JOHN A. GRANT: Morning. Thanks to Dr. [INAUDIBLE] and then his team for the invitation to speak to guys here this morning. I think we've got a nice lineup of things, starting with Dr. Northway, with introduction to the shoulder. And I'll talk a little bit about surgical management, do some surgical-- some shoulder issues, and then on with Dr. Reuters and then Dr. Jacobson and Dave [INAUDIBLE] at the end. As Dr. [INAUDIBLE] mentioned, I primarily work here at the CMC in sports. I do shoulder and knee primarily. We see a lot of shoulder issues. I do a lot of knee cartilage and complex [INAUDIBLE] and knee stuff, as well.

So today, we're going to talk about a couple of different things. We'll start first with rotator cuff primarily. I think that's a little more common in most of our practices, and we'll spend most of our time on that, looking at, from a surgery point of view, after the people have been through a course of hopefully very appropriate physical therapy and other nonoperative managements, if that hasn't been successful in achieving their goals with respect to pain reduction and function improvement strength, et cetera, then we'll figure out, do we need to do something surgically about the shoulder?

When do we do that? What are the considerations that us, as a surgeon, take into account as to who we decide should have surgery and what type of surgery they should have? Some of the techniques we use to fix that will give you some insight into the operating room a little bit there.

One quick slide on rehab-- I know Dave is talking more about shoulder-- throwing injuries, so we'll just have a quick overview of a typical time frame for rehab after rotator cuff repair. We'll talk a little bit about what happens if the repair fails, or what happens if we catch them really late, and these rotator cuffs are no longer fixable. What are the other options available for these patients?

And if we have a little bit of time, we'll talk a little bit about shoulder instability. This tends to be the other end of the age spectrum primarily. We'll have a short discussion there about mechanism injuries and anatomy of shoulder instability there, and some of the goals of repair that we do there.

So what are the symptoms of rotator cuff tear? So pretty typically, I'm sure we've all see these patients in our clinics-- pain primarily in the lateral aspect of the shoulder aggravated by forward reaching, overhead reaching, a lot a pain at night that prevents people from sleeping or wakes them up after sleeping, especially if they roll over on that side. And then lifting, especially if the arm is away from the body and at or above shoulder level, this increases the lever arm on the shoulder, puts a lot of stress on the rotator cuff muscles. This is the basis for that painful arc that we notice in the physical exam, painful somewhere between 60 degrees and 120 degrees, because the weight of the hand is furthest from the center of rotation of the shoulder, putting most of the pressure on that rotator cuff, and being the most aggravating.

The other option that can come here sometimes is weakness. Pain is the primary presenter typically, but weakness can also come along with it. Is that weakness directly related because it hurts, and they just won't do it, or because they also have some other anatomical reason for weakness? We talked about forward elevation and above shoulder height certainly being weak.

But at the other end of the scale, we have this pseudo paralysis, where the patient comes in, and they can't lift their arm any more than this. The first thing is, oh, do I have a nerve injury, a neck injury, something like this? But if they have a massive rotator cuff tear that has become decompensated, the biomechanics of their shoulder's thrown off so much, that they're deltoid superiorly migrates their humeral head and catches under the acromion, and it can't clear any more. And so they can't get that motion going. We'll talk about that at the end of the rotator cuff part.

We look at strength and internal and external rotation. Typically, with smaller tears, that's not really a big deal, as long as the subscapularis is not affected. But certainly, the bigger the tear gets, the more of these four rotator cuff tendons that are affected, the more the internal and external rotation strength will be affected; and then, of course, loss of function related to these weakness and shoulder dysfunction.

As Dr. Northway alluded to, there's lots of analogies for the shoulder. The shoulder certainly has the most range of motion, is the most flexible of the body, and that helps us a lot with our upper extremity motion. But the downside to that is it's not a very stable joint. Basically, I like to say it's like a cup on a plate or a ball on a plate or a golf ball on a golf tee. And so it allows us all this motion, but from a bony stability point of view, it's very limited, especially if you compare it to the hip, which is much more constrained.

So the shoulder is much more reliant on the other soft tissue structures around it to help maintain its stability and maintain its biomechanical function. Primarily, the rotator cuff tendons, as Dr. Northway outlined, subscapularis in the front, and then going around the top to the back, supra, infra, and teres minor. So once these muscles get torn or get aggravated, this significantly throws off the biomechanics of the shoulder and affects function directly.

So why do we need to fix these things, other than the fact the patient still has pain, after trying all these non-operative management things? So we'll talk a little bit about the force couples around the shoulder and why the shoulder doesn't work when there's tears of the rotator cuff. So there are two basic sets of force couples. One's in the coronal plane. So your deltoid muscle here attaches from the acromion around down to the deltoid tubercle. And when you contract this muscle primarily, it's going to cause motion in this direction.

That's not going to help us elevate our arm. So in order to allow us to do that, we need to have a hinge inside the joint. The rotator cuff maintains the contact between the ball and the cup to allow that to act as a hinge. So the deltoid actually makes a rotatory motion, as opposed to a superior migration motion. So the balance between the superiorly migrating deltoid and the rotator cuff muscles that keep the head down in the joint is very important. And so once that's lost, that balance gets off. We'll talk about that later in cuff tear arthropathy.

The other balance is front and back. So we have subscapularis in the front, and we have infraspinatus and teres minor in the back. And so they keep the ball stable in the front-back direction. So that force couple is also important. And that plays a role even in large tears, where we may not be able to get it all fixed. But if we can get partial rotator cuff repair, we can restore some of these force couples to improve some of the function of the shoulder.

So the goal of rotator cuff repair is really to restore the force couples and therefore, restore stable fulcrum and motion of the shoulder. And we can look at these two ways. So here, so the deltoid, this represents the deltoid here. The deltoid is going to attach to the acromion and down here on the humerus. It's going to pull in this direction. So if it pulls by itself, it's just going to pull the humeral head right up underneath the acromion. It's going to impinge, and you won't get any motion.

So the lower parts of the rotator cuff are compressive, where they compress the ball into the cup, keep it there, so there's a rotatory motion with the deltoid. The second force couple here is the subscap in the front, teres minor and infraspinatus in the back. And when these are thrown off, the ball can shift forward or backward and cause some instability or some feelings of lack of perfect biomechanics, which also affects shoulder function.

So what's the natural history of these tears, and why do we think about fixing them and fixing them perhaps a little bit sooner rather than later, if indicated? Well, one, unfortunately, they don't heal. So unless separate from muscle strains that may occur in the muscle belly, once this tears off, because it's like an elastic band, once you release one end, it starts to retract towards the other end. And it's never going to grow back down to that attachment. So they don't heal for themselves.

Because of this start of retraction, they tend to get bigger with time. Now, it's really hard to predict how quickly they get bigger, but the history is that they will slowly get bigger with time. OK? And then, because of this fact, they will start to get progressive dysfunction of the shoulder joint. They'll start getting more glenohumeral pain. You'll get more glenohumeral weakness.

And then, as Dr. Northway also discussed, as well, get this periscapular dysfunction and pain. The subscapular system and the glenohumeral joint are intimately related for all the motion activity of the shoulder. If there is a problem in one part, the other aspect tries to take over and compensate for that. Then that part is doing double duty. They start to complain. They don't work very well. They get spasm. They get weak. They get painful, and you get dysfunction.

