Lower Limb Bones
Lecture Objectives

• List the bones of the lower limb (pelvic girdle, thigh, leg, and foot bones).
• Describe the structure, relationships and function of the lower limb bones.
• Identify the surface anatomy of the lower limb bones.
• Describe the arches of the foot.
Lower Limb Bones
Pelvic (Hip) Girdle

- Each coxal (hip) bone consists of three bones that fuse together: ilium, pubis, and ischium
- The two coxal bones are joined anteriorly by the pubic symphysis (fibrocartilage)
- Joined posteriorly by the sacrum forming the sacroiliac joints
Ilium

- Largest of the three hip bones
- Ilium is the superior part of the hip bone
- Consists of a superior *ala* and inferior *body* which forms the acetabulum (the socket for the head of the femur)
- Superior border - iliac crest
- *Hip pointer* - occurs at anterior superior iliac spine
  - iliac spines
- *Greater sciatic notch* - allows passage of sciatic nerve
- Iliac fossa for muscle attachment
- *Gluteal lines* indicating muscle attachment
- Sacroiliac joint at auricular surface & iliac tuberosity
Ischium and Pubis

- **Ischium - inferior and posterior part of the hip bone**
  - Most prominent feature is the *ischial tuberosity*, it is the part that meets the chair when you are sitting
    - ischial spine
    - lesser sciatic notch
    - ramus

- **Pubis - inferior and anterior part of the hip bone**
  - Superior and inferior rami and body
False and True Pelves

- **Pelvic brim** - a line from the sacral promontory to the upper part of the pubic symphysis
- **False pelvis** - lies above this line
  - Contains no pelvic organs except urinary bladder (when full) and uterus during pregnancy
- **True pelvis** - the bony pelvis inferior to the pelvic brim, has an inlet, an outlet and a cavity
- **Pelvic axis** - path of baby during birth
Comparing Male and Female Pelves

• Males
  • Bone are larger and heavier
  • Pelvic inlet is smaller and heart shaped
  • Pubic arch is less the 90°

• Female
  • Wider and shallower
  • Pubic arch is greater than 90°
  • More space in the true pelvis
## Comparing Male and Female Pelves

**TABLE 8.1**

<table>
<thead>
<tr>
<th>POINT OF COMPARISON</th>
<th>FEMALE</th>
<th>MALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>General structure</td>
<td>Light and thin.</td>
<td>Heavy and thick.</td>
</tr>
<tr>
<td>False (greater) pelvis</td>
<td>Shallow.</td>
<td>Deep.</td>
</tr>
<tr>
<td>Pelvic brim (inlet)</td>
<td>Larger and more oval.</td>
<td>Smaller and heart-shaped.</td>
</tr>
<tr>
<td>Acetabulum</td>
<td>Small and faces anteriorly.</td>
<td>Large and faces laterally.</td>
</tr>
<tr>
<td>Obturator foramen</td>
<td>Oval.</td>
<td>Round.</td>
</tr>
<tr>
<td>Pubic arch</td>
<td>Greater than 90° angle.</td>
<td>Less than 90° angle.</td>
</tr>
</tbody>
</table>

**Anterior views**

- False (greater) pelvis
- Pelvic brim (inlet)
- Acetabulum
- Obturator foramen

Pubic arch (greater than 90°)

Pubic arch (less than 90°)
<table>
<thead>
<tr>
<th>POINT OF COMPARISON</th>
<th>FEMALE</th>
<th>MALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iliac crest</td>
<td>Less curved.</td>
<td>More curved.</td>
</tr>
<tr>
<td>Illium</td>
<td>Wide.</td>
<td>Narrow.</td>
</tr>
<tr>
<td>Greater sciatic notch</td>
<td>More movable and more curved anteriorly.</td>
<td>Less movable and less curved anteriorly.</td>
</tr>
<tr>
<td>Coccyx</td>
<td>Shorter, wider (see anterior views), and less curved anteriorly.</td>
<td>Longer, narrower (see anterior views), and more curved anteriorly.</td>
</tr>
<tr>
<td>Sacrum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Right lateral views**

| Pelvic outlet | Wider. | Narrower. |
|              | Shorter, farther apart, and more medi ally projecting. | Longer, closer together, and more laterally projecting. |
| Ischial tuberosity | Ischial tuberosity | Ischial tuberosity |

