



Sports Medicine 15

Unit I: Anatomy

Part 3 Anatomy of the Lower Limbs: The Foot, Ankle and Lower Leg

By Andrew Morgan BPE/BEEd

Anatomy: The Foot

- Many sport activities involve some elements of running, jumping and changing direction.
- The foot is in direct contact with the ground, and the forces created by these athletic movements place a great deal of stress on the structures of the foot.
- **Foot = high incidence of injury**



Anatomy: The Foot

Function of foot:

- Critical in all athletic activities – **shock absorber** to dissipate the ground reaction forces.
- **Lever** – that functions to move the body forward, backward, or to the side

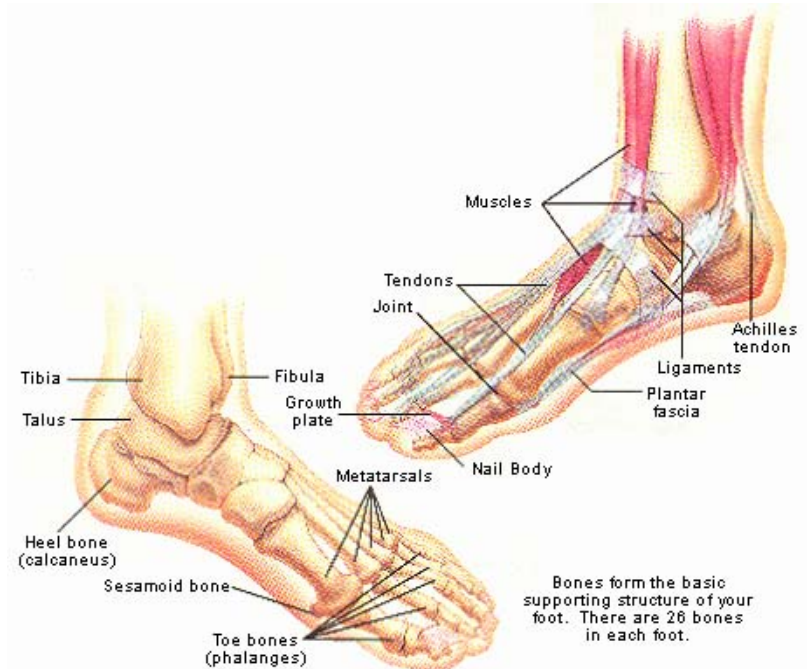


Anatomy: The Foot

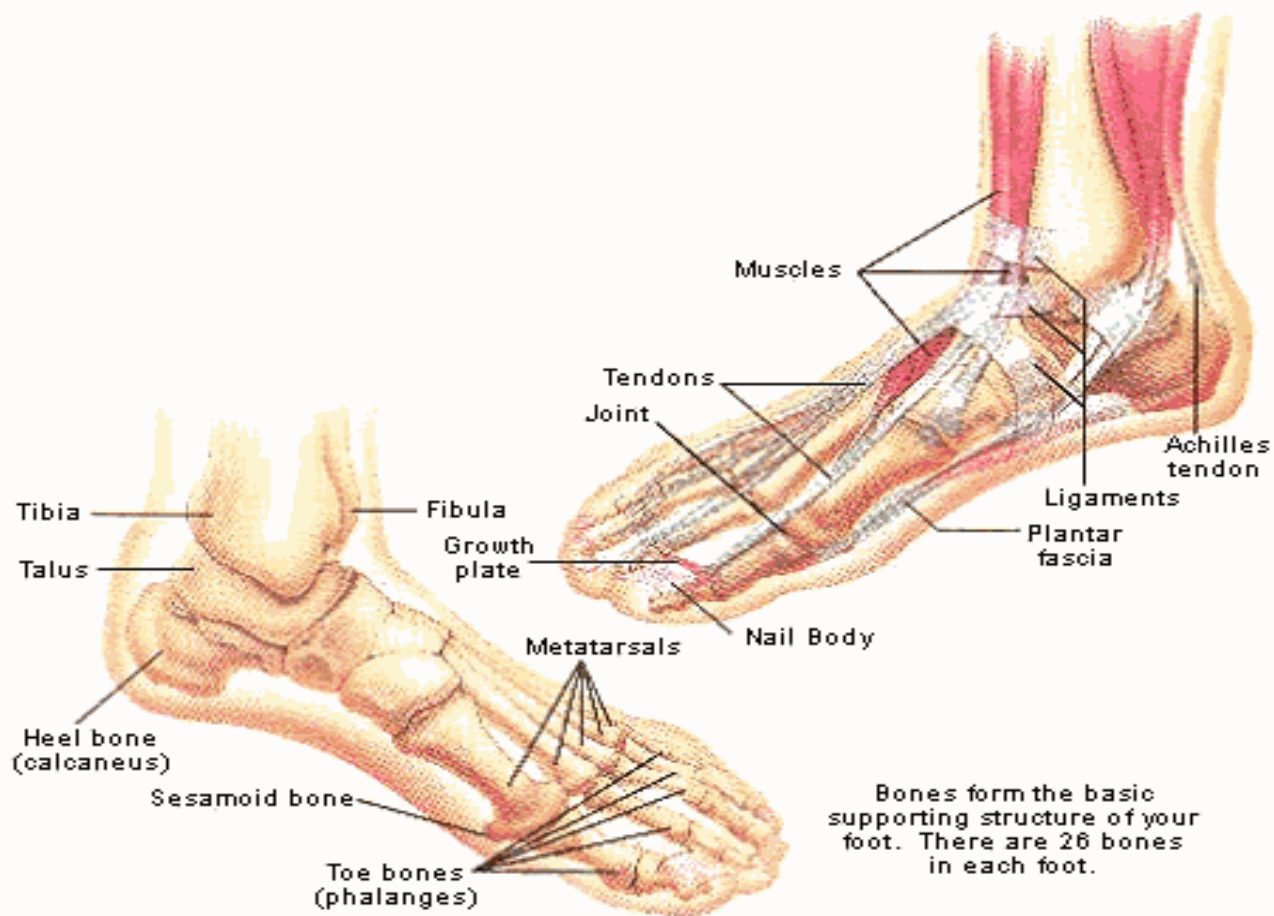
Foot consists of 26 bones:
**14 phalangeal, 5 metatarsal
and 7 tarsal**

