The arteries of the lower limb

(Figs 8 24–8 26)

The external iliac artery becomes the **common femoral artery** where it crosses under the inguinal ligament midway between the anterior superior iliac spine and the pubic symphysis **The common femoral artery has three superficial branches at this point, namely:**

- **the superficial circumflex iliac artery;**
- **the superficial inferior epigastric artery; and**
- **the superficial pudendal artery**

The **profunda femoris artery**, its biggest branch, arises 5 cm distal to the inguinal ligament **and has six branches** as follows:

- **medial and lateral circumflex femoral arteries; and**
- **four perforating arteries**
  - Medial and lateral circumflex femoral arteries

These arteries form a ring around the upper femur The lateral circumflex femoral artery has an ascending branch that anas- tomoses with a branch of the superior gluteal artery and it also sends a descending branch to the knee Thus it can provide a route of collateral supply capable of bypassing an obstructed common femoral artery or an obstructed superficial femoral artery

  - Four perforating arteries

These supply the muscles of the thigh (the last of these is the continuation of the profunda) and surround the femur on angiography

The femoral artery continues as the **superficial femoral artery** and has few branches in the thigh It passes in the adduc- tor canal between vastus medialis, the adductors and sartorius At the junction of the upper two-thirds and the lower third of the femur it passes through the adductor hiatus close to the femur and into the popliteal fossa to become the popliteal artery Just before it does this it supplies a descending branch to the genicular anastomosis

The **popliteal artery** (see Fig 8 26) supplies branches to the genicular anastomosis, branches to the knee joint and divides

at the lower border of the knee joint into anterior and posterior tibial arteries

The **posterior tibial artery** is the larger of the two terminal branches Its proximal part is sometimes called the **tibiopero- neal trunk** It gives rise to the peroneal artery 2 5 cm from its origin The posterior tibial artery then passes between the superficial and deep muscles of the posterior compartment of the lower leg As it descends it becomes more medial

The posterior tibial artery supplies branches to the genicular anastomosis, to the muscles, the skin and the tibia At the ankle it supplies a medial malleolar branch to the ankle anastomosis and then passes posterior to the medial malleolus (halfway between the tip of the malleolus and the midline posteriorly) to divide into the medial and lateral plantar arteries, the prin- cipal supply to the foot The lateral plantar artery is the main contributor to the plantar arch

The **peroneal artery**, as it descends, comes to lie close to the medial aspect of the posterior of the fibula It runs behind the distal tibiofibular joint and ends as calcaneal branches sup- plying the superior and lateral aspects of that bone Its other branches are the:

- muscular branches;
- nutrient artery to the fibula;
- perforating branch, which perforates the interosseous membrane about 5 cm above the lateral malleolus and descends anteriorly to supply branches to the tarsus; and a
- communicating branch, which joins a similar branch from the posterior tibial artery as part of the circle of vessels around the ankle

The **anterior tibial artery**, after it arises from the popliteal artery, passes above the upper margin of the interosseous membrane and descends anterior to this membrane until it becomes superficial at the ankle midway between the malleoli

This continues as the **dorsalis pedis artery** which, having supplied the arcuate artery for the metatarsal and digital

