

Lower limb (LL)

skeleton, joints, muscles, blood supply, venous and lymphatic drainage, innervation, regional anatomy

Skeleton of LL

Pelvic girdle	1/ hip bone (2x) - acetabulum - acetabular margin (limbus) - acetabular fossa - acetabular notch - lunate surface - obturator foramen <i>hip bone: ilium + ischium + pubis</i>
ilium	- body of ilium - wing of ilium - iliac fossa - arcuate line - gluteal surface – anterior, posterior, and inferior gluteal lines - sacropelvic surface - auricular surface - iliac tuberosity - iliac crest - outer lip – tubercle of iliac crest - intermediate zone - inner lip - anterior superior and anterior inferior iliac spines - posterior superior and posterior inferior iliac spines
ischium	- body of ischium - ramus of ischium – ischial tuberosity - ischial spine - greater and lesser sciatic notches
pubis (pubic bone)	- body of pubis - pubic tubercle - pubic crest - symphyseal surface - superior ramus - iliopubic eminence - pecten pubis - obturator crest - obturator groove - anterior and posterior obturator tubercle - inferior ramus - pubic crest

dorsally: sacrum and coccyx

Free LL
on thigh

1/ femur

- head of femur – fovea of head
- neck of femur
- greater trochanter – trochanteric fossa
- lesser trochanter
- intertrochanteric line
- intertrochanteric crest
- body of femur
 - gluteal tuberosity
 - pectineal line
 - linea aspera
 - medial and lateral lips
 - medial and lateral supracondylar lines
 - popliteal surface
- medial epicondyle – adductor tubercle
- lateral epicondyle
- medial and lateral condyles
 - intercondylar line
 - intercondylar fossa
- patellar surface

2/ patella

- base of patella
- apex of patella
- articular and anterior surfaces

on leg

1/ tibia

- superior articular surface
- medial condyle
- lateral condyle – fibular articular facet
- anterior and posterior intercondylar areas
- intercondylar eminence – medial and lateral intercondylar tubercles
- body of tibia
 - tibial tuberosity
 - medial and lateral surfaces
 - posterior surface – soleal line
 - anterior, medial, and interosseous borders
- medial malleolus
 - articular surface
 - malleolar groove
- fibular notch
- inferior articular surface

2/ fibula

- head of fibula
 - articular surface of head of fibula
 - apex of head of fibula
- neck of fibula
- body of fibula
 - medial and lateral surfaces
 - posterior surface – medial crest
 - anterior, posterior, and interosseous borders

- lateral malleolus
 - articular surface
 - lateral malleolar fossa
 - malleolar groove

on foot

1/ tarsal bones

talus

- head of talus
 - navicular articular surface
 - anterior calcaneal articular facet
- neck of talus
 - middle calcaneal articular facet
- body of talus
 - trochlea of talus
 - superior facet
 - medial and lateral malleolar facets
 - lateral process of talus
 - posterior process of talus
 - medial and lateral tubercles
 - sulcus for flexor hallucis longus
- sulcus of talus
- posterior calcaneal articular facet

calcaneus

- calcaneal tuberosity – medial and lateral processes
- calcaneal tubercle
- sustentaculum tali (talar shelf)
- groove for tendon of flexor hallucis longus m.
- anterior and middle talar articular surfaces
- calcaneal sulcus
- posterior talar articular surface
- fibular trochlea – groove for tendon of fibularis longus m.
- articular surface for cuboid

tarsal sinus: sulcus of talus + calcaneal sulcus

navicular bone – tuberosity of navicular bone

cuneiform bones – medial, intermediate, and lateral

cuboid bone

- groove for tendon of fibularis longus m.
- tuberosity of cuboid bone
- calcaneal process

2/ metatarsal bones

- base – tuberosity of 1st and 5th metatarsal bones
- body
- head

3/ phalanges

- proximal phalanx – base, body, and head of phalanges
- middle phalanx – base, body, and head of phalanges
- distal phalanx – base, body, and tuberosity of distal phalanx

Joints of lower limb (LL)

Immobile
syndesmosis

1/ pelvic girdle

obturator membrane
sacrotuberal lig.
sacrospinal lig.,

synchondrosis

pubic symphysis (anterior connection of pubic bones)
superior pubic lig.
inferior pubic lig. (arcuate pubic lig.)

syndesmosis

2/ free extremity

interosseous membrane of leg
tibiofibular syndesmosis
anterior tibiofibular lig.
posterior tibiofibular lig.

