The foot

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Foot Anatomy

- The foot consists of 26 bones: 14 phalangeal, 5 metatarsal, and 7 tarsal.
- Toes are used to balance the body.
- Metatarsal Bones gives elasticity to the foot in weight bearing.
- Tarsal Bones located between the bones of the lower leg and the metatarsals are extremely important for support and locomotion.
Medial View of Foot

Rear foot/Hind foot
Talus and calcaneus

Midfoot
Navicular, 3 cuneiforms and cuboid

Forefoot
Metatarsals (5) and phalanges (14)
Lateral View of the foot

Forefoot

Midfoot

Hind foot/Rear foot

Phalanges

Metatarsals

Cuboid

Talus

Calcaneus

Second cuneiform

Third cuneiform

Talocalcaneal articulation
Bone of the foot: Tarsals

- Proximal region of the foot
  - 7 tarsal bones
    - Calcaneous (heel bone)
    - Talus: ankle bone (main weight bearing)
    - Navicular- medial ‘like a little boat’
  - 3 cuneiforms: wedge shaped - lateral, intermediate, medial
  - Cuboid-cube shaped - lateral
Bones of the Ankle: During walking the talus distributes about half the weight to the calcaneus the rest to the other tarsal bones

➢ Tibia
  ● Main weight bearing bone of LOWER LEG
  ● Forms medial malleolus

➢ Fibula
  ● Non-weight bearing
  ● Mainly muscle and ligament attachment
  ● Forms lateral malleolus

➢ Talus
  ● Talus is the only bone that articulates with the fibula and tibia to form the ankle joint
  ● Main weight bearing bone of the ANKLE
Ankle

Tarsus--forms ankle joint

Calcaneus--forms heel
At the upper and forepart of the medial surface of the calcaneus is a horizontal eminence, the sustentaculum tali, which gives attachment to a slip of the tendon of the Tibialis posterior.
Talus bone

- the second largest tarsal bone. It supports the tibia, rests on the calcaneus, and also articulates with the malleoli and navicular bones. It consists of a body, neck, and head. Also called
Metatarsus

- 5 metatarsal bones: numbered I – V [1 – 5] medial to lateral
- Each has a proximal base, an intermediate shaft and a distal head
- The shaft is in the middle.
- The heads are located at the distal ends of the bones. The heads are the weight bearing portion of the foot.
- The base articulate proximally with the first second and third cuneiform bones and the cuboid to form the tarsometatarsal joints
- The heads Articulate distally with the phalanges to form the metatarsophalangeal joint
Phalanages

Medial cuneiform

Intermediate cuneiform

Lateral cuneiform

Navicular

Talus

Metatarsals

Cuboid

Calcaneus
Phalanges [digits]

- Numbered I – V medial to lateral
- Each phalanx: proximal base, intermediate shaft and distal head.
- Hallux: has two phalanges [proximal & distal]
- Other toes have three phalanges: proximal, middle and distal
- Interphalangeal joints [between phalanges]
Sesamoid bones are always present at the metatarsophalangeal joint of the great toe. Function: protect the tendon that flexes the toe, [flexor hallicus longus/brevis] by protecting it from the body's weight.
Arches of the foot

• Foot arches assist the foot in supporting the body weight; in absorbing shock of weight bearing; and in providing a space on the plantar aspect of the foot for the blood vessels, nerves, and muscles.

• There are 3 arches: The metatarsal, transverse arch, medial longitudinal arch, lateral longitudinal arch.

• Two arches held by tendons & ligaments

• Allow foot to support weight of the body: the foot – 40% weight. Heel – 60% weight
The arches

- Function to support and distribute body weight
- Three arches:
  - Medial longitudinal (higher)
    - supported by calcaneal-navicular ligament (spring)
  - Lateral longitudinal
  - Transverse
- Plantar Fascia
  - Supports longitudinal arch
  - They are Fully developed by age 13
Longitudinal arch

- The plantar fascia is a fibrous ligament-like structure that runs from the calcaneus to the bases of the toes. Lifting (extending) the toes tightens the plantar fascia and deepens the arches.
The medial longitudinal arch is on the medial side of the foot. It is made of the talus, calcaneus, navicular, cuneiform, and medial metatarsal bones forming. This is the deeper arch.

