4- Patella & Leg (Tibia ,Fibula)

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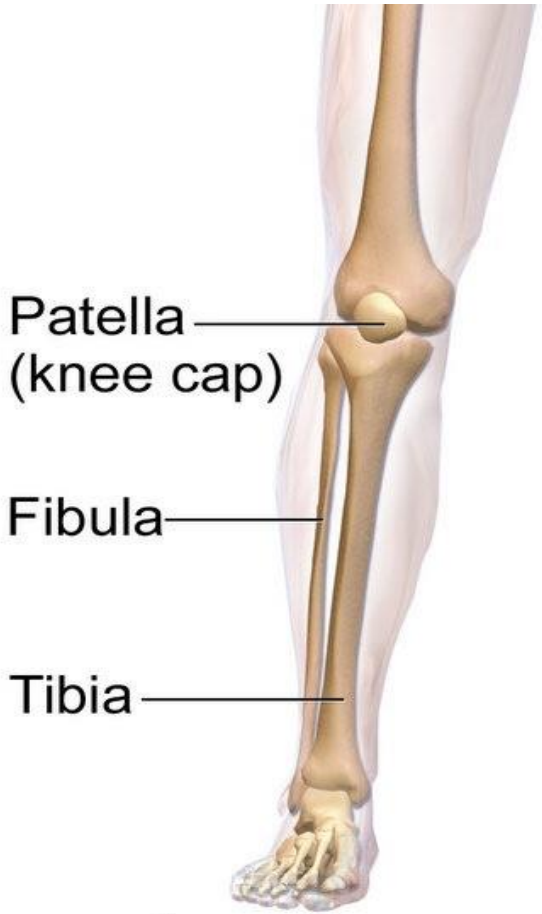
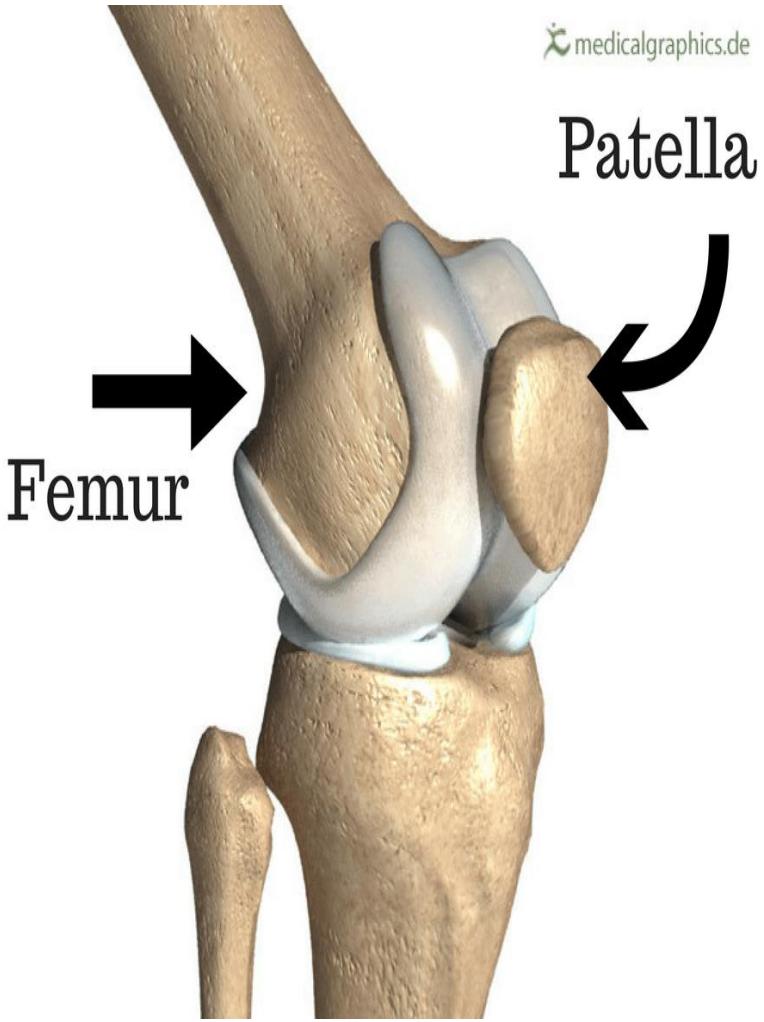


Leg Bones

Patella Functions

- The patella has two main functions:

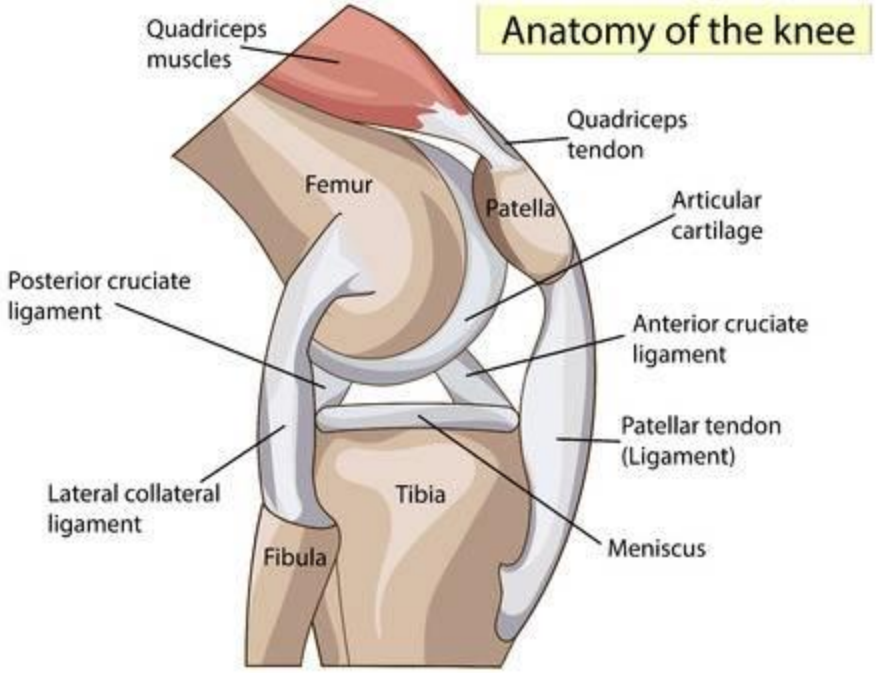
- Leg extension – Enhances the leverage that the quadriceps tendon can exert on the femur, increasing the efficiency of the muscle.
- Protection – Protects the anterior aspect of the knee joint from physical trauma

