

[MUSIC PLAYING]

RICHARD

So Holly wanted me to talk about how to evaluate knee pain. Sort of take a step back and really not lose sight of the forest for the trees. So let's go ahead, here.

KANG:

And our objectives for this talk is to learn how to work up knee injuries, first of all. And then come up with a differential diagnosis for knee injuries. And then, very important also, is-- especially in our health care environment now-- is to talk about indications for advanced imaging. Also non-operative management modalities as well as when to refer. So these are very important questions to answer.

So first of all, I think that any work up really is just as good as your history taking. So it's really important to get a good history on your patients. Start out with some things like knowing the age, how did it happen, who, what, where, and why. You kind of want to answer all those questions. And you know you can get some answers right away.

You want to know if there's any swelling. You know sometimes it's good to know whether it's rapid versus gradual, because that can tip you off to, you know, what you're thinking right away. Is there any mechanical issues, like locking or catching? And so forth. Is there any instability? And have they had any prior tests or evaluations done to the point of seeing you?

It's always good to know their medical history. You can get a good idea of what you're addressing when you're looking into a patient. Not just in the knee, but also overall as a patient in terms of taking care of them as well. You also want to know if they've tried any other treatment modalities. So I always find out if they have tried any medications, injections, PT, and so forth.

All right. So the physical exam-- typically I do this in different positions. So I start with a standing or gait examination. You can tell a lot from how the patient walks. So one thing that I'll often do is just watch the patient as they walk into the examination room. You can tell a lot of information just from that.

You want to take a look at their knee. So one of my pet peeves is seeing a patient in jeans and, you know, a resident coming by and saying, oh, yeah, I took a look at the patient's knee. And I'm not sure if they did, because you know you can't really roll the pants up. So you kind of want to make sure that you actually see what the knee looks like. You can tell a lot from that as well.

And then, you know, start with inspection and palpation, go on to range of motion, then you go on to your stability exams, and then your special tests. I think I like to do it in that order just so that you can ease the patient into the exam. You don't want to go for the home run right away. You want to get them kind of use to you as an examiner first.

Another point I'd like to make is that I do like to test the contra lateral knee first, too. I think that just gives the patient an idea of what you're going to do to their injured knee.

All right. So imaging I use it in my clinic almost like a stethoscope. So for me it's kind of like the first thing that I look at. But there are certain criteria to review. And I think one of them is the auto indications for radiographs in an acutely injured knee.

And here is kind of what they look like. So you know, age greater than or equal to 55 years old, anyone with isolated patellar tenderness. Tenderness is at the head of the fibula-- as well as inability to flex beyond 90 degrees and so forth. And obviously anyone who has difficulty bearing weight.

So some of the images that I like to get initially are bilateral weight bearing standing views. Here's an AP on the left. And I think it's important to get weight bearing views if they can weight bear, because I think that gives you an idea of how they're loading their joint, you know, versus someone who's supine and not loading. I also get that image on the right. And that's called a skier's view.

There's many different names to a skier's view, merchant-- or, I'm sorry-- a tunnel view or a Rosenberg view. And that's typically when they're kind of in a bent position about 30 degrees flexed and still weight bearing. And what that tells me is how they're weight bearing especially in the posterior aspect of the knee. So that kind of rolls the knee back so you can see how that articulates there as well.

On the left is the merchant view. And I think that tells me a lot about how that patella is sitting in the trochlear groove. Also tells me if there's any patellofemoral issues in terms of joint space lost and so forth. Of course a lateral view. It's always good to get orthogonal views whenever you get x-rays.

OK. So laboratory studies-- you get this in selected patients. You can get those that you suspect aseptic arthritis. A serum study of ESR, CRP, and CBC. I think the best study to get-- really, the most specific way of doing that is to do an arthrocentesis. And here's an example of what that looks like there. And typically what you get is-- in that study-- is cell count and differential. You want to, of course, check for any bacteria in their cultures, and then do a crystal analysis.

So I mean there's different ways to come up with a differential. I think one way is to look at the location. Right? So where does it hurt? And I think that can tip you off in terms of how to focus your exam. You know, so if someone's pointing more anteriorly, you're thinking more patellofemoral, maybe patellar tendonitis. Someone is pointing towards the joint line, then perhaps you're thinking more arthritic versus perhaps a meniscal tear.