The plantar aponeurosis also plays an important part in maintaining the medial longitudinal arch.
The lateral longitudinal arch is located on the lateral side of the foot. It is made of the talus, calcaneus (heel), cuboid, and lateral metatarsal bones form. This is the shallower arch and is the main weight-bearing surface of the foot.
The muscles that dynamize the arches

- are divided into the intrinsic and extrinsic muscles of the foot.
- The intrinsic muscles originate from and insert onto bones within the foot.
- The extrinsic muscles originate from the lower leg and insert onto the bones of the foot.
- **Peroneus longus and brevis** and the **tibialis posterior**—three of the extrinsic foot muscles.
- Contracting the peroneus longus and brevis muscles tilts the foot outward (eversion).
- Engaging the tibialis posterior muscles tilts the foot inward (inversion).

The muscles whose tendons run into the apex of the arches and tend to increase their height (e.g. **tibialis interior**)

- All three muscles can be used to strengthen and deepen the longitudinal arch of the foot.
While the normal tone of the small intrinsic muscles of the foot also plays an essential part in keeping the arches intact, **THE LONG** muscles which are inserted by tendons into the bones of the foot have an even more important role. These are the tendon of the tibialis anterior muscle, the tendon of the tibialis posterior, the tendon of the peroneus longus, the tendons of the flexor hallucis longus and flexor digitorum longus muscles.
The transverse arch of the foot is primarily formed by the 5 metatarsal bones.
Bones of the hand
Hand

- Skeleton of the hand contains wrist bones (Carpal bones 8), bones of the palm (Metacarpal bones 5), and bones of the fingers (Phalanges 14)
Carpal Bones

• The carpal bones are a group of eight, irregularly shaped bones. They are organised into two rows – proximal and distal.

• In the **proximal** row, the bones are (lateral to medial):
  – Scaphoid, Lunate, Triquetrum, and Pisiform – A sesamoid bone, formed within the tendon of the flexor carpi ulnaris

• In the **distal** row, the bones are (lateral to medial):
  – Trapezium, Trapezoid, Capitate, and Hamate – has a projection on its palmar surface called the hook of hamate

• Proximally, the scaphoid and lunate articulate with the radius to form the wrist joint. In the distal row, all of the carpal bones articulate with the metacarpals.
Fig. 50.6 A, Dorsal aspect of the carpal and metacarpal bones of the left hand.

Metacarpal Bones

- The metacarpal bones articulate proximally with the carpals, and distally with the proximal phalanges. They are numbered, and each associated with a digit:
  - Metacarpal I – Thumb.
  - Metacarpal II – Index finger.
  - Metacarpal III – Middle finger.
  - Metacarpal IV – Ring finger.
  - Metacarpal V – Little finger.
- Each metacarpal consists of a base, shaft and a head. The medial and lateral surfaces of the metacarpals are concave, allowing attachment of the interosseoi muscles.
(b) Right wrist and hand, anterior (palmar) view
(c) Right wrist and hand, posterior (dorsal) view
CARPAL BONES

All carpal bones participate in wrist function except for the pisiform. The scaphoid serves as a link between each row; therefore, it is vulnerable to fractures.

The distal row of carpal bones is strongly attached to the base of the second and third metacarpals, forming a fixed unit.
- Colles’ fracture is a fracture of the distal end of the radius in the forearm with dorsal (posterior) displacement of the wrist and hand (outstretched hand).

-Smith’s fracture: known as a reverse Colles’ fracture. It is a fracture of the distal end of the radius. It is caused by a direct blow to the dorsal forearm (fall on the back of the hand).

The anteroposterior view (A) of the injured radius appears normal, but widening of the physis is apparent on the lateral view (B).
Scaphoid Bone Fracture

- About 60% of all wrist fractures involve the scaphoid bone.
- The bone is shaped like a cashew nut and is located on the lateral aspect of the wrist close to the radius bone.
  - Unfortunately, someone with a broken scaphoid may think the wrist is just sprained, because there is usually no obvious deformity and little swelling.
- Symptoms include pain and tenderness on the thumb side of the wrist, pain when gripping and a deep, dull ache in the wrist.
- Untreated scaphoid fractures often do not heal, which can eventually lead to wrist arthritis.
Carpal Bone Fracture

Carpal Bones:
- Hamate
- Pisiform
- Triquetral
- Lunate
- Capitate
- Trapezoid
- Trapezium
- Scaphoid
Scaphoid Anatomy & Fractures

- Scaphoid tubercle vessels = distal 20%
- Dorsal ridge vessels = proximal 80%
- Proximal pole
- Distal pole
- Waist
- 80% is articular surface

FIST

Foosh

Bruising, swelling, pain in snuff box
think scaphoid fracture if pain and swelling in this area
reduced wrist extension

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