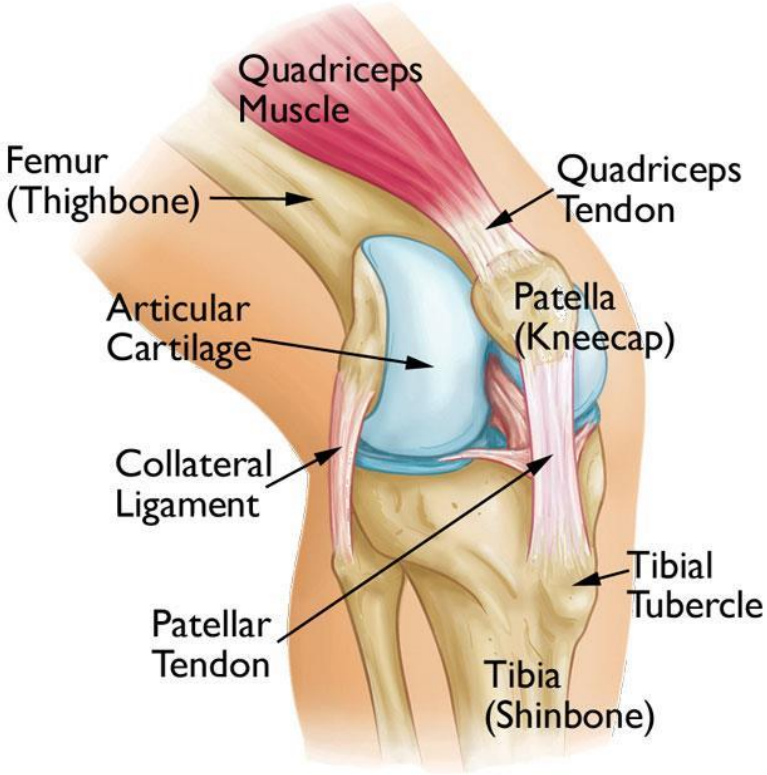


The patella

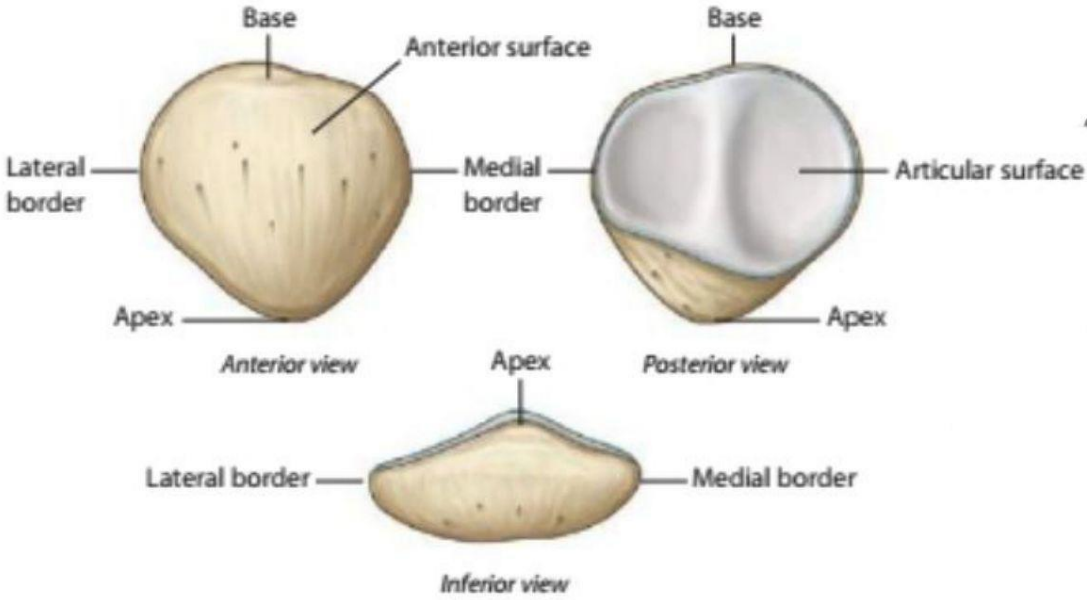
-The patella (knee-cap) is located at the front of the knee joint, within the patellofemoral groove of the femur. Its superior aspect is attached to the quadriceps tendon, and inferior aspect to the patellar ligament.

-It is classified as a sesamoid type bone due to its position within the quadriceps tendon, and is the largest sesamoid bone in the body.



