Bones of lower limbs

- Including bones of pelvic girdle (hip bones) and lower limb
- Compared with upper limb
  - No equivalent movements to pronation and supination in upper limb;
- More stable in lower limb, for weight-bearing
Bony pelvis

- Ilium
- Ischium
- Pubis

Right pelvis
Post. view
Ilium (lateral surface)

- ant. sup. iliac spine: a.s.i.s.
- post. sup. iliac spine: p.s.i.s.
- Iliac crest: a.s.i.s. – p.s.l.s.
- tubercle of crest
- ant. inf. iliac spine: a.i.i.s.
- post. inf. iliac spine: p.i.i.s.
- greater sciatic notch
- gluteal surface
Ilium (medial surface)-1

- obturator foramen
- iliac fossa
- a.s.i.s.; p.s.i.s.
- iliac crest: a.s.i.s. – p.s.i.s.
- greater sciatic notch (g.s.n.)
Ilium (medial surface)-2

- ala (iliac fossa)
- Body of ilium
- ridge between upper and lower part of iliac
  - arcuate line
- articular surface for sacrum (auricular face)
- attachment for ligaments (sacroiliac joint)
- iliac tuberosity
• arcuate line: linea terminalis of pelvic brim
• below: pelvic part; lesser/true pelvis
• above: abdominal part; greater/false pelvis
Ischium

- body of ischium
- lesser sciatic notch
- ischial tuberosity
- ischial spine
- ischial ramus: with inf. ramus of pubis → ischiopubic ramus
Pubis: rami

- sup. ramus → contribute to acetabulum
- inf. ramus → join ischium (ischial ramus)
Pubis: 1

- body of pubis
- pubic crest
- public tubercle
- sup. pubic ramus: **pectineal line** on its sup. border, continues into **arcuate line**
- inf. pubic ramus
- obturator foramen

Right pelvis
**Ant. view**
Obturator canal

- **obturator canal**: at the upper, posterior angle of obturator foramen (obturator n.,a.,v.)
Iliopubic eminence

Right pelvis
Ant. view
Pubis: external

- acetabulum: acetabular notch, limbus
- Gluteal line
  - Anterior
  - Posterior
  - Inferior

Right pelvis
Post. view
Pubic symphysis

- cartilaginous joint (fibrous cartilage)
- as a landmark of pelvic cavity
Pelvis

- The complete pelvis:

- the line (pelvic inlet) from promontory of sacrum -- arcuate line -- pectineal line -- pubic crest separates

- false pelvis and true pelvis

- sacrum + linea terminalis + pubis symphysis
Pelvis: anatomical position

- a.s.i.s. and symphysis pubis on the same coronal plane
Pelvis: female vs. male

- **Shape:** circular in female (less distinct promontory, broader alae); heart-shaped in male
- **Angle:** larger in female; smaller in male
Pelvis: pelvic outlet

- bounded by symphysis pubis - ischiopubic rami - ischial tuberosity - sacrotuberous lig. - coccyx
Pelvic outlet

not on the same plane; line joining the ischial tuberosities of both sides divides it into two parts
The sacro-iliac joint-1

- synovial joint in childhood; fibrous bands in joints of adult;
- > 50 years old, completely fibrous
- supported by many tough ligaments including:
  - interosseous lig., ant. & post. sacroiliac lig., sacrospinous lig., sacrotuberous lig.
Sacro-iliac joints-2

- interosseous lig., ant. and post. sacroiliac lig.
Sacroiliac joints and Sciatic foramens

- greater sciatic foramen; lesser sciatic foramen
- *posterior aspect of joint heavily armed with ligaments (to counter body weight)
Sciatic foramen

Greater sciatic foramen
Sacrospinous ligament
Lesser sciatic foramen

Right pelvis Anterior view
Right pelvis
Post. view

Sciatic foramen
Femur: proximal end (anterior Surface)

- head: faces upward, medially, slightly forward; **fovea;** neck:
  - greater trochanter; trochanteric fossa (obturator internus attachment)
  - intertrochanteric line
  - lesser trochanter

Right femur
Ant. view
Femur: angle of inclination

Angle of inclination in 3-year-old child

Right femur
Ant. view

Angle of inclination in adult

Angle of inclination in old age

Bone: Lower limb - 26
Femur: proximal end (medial surface)

- head; **fovea**; neck:
- greater trochanter; trochanteric fossa
- lesser trochanter: (iliopsoas inserts here): on posterior aspect of femur;
- intertrochanteric crest: posterior surface
- intertrochanteric line: anterior surface
Femur: proximal end (posterior surface)

- head; **fovea**; neck:
- **greater trochanter**
- **lesser trochanter**: (iliopsoas inserts here): on posterior aspect of femur
- **intertrochanteric crest**: posterior surface
Right femur
Post. view

Femur: shaft
- gluteal tuberosity
- linea aspera (post. surface)
Femur: distal end-1

- medial epicondyle; adductor tubercle (adductor magnus m.)
- lateral epicondyle
- intercondylar notch (fossa): deep, posteriorly located
- articular cartilage: tibial surface; patellar surface
Femur: distal end-2

- **medial condyle**
- **adductor tubercle** (adductor magnus m.)
- **lateral condyle**
- **intercondylar notch** (fossa): deep, posteriorly located
- **articular cartilage**: tibial surface; patellar surface
Tibia: proximal end-1