Toes:

- Shorter than fingers.
- Give a wider base for balance and forward motion.
- The first toe, or hallux, has two phalanges.
- Two **sesamoid** bones are located beneath the **metatarsophlangeal joint**. One of their functions is to assist in reducing pressure in weight bearing activity.



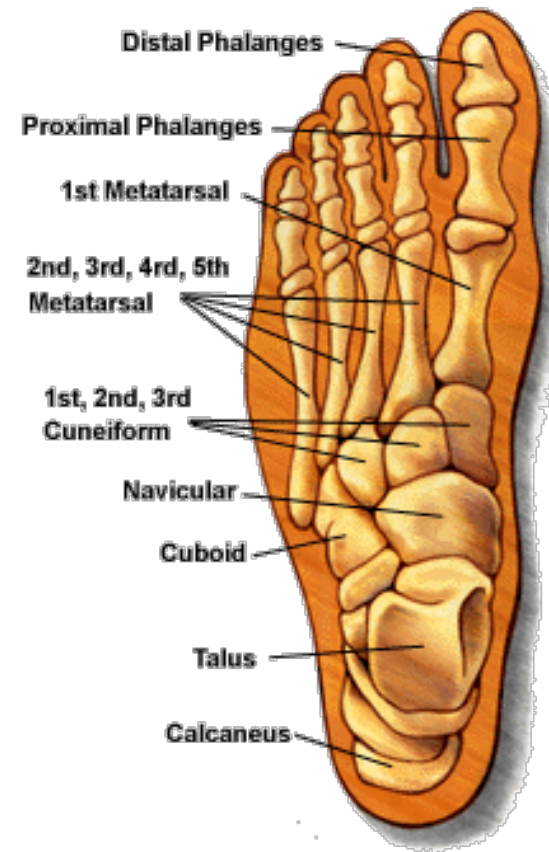
Anatomy: The Foot



Anatomy: The Foot

Metatarsals:

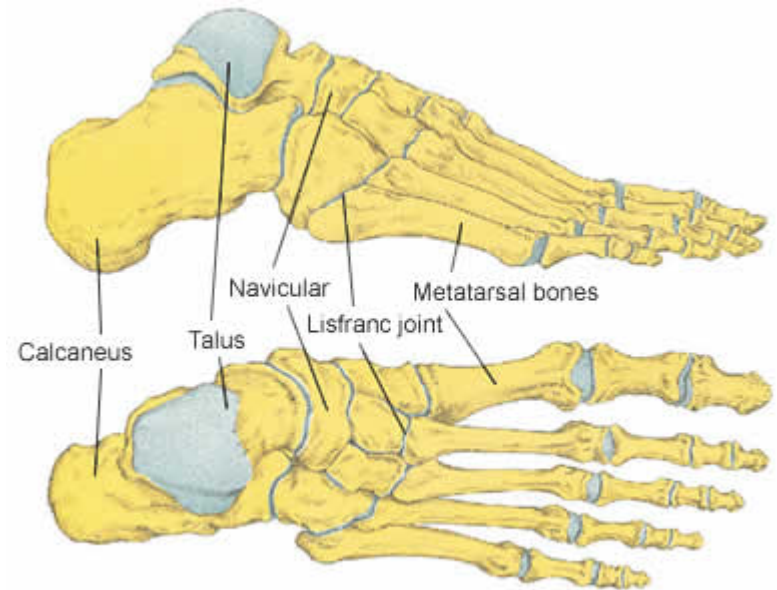
- 5 bones that lie between and articulate with the tarsals and the phalanges, **thus forming the two semi-movable joints.**
- Although there is little movement permitted, the **arrangement of the ligaments** gives elasticity to the foot in weight bearing activity.
- *The first metatarsal is the largest and strongest – it supports the foot during walking and running*



Anatomy: The Foot

Tarsal bones:

- Seven of them.
- Located between lower leg and the metatarsals.
- Very important for support of the body and its locomotion.
- **Calcaneus, Talus, Cubiod, Navicular and the first, second and third Cuneiform bones.**



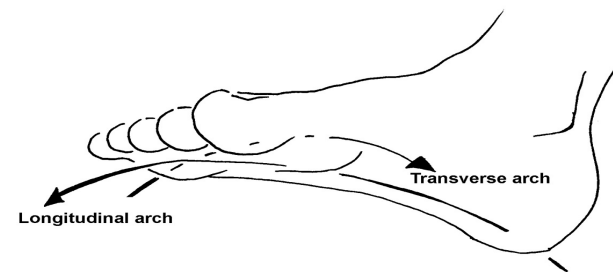
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Anatomy: The Foot

Arches of the foot:

- The foot is structured (by means of ligaments and bones) to form several arches.
- The arches assist the foot in supporting the body weight, absorbing shock and in providing space for blood vessels, nerves and muscles. There are four arches: **Medial and Lateral Longitudinal Arch, the Anterior Metatarsal Arch and the Transverse Arch.**

Arches of the Foot



Anatomy: Lower Leg, Ankle, and Foot

Movements:

- **Dorsiflexion** of the ankle joint
- **Plantar Flexion**
- Lateral (outward) movement of the foot – **Eversion**
- Medial (inward) movement of the foot – **Inversion**
- **Supination** – inversion of the ankle and adduction of the foot
- **Pronation** – eversion of the ankle and abduction of the foot



There are over 132 ligaments in the foot itself!!

Anatomy: The Foot

Plantar Fascia:

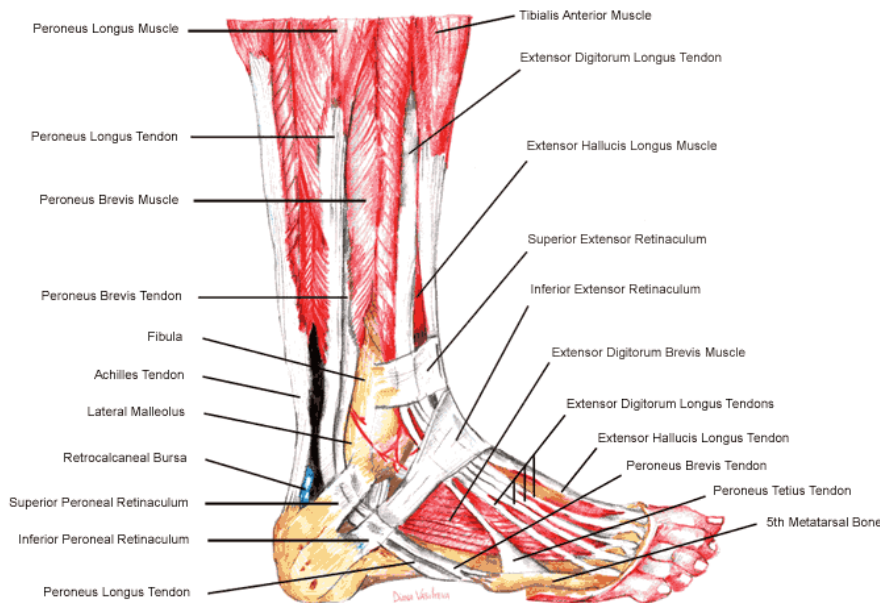
- This is a thick white band of fibrous tissue originating from the **Calcaneus** bone and finishing up at the **proximal heads of the the Metatarsal bones**.
- *Supports the foot against downward forces.*