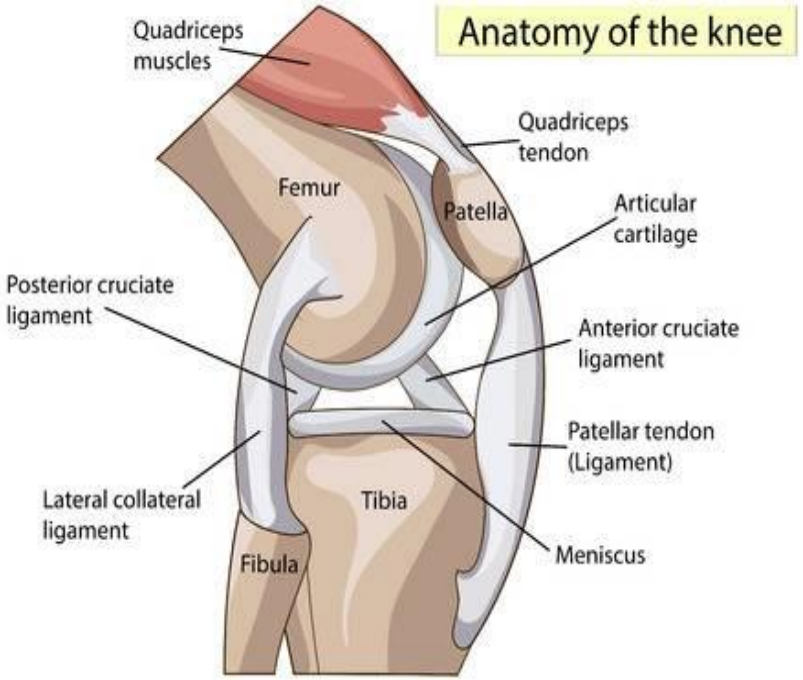


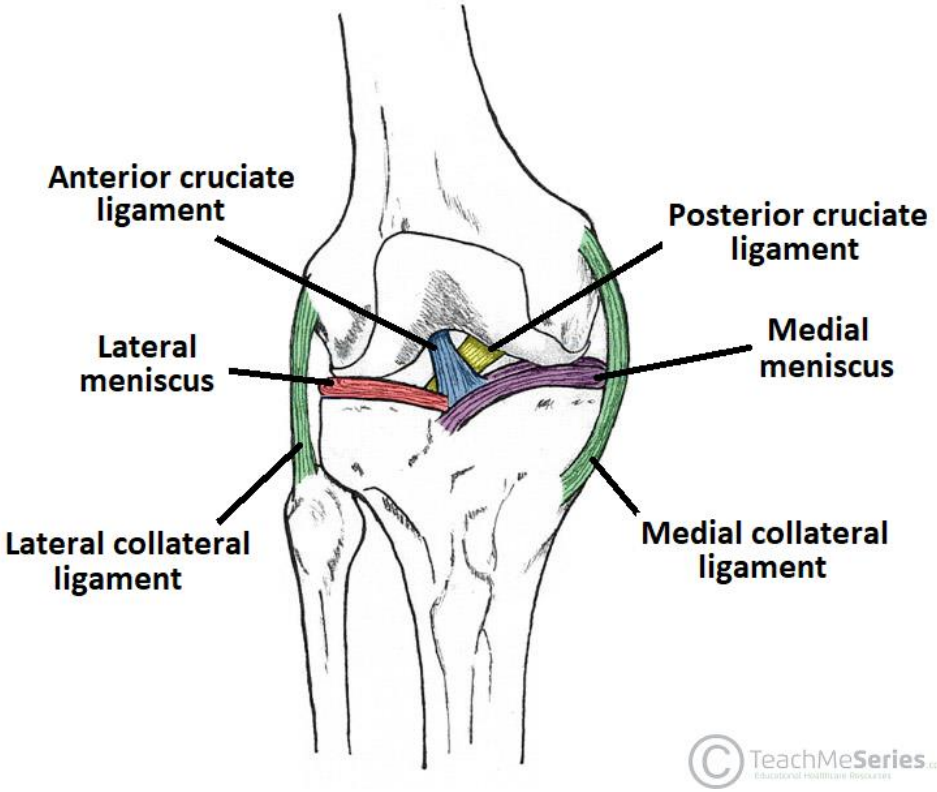
- **The patella** has a triangular shape, with anterior and posterior surfaces. The apex of the patella is situated inferiorly, and is connected to the tibial tuberosity by the patella ligament(tendon). The base forms the superior aspect of the bone, and provides the attachment area for the quadriceps tendon.
- The posterior surface of the patella articulates with the femur, and is marked by two facets:
- Medial facet – articulates with the medial condyle of the femur.
- Lateral facet – articulates with the lateral condyle of the femur



Patella (right)

PATELLA LIGAMENTS



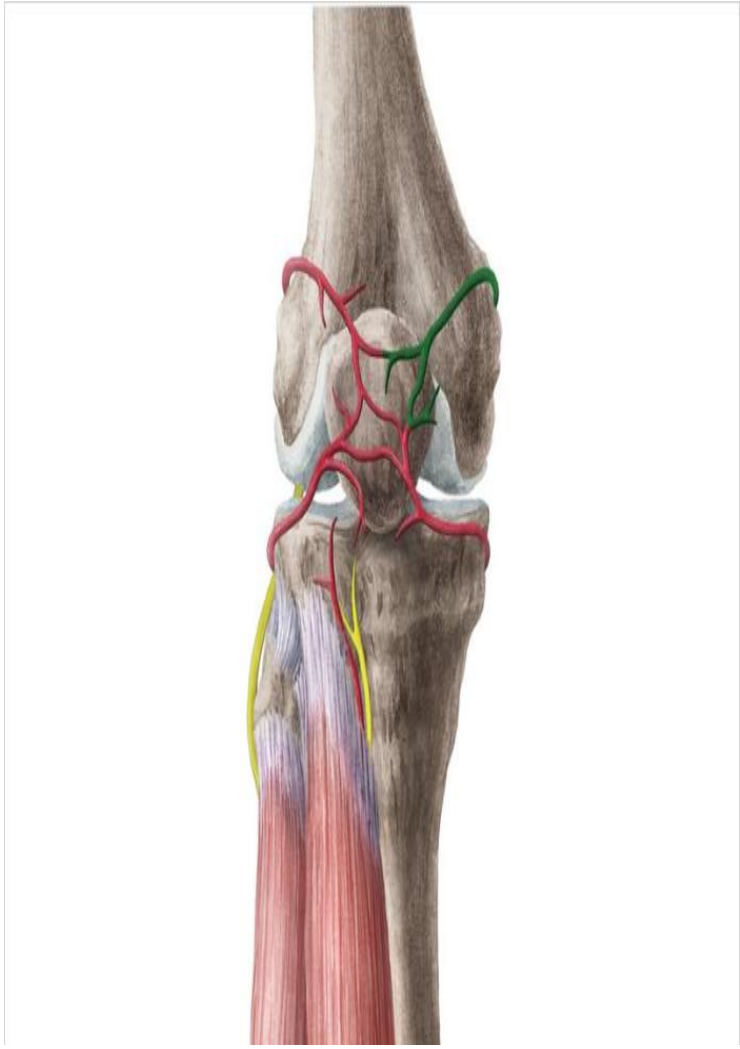


INJURIES TO THE LIGAMENTS AND MENISCI

The ligaments and menisci are commonly injured in active sports. The medial meniscus is damaged much more frequently than the lateral, probably because of its strong attachment to the medial collateral ligament, which restricts its mobility.