Mobile

1/ pelvic girdle

sacroiliac joint – immobile joint (amphiarthrosis)
iliolumbar lig.
anterior sacroiliac lig.
interosseous sacroiliac lig.
posterior sacroiliac lig.

2/ free extremity

hip joint
iliofemoral lig.
pubofemoral and ischiofemoral ligg. – orbicular zone
acetabular labrum
transverse acetabular lig.
pulvinar
lig. of head of femur

knee joint

patellar lig.
infrapatellar fat pad
medial and lateral retinacula of patella
tibial and fibular collateral ligg.
oblique popliteal lig.
arcuate popliteal lig.
medial meniscus
lateral meniscus
transverse lig. of knee
infrapatellar synovial fold – alar folds
anterior cruciate lig.
posterior cruciate lig.
anterior and posterior meniscomfemoral ligg.

tibiofibular joint

- anterior lig. of head of fibula
- posterior lig. of head of fibula

upper ankle joint (talocrural joint)

- medial collateral (deltoid) lig.
 - anterior tibiotalar lig.
 - tibionavicular lig.
 - tibiocalcaneal lig.
 - posterior tibiotalar lig.
- lateral collateral lig.
 - anterior talofibular lig.
 - calcaneofibular lig.
 - posterior talofibular lig.

lower ankle joint

- posterior part – subtalar joint (talocalcaneal joint)
 - medial talocalcaneal lig.
 - lateral talocalcaneal lig.
 - posterior talocalcaneal lig.
 - interosseous talocalcaneal lig.

- anterior part – talocalcaneonavicular joint

- calcaneocuboid joint

- transverse tarsal joint (Chopart's joint)

- dorsal tarsal ligg.

- bifurcate lig.

- dorsal calcaneonavicular lig.

- dorsal calcaneocuboid lig.

- dorsal talonavicular lig.

- plantar tarsal ligg.

- plantar calcaneonavicular lig. (spring lig.)

- plantar calcaneocuboid lig. (short plantar lig.)

intertarsal joints

tarsometatarsal joints (Lisfranc joint)

- plantar tarsometatarsal ligg.
- dorsal tarsometatarsal ligg.
- long plantar lig.

intermetatarsal joints

metatarsophalangeal joints

- collateral ligg.
- deep transverse metatarsal lig.

interphalangeal joints

- collateral ligg.

Muscles of LL

Hip muscles

1/ anterior group

iliopsoas – iliacus and psoas major, psoas minor

2/ posterior group

superficial (gluteal) muscles – gluteus maximus, medius, and minimus, tensor fasciae latae

deep (pelvitrochanteric) muscles – piriformis, gemellus superior, obturator internus, gemellus inferior, quadratus femoris

Thigh muscles

1/ anterior group

quadriceps femoris – rectus femoris, vastus lateralis, medialis, and intermedius
sartorius

2/ medial group

pectineus, adductor longus, adductor brevis, and adductor magnus, gracilis, obturator externus

vastoadductor membrane: adductor hiatus and canal

3/ posterior group

biceps femoris – long and short heads, semitendinosus, semimembranosus

fascia lata: iliotibial tract

saphenous hiatus

pes anserinus: sartorius + gracilis + semitendinosus

Leg muscles

1/ anterior group

tibialis anterior, extensor digitorum longus – fibularis tertius, extensor hallucis longus

2/ lateral group

fibularis (peroneus) longus, fibularis (peroneus) brevis

3/ posterior group

triceps surae – gastrocnemius lateral and medial heads, soleus

calcaneal (Achilles) tendon

plantaris, popliteus, tibialis posterior, flexor digitorum longus, flexor hallucis longus