- medial condyle, lateral condyle; intercondylar area (intercondylar tubercles) for meniscus and lig.
- tibial tuberosity (tubercle): ligamentum patellae attachment

Right tibia
Ant. view
Tibia: proximal end-2

- intercondylar area (intercondylar tubercles): medial and lateral attachment of cruciate lig. & horns of med. and lat. menisci
- articular surface for head of fibula

Right tibia
Post. view

Med.                        Lateral

Attachment of medial meniscus
Attachment of posterior cruciate ligament

Articular facet for proximal head of fibula

post. surface
Tibia: shaft

- **soleal line** (oblique line): on upper 1/3 of post. surface
Tibia: shaft (cross-section)
- quadrangular in cross section
- med., lat., post. surfaces
- ant. (subcutaneous); interosseous, posteromedial borders

Right leg bone (fibula / tibia)
Ant. view
Tibia: distal end

- **medial malleolus**: groove for tibialis posterior

Right leg bone (fibula / tibia)
- Ant. view

Right leg bone (fibula / tibia)
- Post. view
Tibia: with Talus

- **inferior articular facet for talus (trochlea)**

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Epiphysial cartilage plate of distal end of fibula

Ankle joint “space”

Medial malleolus

Body of talus

Trochlea of talus

Epiphysial plate of distal end of fibula

Lateral malleolus

Fibular groove on tibia

Articular surfaces for talus

Roughened triangular area that fits into fibular groove of tibia
Fibula: head

- Surface anatomy of fibular head
- Articular surface with tibia
- Apex of head (styloid process)
Fibula: distal end

- lateral malleolus
- articular facet for talus

Right fibula
Ant. view
Knee Joint

- Weight-bearing
- 3 joint compartments:
  - 1) medial compartment: medial condyle (femur) + tibia
  - 2) lateral compartment: lateral condyle (femur) + tibia
  - 3) patella + femur
Patella

- ligamentum patellae (patellar lig.)
- Continuation of quadriceps femoris tendon above to apex of patella, below to tibia tuberosity
Tibio-femoral joint compartment

- 4 ligaments:
  - 1) medial (tibial) collateral lig.
  - 2) lateral (fibular) collateral lig.
  - 3) ant. cruciate lig.
  - 4) post. cruciate lig.
Cruciate ligaments (anterior view)

- ant. cruciate: ant. intercondylar area of tibia to lateral wall of intercondylar fossa of femur
- post. intercondylar area of tibia to medial wall of intercondylar fossa of femur

(前外後內)
Knee: cruciate ligaments

- Interconnect femur and tibia
- Ant. cruciate: ant. intercondylar area of tibia to lateral wall of intercondylar fossa of femur
- Post. intercondylar area of tibia to medial wall of intercondylar fossa of femur
- Limitations of extreme anterior and posterior displacements of tibia on fixed femur
Knee: collateral ligaments
Meniscus

- **Medial meniscus**: fibrocartilage; wide-C shaped; periphery attaches to joint capsule
- **Lateral meniscus**: more circular in shape
Bones of the foot

- Tarsal bones
- Metatarsal bones
- Phalanges (pl. of phalax)
Tarsal bones: proximal row

- Proximal row: Talus, Calcaneus (Calcaneum), Navicular
Talus

- transfers body weight
- postero-inferiorly to calcaneum which relays it to ground
- antero-inferiorly to calcaneum and navicular, through which to distal row of tarsus and metatarsus
Calcaneus (Calcaneum)

- calcaneal tuberosity
- ant. surface for Cuboid
- insertion of calcaneal tendon (Achilles tendon)
- groove for tendon of flexor hallucis longus on its undersurface

Right calcaneus
Inf. view
Navicular bone

- between head of talus and distal row of 3 cuneiform bones

- tuberosity: attachment of Tibialis posterior
Tarsal bones: distal row-1

- Distal row: Cuboid + 3 Cuneiform bones
Cuboid

- ant. surface: for 4th, 5th metatarsals
- proximal: articulate with calcaneum
- medial: with navicular & lateral cuneiform
Cuboid-2

- Lateral surface: tuberosity
- **groove for fibularis (peroneus) longus tendon** on underside
Cuneiforms (Latin: wedge)

- Cuneiforms:
  - Med.
  - Intermediate
  - Lat.
- Medial: largest
- Proximal: navicular bone
- Distal: metatarsus 1-3
Metatarsus

- all metatarsals in the same plane (different from hand)?
- Base
- Body
- Head (distal end)
Phalanges

- Big toe: proximal and distal phalanx
- 2\textsuperscript{nd}-5\textsuperscript{th} toe: proximal, middle, distal phalanx
The arches of the foot: longitudinal arch

- **medial view:**
  - ant.: head of metatarsals on the ground
  - post.: calcaneal tuberosity (tuber calcanei) on the ground

- **lateral view:** lower longitudinal arch; apex at the ant. part of calcaneum
The arches of the foot: transverse arch

- obvious at the distal row of tarsal bones,
- cuboid (laterally) close to ground; medially, medial cuneiform off the ground
- movement (of foot at ankle): dorsiflexion/plantar flexion; inversion/eversion