The blood supply

- The blood supply to the patella arises from the **genicular arteries**, branches of the **popliteal artery**.
- There is:
- a superior lateral and medial
- inferior lateral and medial
- a descending and anterior genicular artery
- They form a peripatellar anastomosis and supply the patella and the knee joint.



THE LEG

The number and arrangement of bones in the lower limb are similar to those of the upper limb. the lower limb are adapted for weight bearing and locomotion and are therefore shaped and articulated differently. The femur and tibia are essentially pillars for supporting the weight of the body.

*The leg proper extends from knee to ankle and contains two bones, the medial tibia and lateral fibula.

Tibia and Fibula

The tibia and fibula are the two long bones in the lower leg. ... The tibia is the bone that forms the shin and is the larger of the two lower-leg bones. The top of the tibia connects to the knee joint and the bottom of the tibia connects to the ankle join

The tibia is the medial bone of the leg and is larger than the fibula, with which it is paired. The tibia is the main weight-bearing bone of the lower leg and the second longest bone of the body, after the femur. The medial side of the tibia is located immediately under the skin, allowing it to be easily palpated down the entire length of the medial leg.

The proximal end of the tibia is greatly expanded. The two sides of this expansion form the medial condyle of the tibia and the lateral condyle of the tibia. The tibia does not have epicondyles. The top surface of each condyle is smooth and flattened. These areas articulate with the medial and lateral condyles of the femur to form the knee joint. Between the articulating surfaces of the tibial condyles is the intercondylar eminence, an irregular, elevated area that serves as the inferior attachment point for two supporting ligaments of the knee. The tibial tuberosity is an elevated area on the anterior side of the tibia, near its proximal end. It is the final site of attachment for the muscle tendon associated with the patella. For the attachment of the interosseous membrane of the leg, the sheet of dense connective tissue that unites the tibia and fibula bones. The large expansion found on the medial side of the distal tibia is the medial malleolus ("little hammer"). This forms the large bony bump found on the medial side of the ankle region. Both the smooth surface on the inside of the medial malleolus and the smooth area at the distal end of the tibia articulate with the talus bone of the foot as part of the ankle joint. On the lateral side of the distal tibia is a wide groove called the fibular notch. This area articulates with the distal end of the fibula, forming the distal tibiofibular joint.

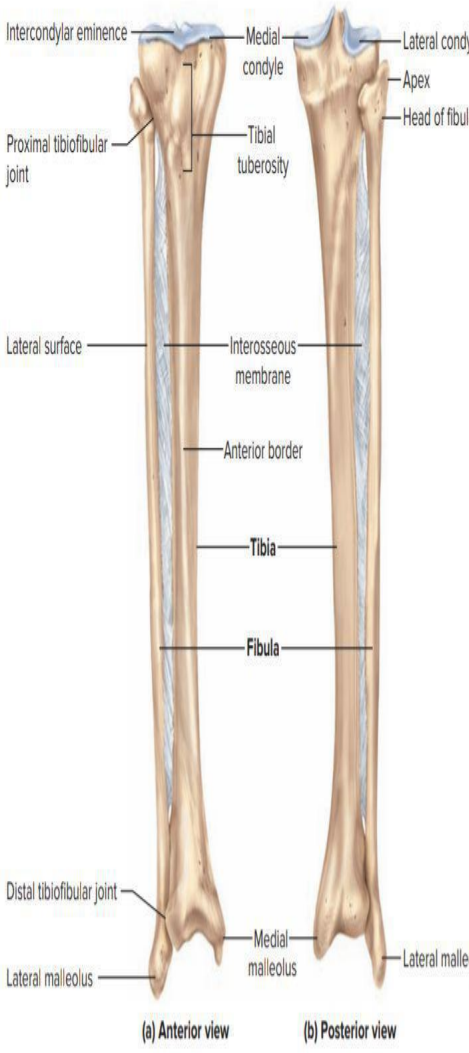


FIGURE 8.39 The Right Tibia and Fibula. AP R

Fibula

The fibula is the slender bone located on the **lateral side** of the leg. The fibula does not bear weight. It serves primarily for muscle attachments and thus is largely surrounded by muscles. Only the proximal and distal ends of the fibula can be palpated.

The head of the fibula is the small, knob-like, proximal end of the fibula. It articulates with the inferior aspect of the **lateral tibial condyle,** forming the proximal **tibiofibular joint**. The thin shaft of the fibula has the interosseous border of the fibula, a narrow ridge running down its medial side for the attachment of the interosseous membrane that spans the fibula and tibia. The distal end of the fibula forms the **lateral malleolus**, which forms the easily palpated bony bump on the lateral side of the ankle. The deep (medial) side of the lateral malleolus articulates with the talus bone of the foot as part of the **ankle joint**. The distal fibula also articulates with the fibular notch of the tibia.