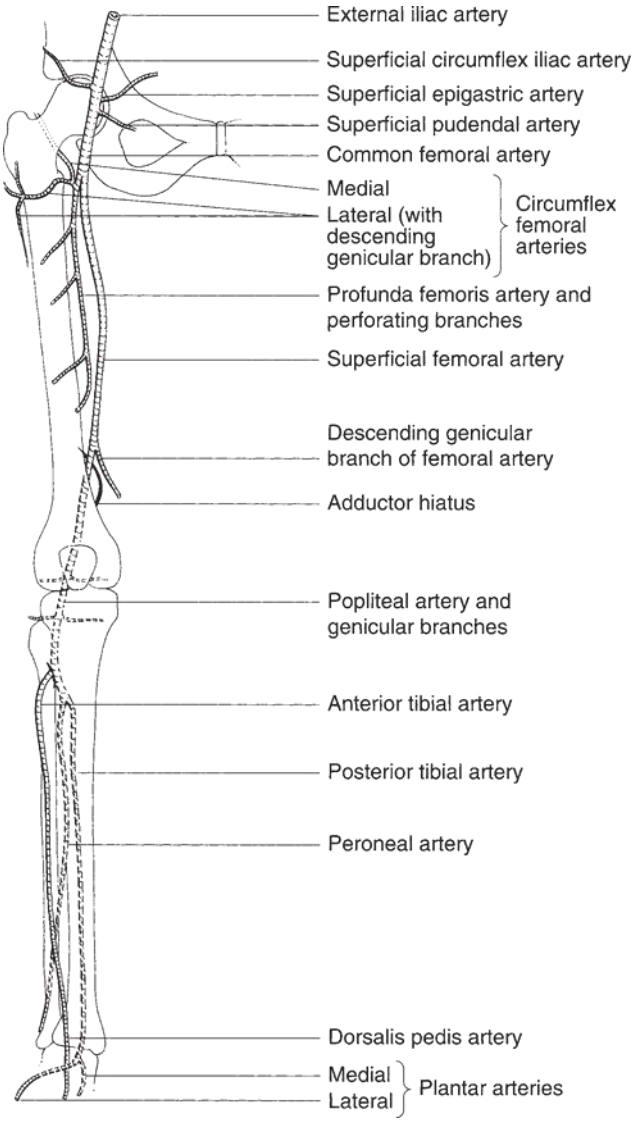
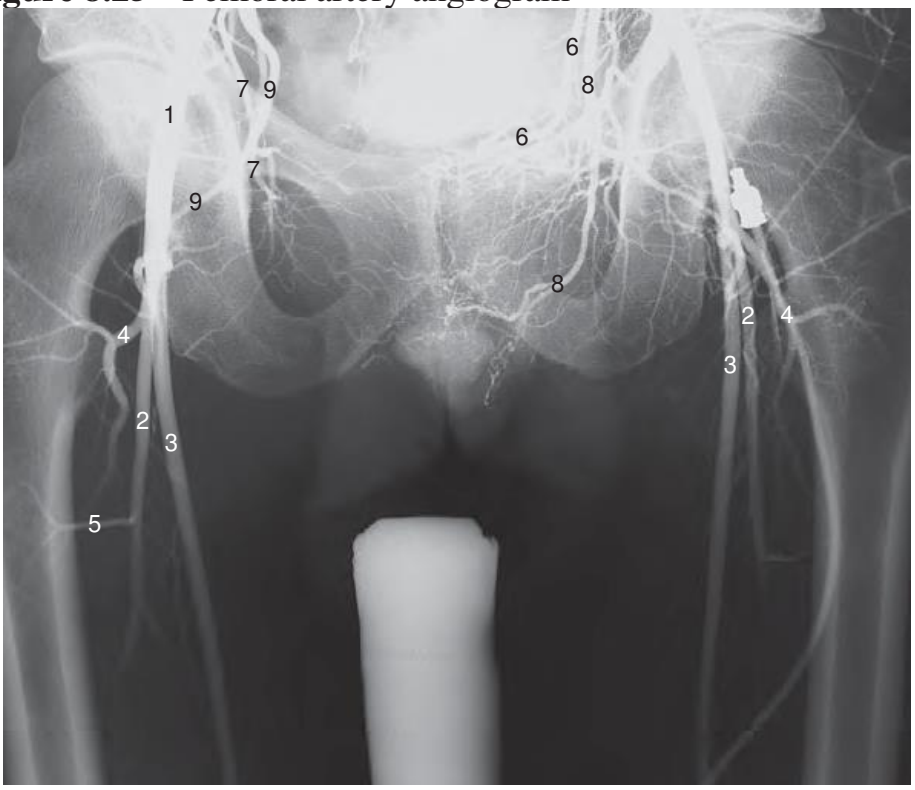


Figure 8.24 • Arteries of the lower limb as seen on angiography

Figure 8.25 • Femoral artery angiogram



1. Common femoral artery
2. Profunda femoris artery
3. Superficial femoral artery
4. Lateral circumflex femoral artery
5. Perforating artery
6. Superior vesical artery
7. Obturator artery
8. Internal pudendal artery
9. Inferior gluteal artery

Radiological features of the arteries of the lower limb

Arteriography of the lower limb (Figs 8 24–8 26)

This is performed by catheterization of the femoral artery or, in special circumstances, by translumbar aortography or even by approaching the aortic arch from one of the upper limb arteries

In arteriography, the femoral artery is projected over the lower part of the head of the femur The superficial femoral artery has a vertical course, whereas the shaft of the femur lies obliquely The artery, as a result, is medial to the upper shaft but posterior to the lower shaft as it approaches the popliteal fossa The profunda femoris artery lies closer to the femur and is also distinguished from the superficial femoral artery by its numerous branches – the superficial femoral artery has no significant branch in the thigh The origin and proximal part of the profunda tend to overlie the superficial femoral artery in AP views and are best seen in oblique views