And so that's why any rotator cuff issue, part of that rehabilitation is in very, very importantly periscapular control and management. So that I 100% agree with Dr. Northway and that on your prescriptions-- and everyone of that goes out with mine with any shoulder pain, is please address periscapular dysfunction, strengthening, and rhythm. Because that's the basis. That's the whole support for the shoulder. If that's not done, the shoulder is not going to work at all. And in fact, if that is poor, it can actually make your shoulder problems worse, as opposed to better.

Muscle retraction, fibrosis and atrophy-- this is one of the big considerations that we look and why the MRI we use is very important, to help to give some prognostication to what's going to happen here. Over time, as I said, because the muscle is a contractile entity, if you release one end, it retracts and retracts back towards the other end, makes this tear bigger and bigger. If it's not functioning, if it's not attached, the body says, well, it's not working it. Why do I need it? I'll just start eating it away.

It's like leaving an elastic band out in the sun. It starts to get dry and starts to get stiff. And so even if we go in there with surgery, it may have stiffened up enough that we can't literally pull it back to where it's supposed to go, if it's been there a long time.

There's also a change of the muscle from muscle tissue to fatty tissue. Once that happens, for the most part, even if we get it repaired, that tissue does not regenerate back to muscle. It's left as fat. So you never actually get back that function.

And then we'll talk at the end about cuff tear arthropathy. This is the case when you have a chronic, massive rotator cuff tear that's not fixable, and you develop a type of arthrosis and superior migration of the humeral head related to that lack of biomechanical function. We'll talk about that at the end.

So what are our indications? First of all, primarily, everything is non-operative first. Let's see if we can keep people out of the operating room. If they can get better, great. So nonoperative management-- that includes the most important part is a good and appropriate course of physical therapy.

Pain, weakness, loss of function, despite this adequate therapy-- cortisone injections are a big thing that comes up. In my book, cortisone injections are not a fix. They can be used to help the therapy better. So if patients aren't able to do the therapy because they're in too much pain, the cortisone injections are a reasonable option to help them do the therapy more effectively.

By itself, cortisone is like taking Tylenol for a headache. As soon as it wears off, the pain comes back. So there's no point to it, OK? So in my clinic, I do a fair amount of cortisone injections, but they're always paired with physical therapy prescription. You should start therapy three or four days after the injection. Cortisone takes about two or three days to start working. Tell your patients to avoid any real aggravating symptoms or activities in those first couple of days, because if they really flare up before the cortisone kicks in, it's a useless injection. But it needs to be paired with that therapy to start to take advantage of that pain relief, so they can do the work in therapy that's actually going to get them better.

Next, high grade and symptomatic partial thickness tears-- no rush to get these to the operating room. But again, push, push, push non-operative management. If, despite all of that, they're still painful primarily, then taking in some of the bursitis, looking for bone spurs, and assessing whether that tear is really fixable or needs to be fixed or not is a reasonable option. Interestingly, anecdotally, these partial tears tend to be more painful than full thickness tears. And sometimes, going in and just cleaning up the frayed tissue can be very helpful to these patients, but certainly, no rush to do it and go to operating room with them.

Full thickness tears in symptomatic patients, especially in young, active patients, acute tears that just happen-- very reasonable. Although small tears, around a centimeter or so, centimeter, centimeter and a half, are very reasonable to push the non-operative management. Some people can get improvement in pain and function with therapy. And if that's the case, no rush. We'll watch them. But because of this natural progression, I want to keep an eye on them, because they can progress sometimes without an increase in symptoms.

So typically, I'll start with a surveillance ultrasound about six months later, just to check. If that tear is staying stable, not getting any better-- or not getting bigger and the patient is still asymptomatic, then I'll follow them yearly after that. If the patient becomes symptomatic, or the tear is noticeably getting bigger, then we start to have a more serious discussion about, well, should we do surgery before it gets too big? Because the bigger it gets, the harder it is for me to fix, and the less predictable the outcomes are.

There is some research to show that an increase in pain after initial good control can be a sign of increasing size. It's not 100%, but it's something to be attuned to. The last part here is these chronic massive retracted tears and fatty atrophy. These are ones that the cat's out of the bag. We may not be able to get them back or back down where they're supposed to go, and even if we do, their function may be limited. However, as I mentioned before, if we can get a partial repair, even repair that front-back force couple, that can help improve their function. So a partial repair has been shown to be better outcomes compared to no repair at all.

Predictors of success-- so what patients are going to tell, yeah, you've got a good chance of outcome, versus we're going to say, this is going to be a little bit guarded? Age has been shown to be a predictor of outcome, with increasing age being a decreased predictor of outcome. However, there's some question as to whether or not this is a confounding factor, because it's only been shown in univarate analysis. It's probably a better surrogate or acting as a surrogate for more important outcomes like the presence of a larger tear or increasing tear size, the presence or a significance of fatty atrophy, and in some cases, poor bone marrow density, which has been shown to affect the ability of repairs of rotator cuff back down to a [INAUDIBLE].

Tear size makes sense. The bigger the tear, the less predictable the outcomes. They tend to come along with these other factors, such as stiffness, fatty atrophy, retraction, those types of things. Success rates in these surgeries aren't as great as we would like. And certainly, the bigger the tear, the more unpredictable. So smaller tears, smaller medium tears between one to three centimeters in size, reasonable-- somewhere between 5% to 30% failure rate-- not great. But the bigger the tear, certainly a higher chance of failure afterwards.

Fatty infiltration, and we can see this here on this saggital cut. Here's subscap in the front, teres minor-- sorry, subscap in the front here, infraspinatus teres minor and supraspinatus here. This supraspinatus should fill this whole space. Now, in this T1 image, with all this white, this is fat. So this muscle has shrunken in size. You can see a little bit of fat inside the muscle, as well. So this started this process of atrophy and fatty conversion.

Chronicity of the tear-- again, it makes sense. The longer the tear has been there, the less likely to heal well. And of course, in everyone's practice, across all aspects of medicine, diabetes is the unfortunate thing that affects all types of healing issues, so poor quality tissue, poor blood supply, and poor outcomes.

This is the big one I encourage all of you to speak to your patients about. Every single patient who I see with this disease has a discussion about this. Smoking-- bad for rotator cuffs, to cause it and to decrease healing rates afterwards. So the odds of having a rotator cuff repair in people with shoulder pain that started without any particular trauma are very high, smokers double that of nonsmokers. People who smoked in the past 10 years, 4 times the increase odds, and also increases with the dose. So the more you smoke, the worse your possibilities are of having a tear and having your outcomes.

Nonsmokers have been shown to have significantly better improvement in pain and functional scoring following rotator cuff repair. And the biggest thing that I tell my patients is that, if you're a smoker, your risk of failure of your outcome is double that of nonsmokers. And so in my elective practice, all patients who smoke need to quit before they have their surgery.

And in fact, we do a urine cotinine tests two weeks before their surgery to ensure that they have had nicotine out of their system for four weeks. And if not, they're out. The risk of DVTs, the risk of infection, the risk of wound healing problems, and the risk of failure is too high. In an elective procedure, it's not worth putting the person through that risk of anesthesia and the ensuing four or five months of recovery, if we're setting them up to fail from the beginning. So my little soap box for the day, sorry.

Anti-inflammatories-- great for a lot of musculoskeletal pain. Unfortunately, there's been some mixed evidence, primarily in animal models, that shows that bone-bone healing and bone-tendon healing is not as great in the presence of anti-inflammatories. So there's been studies, again mainly in rats-- increased failure rate, less robust healing tissue. And the bone-tendon interface with this healing occurring is a little bit more disorganized.