You can also look at it by age group. Right? So you know in children and adolescents you're thinking something different than an older adult. Obviously you won't suspect arthritis in a 15 year old kid. And I think the corollary for that would be you can't really suspect something like Osgood-Schlatter in someone who's 60 years old or older. So that's another way to look at it.

And I think, of course, it's good to know how to break it up in terms of urgency. I think it's not really a question of whether or not to refer to an orthopedic surgeon when you see that picture on the top right. So open fracture, send it off right away. All right? If you see a dislocation, you know especially-- obviously the irreducible dislocations, like you see in the bottom right. That probably needs to be sent off as well.

One thing I want to say is that with dislocated knees-- if you see a dislocated knee, don't take all these x-rays. You know it's already dislocated. I think one of our pet peeves is when patients in the ER get like seven x-rays to evaluate whether or not their knee's dislocated. If you look at it, you know it's out. Right?

So pull on it. You know see if you get it back in. You know, because that's really important, because the patient's neurovascular status is really going to be compromised. And it can mean the difference between, you know, having that limb survive or not. So just pull on it as hard as you can and get it back in. If you cannot, send it to us right away. Of course any neurovascular compromise you want to send off, and septic arthritis.

So septic arthritis kind of looks like that. You know big, red, hot, swollen knee. They have abrupt pain and swelling with no antecedent trauma. So that's very important to know. Nothing really occurred to cause this. So you're thinking right away, perhaps septic arthritis. It can occur in any age group. OK? So and especially those who are immune deficient. So if you have someone who's diabetic, has AIDS, this might be at the top of your list.

In your exam it's classic for a patient with this to have pain on short arcs. OK? So if they can't really move their leg, you're thinking it's probably septic arthritis. Studies like this I mentioned before you want to do a tap of the joint. And typically in a native knee, the white blood cell count is going to be greater than 50,000. OK? And of course you want to do a Gram stain and so forth. But I think, you know, that plus the neutrophil count gives you an idea of whether or not it's infected or not.

One caveat to this is that let's say someone has a prosthesis. So let's say they've had a total knee arthroplasty in the past, the number is not 50,000 anymore. Studies have shown that the number is 3,000. So just be aware of that. So when you see 3,000 on your joint tap and a white blood cell count in a patient who's had a prior arthroplasty that's when you think septic arthritis. So very different than a native knee.

Non-operative management-- nothing, really. You want to send it immediately off to the orthopedic surgeon to wash that knee out. So kind of similar in presentation, you know, is crystal-induced inflammatory arthropathy. Gout- pseudo-gout falls under that category. And you can see how the history and exam kind of looks very similar. Right?

So it's important-- part of your, you know, study to actually send the fluid that you tap off for crystal analysis as well. So that way you can sort of, you know, discern whether or not it's something that's crystal induced versus something else. You'll see that there is some overlap in terms of the white blood cell count, so you know 50,000 to 75,000 is kind of that borderline area. And if you get some crystals, then it's probably more likely to be crystal induced.

And of course there is some non-operative ways to treat this-- NSAIDs, colchicine, and so forth. And sometimes injections help as well. Diet is important. So I personally don't want to have this, because, you know, if you have this you'd have to avoid red wine and meats, and that's not something I want for myself. So--

[LAUGHTER]

--referral, you know, just as needed.

All right. So let's not forget that you can also get knee pain from the hip. So in pediatric patients you're thinking SCFE. You know if you have a child or teenager that is obese, and has no history of trauma, and they have this vague, you know, history of knee pain, you're thinking, OK. Well, could it be the hip?

And they typically present with the hip flexed and externally rotated, or they'll have something called obligate extra rotation on your exam. And you can see that it's really hard to get them internally rotated. Sometimes you know their knee exam is usually normal, so you're thinking that maybe I should take an x-ray of the hip.

You can see an example of that on the right side where the patient has an AP of the pelvis and can see a Klein's line. That's a way-- one way of measuring for SCFE. You can see how that epiphysis has moved.