The division of the popliteal into anterior and posterior tibial arteries (called the trifurcation because the posterior tibial artery soon gives rise to the peroneal artery) lies over the proximal tibiofibular joint The anterior tibial artery arises at

an angle, whereas the posterior tibial (the tibioperoneal trunk) is a more direct continuation of the popliteal artery

The three main vessels of the lower leg lie over and between the shafts of the tibia and fibula Slight internal rotation of the foot helps to project the tibia away from the fibula and allows the vessels to be seen between them

The dorsalis pedis artery is best seen on lateral views of the foot and the medial and lateral plantar arteries and the plantar arch are seen on dorsiplantar views of the foot

Magnetic resonance angiography

Gadolinium contrast bolus chasing is now routinely performed by combining moving table top acquisition with coronally acquired data sets

With this approach the lower extremity vascular tree can be examined completely by three to four coronal acquisitions Acquired images now compete with diag- nostic catheter angiograms and in many centres have replaced catheter diagnostic angiography, catheter studies now only undertaken for interventional purposes (Fig 8 27)



Figure 8.26 • Femoral angiogram: popliteal arteries

1 Popliteal artery

2. Descending genicular artery

3. Medial superior genicular artery

4. Lateral superior genicular artery

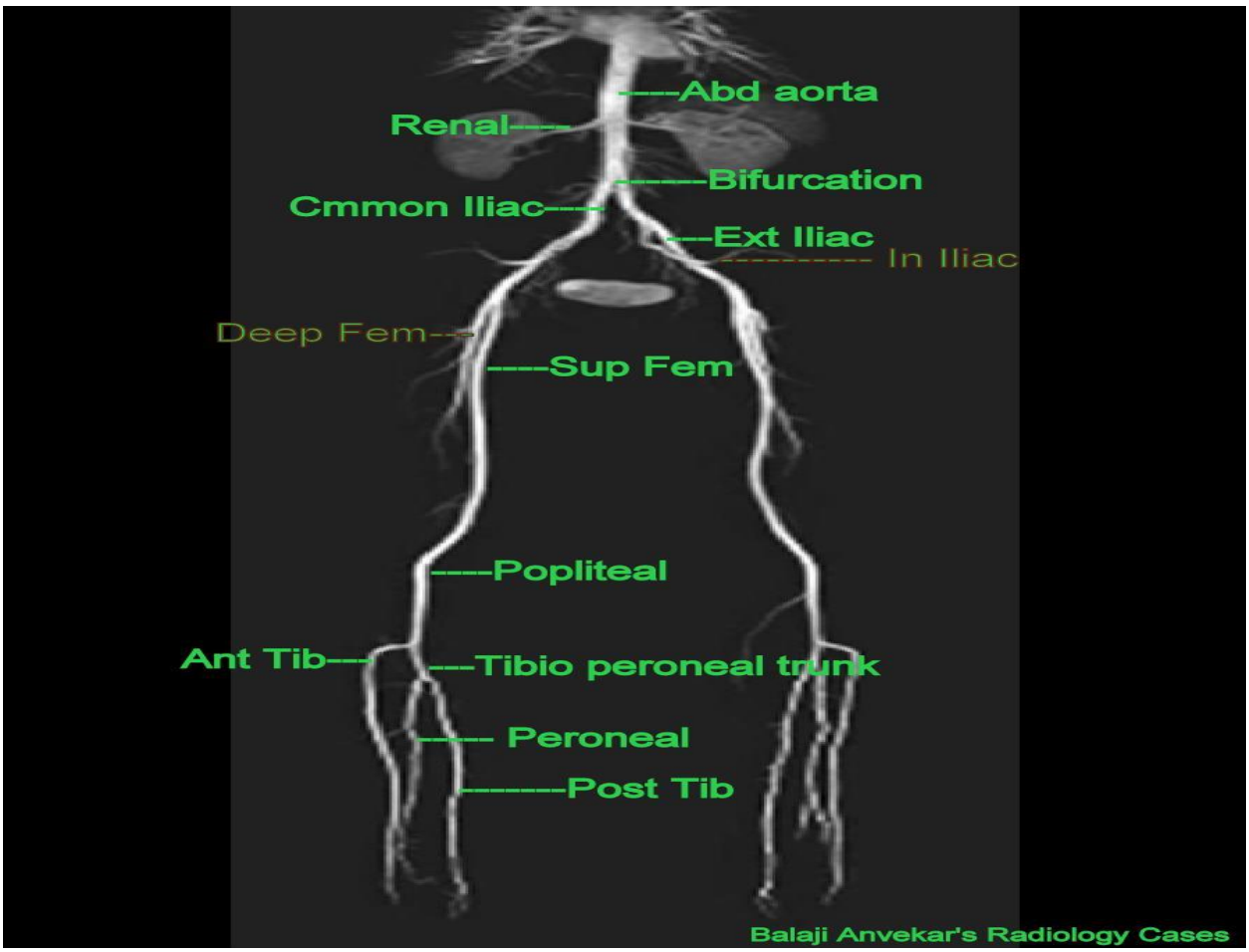
5. Middle genicular artery

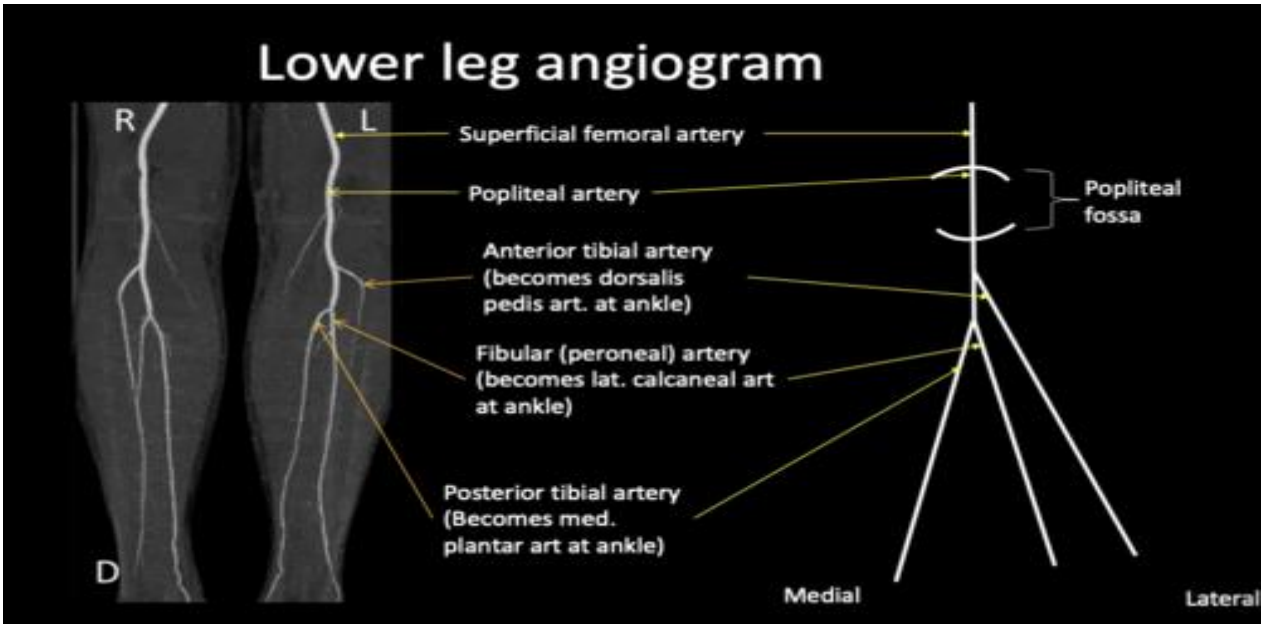
