reinforce these conclusions that we have for these preliminary studies.

But this is the only paper to my knowledge that looks at outcomes in the setting of FEAR index. A couple other studies looking at validating the FEAR index, associating FEAR index measurements with measures of clinical and or exam under anesthesia instability measurements, but I think this is a good preliminary study looking at the outcome between these two groups. But certainly you bring up that fantastic point. And I think collaboration between high volume hip centers and centers that treat hip dysplasia would be great to try to see if our results here hold up.

Dr. Andrea Spiker:

Yeah, that's an excellent point. Now what are some of the other indicators that you find helpful in your practice to identify this hip instability in this group of patients, the borderline group of patients, who you're not sure would benefit from a hip arthroscopy versus a periacetabular osteotomy? What are some of the clinical and perhaps radiographic tools that you're using?

Dr. Stephanie Wong:

Yeah, absolutely. Similar to other three-dimensional complex problems, for example, like patella femoral instability or shoulder instability, I think of hip instability similarly. I'm trying to measure every possible thing I can on radiograph to try to put all those factors together to treat that individual patient. For me, I'm measuring the lateral center edge. I also routinely get a full profile view to measure the anterior coverage or anterior center edge angle, Tönnis angle, the FEAR index I've started to use in my clinical practice as well. And then I rarely obtain CT scans, but that is something that could certainly be considered to look more at the three dimensional morphology femoral version and get a better understanding of the acetabulum in three dimensions.

But essentially I'm getting 3Ds of the pelvis and measuring everything I possibly can, looking at retroversion, et cetera, on the radiographs, as well, to try to understand the patient. And then on clinical exams, I pay attention to other factors, including hypermobility, the Beighton score, the activities a patient participates in. Are they in an activity or sport that requires a lot of hyper flexibility? Are they a dancer, ballerina, gymnast? Things like that play a role in how I think about each individual patient. I don't think there's one perfect answer. I think we all do it a little bit differently. That's my approach.

Dr. Andrea Spiker:

Yeah, I absolutely agree with you. I think there's no one right way to do it. I think hip patients in general as we know come into our clinic and they're a lot more in depth evaluation of the clinical exam of the radiographic findings in order to make a diagnosis, but then especially in this borderline group, it's perhaps yet another layer of investigation that we have to perform in order to understand what the best treatment options would be.

Dr. Stephanie Wong:

Absolutely.

Dr. Andrea Spiker:

How do you think the findings of this study have influenced your practice?

Dr. Stephanie Wong:

Yeah, I think when you look at the abstract of this study, you could easily conclude that you should operate on patients with borderline hip dysplasia, but I think it's much more nuanced than that. I think about the results of the study in the context of also my mentor, Shane Nho's practice, so his management of the capsule, for example, I think is extremely important, and so he routinely does a T capsulotomy and then closes it with five to six simple sutures. And I think that if you were to take the outcome, the outcomes of this study and apply it to borderline patients and do a different type of capsulotomy and you're not closing the capsule et cetera, I think it would potentially change the results.

I think very carefully about borderline patients, which is a little bit of a departure from the inclusion group of this study, but I think of borderline patients, because I do primarily hip arthroscopy in my practice, alternative cutoffs have been mentioned for considering the borderline group, including lateral centers between 20 to 25, so I'm a little bit more strict, because as I start my practice, I'm trying to make sure the patients that I'm operating on have really excellent outcomes and I'm also refining my own technique and being comfortable with my own practice, so I'm using a lateral center and it's closer to 20 to 25.

If they're dipping to the 18, 19 range, then we're looking at all their other radiographic measures. If their Tönnis angle's above 10 and they have hypermobility and their anterior coverage is also low, then those are patients that I'm saying, "You should also maybe see my hip preservation colleague who does PAO," just to at least have a conversation and talk about it. Of course, a PAO is a much higher morbidity open procedure compared to an isolated hip arthroscopy, but I think that we'd all agree that we ultimately just want to do what's going to be the best outcome for the patient, whether it's a combined procedure or an isolated one.

Dr. Andrea Spiker:

You bring up such an excellent point about scrutiny of all of our publications in the literature. You really do have to put that in context, and I think you bring up an excellent point about understanding the other procedural and technical aspects that are happening in order to make these outcomes and the findings happen. That's an excellent, excellent point that you bring up, there. Now, to end our conversation today, I'd love to hear, based on your experience with this current study, as well as your current experience in practice, where do you think we should take this research on borderline dysplasia next to get more answers?

Dr. Stephanie Wong:

Yeah, I think that one thing that would be really interesting to develop would be some sort of risk calculator. Similar to these risk calculators for patients at risk of hip fracture and things like that where you can input their age and their history of fracture, et cetera. I think it would be really nice to have something like that for this group of borderline dysplastic patients. Maybe you can enter their various radiographic measures, which we discussed, as well as maybe some clinical exam findings, to be able to say, "What is the likelihood that their hip is stable or unstable?"

And then you'd have to decide how are you defining stable or unstable? In a lot of the literature, there's various definitions. There's stability on clinical exam. There's stability postoperatively on clinical exam and pre-op, and then stability intraoperatively on EUA before the surgery's done, after the surgery's done. And then of course, ultimately, the patient outcomes. I think we haven't necessarily agreed on how we determine stability, and I think that maybe is one of the main points that we need to decide.

Obviously, in this study, we use the FEAR index cutoff of two, but that definition changes for many, and it's probably not one radiographic measurement that's going to determine stability or not. I think it'd be nice to have some sort of calculator where you could go through it with a patient and say, similar to calculators available for choosing an ACL graft, what would you benefit from X percent chance that the HIPAA stable or unstable status suggests that you should have an isolated hip arthroscopy or a combined procedure with open? I think that would be really interesting.

And then, like I said, trying to combine or pool our data in the hip arthroscopy world to look at different surgeons, different centers, high volume surgeons that maybe manage the capital differently, and see if any of those factors kind of stratify out. But of course, we introduce all these variables, it does make it a little bit more difficult to study. But I think that ultimately it's a complicated problem, so it's not going to be one straightforward radiographic measurement to explain it.

Dr. Andrea Spiker:

Yeah, those are all excellent ideas. We have a lot of work to do, don't we?

Dr. Stephanie Wong:

Absolutely, but I think the hip arthroscopy and hip preservation world is a smaller one, so I think definitely achievable, potentially. And I think there's a lot of interest in identifying which patients would benefit from which procedures.

Dr. Andrea Spiker:

Well, thank you so much, Stephanie, for joining us today. It's been wonderful talking with you and hearing about this article and your findings.

Dr. Stephanie Wong:

Thank you so much for having me.

Dr. Andrea Spiker:

Dr. Wong's article titled, "Patients With a High Ephemeral Difficile Roof With Concomitant Borderline to Hip Dysplasia and Femoral Acetabular Impingement Syndrome Do Not Demonstrate Inferior Outcomes Following Arthroscopic Hip Surgery," can be found online at www.arthroscopyjournal.org. This concludes our episode of the Arthroscopy Journal Podcast. Thank you so much for joining us. The views expressed in this podcast do not necessarily represent the views of the Arthroscopy Association or the Arthroscopy Journal.

professional medical advice or delay in seeking it because of something you were exposed to from this podcast or its referenced paper. The information discussed in this podcast and its referenced paper may not apply to every individual and may cause harm.