**Interior views**
Male pelvis

[Description of image contents related to male pelvis anatomy]
Female pelvis
Surface Anatomy of Pelvic Girdle

- Iliac crest
- ASIS
- Pubic symphysis
- Pubic tubercle
  - 2cm from pubic symphysis
- Ischial tuberosity
Lower Extremity

• Each lower limb = 30 bones
  • femur and patella within the thigh
  • tibia & fibula within the leg
  • tarsal bones in the foot
  • metatarsals within the forefoot
  • phalanges in the toes

• Joints
  • hip, knee, ankle
  • proximal & distal tibiofibular
  • metatarsophalangeal
Femur (thighbone)

- longest & strongest bone in body
- head articulates with acetabulum (attached by ligament of head of femur)
  - Fovea capitis
- neck is common fracture site
- greater & lesser trochanters, linea aspera, & gluteal tuberosity-- muscle attachments
- Adductor tubercle - adductor magnus
- medial & lateral condyles articulate with tibia
- patellar surface anteriorly between condyles
- intercondylar fossa - depression between the condyles
- Angle of inclination
  - Normal range 115°-140°
  - Male > Female
Patella

- Largest sesamoid bone in the body
- Forms the patellofemoral joint
- Superior surface is the base
- Inferior, narrower surface is the apex
- Thick articular cartilage lines the posterior surface
- Increases the leverage of the quadriceps femoris muscle
Surface Anatomy of Femur

- Greater trochanter
- Femoral epicondyles
- Adductor tubercle
- Patella
Tibia and Fibula

- **Tibia**
  - medial & larger bone of leg
  - weight-bearing bone
  - lateral & medial condyles
  - Intercondylar ......
  - tibial tuberosity for patellar lig.
  - proximal tibiofibular joint
  - medial malleolus at ankle
  - fibular notch

- **Fibula**
  - not part of knee joint
  - muscle attachment only
  - Head, neck, shaft
  - lateral malleolus at ankle

MNEMONIC for location of tibia and fibula: The fibula is Lateral.
Surface Anatomy of Tibia & Fibula

- Tibial tuberosity
- Anteromedial surface of tibia
- Head of fibula
- Medial malleolus
- Lateral malleolus
Tarsus

- Proximal region of foot (contains 7 tarsal bones)
- Talus = ankle bone (articulates with tibia & fibula)
- Calcaneus - heel bone
- Cuboid, navicular & 3 cuneiforms
Tarsus

- Calcaneum
  - Tubercles
  - Sustentaculum tali
  - Sulcus calcanei
  - Peroneal tubercle (fibular trochlea)

- Talus
  - Head, neck, and body
  - Sulcus tali
    - Sinus tarsi
      - Interosseous talocalcaneal ligament
Metatarsus and Phalanges

- **Metatarsus**
  - 5 metatarsals (1 is most medial)
  - each with base, shaft and head

- **Phalanges**
  - distal portion of the foot
  - similar in number and arrangement to the hand
  - big toe is hallux
Surface Anatomy of Bones of Foot

- Medial tubercle of calcaneus
- Medial side
  - Head of talus
  - Sustentaculum tali
- Lateral side
  - Fibular trochlea
  - Tuberosity of the 5th metatarsal
Arches of the Foot

- **Function**
  - distribute body weight over foot
  - yield & spring back when weight is lifted
- **Longitudinal arches along each side of foot**
  - Medial longitudinal arch
    - Calcaneum, talus, navicular, cuneiforms, and 1-3 metatarsals
  - Lateral longitudinal arch
    - Calcaneum, cuboid, and 4-5 metatarsals
- **Transverse arch across midfoot region**
  - Cuboid, cuneiforms & bases of metatarsals
- **Flatfoot** - the arches decrease or “fall”
- **Clawfoot** - too much arch occurs due to various pathologies