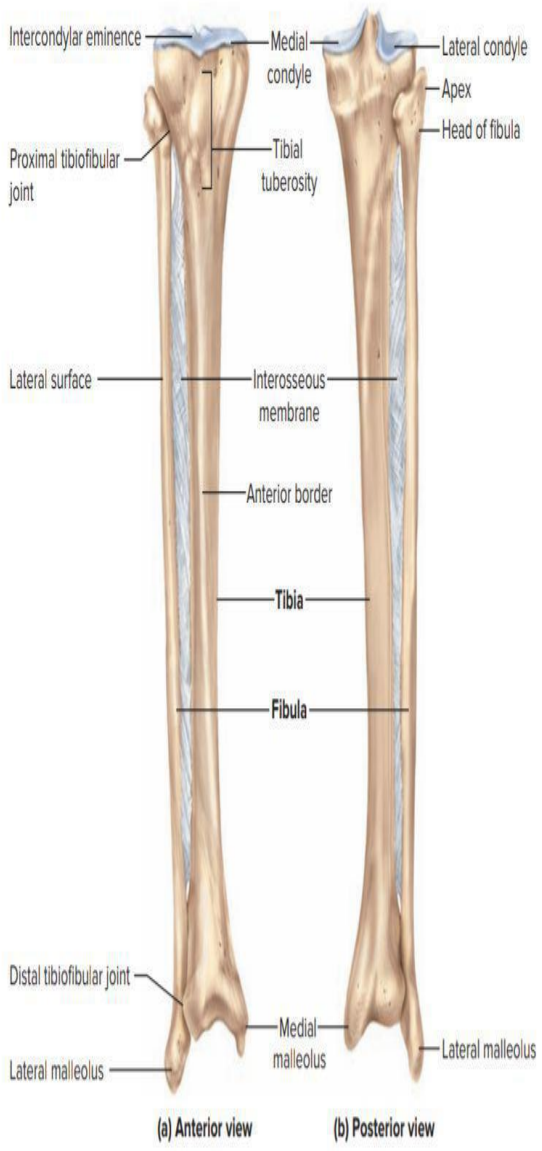
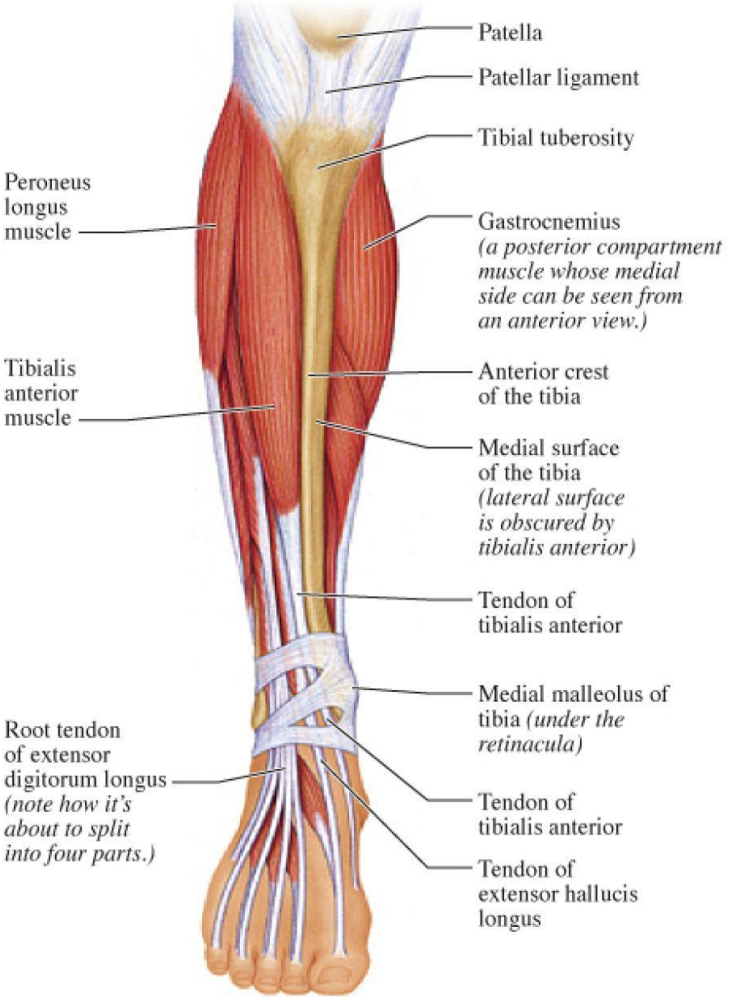
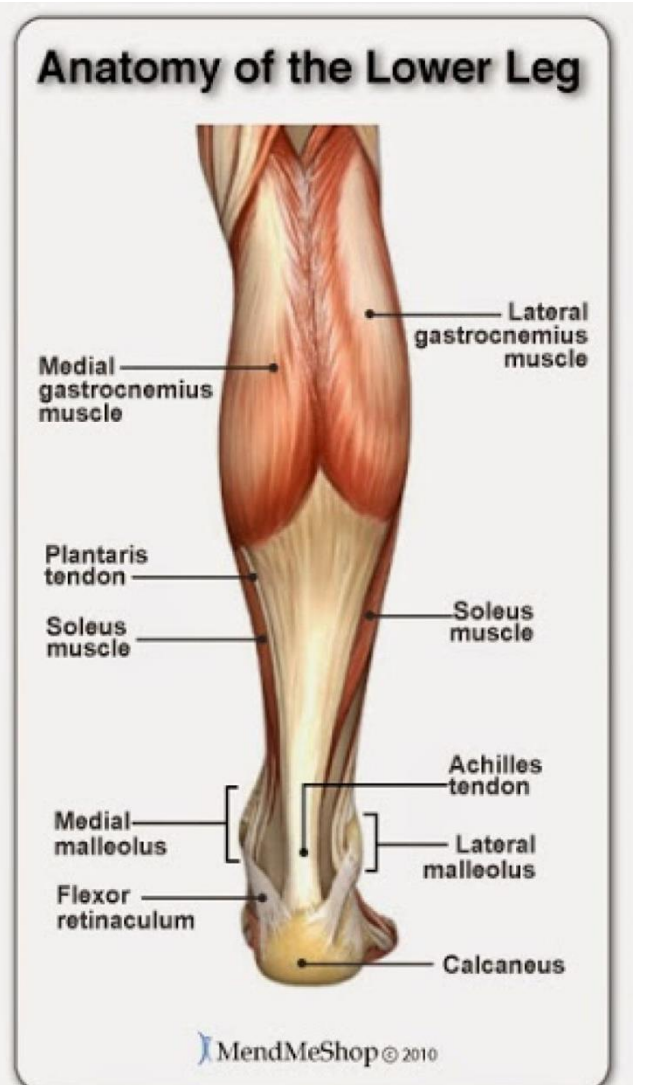


