

Injury patterns - part 2

So you can have injuries that happen in the lower extremity of the body, right, in your legs, injuries that can happen in the upper extremity of the body, especially your arms and appendages, and then injuries that can happen along the spinal cord or the vertebral column and the entire posterior chain. So those are some of the injuries we will discuss here. First and foremost, let's start with the lower extremity. So a few examples of lower extremity injuries. Let's start with the ankle joint. So you can have a sprain of the ankle, which is inflammation of the ankle tissue.

You can have Achilles tendonitis, which is the inflammation and damage to the tendon, the Achilles tendon that connects the calf muscles to the ankle. So this can happen because of poor control of the foot during movements or because of environmental impacts. If you're running on an uneven surface and you twist your ankle, that can cause sprains. You exert too much force during a jump and you might cause damage to the Achilles tendon, and over time, it can develop as a reuse, overuse injury in the form of Achilles tendonitis.

Next up is the knee. It is one of the most important joints in the human body and one of the most commonly injured ones as well. If you remember from the anatomy lessons, there are multiple ligaments that connect that form the knee joint. So you have the LCL or the lateral collateral ligament. You have the medial collateral ligament or the MCL, which is towards the medial side, so center of the centerline of the body.

You have the anterior cruciate ligament, which stabilizes the knee from the back to the front and the posterior cruciate ligament in the center. Now damage to one of these, just like we discussed earlier, is quite common in highly dynamic movement sports like football, volleyball, basketball, anything that requires a lot of cut, dynamic run and cut movements, for example, or movements in which you are landing and changing directions all of a sudden. It's very common injury that occurs and there is a lot of research that goes into just preventing ACL injuries. The primary cause of ACL injury is, I will just give the example of ACL injuries like how the joint dynamics dictate the kind of movement that can occur. So let's take this weightlifter's movements as an example and we look at how an ACL injury might occur.

So if you remember, the knee joint is predominantly a hinge joint, which means it can only operate about this axis. It can operate about this axis. That's not a straight line. Let's see if I can draw one. Some sort of axis like this.

So this is about which the knee joint can move. So this kind of a movement can occur. So if you're running or walking, you are predominantly moving the knee in the sagittal plane. So that is a relatively safe movement. Now imagine you had to do an exercise and your knee starts to buckle inwards.

So if I was taking this, if this person was taking this load and there is, and they're doing a clean movement, right, when they are moving upwards to this position dynamically, they might have a compromised biomechanics in the sense that they might actually move their knee inwards instead of retaining a neutral position. So if I was trying to bend this knee in this plane, I will cause a stress, a significant stress on the ligament here. And it might break. It might at least get damaged, which could cause swelling, broken altogether. Now this is the kind of movement you see in a lot of dynamic activity when you are, say, running straight on and then changing direction to tackle an oncoming football player, for example.

In that case, or if you are trying to recover from a rebound in basketball where you recovered the ball from the board and you are looking for the next opportunity to pass the ball to someone else in your team so you can score a point. But because of poor biomechanics, as soon as you land, the knee collapses towards the center line and you end up causing a ligament here. You can actually look up some of these famous videos of ACL injuries because they are pretty common. But fair warning, it can be a little queasy to watch them. If you're like me and you've ever run for extended durations of times, you might have experienced pain in the front of your shins, and they're referred to as shin splints.

So you can have it in the anterior or the posterior part here. So again, these are some of the common injuries. Of course, there are other injuries as well. That's beyond the scope of this course. But just to give you a flavor of what all injuries are commonly observed and where is a lot of this research going into these days.

For upper extremity, you have one of the common injuries is shoulder impingement. So because of the inflammation of PERSA, you don't have a decent movement in a certain range. So you cannot move your shoulder up to this point itself. So you might restrict your movement in this range and you might want to only move here or you might face no pain while you're moving your arms above your head. So the shoulders impinged, this joint impinged when you're trying to move in this arc.

So this is the arc of pain basically here. Similarly, you might have heard of tennis elbow, which is caused by the extensive muscles trying to cause the pronation and supination of the wrist. So the point at which they attach here, it faces too much stress because of overuse. And over time, you can end up developing what is called tennis elbow. So this is an overuse and muscle strain injury.

Microtears occur in the tendon over here, as you can see. And there's not enough time for you to recover from say one training session to the next and you end up causing long-term damage. Again, rotator cuff is a pretty important muscle group in moving your arms backwards and stabilizing. So rotator cuff injury can lead to long-term pain in movements

like bowling or in a tennis serve or tennis movements. So anything that requires dynamic movements of the upper body.

And of course, you can have wrist strains just because they could be caused mostly by acute injuries. So you lift something too heavy or let's say you're boxing and you make a strike and your form is not proper and you might end up injuring the ligament, loading the ligament first and the direction it is not designed to and then that might cause the injury. Then we have spinal injuries. So you can have pain in the lower back because again, perhaps the lifting form was improper when you were lifting something heavy, which can lead to poor recruitment of the lower back muscles, which can lead to injury over time. Similarly, because of improper loading along the vertebrae, the discs, the intervertebral discs can become herniated or protrude, which can cause a permanent strain in the muscles here in the back and that can lead to a different kind of an injury usually requiring some sort of surgical intervention.