There is some other evidence that is refuting this a little bit. We don't really know, in humans, when or what dose is OK and not OK. Can you have them right after surgery, but not later? Is it OK right after surgery, but not as the healing goes on? So this is up in the air. If it's going to be the difference between people on narcotics and getting off them, I'm OK with a little bit, but I typically don't recommend them as their main line treatment, once they've had a surgical repair; non-operative management-- great, very helpful.

So we'll move on to a little bit about what we do once they come to me and once we've decided to do surgery at this point. So I'm going to show an overview of what we do during surgery, and then I'll show you some pictures of how this works. First of all, we do look at two different areas, particularly. We go intra-articularly into the glenohumeral joint first. So that's true arthroscopy. The second part occurs underneath the acromion in the subacromial space, which technically is endoscopy instead of arthroscopy. But we look in both places.

The bicep tendon, which wasn't a really big part of this talk, the long head of biceps is intra-articular and is right here at the anterior edge of the supraspinatus, is right in the area where most of this impingement occurs. It tends to be almost ubiquitously involved with a rotator cuff impingement, biceps tendinitis, or a complex in this pain. Rotator cuff pain tends to be lateral. The biceps pain tends to be more anterior. But a lot of times, they will come together.

And so many times, the biceps in this groove, either where it goes through the bicipital groove and turns a 90-degree corner into the shoulder, is either gets inflamed, frayed, or otherwise beat up by the same process that aggravates the rotator cuff over a wear and tear of life. And so looking at that and treating that as a pain source in these patients is also very important. So we'll look at that intra-articularly. In most patients who we do rotator cuff repairs on, we'll usually just release that bicep tendon, so it's not sawing back and forth through the groove.

One of the nice things about the biceps is it's one of the few muscles in the body that actually has two attachments up at the shoulder. So by releasing the intra-articular component, the extra-articulate component attaching to the coracoid is still intact. It maintains over 99% or 95% of the function of the biceps, and therefore, the functional loss, by cutting one of those tendons, the one that's causing all the pain, is very minimal, especially in patients with rotator cuff disease. Younger patients-- and again, age is very relevant, depending on the pathology-- young in a rotator cuff patient is 50. When I talked about the instability patients, old in an instability patient is over 30. So it varies, depending on the population.

In much younger patients, whether for rotator cuff disease or not, sometimes we'll cut the biceps and then re-fix the biceps outside the groove. So it's not moving back and forth anymore. That's a tenodesis. In a lot of older people, in my opinion-- this can vary from person to person-- it's more of a cosmetic reason to re-fix the biceps. It's additional surgery, basically just decreases the risk of having this Popeye deformity or shortening of the bicep muscle. It doesn't completely eliminate it, but decreases it.

Once we're inside the shoulder joint-- so we'll look at the articular cartilage in the glenoid and the humeral head. We'll look at the subscapularis internally. That's the best view of that that we get, as well as this biceps tendon. And we'll also look at the articular surface of the rotator cuff. And usually, if there's a tear, we can identify at that time. Once we've done some work inside the joint, then we'll take the camera outside the joint and then go into the subacromial space. So we're now superior to the rotator cuff on the bursal surface, in between the inferior aspect of the acromion and the rotator cuff.

The bursitis that's in there, this myxoid inflammatory tissue, that helps the rotator cuff glide underneath the acromion, sometimes that can get overly inflamed. We'll remove all that tissue for that purpose, but also so that we can see the rotator cuff better. This also allows us to see the anterior aspect of the acromion. And in some patients, there is a bit of a hook or a spur that may be impinging on that rotator cuff and causing some mechanical wear, leading to their pain and tears.

Once we've identified the tear, we'll freshen up the edges of the tissue, to get some more blood supply there and make a little bit more of an inflammatory situation to help with the healing. We'll do the same thing on the exposed bony footprint where the rotator cuff needs to be attached, to make that a good healing bed. We'll repair the rotator cuff tendons with some suture anchors. These are some examples up here.

They basically look like sheet rock anchors that you use to hang heavy pictures on the wall. They go down into the bone. They've got some stitches that come up out of them. We pass that through the tissue and use that to tie it back down onto the bone. And we'll see some pictures of those in a second.

We'll then look back and forth from a couple of different views and make sure that we've fully repaired it, and we think we've got it anatomically back in position. Then we'll go from there. This, unfortunately, is some of that-- hopefully, I don't see too much when I'm doing a rotator cuff repair. For orientation, the glenoid is on the left. The humeral head is on the right.

Here we've got some pretty significant wear of the humeral head cartilage, probably about grade three cartilage wear here. This person is getting on towards osteoarthritis here, so not a typical rotator cuff patient. Apologies-- this is one I picked out, but here a little bit better. Down in the low corner here, this is the edge of the anterior aspect of the humeral head. This is the superior border of the subscapularis here. The bicep tendon is just out of view, coming over here. OK? The glenoid will be back over here. This is the middle glenohumeral ligament here, in the anterior aspect of the shoulder.

Above, this now is the bicep tendon. This is the long head of bicep coming in to attach to the anterior superior corner of the labrum. So if you think of a clock face of your glenoid, probably about 1 o'clock to-- sorry, 11 o'clock in the left shoulder. This is a right shoulder.

This is a pretty good-looking bicep. This is a not so good-looking bicep, OK? Not too hard to tell the difference there. This is one that's probably pretty painful. It looks like it's actually subluxed a little bit lower, as well, so it may have a small subscap tear, as well. Another view of a not so healthy bicep tendon-- should look nice and white and shiny like that.

And then we can put a little probe in the shoulder through the front, and we can pull in some of that tendon that's sitting out in the groove. Because a lot of times, it's the part that's out in the bicipital groove that's the main problem, not necessarily the intra-articular part. And so if we don't pull the tendon in, we'll miss that. We don't see it intra-articularly. So we'll pull on that tendon to try to bring it more into this joint, so we can have a better look at it and see how frayed and beat up it is.

Once we then go into the subacromial space, we've now looked up-- this is the inferior surface of the acromion. The rotator cuff now is down here. This is lateral. This is medial. This should be a fairly smooth surface of the periosteum, the undersurface of the acromion.

Here we can see how frayed it is. This is a sign that that humeral head is coming up either directly, if there's a tear, or through the rotator cuff, and abrading the undersurface of the acromion, showing that cuff dysfunction, where the humeral head is elevated and getting caught underneath the acromion. We call this an impingement sign, because the humeral head is impinging on the inferior aspect of the acromion.

Once we clear that soft tissue away, now we can see this is what's underneath. This is a spur on the anterior aspect of the acromion. And so you can imagine that as you abduct your arm, the humeral head elevates a little bit, the rotator cuff comes up, and is rubbing against this. Think of how many times a day you do this and how many times it's going to rub-- not good for the tendon.

Here's an example of one particular type of tear. Again, this is superior, inferior. This is medial and lateral. So the footprint of the rotator cuff is here. This is an interesting tear. A lot of times, it'll tear right off on the edge and will track this way. This is a little bit of an intra-substance tear near the muscular tendon's junction, which makes it a little bit more challenging to get good response.

Most of these pictures are taken with the camera in the posterior, looking towards the interior, then sweeping back and forth. This picture here, what I've done now is move the camera to a lateral portal here, so I'm looking directly medially. Inferiorly, this is the edge of the humeral head. This is the footprint where the rotator cuff should attach.