So you can also get a lateral in your studies. And you know, if you see this acutely, then you do want to send it to an orthopedic surgeon to get that fixed. OK? In chronic cases you probably don't really need to right away, but certainly in the acute study you do.

All right. So another thing that kids can get is patellar instability. And typically you get a young female with multiple giving away episodes or one big episode that they've come in with. The typical way of doing this is twisting your upper body on a planted foot. So I get people who are dancers, who do a spin move, and somehow this comes out.

So in an exam you'll find that they'll have an effusion-- especially if it's acute. And then they also present with patellar apprehension. And I'll go through all this-- you know if some of you guys are coming to the knee exam workshop later, I'll definitely go through this in more detail. But here's a just quick idea of what you'll find their.

X-rays-- you can get the different views, like we discussed before. Certainly you can certainly see some lateral translation of the patella in relationship to the trochlear groove on your x-ray and your merchant view. MRI's good to get, especially at that first injury or of a dislocation. You want to rule out any loose bodies, contra injuries, or meniscus tears. Because if you have something like that, that may make it more prudent to send it off to an orthopedic surgeon for operative management.

You also get a CT scan for those who are recurrent dislocators. That way I can measure something called the TT-TG, or the tibial tubercle groove distance. And that gives me an idea of whether or not I would need to do any bony work in addition to the soft tissue work that I would do.

Non-operative management for patients-- typically those who are first time dislocators without any positive MRI findings. NSAIDs, PT and bracing are good ways to start out. And then, again like I said before, referral if you have any MRI findings or recurrence.

So OCD lesions-- you know you can have both pediatric or skeletally immature versus skeletally mature patients. And they kind of have a different algorithm in terms of management, but what they present with is you know poorly localized knee pain. They may have locking or catching episodes, especially if they have a loose body that's come off from that. Typically they have effusions that come and go. So there are days when it's not so bad, and then there's other days where they're more active and their knee blows up.

X-rays-- you can see an example of that in top right. Where typically you'll find it in the lateral aspect of the medial femoral condyle. You can see that lesion right there. An MRI is also helpful in terms of determining the stability of the lesion.

Non-operative management I think I really reserve for children, or skeletally immature patients, as they do, in most cases, tend to get better. So NSAIDs, crutches, and activity modification helps. You refer in adults as they tend not to do as well with non-operative management. Anyone with an unstable lesion, and of course anyone who's failed conservative measures.

So patellar tendonitis is another common injury that young patients can get. Typically in teenage males who are in their growth spurt. And they have pain in the anterior aspect of their knee. On exam you'll find focal tenderness right at that patellar tendon. And then sometimes they'll have pain with resisted knee extension.

Studies are not really indicated. I think x-rays or MRI you don't really need. So that MRI in the right is from a research study that I did on the Chicago Bulls. And you can see that almost all of them had something in their knee.

So you know that's very typical for any athlete. You'll find-- if you look for it, you'll be able to find it. In this case you'll see just classic jumpers knee or tendonitis in the patella. So in non-operative management, NSAIDs, PT, and activity modes, and referrals as needed.

So Osgood-Schlatter-- typically a teenage male that's between 13 and 14 years old, or a female around 10 or 11 years old. And they'll get this intermittent anterior knee pain that worsens with activity. So on exam they're tender and sometimes swollen at the tibial tuberosity. And again, you can elicit that pain with active extension.

Studies I don't think are really necessary, but if you have a patient that presents with atypical type pain, then I think that x-rays are fine. No need for an MRI in this case. So non-op management, again, NSAIDs, PT, and activity mods, and referral as needed.

So ACL sprains-- of course there's different gradations of that, but certainly a patient who has a full on rupture will have a pop sensation-- hearing or feeling it-- with a non-contact force. So that's important to get in your history. Was it contact or non-contact? Typically these are patients that are non-contact.

And then, again, you know you want to note when that swelling occurred. They typically report getting swelling immediately within the first couple of hours. On exam it very often is limited, because they're guarding against you. But if they're not guarding too much, you can get allotments. Sometimes you'll get an anterior drawer and a pivot shift.

