Biomechanics
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Lecture – 41
Ankle Muscles

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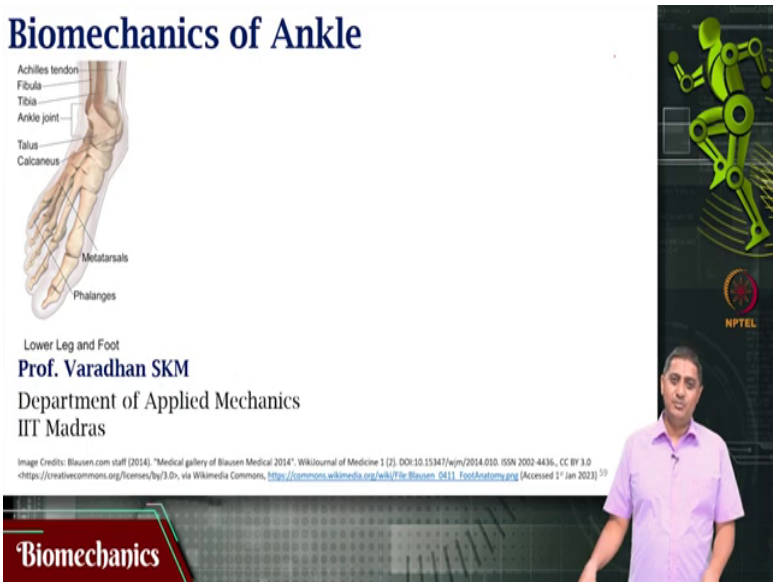

(FL) Welcome to this video on biomechanics, we have been looking at biomechanics of the lower limb, we looked at the hip. We looked at the knee and in the last video we looked at the anatomy of the ankle joint and the moments that are possible in the ankle joint.

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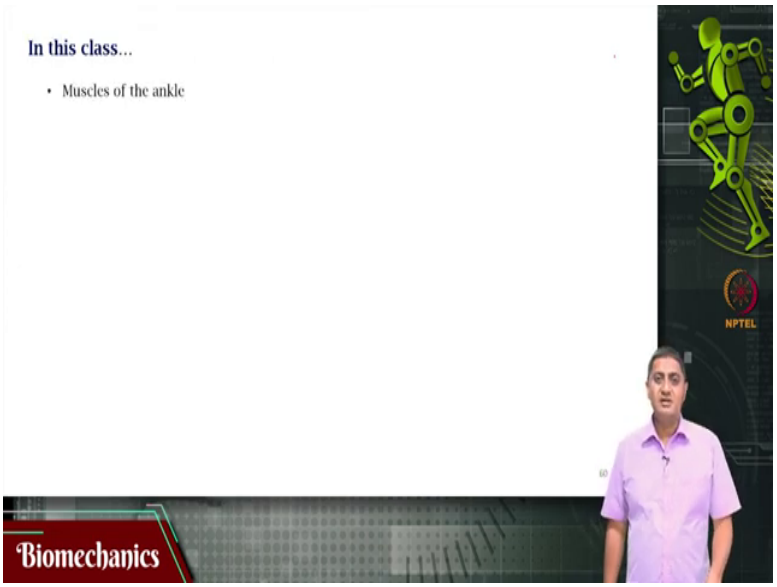

Now, a question is what are the muscles that are responsible or that cause these moments? So, in this video we will be looking at muscles of the ankle joint.

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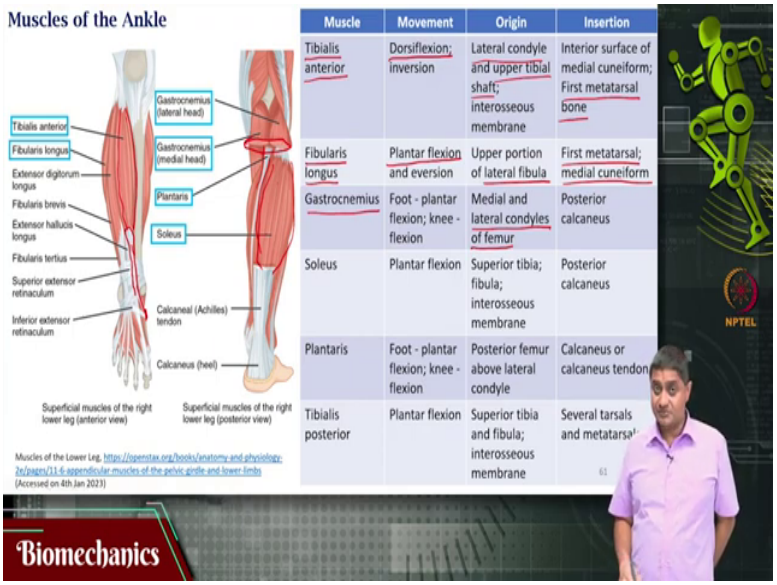