Here's the articular margin. And deep in here, we can see the glenoid, OK? From this view above the rotator cuff, I shouldn't be able to see any of this intra-articular aspect. So this is actually the torn edge of the rotator cuff here. It's kind of like the sheets going down towards the end of the bed. And so what we're going to do here is take a hold of this edge of tissue, pull it up like you're pulling the sheets up over the bed, and reattach it right down here to the bone, to close off that space.

Once we've identified the tear, then we want to assess those different patterns. How are we going to repair it? How are we going to put it down? Where do we think it fits? And so we have a little grasping instrument in here, and we can pull on it a little bit just to see where it's supposed to go. So you can see it's retracted to begin with, and I'm going to pull on it to see if I can get it to go back where I want it to go on this footprint-- just trying to see which direction it's going to go best and go on from there.

So this is just an example of how we can deal with these bone spurs, so another shot of this subacromial spur here in the front. This is the edge of a little burr that we use. It looks like a Dremel tool. It goes in the subacromial space and basically just trims off this bone spur here, to leave us like this. So now we've got much more space in here. There's no more bump. And so as you move the shoulder back and forth, there's nothing abrading against that tendon.

As you start the rotator cuff repair, this is an example of one of these anchors that we put in. These are put in percutaneously, small little stab incision through there. We make a little hole in the bone, and we screw these down into the spot. If I look over top of it now once it's in, this is buried down in the bone, and you can see the stitches are coming out of it.

We now have different instruments that we can use to pass the stitches from the deep surface to the superficial surface and grasp another cannula in the front here. And then we can tie these things back down. And this is how we repair it back down on the bone.

Another look here-- so we start with this image again. We're going to go from here to all kinds of different configurations of suture management, and depending on the size of the tear, the quality of the tissue, and what our goals are for the repair. And again, these are just some examples of different types of anchors that we'll use.

Some of these are metal, titanium typically. We don't use those very much anymore. One of my partners does. A lot of them are peak or a plastic compound that's inert, and have movement out to more some biocomposite calcium phosphate derivative type anchor, so that over the course of a year or two, they actually absorb and turn into bone. So over time, there's actually no anchor left down in the bone, which I think is very beneficial, unfortunately because we also see some revisions of these that don't work. So it's nice to have back-to-normal landscape to fix them again, if need be.

Rehab-- just one quick slide-- typically, they're in an abduction sling. Just takes the pressure off that repair for a period of time. In my practice, patients are in this sling for anywhere between four to eight weeks, depending on the size of the repair and the quality of that tissue, so a little bit longer for bigger tears.

Right away, we start them with some gentle elbow, neck, and wrist exercises to help avoid any stiffness in the elbow as they're in this sling, because that can be aggravating. Arthroscopically, as long as it's all done arthroscopically through small one-centimeter incisions, usually within three or four days afterwards, I can allow them to get it wet and shower over it. By the time I see them back at a week to 10 days, the incisions are pretty much closed and healed.

Initially, there's a lot of research going on now about when can we start early motion, passive, versus active motion. These stitches are really the only thing holding this rotator cuff tear to the bone in the early stages, so we want to give that tissue enough time to get sticky, like a fracture. If we start pulling on that muscle too early, it's going to pull through the stitches. So the initial period, we just get going with passive motion to help avoid stiffness, but no active motion initially, until we start getting that sticky a little bit.

Usually, by six weeks, we can start them doing some active, a gentle active motion under direction of the therapist, and then move on from there. Once we achieve passive motion, then progress to active motion, then to strengthening, and then back to functional activities in progressive phases over time. Typically, this is about a four to five-month recovery before people are back to most of the things they want to do. Certainly, it will continue to improve for upwards of a year after the surgery, but most of the improvement happens in the first four to five months.

Switching gears a little bit-- this is what we don't like to see. What inevitably, it happens. So what happens if we fix it, and it doesn't heal? It either heals or re-tears somewhere else, or it doesn't heal initially?

Research from Bruce Miller, one of my colleagues, has demonstrated that if it does re-tear, many times, it re-tears pretty early, within the three to six months. And so it's always counseling patients around this period of time, because by that time, they're feeling pretty good. Day to day stuff, they can do what they want to do, but they still need to be very careful about lifting, carrying, pushing, pulling, sudden quick, jerky movements.

Overall, all comers, all ages, all sizes of repairs, all comorbidities-- re-tear rate's about 17%-- not great. We'd like it to be smaller, but it is what it is. As we talked about before, some of the risk factors are older age, larger tear size, OK? But interestingly, a lot of people, if they've had a repair, even if they have a small re-tear, probably still tend to do better than they did before they had the repair in the first place. So deciding whether we go in and repair it again is a decision point, depending on how the patient is doing, not necessarily because we see it on MRI.

In the patient who comes to us, and these happen-- the patient comes in and says, you know, my shoulder was perfect till three weeks ago. Then I fell. Now I can't lift my arm any more than this. Unfortunately, the rotator cuff is this big faker, because these tears in most people tend to be attritional and happen very slowly over the course of our life. And so the body compensates very well for that.

And then all of a sudden, you have one little disruption that's like the straw that broke the camel's back, and the shoulder decompensates. So they go from having pretty good function, a little bit of ache and pain every now and then, to not being able to lift their shoulder. And they're like, well, this is brand new. You should be able to fix it.

And we get an MRI, and it shows they've got significant fatty atrophy, wasting infiltration all around the shoulder, with a big retracted tear, which I know did not happen three weeks ago. And so they just compensated so well and then decompensated. I'm like, I don't really have a good option for you. I don't think this is repairable.

And so what happens then? Or what happens in the patients who've had multiple tears, we've tried to fix it, and they just haven't been successive? So what happens then as we talked about before they have a loss of this force couple, causing the pseudo paralysis or this pain and loss of function.

And you see here this humeral head now is not really well articulated with the glenoid anymore. It's actually making a new articulation up here with the acromion. So it actually femoralizes the humeral head. You get rounding of the superior humeral head, and you get acetabularization of the acromion. So the acromion actually starts to get a cup, because the shoulder starts to wear up there. This is cuff tear arthropathy, or arthritis related to having a massive rotator cuff tear. You get arthritis, typical pain, loss of function-- problems here.

The challenge is here, because they've got arthritis, and because if the rotator cuff is not repairable, their only option now is a shoulder replacement. The problem is the standard shoulder replacement, like your standard shoulder, relies on the rotator cuff for good function. And so a standard total shoulder replacement is not indicated in these patients, because it's going to have the same problems with lack of function and pain that their current shoulder has-- impinging, not moving. And so they've moved towards-- this is new developments of these reverse total shoulder arthroplasty, which you may have heard of.

What happens over time is you get this arthritis, and you start to see this superior migration of the humeral head. Here in the CT scan, it should be sitting down here. Now it's sitting up here, with a little bit of bursa in between the head. And you can see how rounded this head is, as opposed to having the rounded part facing down here. This is obviously a pretty bad end stage.

So I'm going to quickly go through this, instead of all of the biomechanics of it. But the idea of the reverse total shoulder is that it changes around the mechanics. And instead of relying on the rotator cuff to have compression of the humeral head against the glenoid to make that hinge, it takes that process away from the body, and it puts it into the mechanics.

So what we do here now is instead, we switch it around. it's literally a reverse. The ball goes on the glenoid side, and the cup goes on the humeral side. And so with the compression of the deltoid now compressing in this way, it forces a rotational motion around the circle, centered on the glenoid.