One thing to note is that the Lachman is the most sensitive test for an ACL, whereas a pivot shift is the most specific. All right? So x-rays and MRI are certainly things that can use to evaluate for this, and any other concomitant lesions in the knee.

I think that non-operative management is somewhat dictated by how active the patient is, as well as what their expectations are. So certainly an 18-year-old male basketball player is going to be very different versus a 90-year-old grandmother who doesn't really do much. So you really want to discern that as well in terms of determining whether or not they would be a good ACL reconstruction candidate.

I think referral can happen within the first couple weeks. And initially I would give crutches just to get some weight off the injured knee, and also a little PT. Some-- what I call pre-hab just to normalize the range of motion and gait.

PCL injuries can also occur, where you have, typically, a direct blow-- so like a dashboard type of injury or a hyper-extension injury. And another thing to know is that if the patient falls and injures their PCL it's usually associated with ankle plantar flexion. So on exam they'll have a joint effusion. And different tests that you can elicit this with is a posterior drawer test, posterior sag test, as well as a reverse pivot shift. X-rays and MRI again are useful.

And you know, a little bit different than your ACL injuries, I think PCL Injuries tend to do, for the most part, pretty well if it's an isolated injury to the PCL with non-operative management. So there's a lot of NFL players that are running around playing professional sports with a PCL injury and never needed a surgical intervention. So that's one of the main differences between ACL and PCL.

I think you consider a referral if they have any concomitant injuries. So if it's a multi-leg patient, if they have meniscus tears, you know a big avulsion fracture right at that-- you know insertion site of the PCL, or if they have persistent instability. All good reasons to refer.

MCL sprain-- very common thing. You know I think this happens with a misstep or a collision with valgus stress on the knee. And the patients present with medial sided pain. And they'll have tenderness on exam right along the MCL and sometimes they'll have localized swelling.

You also want to check in terms of valgus stress testing at 0 and 30 degrees. The difference between the 0 and 30 is that I've-- the 30 degrees really isolates that MCL, where at 0 degrees you're getting the MCL plus some involvement from the cruciate. So if you want to just look at the MCL, 30 degrees.

Studies I don't think are really necessary for low grade injuries. But if you sense more instability, then it may behoove you to get x-rays and MRI. So for those with lower grade injuries, or even higher grade, you can try non-operative management first with NSAIDs, PT, bracing, and crutches-- unless they have a painless gait.

And then typically terms of return to sport-- I think that's sort of the general timeline that I give the patients there. You want to refer to an orthopedic surgeon when you have concomitant injuries. Like I said before-- multi-leg, meniscus, and so forth.

LCL is an injury that occurs with various stress to the knee. So the patients will have lateral sided tenderness. They'll have various stress testing that you can elicit at 0 and 30 degrees. And very similar to the MCL, you isolate that LCL at 30 degrees.

And it's good to know to really check for the peroneal nerve as a good number of them also get concomitant nerve injury, as well. And you can also examine their gait. So if you have a various thrust gait, then perhaps they have a higher grade injury-- especially in a chronic situation.

And I think studies, again, you know not really necessary for low grade, but if you suspect something higher, then x-rays and MRI are very important. Because LCLs can occur with posterolateral corner injuries, one thing I'll do in my MRI order is, in the comments section, put in you know posterolateral corner protocol just so that they can do different cuts of it, so they don't miss any other injuries.

Non-operative management-- immobilize for several weeks, then start an early range of motion program. In terms of referrals, any high grade injuries, of course any concomitant injuries, and avulsions, and of course instability that's persistent.

So posterolateral corner, or PLC-- that typically occurs in a traumatic fashion. And they're rarely found in isolation, so you definitely want to see if there is any other concomitant injuries-- ACL, PCL, LCL, and so forth.

There is various exam maneuvers, as you can see here. The picture on the right you see is the dial test. Place the patient prone and you can dial them out at 30 degrees, as well as at 90 degrees. If you get a dial test at only 30 degrees, then it's likely just isolated corner injury. Whereas you've dialed them out at 90 degrees, and they have a positive exam, then you're thinking PCL's probably involved as well.