And then of course, we have hinted at a strain in the neck muscles, which can lead to strains and sprains because of poor posture or because of improper use, poor posture during work or poor ergonomics. And lastly, I wanted to discuss just briefly the overuse syndromes. So there is this thing called runner's knee or patellofemoral pain or anterior knee pain. Usually one of the cases where you cannot diagnose it except by exclusion. So if all other conditions have been excluded, then it's most likely anterior knee pain.

We still don't fully understand the causes behind it. Iliotibial band is this band right here, which collects the ilium and the tibia and you can experience pain in these regions where this attaches or passes over the trochanter, greater trochanter head and at the knee joint. And then shin splints again overuse syndrome. Basically you end up putting too much stress on these muscles because of extensive extended periods of training without any recovery.

So no recovery. So we have looked at multiple conditions which can lead to injuries, the various joints and the kinds of injuries that might occur. If you notice the common pattern, it's usually the tissue that is injured is not either designed to take the loads in the directions the load is being applied in because of which it undergoes an injury. Like in the case of ACL injury, you have a frontal movement of the knee. So you have the knee abduction, which can cause the injury. Or it can be an overuse injury because of extensive loading of the tissue without recovery without enough time to recover in between.

So that could be shin splints, that could be your rotator cuff injuries. But then again, a rotator cuff injury can also be an acute injury because of sudden overload. So that brings us to prevention strategies. Some of the common ways you can prevent these injuries from occurring is proper warm up and cool down. So muscle tissue in particular requires blood flow for it to be properly lubricated and activated.

So it is always a good idea to do a warm up session before any activity so your muscles are loosened, are ready to take the kind of strain. It's basically just like we have to psychologically prepare for an interview, the muscles have to physiologically prepare for the excessive stress that is about to be applied on them. And after an exercise session, it's good to cool down instead of keeping the muscles in that excited state, physiologically excited state and continue to do loading activity on that. Strength and conditioning after proper warm up will help your muscles gradually adapt to the physiological loads that you're going to apply. Not just the muscles but also the other tissue, your bones grow stronger with strength and conditioning as well.

So you're essentially training the tissue to take loads and it is important to do it gradually. Further, you can focus on the skill acquisition and techniques. So proper technique of doing a particular exercise or a particular task or a particular movement in sport is important. And for example, if you are to take a rebound in a basketball match, then what is the right way to land if you acquire that skill and it becomes ingrained in your movement patterns, then you don't have to think about it and the movement happens correctly and in a way that will not cause the injury. And modification if some equipment is indeed causing you to move improperly, then of course that equipment has to be modified and then periodization and recovery, which means there should be an interval between your training sessions and exercises.

So you have to let the body recover and do its thing. The growth happens in between training sessions. The challenge is applied during the activity and the recovery is what brings you back stronger or the tissue stronger quite literally. Yes, we cannot go without saying that proper form is very important. So that is part of skill acquisition and technique and recovering between and of course, strength and conditioning and recovering in between sessions.

If for some unfortunate reason someone is injured and they have to be rehabilitated and they have to return to their original activity level, then it is most important that an early intervention be performed. After an injury happens, you should not wait. Immediate attention to the site of injury should be given. All the medical treatments and diagnostic procedures that are required from the physiotherapist, from the orthopedics and anyone involved in this process, that intervention should be done at a very early stage to stop the propagation of the injury further or to prevent further damage from that injury. Individualized treatment plans are important when you are undergoing physical therapy.

It's not like one single treatment works for everyone. Someone might be recovering at a rate of, in a week they might be able to show significant progress and it's unrealistic to expect that everyone who comes through a particular treatment program will experience the same level of progress in the same amount of time. So the treatment plans have to be individualized and targeted. Progressive rehabilitation is the other important thing where

you have to develop the plan for a duration of time and you cannot expect the injured person to just recover instantaneously, which means progressively increase their loading. So if they are returning to exercise movements, they should not start all of a sudden with the heaviest load that they could do or if they're an athlete, they should not start running the same distances they were before the injury.

Gradually start slow and small and then progress over a certain duration of time and that should be monitored by professional medical opinions. And return to sport is another fundamental thing in the area of sports science. So after an injury, how soon can an athlete return to playing the game? And that is one of the most common questions from all injured athletes who are anxious and eager to get back to the field to play with their friends and colleagues. Now it is important to quantify their movements, come up with objective criteria for that particular injury, whatever they face, and be able to quantify their performance and characterize their improvement over time to give a sound advice on when they should return to sport. It should not be just a completely subjective observation.

There should be some objectivization of the improvement metrics. So clinicians will typically do this with a multitude of equipment or performance metrics. So in conclusion, injury patterns cover a broad spectrum of conditions. They can be acute injuries.

They can be overused and chronic injuries. And understanding the characteristics of the human anatomy, right, the nature of joints, how the muscles are attached at different points, what are the loading directions acting on those joints or on the muscles or on the tissue itself will help us understand the causes of injury and then identify if a person is performing certain movements that are more likely to injure them and then develop techniques to avoid those injuries. And that's the entire goal of using quantifying metrics from movement science to develop improved movement patterns for individuals so they can avoid injury movement patterns. And with that, we conclude this section and I will see you in the next one. Thank you.