Foot muscles

1/ dorsal group

extensor digitorum brevis, extensor hallucis brevis, dorsal interossei

2/ plantar group

big toe muscles – abductor hallucis,

flexor hallucis brevis – lateral and medial heads,

adductor hallucis – oblique and transverse heads

little toe muscles – abductor digiti minimi, flexor digiti minimi brevis, opponens digiti minimi

middle group – flexor digitorum brevis, quadratus plantae, lumbricals, plantar interossei

Arterial supply of LL

Femoral a. is a continuation of external iliac artery, it ends in the popliteal fossa branches:
1/ superficial epigastric a.
2/ superficial circumflex iliac a.
3/ external pudendal aa.
4/ deep femoral a.
 lateral circumflex femoral a. – ascending br., descending br., transverse br.
 medial circumflex femoral a. – superficial br., deep br., ascending br., descending br., acetabular br.
 perforating aa.
5/ descending genicular a. – saphenous br., articular br.

Region of supply: part of the abdominal wall, thigh, hip joint, knee joint

Popliteal a. is a continuation of femoral a. in the popliteal fossa
it has articular and muscular branches:
terminal branches of popliteal a.: anterior tibial a. and posterior tibial a.
branches of popliteal a.:
1/ medial and lateral superior genicular aa
2/ middle genicular a.
3/ medial and lateral inferior genicular aa
4/ medial and lateral sural aa.

Region of supply: knee joint, part of the leg muscles

Articular rete of knee is formed by branches of:
1/ femoral a.
2/ popliteal a.
3/ anterior tibial a.
4/ posterior tibial a.

Anterior tibial a. runs deeply between the anterior muscles of the leg
branches:
1/ medial and lateral anterior malleolar aa.

Dorsalis pedis a. continuation of anterior tibial a. on the dorsum of the foot
(dorsal a. of foot) branches::
1/ medial and lateral tarsal a.
2/ arcuate a. – dorsal metatarsal aa. – dorsal digital aa.

Region of supply: leg, knee joint, ankle joint, dorsum of the foot

Posterior tibial a. is situated deeply between the muscles of the calf on the medial side, into medial and lateral plantar aa.
branches of posterior tibial a.:
1/ fibular (peroneal) a. – communicating br., perforating br.
 lateral malleolar br.
2/ medial malleolar br.

Region of supply: calf, knee joint, ankle joint

Medial plantar a.	is tinner than the lateral one, it has: 1/ superficial br. 2/ deep br.
Lateral plantar a.	is thicker than the medial one, it connects with medial plantar a. and form plantar arch (deep)
Plantar arch (deep)	plantar metatarsal aa. common plantar digital aa. – proper plantar digital aa. <i>Region of supply: sole of the foot and digits</i>
Internal iliac a.	gives off branches for the LL: 1/superior gluteal a. 2/ inferior gluteal a. 3/ obturator a. <i>Corona mortis anastomosis: pubic br. (from obturator a.) + obturator br. (from inferior epigastric a.)</i> <i>Region of supply: gluteal region, hip joint, medial group of thigh mm.</i>

Venous drainage of LL

Superficial veins	arise from dorsal venous arch 1/ great saphenous v. – medial marginal v. superficial epigastric v. superficial circumflex iliac v. external pudendal vv. 2/ small saphenous v. – lateral marginal v.
Deep veins	accompany equal deep arteries 1/ anterior tibial vv. 2/ posterior tibial vv. – fibular vv. 3/ popliteal v. – receives small saphenous v. 4/ femoral v. – receives great saphenous v. deep femoral v. medial and lateral circumflex femoral v. femoral v. turns into the external iliac v. above inguinal lig,

Lymphatic drainage of LL

The lymph of LL runs through superficial and deep lymph vessels and nodes.

superficial lymph nodes	superficial inguinal lnn. are the main regional lymphatic nodes of LL
deep lymph nodes	deep inguinal lnn. – lnn. of Rosenmüller (Cloquet) popliteal lnn.