So studies, x-ray, and MRI. Sometimes these patients have other injuries, not just the PLC, so-- and they're typically traumatic, so you definitely want to make sure if you suspect any neurovascular compromise, then you may want to order an MRA in addition to the MRI.

So non-op management are those patients with low grade injuries. I think PT and bracing are good ways to start. But otherwise, these are patients that I'd like to see sooner than later, because the literature has shown for those that needed surgical management that acute intervention does lead to better results than more chronic situations.

So extensor mechanism ruptures is another thing that patients can get. Especially those who are a little bit older. So patients will complain of a sudden pop in the front of their knee. They'll also have an inability to extend their knee. And generally, you know you think when a patient is less than 40 years old, more patellar. Generally if they're older than 40 years old, then more quad. Of course there's overlap, but that's some good general guidelines.

On exam you can find very often a palpable gap. You can feel that gap between the tendon and the bone. And they also have the inability to actively extend their knee. X-rays is probably all you'll need in these patients. No need, really, for an MRI unless you're suspecting any concomitant injuries.

The x-ray on the right, you can see that's pretty classic for a patellar tendon rupture. You can see how that patella is riding pretty high up. So non-operative management I think, really, not really indicated. So typically I'd like to take care of these patients right away within a couple of weeks. So if you can refer them into our office within a week, that'd be great.

Meniscus tears-- you can get different kinds of meniscus tears. You can get those that are acute versus those that are chronic. The acute type typically occurs with a sudden twisting injury, whereas the chronic type are those that are typically associated more with that spectrum of arthritis and some more degenerative. Patients may complain of locking and catching along with the pain and swelling that they get in their knees.

On exam you'll get joint-line tenderness. And sometimes you'll get McMurray's that's positive, as well. X-rays and MRI are indicated if you suspect an acute injury, or those who have mechanical locking or catching symptoms.

And I think non-operative management is really those with degenerative tears. NSAIDs, PT, injections, are good ways to go. Otherwise those patients who are younger and have acute injuries-- I think it's important to refer them on. Obviously patients with mechanical symptoms, or persistence symptoms, also are good to refer on to as well.

So let's not forget about arthritis. You know you'll see this in older patients with activity related knee pain and stiffness. Sometimes they get weather related pain. And pretty classic-- decreased range of motion, you know stiffness, crepitus and so forth on your exam.

I think x-rays are all you need. You'd be surprised I get a lot of patients who get MRIs only, and think they could have saved a lot of money if they just got x-rays first to rule that out. So non-operative management-- pretty typical. NSAIDs, PT, weight loss, and injections. And refer if they fail conservative measures.

Patellofemoral Syndrome-- patients are typically runners. People who present with anterior knee pain and perhaps pain with prolonged sitting. We call that the theater sign. And stairs are really tough for a lot of these patients. And it's more common in women than men.

On exam you can find crepitus in the anterior compartment. They sometimes have effusions. And what I do is really grind on the patella to see if that hurts. And you can also see how the patella tracks if you have them slowly extend their knee passively.

I don't think x-rays are necessary in this case. If you have a patient that's pretty classic in their presentation. Typically I will start with NSAIDs, PT, and-- you know plus-minus a sleeve versus injections. I think a referral, again, as needed.

Sometimes you get patients who have pes anserine bursitis. And as you all know that's where the sartorius, gracilis, and semi-T insert onto the proximal tibia. These patients have pain in that area with repetitive flexion and extension activities. And on exam you'll find that they have localized swelling and pain right there on the proximal tibia.

I don't think any imaging studies are really necessary for this. Again, non-op management does do well with PT, NSAIDs, injections, and referral as needed.

And finally, IT band tendonitis-- a lot of runners or cyclists get this. They'll get this pain that's more lateral right at Gerdy's or more proximal to that. On exam you can test for this with, you know, palpation right above the lateral epicondyle or you can do a dynamic test with a Noble test. Studies, again, I don't think are necessary. And I think non-operative management does well for a lot of these patients, and refer as needed.

OK. So if you have any questions-- I know I went through this very quickly, so if you have any questions at all-- or better yet, if you want to refer-- my email address is up there. So thank you very much for your attention.