Now, this isn't for everyone. There is a push for this being used more often. I'm very concerned about that. This is kind of the end of the road. After this procedure, you don't have a lot of great options if this fails. So to me, this is still, in particular patients, the primary indication, and a lot of other ones, kind of a salvage. However, it's sneaking into more and more patients, I think, is a bit of concerning.

So typically, these are patients with symptomatic rotator cuff tears and pseudo paralysis especially. Now, this is pseudo paralysis of elevation, not necessarily external rotation. Because this reverse is not going to fix external rotation motion or strength. Sometimes, tendon transfers are done for that reason, if necessary, but this arthroplasty is not going to fix that primarily.

The important thing is that the deltoid function needs to be preserved. The deltoid is the only muscle that is now going to be moving and controlling the shoulder. So if you have deltoid dysfunction, deltoid nerve palsy, axillary nerve palsy, this is not a good indication, because you're going to have a flail shoulder. This also puts a lot more stress on the bony aspects of the shoulder, especially the glenoid. So having good glenoid bone stock is also important, because there's a lot more sheer stress on there.

So here's a comparison of x-rays between a standard total shoulder, on the right, with you've got a polyethylene or plastic cup with a little metal peg, and replace the ball here with the stem inside it. So it looks like a hip replacement. The reverse, on the opposite side here, so we've fixed this ball to the glenoid side. And you can't see, but there's a plastic cup that sits on top of this tray that the ball sits in and glides around for the rotation.

So I can stop quickly at that point, and just see if there's any questions about the rotator cuff component of this talk so far. Yeah?

AUDIENCE: Do you think athletes who have hyperlaxity in their glenohumeral joint are at greater risk to injury, as opposed to athletes who don't have hyperlaxity in the joint? Or does that [INAUDIBLE] like a safety net acquired by greater stress [INAUDIBLE]?

JOHN A. GRANT: I think it depends a lot on what their sport is and what their activities are, right? Some increased laxity is inherent and actually helpful, right? And so you look at throwers, when you look at their amount of external rotation-- and Dave may talk about this a little bit-- some lax in external rotation is beneficial, because they get more range of motion to develop that power. That can cause issues on the other side, whether they're adaptive or not.

Swimmers tend to be hyperlaxive, lax, all these types of things. But I think, if they get an injury, it's more challenging to deal with them. You have to figure out, are they truly a hyperlax? When we look at the spectrum of that-- people like Ehlers-Danlos and Marfans, who have a genetic collagen issue, that's a much bigger problem. Because surgically, we can't help them as much, because if their tissue is poor, to begin with, even if we tighten it up, it's probably going to stretch back out.

I think probably rehab and good endurance muscle, stabilizing muscle control, is more important in those athletes, because they rely more on their dynamic control of their joints to maintain the stability in the health than people who aren't quite so lax. So I think identifying those patients, especially if they're in a sport or an activity that puts a lot of stress and range on those joints, I think that's important, and to make sure that those stabilizing muscles are strong and maintained. Yep?

AUDIENCE: You made statement about bone marrow density and the ability to heal, is that just a noted thing, or is there some--

JOHN A. GRANT: There's some research to show that-- and actually, again, Dr. Miller has done some research a number of years ago, looking at, in rats, I think it was, looking at the bone marrow density humeral head with respect to the success of repair ability of tendons onto that bone. And so you're looking at the interface. One of the challenges with rotator cuffs is they have a fairly poor blood supply. And that's one of the reasons why I think smoking has a big effect on it, because nicotine is a beta constrictor.

And so when you do anything to either side of that repair side, either the tendon side or the bone side, that doesn't have optimal health, I think the ability of those crossing fibers, Sharpey's fibers to develop all those types of things, is inhibited and a problem. Bone mineral density also plays a role in our fixation. So even trying to use the anchors, if the bone quality is not as good, we don't get a good fixation with the anchors, and we need to use bigger anchors to get better purchase. So all those things, I think, can contribute to the success. Is it a be-all, end-all? Probably not. But I think it's one of the multiple factors, as a lot of these things are, that can contribute, to some extent, about the success.

AUDIENCE: So the bone marrow density relationship [INAUDIBLE]?

JOHN A. GRANT: Which is more important, is that your question?

AUDIENCE: [INAUDIBLE] the direction [INAUDIBLE].

JOHN A. GRANT: I think they're all options or all aspects and factors that weigh into things that we'll look at to say, what are the chances of this healing well? Now, most cases, we don't go and get a DEXA scan or anything on our rotator cuff patients. But that being said, maybe we should. There is some research to show that bone marrow density has an effect on surgical outcomes of rotator cuff repairs. So getting that good in all your patients, just like the rest of their body is important, and keep their bone marrow density up. Any other questions? Yeah?

AUDIENCE: Wouldn't vaping cause the same issue?

JOHN A. GRANT: You know, that's a good question. Any nicotine of any source, so it depends on what they're vaping, right? So nicotine of any source is the problem. It's not the smoking itself. That's bad for a bunch of other things. But it's the nicotine. And so what patients-- actually, I should have clarified it. They need to be off smoking. They need to be off gum. They need to be off patch, because it's the nicotine that's the issue, not the method of smoking [INAUDIBLE]. So it depends. If they're vaping a nicotine containing solution, then yeah, that would be a problem, as well. Any else?

AUDIENCE: So vaporizing propylene glycol you don't think is a problem?

JOHN A. GRANT: I wouldn't say that's not a problem. It's not a problem from a nicotine point of view, but I wouldn't suggest that. I don't think vaping is a good thing. It's not a good adjunct or a separate thing from smoking, I don't think. Yeah?

AUDIENCE: [INAUDIBLE] stem cell patches [INAUDIBLE]

JOHN A. GRANT: So there's a lot of evidence in-- or a lot of interest in all these biological use in a lot of different things. So whether it's in the knee, whether it's in the shoulder, looking at things like platelet-rich plasma and PRP, mesenchymal stem cells, either from your own body or from other allergenic sources, like amniotic tissue or other things, there's a lot of research going on in that. The whole PRP thing has been going on for a number of years. We have more evidence in that as opposed to stem cells, because it's been around a little longer.

The best evidence for PRP in a joint-- and this is all still limited-- is for the symptomatic treatment of mild to moderate osteoarthritis. There's some Renwick's clinical trials, one or two, that have shown improvement symptoms for a period of time. Doesn't reverse things, it just-- in the shoulder, most of the literature has actually shown that PRP has been less than helpful in the rotator cuff, but there's been some studies show that it is.

One of the problems with PRP is that every different company has a different system that makes it. Is it leukocyte rich? At leukocyte poor? What's the amount of platelets in there, how much-- and even within a person, if you take a sample once a week for three weeks, their samples are different.

So any studies that involve PRP is like comparing apples and oranges. Do you activate it first? Do you make a little clot to put in there? Do you just Inject it in at the time of surgery, a week later, five weeks later? So all of these studies do all these different things, so there's no consensus.

AUDIENCE: So what about [INAUDIBLE]?

JOHN A. GRANT: So my understanding of the best available literature is that it depends on what you want out of it. For an intra-articular injection-- and this is away from the talk-- but for a knee arthritis, for example, you don't really want to set up an inflammatory reaction. So in general, the best results are leukocyte-poor into a joint. In an area where you want to have healing-- for example, tennis elbow, maybe rotator cuff, although the jury's still out-- perhaps leukocyte-rich is better, because you want to get some more inflammatory things in there to incite that healing response. That's a general overview that's probably reasonably accepted by most people, but it still needs a lot more work.