FIGURE 8.39 The Right Tibia and Fibula. AP R

Muscles of the lower leg and foot

The muscles of the lower leg, called simply the leg by anatomists, largely move the foot and toes. The major muscles of the lower leg, other than the gastrocnemius which is cut away. The **gastrocnemius muscle** has two large bellies, called the medial head and the lateral head, and inserts into the calcaneus bone of the foot via its **calcaneal tendon** (also known as the **Achilles tendon**.) **The soleus muscle** is deep to the gastrocnemius, and the two muscles serve together as the calf of the leg.





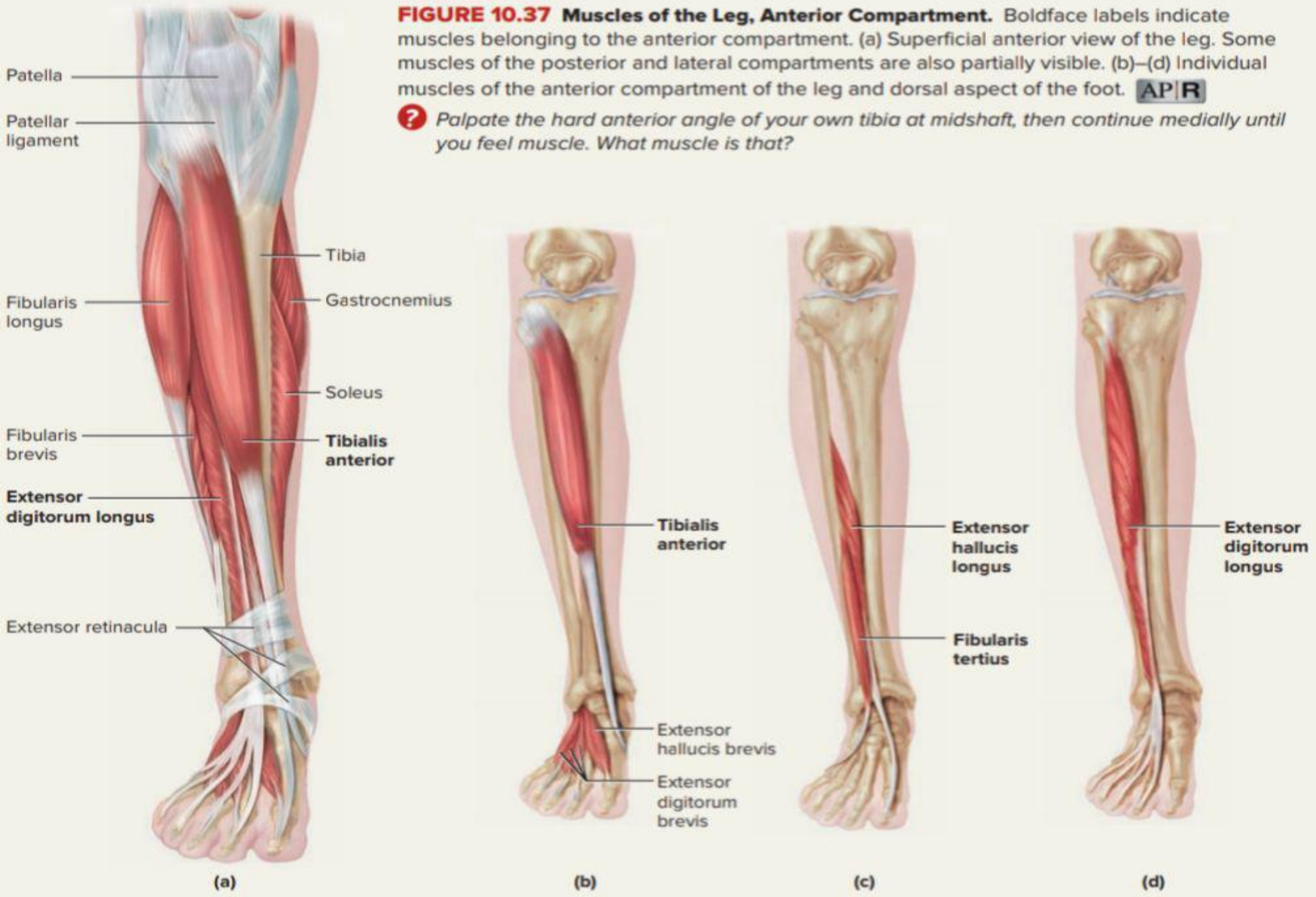
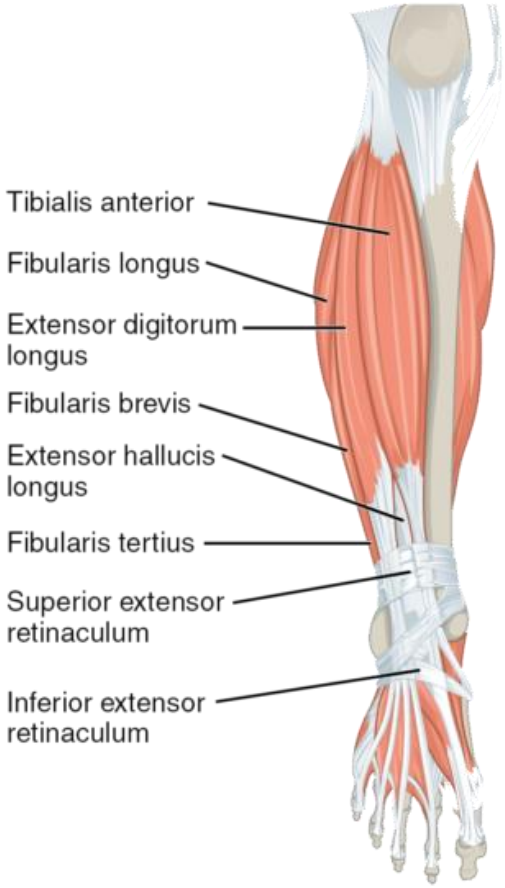