6. Medial inferior genicular artery
7. Lateral inferior genicular artery
8. Anterior tibial artery
9. Tibioperoneal trunk
10. Posterior tibial artery
11. Peroneal artery
12. Muscular branches

Collateral arteries

Complete occlusion of a major artery in the leg does not always lead to loss of arterial supply to the limb because of the estab- lishment of collateral supply via alternative routes Thus occlu- sion of the common femoral artery can be overcome via branches of the superior and inferior gluteal arteries, which anastomose with branches of the lateral circumflex branch of the profunda femoris artery Obstruction of flow in the super- ficial femoral artery can be bypassed by descending branches of the lateral circumflex artery and of the perforating branches of the profunda artery anastomosing with branches of the distal superficial femoral artery and of the popliteal artery in the genicular anastomosis

The anastomosis between all the anterior tibial, posterior tibial and peroneal arteries around the ankle joint allows any artery reaching the ankle to supply the foot


Abd aorta
Renal
Bifurcation
Cmmon Iliac
Ext Iliac
In Iliac
Deep Fem
Sup Fem
Popliteal
Ant Tib
Tibio peroneal trunk
Peroneal
Post Tib
Balaji Anvekar's Radiology Cases


Lower leg angiogram
R
L
D
Superficial femoral artery
Popliteal artery
Popliteal fossa
Anterior tibial artery (becomes dorsalis pedis art. at ankle)
Fibular (peroneal) artery (becomes lat. calcaneal art at ankle)
Posterior tibial artery (Becomes med. plantar art at ankle)
Medial
Lateral