The stem cell thing is more up and coming. It's newer. We're very limited here in the US, because the use of stem cells in the US is limited to-- or is regulated by the FDA. And so it has to be minimally manipulated. And so we can take bone marrow aspirate out for stem cells and inject it right in somewhere else, into a joint perhaps. But we can't even take fat cells, where there's lots of stem cells, use collagenase to take the fat away, and concentrate those stem cells, and use that to inject, because that's too much manipulation.

In other countries, where the rules aren't quite as tight, it's being used more. But still, there's not enough literature out there to say for sure. I mean, lots of people are investigating it, and I think there's not-- again, there hasn't been any consensus at this point, because there's so many different types of things-- amniotic tissue, whether that's fluid, or if it's actually tissue from the amnion, versus stem cells from someone else, stem cells from somewhere else in my body.

So there's certainly stuff going on. Looking at it, we haven't got a good answer yet. Theoretically, yes, we just don't know. Any other questions? All right. So with that, we'll move on to a little quicker tour through shoulder instability. I didn't know how much time I'd have, so this isn't quite as detailed.

So shoulder instability-- basically, at some point, the humeral head disassociates from the glenoid, whether that's a subluxation or small shift, or a frank dislocation, where the head comes right out apart from the joint. Most of these are traumatic, involving some big sudden traction or end range motion of the joint beyond its tolerances. A lot of them are an external rotation and abduction.

For a anterior instability, that's certainly the most common situation, and this occurs mostly in younger individuals, teens, 20s, maybe 30-year-olds. And in that case, it tends to tear this labrum, which is a bumper of cartilage around the glenoid. And I'll show you a picture of that in a second. It also stretches those capsular ligaments or the bag around the joint, because if this big head is going to go away from the glenoid, it has to make its own space. So it's got to stretch something else to get there. And so if that laxity remains, that leaves this amount of motion in the joint for that head to slip out and not be contained.

You can get these atraumatic patient or patients with atraumatic sensations of instability. And this is maybe what the person alluded to earlier, where they may be a loose-jointed person, where the course of their life, their body may have accommodated to that and compensated pretty well. But then they may have some progressive atraumatic trauma or a small injury that's tipped them over the edge, and now they feel-- it feels not quite right. It feels unstable. It may not be popping out. It may never come completely out, but they don't trust it. They have an amount of apprehension out there.

As I mentioned, anterior dislocation is the most common, comes anterior inferior, like that's, typically in an abducted externally rotated position. The humeral head gets levered out of the joint anteriorly. Posterior dislocations-- much less common. Frank dislocations happen a lot with the sudden muscle spasm, typically with electrocution or epilepsy or seizures. But we can see a lot more subtle instability posteriorly. Athletically, one of the big populations we see is in football lineman, where coming up into a straight shoulder blocks, and they get this constant directed force towards the posterior part of their shoulder. And over time, that stretches out a little bit, and a little bit, and a little bit, and gives them that sensation of not being quite right.

Inferior dislocation is pretty rare. Multi-disc-- multi-directional instability tends to be these people with connective tissue disorders, for the most part, whether they're really low on the spectrum or have identifiable diseases like Ehlers-Danlos or Marfan's. So just a quick view from the anatomy-- so here, we're looking at-- this is a shoulder, a left shoulder, as if you're looking at it in the [INAUDIBLE], with the humerus taken away. So superior, inferior, this is anterior and posterior.

Subscapularis would be here in the front, and we'll start with the rotator cuff muscles around the top and [INAUDIBLE] the back. Glenoid is here. The labrum is this rim of cartilage that encircles it. So if the glenoid is fairly flat, like a plate, the labrum makes it a little bit deeper. So it's now like a cup, and gives some more of that stability to it.

Along with the ligaments or along with the capsule, there are also specific ligaments, primarily in the front-- superior, middle, and inferior glenohumeral ligaments, that help maintain this humeral head anteriorly. And these are the ones that get stretched out as part of this pattern of injury. When we look at a specific dislocation, anteriorly, the most common injury is called Bankart lesion. Basically, it's an avulsion of usually the anterior inferior aspect of the labrum, along with the stretching of these anterior inferior ligaments in capsule.

So who gets it? It tends to be young, active people, a lot of people with their arm up here, doing big, exciting things, typically. As we've said, it tears the labrum and stretches the capsule out. We get this Bankart lesion. The other thing that can happen is that, as the humeral head comes out at the front and comes out all the way, the body tries to contract all the muscles to pull it back into place, because it knows this isn't right.

The problem is, as it consumes, it comes out, it moves a slight bit medially. And as that muscle contracts, the humeral head impacts into the anterior aspect of the glenoid and gives you an impaction fracture in the back of the humeral head. This is your classic Hill-Sachs lesion-- so this impaction fracture in the back of the humeral head. That can lead to problems, especially if it gets really big, or depending on the position that the shoulder went out. Because it can actually take away some of the articular surface of the humeral head, therefore decreasing the amount of articular surface facing the glenoid, making it easier to slip out at the front over time.

This is not a specific cut-off, but when we think about shoulder dislocations, most people under 40 or under 30, when they dislocate their shoulder, will get a labral tear and some stretching of the capsule. But whenever these injuries occur, it's always the weakest link that gets injured. So as people get over 40 into 50, the rotator cuff tends to be the weaker link than the labrum. And so more commonly, in these patients who dislocate their shoulder, we're concerned more about a rotator cuff tear that's occurred than a labral tear. And so thinking, keeping, that in your mind, if you see a patient in your office who has a dislocation, and they're 50, you should also be thinking rotator cuff tear in this patient, not just labral tear, and things like that. OK?

High incident of recurrence, especially in these young athletes who are going back to high level activities. Incidence of recurrence in teens to 20-year-olds can be anywhere between 50% and 100%, depending on which study you watch or look at. This is increased or more predictable, obviously, in contact sports, potentially overhead sports. We need to be concerned about that.

And so there's a lot of discussion now in these young athletes. Once they have had a dislocation, should they automatically have surgery as soon as they have their first dislocation? Well, maybe 50% of them will have. So if you operate on everybody, there's 50% of people who might not need surgery. So I think it's debatable.

We have this discussion with our patients, especially these athletes, all the time, who are looking at their timelines to get back to sport, and are worried about having another dislocation that sets them back again. In my practice, I'm usually pretty happy with saying, let's try it the first time, see if you rehabilitate, see how things go. I think if you have a second dislocation, the writing is probably on the wall, and we should talk about having it done, when you think the right time is. But that's what I do.

Recurrent instability certainly is annoying. It's amazing, actually, how many people put up with this, and will come to see me, oh, it's been popping up for three or four or five years. What? Why do you put up with that? But they do. They learn to put it back in themselves, or they learn that it shifts a little bit. And they just come up to the wall, and they'll go, [BUMP]. Oh yeah, that's better, yep. And they go back, because they don't want the downtime. They just felt it's something that happens.

Then it gets bad enough that they roll over in their sleep, and it dislocates. And they kind of figure they need to have something done about it. The problem is, every time this ball comes out of place, that's abnormal stress on your shoulder joint. You're stuffing up that cartilage, so the more this happens, the more likely you are to get degenerative changes that lead to arthritis down the road. And so I think treating that as just becomes recurrent is important.