FIGURE 10.37 Muscles of the Leg, Anterior Compartment. Boldface labels indicate muscles belonging to the anterior compartment. (a) Superficial anterior view of the leg. Some muscles of the posterior and lateral compartments are also partially visible. (b)–(d) Individual muscles of the anterior compartment of the leg and dorsal aspect of the foot. AP|R

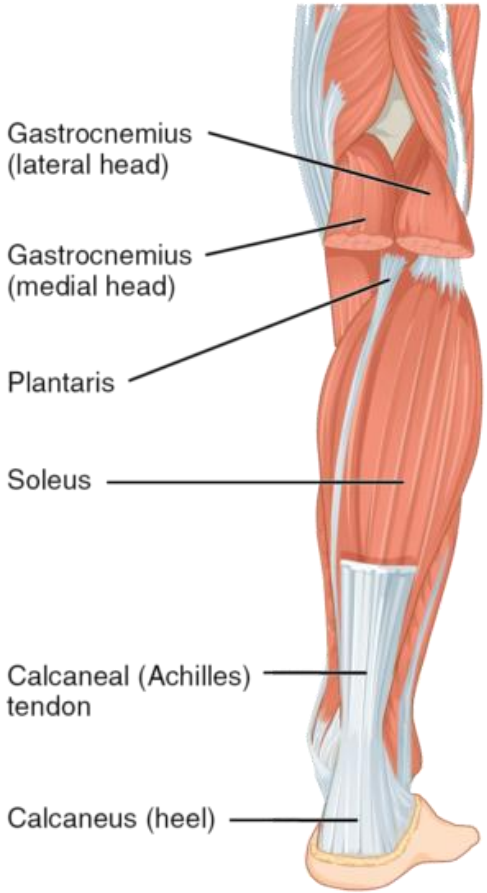
? *Palpate the hard anterior angle of your own tibia at midshaft, then continue medially until you feel muscle. What muscle is that?*

Name	Action	Skeletal Attachments	Innervation
Fibularis (peroneus[84]) tertius[85] (FIB-you-LERR-iss TUR-she-us)	Dorsiflexes and everts foot during walking; helps toes clear the ground during forward swing of leg	• Medial surface of lower one-third of fibula; interosseous membrane • Metatarsal V	Deep fibular (peroneal) nerve
Extensor digitorum longus	Extends toes; dorsiflexes foot; tautens	• Lateral condyle of tibia; shaft of fibula;	Deep fibular

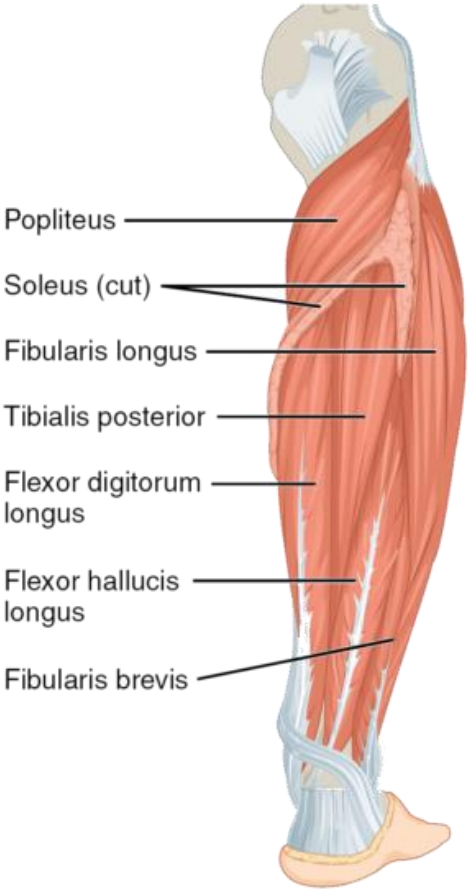
Anterior and posterior muscles of leg



Superficial muscles of the right lower leg (anterior view)



Superficial muscles of the right lower leg (posterior view)