Muscle	Movement	Origin	Insertion
Tibialis anterior	Dorsiflexion; inversion	Lateral condyle and upper tibial shaft; interosseous membrane	Interior surface of medial cuneiform; First metatarsal bone
Fibularis longus	Plantar flexion and eversion	Upper portion of lateral fibula	First metatarsal; medial cuneiform
Gastrocnemius	Foot - plantar flexion; knee - flexion	Medial and lateral condyles of femur	Posterior calcaneus
Soleus	Plantar flexion	Superior tibia; fibula; interosseous membrane	Posterior calcaneus
Plantaris	Foot - plantar flexion; knee - flexion	Posterior femur above lateral condyle	Calcaneus or calcaneus tendon
Tibialis posterior	Plantar flexion	Superior tibia and fibula; interosseous membrane	Several tarsals and metatarsal

So, just like, we have the thigh muscles. So, when we discussed the muscles that cause flexion and extension at the knee, we said that the muscles are divided into compartments. Remember that there is a lateral component, there is a lateral muscle, there is an anterior muscle and then there is a medial muscle and then there is a muscle that is deeper to the anterior muscle.

Remember that these are the four that form the quadriceps femoris. There is a medialis, fastest medialis, there is a lateralis, vastus lateralis then there is rectus femoris and then there is vastus intermedius which is deep to the rectus femoris we saw that. Likewise, in the lower leg in the shin also, we have several muscles, some of which are deep and some of which are superficial and fascia divides this into compartments.

A posterior compartment, an anterior compartment and so on and so, forth. So, remember, depending on the function, the location and the anatomy will vary likewise, like we have seen always. So, structure and function are related, so, anatomy and physiology are interlinked in this manner. Something that we have seen previously an important muscle that is found on the front side of the lower leg is tibialis anterior, anterior means on the front side.

How do you know? Because it has the word anterior, anterior means front side tibialis anterior. Now, this muscle originates at the lateral condyle and upper tibial shaft and inserts at

the first metatarsal bone. Metatarsal bone means, like you, have carpal bones in the hand you have the tarsal bones in the foot like you have metal carpals, you have metatar cells. So, this is the tibialis anterior whose muscle belly is here and this is where the tendon is beginning.

And then the tendon is going through a relatively long you see there are some ligaments and some structures through which it travels and quite a bit of distance and then attaches at the first metatarsal. First metatarsal means it is the metatarsal bone of the big toe first means for the thumb, index, middle, ring and so on and so forth. First means thumb, second means index, third means middle, third, fourth means this, fifth means little and so on.

Like you have the first metacarpal bone or this so, 1, 2, 3, 4, 5 like that. For example, likewise, the one for the toe big toe is called as a first metatarsal. First metatarsal means the attachment is somewhere here you see that is where the tendon is coming and attaching here. If it is attaching on the front side, what do you think will be its function? Because if it contracts, what is it going to do?

If this is the foot and if it is attaching at the thumb like this and it is pulling the thumb then the foot is going to go up like this which is called dorsiflexion is it not? That is called dorsiflexion of the foot or dorsiflexion that happens at the ankle joint. Then you have fibularis longus this originates on the fibula. How do you know the name? Is saying fibularis the previous muscle said tibialis.

So, it originates at the tibia and it attaches to the first metatarsal and medial cuneiform. And this is responsible for plantar flexion. The most superficial muscle at the back is called gastrocnemius. This gastrocnemius, it is function is plantar flexion. So, when it when it contracts, it has a tendency to push the toe down and lift the body up, plantar flexion. It originates in the middle and lateral contents of the femur.