Rehab-- very important, early on to help prevent recurrence, but also after the surgery, to, again, help prevent recurrence. You can never make people normal like they were born. We try to make them as close to that as possible. As much as people might say, I'll make you normal again, they're lying to you, if they are.

Quickly, through what we do here-- so the goal is a repair, basically to re-attach that labrum up under the glenoid, tighten up that tissue in the front, so this ball doesn't have anywhere to go. It's going to stay maintained in the socket, OK? A lot of times, in addition to repairing the labrum, these ligaments in the front have been stretched. They're not frankly torn, so we just don't sew them back together. They're stretched out.

And so what we need to do is take that redundancy of the capsule. So we will basically pleat up that tissue in the front to take that redundant capsule away, so there's nowhere for that bone to go and slip out. Originally, this was done, like a lot of our procedures were done open, before the real advancements of arthroscopic instruments and tools, here through the front. Take the deltoid out of the way. You either take down or split the subscapularis to get down in the capsule. You find this edge of the labrum in here, and then you're sewing it back onto the glenoid, right here.

Now most people will do this arthroscopic. We can do that through three small incisions in the shoulder, about a centimeter each, OK? We've got special devices that fit down these little cannulas, that we can pass these sutures, and small anchors that can go into the glenoid to fix it back in place.

This video is of what we call an engaging Hill-Sachs lesion. And so as you see this, you'll see how big the bony defect is in the back of his head. And during surgery here, what I've done is taken this patient through an external rotation range of motion here. And you'll see that this bony defect will become facing the glenoid. And then eventually, it will slip right off the front. And so you'll see how this big defect actually leads to a higher rate of recurrence, because there's not enough articular surface side to side. See if this is going to work here.

So the camera is in the back. This is the back of the humeral head here. This is all actually missing cartilage. The normal area back here doesn't have any cartilage on it. The teres minor is back there. You'll see this delineation right here. This area here should have all cartilage on it. And you can actually see this is some of the inferior glenohumeral ligaments down here. Teres minor is attaching to the humeral head here.

OK, now we're going to rotate. Here's articular surface. This Hill-Sachs lesion is coming into view. Glenoid here, boom, off the front, comes right down. So this big wedge of bone is actually missing. Now I'm going to reduce it.

AUDIENCE: How old is he?

JOHN A. GRANT: Cluck. Ah, 25, 30? So this is a patient with this injury that, just tightening up the stuff in the front, not going to be adequate. With this amount of bone loss, he basically comes to here, and the shoulder pops out without any force, just basically rotating the shoulder around.

And so in these severe situations, we're looking at trying to replace that bone, to replace the curvature of the humeral head, so we can actually get normal motion. That becomes, obviously, challenging. We're looking at allograph bone with cartilage on it to get him to heal in there. But without doing that, this thing is going to come out over and over again, regardless of what we tighten up in the front.

All right. So going through a repair, camera is in the back, looking towards the front. Humeral head is on the left side, glenoid on the right here. This labrum should be right here. You can see frayed and all beaten up, and there's not really a good bumper along here.

One of the things we'll do now-- a lot of times as this tears off, it slides and retracts medially away from the face of the glenoid. So it's not really helpful. So what we want to do is free up that tissue to bring it back and attach it to that front of the glenoid, to act as a good bumper. I've got this little knife or probe device here. We're stretching it off where it's been stuck down, since it's been injured, freeing it up so we can pull it back up into place.

You can see how worn and frayed the front edge of the glenoid is here. This should be nice and white and shiny, just like this. It's been beaten up from recurrent subluxations or dislocations out at the front.

This here-- so we've just got-- this is through a small cannula. That's about a five-millimeter cannula in the shoulder. We can see the plastic cannula coming in. So here, this labrum has been stuck down, medialized, and not functional. So we're trying to free it up from the anterior aspect of the glenoid, so I can actually pull it up and put it onto the surface of the glenoid. At the same time, we'll put a little shaver down in that interface, scuff up the bone on the anterior aspect of the glenoid to get a good healing bed, so this sticks back down in place.

So now we have these special suture passing devices that couldn't go in there through this cannula. They're like a darning needle that goes through this extraneous tissue, passes a couple of times to make those pleats. We take those sutures out, and we can pass it through an anchor that goes down into the bone. So here, we are just passing it through part of the tissue in the front, curving it around to pass your stitch through there.

You can see another example of it here through the tissue. In this case, the anchor has already been put in the bone. This black suture will be used to shuttle one of these sutures back through this passage in the tissue to pull this back up onto the bone. This is some animations of how this is done. So basically, you're putting these sutures to repair the labrum back up here. The tear is through here. These passing devices pass the stitch through this tissue up in the front, and that's tied back down.

In most cases, these anchors are somewhere in the range of three millimeters in diameter, so they're very down into the bone. And again, same sort of thing-- the anchor's in here. OK? And we can now build up this robust bumper on the front. It doesn't look that impressive, but it plays actually a big role with a tightening up coming up. These are the anchors.

So one last slide on current and future trends-- one is we talked about who do we fix? Do we fix people right away once they've had an instability event? Do we wait and see? Is that based on what their sport, what their symptoms are? Still lots of discussion about what could go there.

When do we let them go back? One of the challenges with arthroscopic surgery is, because the incisions are so small, people start to feel pretty good pretty early. The problem is the biology of healing on the inside certainly is the same as it was when we did it open.

And so it takes a lot longer to heal than it looks like on the outside. So a lot of times, we're reining people in and holding them back, because they feel like they can go back. But we know that the risk of recurrence of recurrent injury is much higher if they go back too soon. So we've got to find ways to say, oh, you've got to work a little bit more on this rehab and do a little bit more of this functional activity, just buying time, until it's healed enough inside.

In this case, where the shoulder's stretched out, how much do we tighten it up? If we overtighten them, we increase the compressor fractures of-- compressive force on the shoulder, and that can lead to actually overuse, overstress, and arthritis. So we don't want to tighten them up too much. But how much is enough, and anchor stuff, all that sort of thing? That's about it. All right. Questions? Yup?

AUDIENCE: Undetermined, like you said, [INAUDIBLE]

JOHN A. GRANT: That's unfortunately the art of medicine in this case. So if there's patients who are having-- perhaps who haven't had a frank dislocation and just have these mild symptoms of instability, a little bit of looseness, we'll probably tighten them up less than someone who'd had a big, traumatic episode, where the ball's come right out and it's basically doubled the size of the glenohumeral joint. But it truly is a little bit of an art most of the time.

Most people get the same amount of tightening, but some of those things will depend. If they've already got a little bit of mild wear in there, I may be a little less aggressive with the tightening. Because I know if I increase the tension on the joint, that wear will be accelerated. So we may not tighten them quite as much, and then counsel the patient, this is what your shoulder looks like on the inside.

And all these patients will see all their pictures after surgery, so they get to see what it looks like on the inside. And I'll say, you may want to do some activity modification and decide what's best for you long term, as opposed to going back to the sport that's going to continue to beat this up. So some of those things play into with the counseling and discussion with patients about what it looks like on the inside, versus what their goals are, how old they are, what their goals are down the road.

AUDIENCE: How long do you expect to take for the tightening to normalize? I mean, you tighten the joint up, and then you expect it to get to a certain [INAUDIBLE]

JOHN A. GRANT: Yeah, so typically, the return to play times here are, getting back to football, something like that, are usually with six to seven months after instability surgery. And so the stitches, like in the rotator cuff, the stitches are there basically in the short term, until the body heals itself back together. So once you pleat up those tissues, the goal is that those pleats stick together and remodel in a shortened fashion, so that they're now less capacious, I guess, in the front.