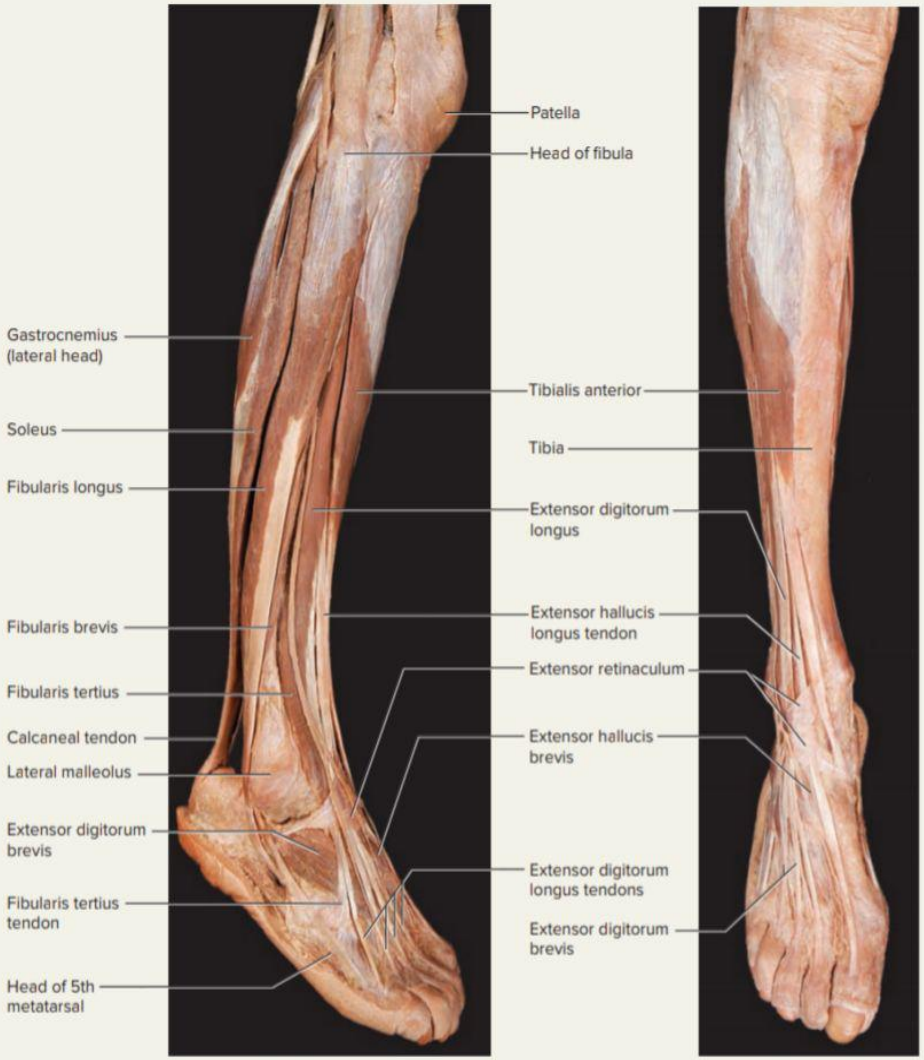


Deep muscles of the right lower leg (posterior view)

TABLE 10.15 Muscles Acting on the Foot

The fleshy mass of the leg is formed by a group of crural muscles, which act on the foot (fig. 10.36). These muscles are tightly bound by fasciae that compress them and aid in the return of blood from the legs. The fasciae separate the crural muscles into anterior, lateral, and posterior compartments (see fig. 10.40b).

Anterior (Extensor) Compartment of the Leg. Muscles of the anterior compartment dorsiflex the ankle and prevent the toes from scuffing the ground during walking. From lateral to medial, these muscles are the *fibularis tertius, extensor digitorum longus* (extensor of toes II–V), *extensor hallucis* longus (extensor of the great toe), and *tibialis anterior*. Their tendons are held tightly against the ankle and kept from bowing by two extensor retinacula similar to the one at the wrist (fig. 10.37a).



(a) Lateral view (b) Anterior view

FIGURE 10.36 Superficial Crural Muscles of the Cadaver. Right leg.

Posterior Compartment of the Leg. Most muscles in the posterior compartment of the leg act on the ankle and foot and are reviewed in table 10.15, but the *popliteus* acts on the knee (see fig. 10.39a, d).

Popliteus[83] (pop-LIT-ee-us)	Rotates tibia medially on femur if femur is fixed (as in sitting down), or rotates femur laterally on tibia if tibia is fixed (as in standing up); unlocks knee to allow flexion; may prevent forward dislocation of femur during crouching	• Lateral condyle of femur; lateral meniscus and joint capsule • Posterior surface of upper tibia	Tibial nerve

Nerve supply of lower limb

The nerves of the lower limb are: femoral, obturator, sciatic, tibial, and common peroneal nerves.

Femoral nerve: It's present on the very front of the thigh and innervates the anterior thigh muscles.
Obturator nerve: It's present on the medial side of the thigh and innervates the adductors of the thigh.
Sciatic nerve (largest and thickest nerve in the body): It's present in the gluteal region and the back of the thigh. It supplies muscles on the back of the thigh. In the lower part of the back of thigh, it breaks up into tibial and common peroneal nerves.
Tibial nerve: It's present on the rear of the leg and supplies all the muscles on the rear of the leg. At the ankle, behind medial malleolus, it breaks up into medial and lateral plantar nerves, which collectively supply all the muscles of the sole.
Common peroneal nerve: At the lateral side of the neck of fibula, it breaks up into the **deep and superficial peroneal nerves**. **The deep peroneal nerve** is within the anterior compartment of the leg and supplies all the anterior leg muscles.
The superficial peroneal nerve is present in the lateral compartment of the leg and supplies all the lateral leg muscles.
Along with the muscles, all the nerves (vide supra) also supply joints and offer cutaneous innervation to the lower limb.

Blood supply of lower limb

The blood to the lower limb is usually supplied by the **femoral artery** and its branches.

Femoral artery: It starts at the midpoint of inguinal ligament as the continuance of the external iliac artery. It enters the front of thigh and immediately produces deep femoral artery (profunda femoris artery) which supplies all the structures of the thigh.

Popliteal artery: It's the continuance of femoral artery into the popliteal fossa. The popliteal artery descends via the popliteal fossa and in the head of fibula it breaks up into **the anterior and posterior tibial arteries.**

Anterior tibial artery: It is located in the anterior compartment of the leg which it supplies and continues into the dorsum of the foot as dorsalis pedis artery.

Dorsalis pedis artery: It is located on the dorsum of the foot which it supplies.

Posterior tibial artery: It is located in the posterior compartment of the leg which it supplies. At the ankle, behind the medial malleolus it breaks up into medial and lateral plantar arteries.

Medial and lateral plantar arteries: They're the terminal branches of posterior tibial artery and supply the sole of the foot.

Along with the femoral artery the following arteries also give a little to the blood supply of the lower limb: **Superior gluteal artery., Inferior gluteal artery., Obturator artery.**

They're all branches of the **internal iliac artery**.