Innervation of LL

1/ Lumbar plexus Th12 – L4

nerves:

- 1/ iliohypogastric n. – anterior and lateral cutaneous brr,
- 2/ ilioinguinal n.
- 3/ lateral femoral cutaneous n.
- 4/ femoral n. – muscular brr., anterior cutaneous brr.
saphenous n. – infrapatellar br., medial cutaneous brr. of leg
- 5/ genitofemoral n. – genital and femoral brr.
- 6/ obturator n. – anterior, posterior, and cutaneous brr.

Region of innervation: lesser part of the abdominal wall (skin and muscles), lesser part of LL

2/ Sacral plexus L4 – L5, S– S5, Co

gives off short direct muscular branches for pelvitrochanteric muscles first

main nerves:

:

- 1/ superior gluteal n.
- 2/ inferior gluteal n.
- 3/ posterior femoral cutaneous n. – inferior clunial brr.
perineal brr.
- 4/ sciatic n.
 - common fibular n.
 - superficial fibular n.
 - medial/intermediate dorsal cutaneous n.
 - dorsal digital nn. of foot
 - deep fibular n. – dorsal digital nn. of foot
 - lateral sural cutaneous n.
 - fibular (sural) communicating br.
 - tibial n.
 - medial sural cutaneous n.
 - medial calcaneal brr.
 - medial plantar n.
 - common/proper plantar digital nn.
 - lateral plantar n.
 - superficial br.
 - common/proper plantar digital nn.
 - deep br.
 - sural n.: medial sural cutaneous n. (from tibial n.)
+ sural communicating br. (from common fibular n.)
 - branches of sural n.:
 - lateral calcaneal brr.
 - lateral dorsal cutaneous n.
- 5/ pudendal n.
- 6/ coccygeal n.

Region of innervation: greater part of LL, external genital organs, region of the anus, perineum, and pelvic floor

Regional anatomy of LL

Borders of LL to trunk	inguinal sulcus, iliac crest, genitofemoral sulcus
Regions of LL	gluteal, anterior and posterior femoral, anterior and posterior genicular, anterior and posterior crural, dorsal and plantar pedis

Gluteal region

Superficial structures	sensory nerves: superior, middle, and inferior cluneal nn.
Deep structures	<i>greater sciatic foramen:</i> <i>suprapiriform foramen:</i> superior gluteal a.+ v.+ n. <i>infrapiriform foramen:</i> inferior gluteal a. + v.+ n., sciatic n., posterior femoral cutaneous n., internal pudendal a.+ v., pudendal n. <i>lesser sciatic foramen:</i> internal pudendal a.+ v., pudendal n.

Anterior femoral region

Important spaces	subinguinal hiatus, inguinal lig., lacuna vasorum, lacuna musculorum, femoral trigone, adductor canal
Superficial structures (above the fascia lata)	great saphenous v. with tributaries, superficial branches of femoral a.: superficial epigastric a., superficial circumflex iliac a., external pudendal aa., sensory branches of femoral n., lateral femoral cutaneous n., superficial inguinal lnn.
Deep structures	below the fascia lata in medio-lateral order: deep inguinal lnn., femoral v. + a. + n. (V A N) deep branches of femoral a. – deep femoral a. with branches deep tributaries of femoral a. – deep femoral a. with tributaries

Posterior femoral region

Superficial structures	posterior femoral cutaneous n., lateral femoral cutaneous n.
Deep structures	division of sciatic n., branches of deep femoral a.

Anterior genicular region – articular rete the knee

Posterior genicular region (popliteal fossa)

Superficial structures	small saphenous v., posterior femoral cutaneous n.
Deep structures	popliteal a.+ v., tibial n., common fibular n., popliteal lnn.

Anterior crural region

Superficial structures	great saphenous v., superficial fibular n. branches, saphenous n.
Deep structures	anterior tibial a.+ v., deep fibular n. (laterally to vessels)

Posterior crural region

Superficial structures	small saphenous v., sural n. with branches (sensory)
Deep structures	posterior tibial a. + vv., tibial n., fibular a.

Dorsal pedis region

Superficial structures	dorsal venous plexus (arch), sensory nerves for the skin
Deep structures	dorsal pedis a. + vv. with branches, deep fibular n.

Planta pedis (sole of the foot)

medial and lateral plantar aa. + vv. + n. and their branches