And giving that labrum enough time to stick back down to the bone, so that they're not dependent on those little stitches to keep it from falling apart again. But they're stable sort of at six to seven months. But by the time they get their strength back, the rotator cuff strength back, their functional and dynamic strength back, currently, the thinking is about six to seven months.

AUDIENCE: It's a little bit off topic, but with the knee, I've been noticing several patients that are unable to straighten their knee out. And it seems like the surgeons are overtightening these [INAUDIBLE]

JOHN A. GRANT: In which case? In ACLs, you mean? Or what particular procedures?

AUDIENCE: Knee replacements.

JOHN A. GRANT: Yeah, I don't do knee replacements, so I won't stand up here and the profess to say I'll be able to tell you about that. But that can happen if they overstuff the joints. So if the spacer they put in there is a little bit too tight, most arthroplasty surgeons will assess that at the end of their procedure.

AUDIENCE: [INAUDIBLE] overtighten [INAUDIBLE]?

JOHN A. GRANT: Well, not really. I mean, you need to get it right, because if it's too loose, the joint is sloppy, and it doesn't feel right. If it's overtight, like you said, you don't get motion. You get increased pain. You get increased wear. That's going to decrease your outcomes, as well.

AUDIENCE: Yeah, [INAUDIBLE]

JOHN A. GRANT: Well, now that can be a different thing. That could be quads activation problem, if it's an active issue. If they're stiff and can't get there, then that can be a stiffness-- can be overstuffing the joint during arthroplasty. Or if they don't get counseled adequately post-operatively about positioning of their knee-- people love to put a pillow in the back of the knee. It's the worst thing to do. The joint loves to be at 30 degrees. But if it stays like that for a long time, it's going to stay stuck there.

And so patients should have their knees out straight right from the get go, pillow under their calf and heal, for any knee surgery at all. Because it quite quickly can get contracted in that position, and it becomes painful to try to get the knee straightened out. So there's a number of different facets that can lead to lack of full extension after any particular knee surgery. Any other questions? Yep?

AUDIENCE: In the first time dislocator, what's the role in mobilization? Do you keep them in a sling for four weeks?

JOHN A. GRANT: Yeah, so typically, in my practice, I'll put them in the sling for five to seven days, just enough to let that initial inflammation and pain settle down. And then I'll start them with therapy pretty much right away. There are some studies that suggested that if you put them in an external rotation brace early on-- this was a Japanese study-- that that theoretically put that tissue anteriorly on tension to allow it to firm up better.

As is with a lot of these studies where there's new thoughts, the person who reports it first gets the best results, and no one's really been able to reproduce that. Right? Because the thought is if the labrum tears off and retracts immediately, that's a problem. If you externally rotate them, maybe it won't retract medially, and it will scar back down where it's supposed to. The evidence is mixed.

And so I don't think immobilizing for a period of time helps improve their risk of-- or decrease their risk of recurrence, I think. I basically will use it for a period of time to help the initial inflammation settle down, make them comfortable, and then start them into guided therapy, so they can do the right gentle motion exercise early and not aggravate-- really work on getting that rotator cuff strength back, that dynamic stability, to help prevent recurrence. Another question? Yep?

AUDIENCE: What are your thoughts on the Sully brace for the secondary or the [INAUDIBLE] football player [INAUDIBLE]

JOHN A. GRANT: Douglas cuff stuff?

AUDIENCE: Yeah.

JOHN A. GRANT: So none of these shoulder-- because the shoulder is so unstable and multi-directional, none of these braces work great. It depends on your athletes. So a lot of times, in the linemen, we'll use that Douglas cuff that attaches to their shoulder pads. The Sully is reasonable for other people who are more position players, hockey players, things like at.

I mean, at the end of the day, you're trying to put a strap around the skin that's going to try to prevent excessive rotation of the arm. It's like a check rein. It's like ankle tape. It's going to get loose over time. It's not attached right to the bone, so it can't perfectly fix it. I think it acts more like a check rein to remind the patient. I think it can probably decrease mild to moderate aggravations of it, because it keeps it from doing that. But if someone's doing a straight arm block, and that running back's running right by him, and he's going to take the arm like this, the Sully is probably not going to prevent it from coming out again.

AUDIENCE: Do you put anybody in it, like returning [INAUDIBLE]

JOHN A. GRANT: Yeah, we do.

AUDIENCE: [INAUDIBLE]?

JOHN A. GRANT: Yeah, a lot of times, especially the linemen, we'll put them in a Douglas cuff for sure. Whether they've had surgery or are recovering and trying to get back without surgery, we'll use them. The Sully, we'll use more in the position players, if they need to be able to reach, to do things like that, so it's not the less restrictive. But I don't think we've got great research to say it reduces the recurrence rate, but I think it's something we can use, both for them mentally and for us to think, well, maybe we're helping a little bit. Another question? Yeah?

AUDIENCE: You said six, seven months for your [INAUDIBLE] return.

JOHN A. GRANT: Yep.

AUDIENCE: What about for your overhead or for [INAUDIBLE]

JOHN A. GRANT: I think that that's probably about the same, maybe a little bit longer. But we'll get them certainly into a very well-defined interval throwing program as part of that couple of months before they going back, right? So they start with the easy short toss, step back a little bit further, you increase the distance. Then as you increase the distance, you increase the velocity. So they've got this progressive program of going back.

And as long as they think they go through a good stepwise progression like that at the proper time, and they've got the right strength before they start that, I think that's OK. Whether it's going back to contact football or throwing, I think they have this similar stress on the joint, but in different ways. So I think as long as you do the appropriate rehab, I think they can still get back at that time. Will they be at maximum velocity by then? Questionable. But I think if they can start doing stuff, well, then I think that's reasonable. And other questions?

AUDIENCE: Yeah, I was wondering--

JOHN A. GRANT: Sure.

AUDIENCE: As a practicing podiatrist, I've actually seen a lot of auto no-fault cases, especially where people allege progression of a shoulder injury or nuance of a shoulder injury in relation to a rear-end motor vehicle impact, side impact. Sometimes, it's very difficult to get on top of it and prove or disprove what happened when. But one of the arguments I'll see is the down-sloping acromion may have some impact on that type of injury. Comments? Experience?

JOHN A. GRANT: I think, from an instability point of view, I think if the person says that they had their hands on the steering wheel, and they have posterior instability symptoms, especially from a rear-end or front, I think that's reasonable, because they can get this axial loading. Anterior instability from a car accident-- I find that a little bit harder to justify, I mean, unless they're driving along with their arm around their honey over here, and they get rear-ended, and the shoulder [INAUDIBLE]-- reasonable. That probably doesn't happen in most cases.

So I think you really have to, without prompting them, say, well, what-- as best as they can. They're going to say, I don't remember. But what was going on in the car when this happened? What position were your hands in? What were you doing? And try to correlate that with the mechanism of injury, and see if it's plausible or not, right? If their hands were on the steering wheel, and they're saying that they have increased anterior instability, unless the steering wheel got ripped off and went to the backseat, it's probably not going to be associated.

So I think you got to do a little sleuthing. And of course, in this population, you have to be very careful about not leading them, and say, just tell me about what you think happened. And then do your assessment to figure out where their symptoms are and see if they pair up or not. And sometimes they so. Sometimes they don't.