Remember it originates at the thigh at the lower part of the thigh and attaches at the posterior part of the calcaneus bone. Deeper to this is the soleus which is also performing a similar function which is plantar fraction. Then you have plantaris and tibialis posterior muscles which are responsible for plantar flexion. The attachment is at various different points and in the origin is at various different points either at the femur or at the tibia and fibula and the insertion is at the calcaneus or the calcaneus tendon or several tarsals and metatarsals

That is the case may be some deep muscles that were not seen in the previous picture. So, here only the superficial muscles are shown. This is a gas medial; this is the medial head of the gastrocnemius that is cut and shown. This is a lateral head of the gastric name is that is cut this posterior view of the right leg when I am looking at the right leg from the back so that is the lateral view.

These are the superficial muscles and then you have the plantaris which is this and then you have the soleus. You can see the soleus only if you cut the gastrocnemius. Gastrocnemius is cut at that level here see and you can see this band like soleus. That is responsible for plantar flexion look all of this attach here. So that so, as to pull the heel upwards.

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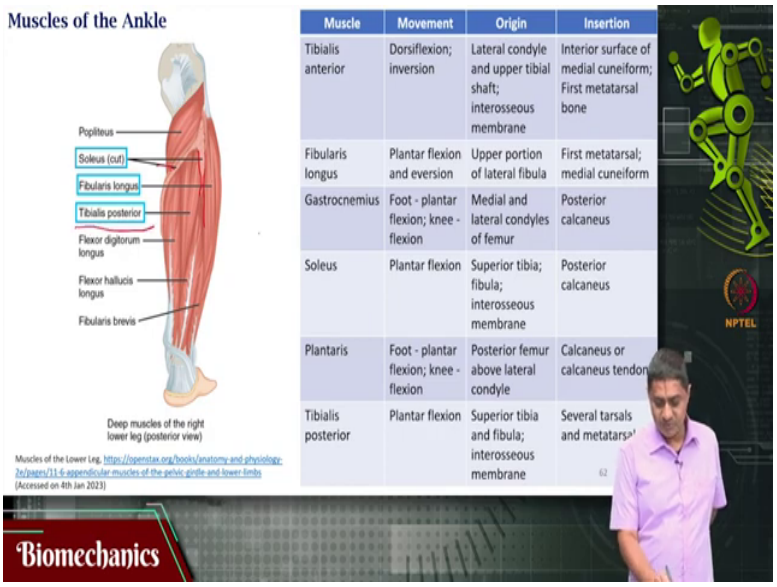

Some deep muscles that are not shown. Yes, the soleus that is cut here, for example, see the soleus or the cut part of the soleus and fibular is longus on the side and tibialis posterior these are deeper.

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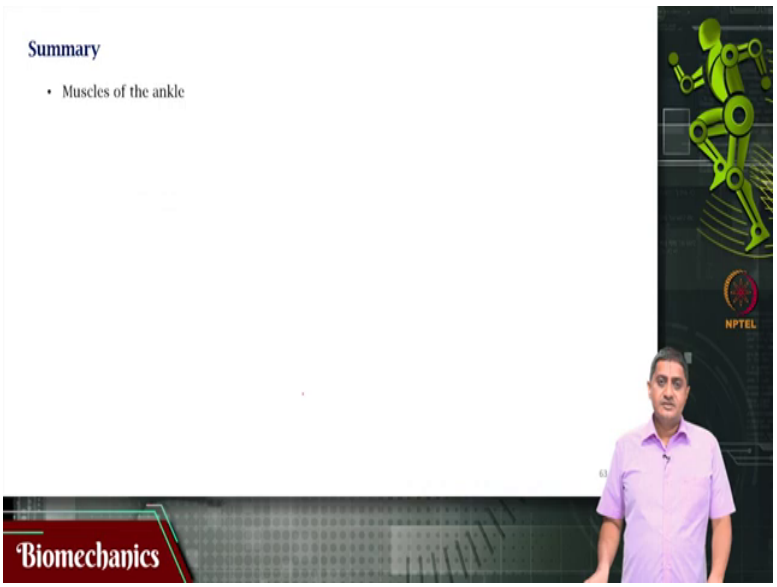

So, in this video we saw some of the muscles that contribute to movement at the ankle. Joint specifically, we focused on plantar fraction and dorsiflexion. Tibialis anterior, for example, is the most important dorsiflexion of the ankle joint. There are many muscles that contribute to plantar fraction, such as cash anaemia, Soleus and many others deeper muscles. Some of these are superficial some of these are deep and so on. With this, we come to the end of this video. Thank you very much for your attention.