Plantar Fascia



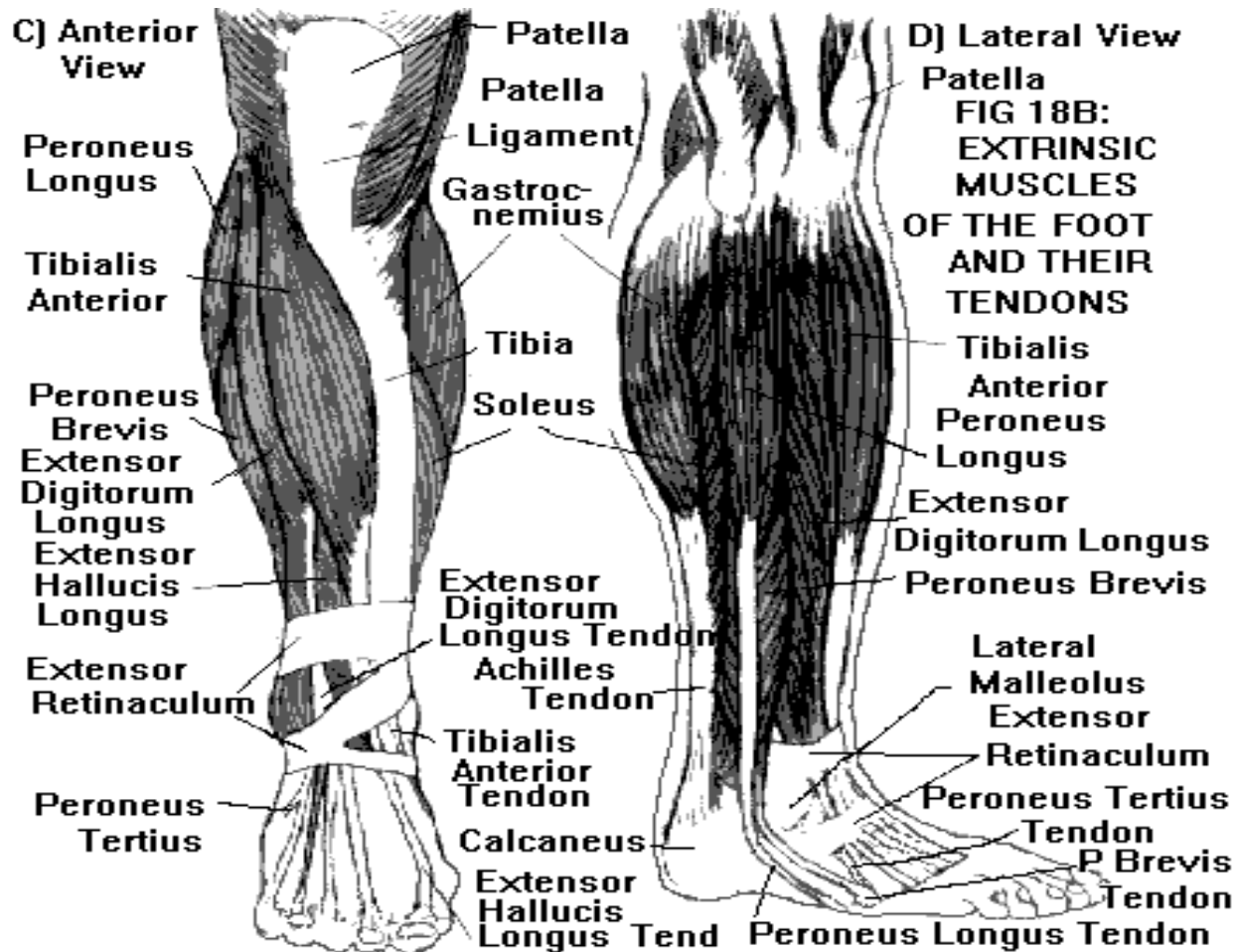
Anatomy: The Foot

Side View of Foot Muscles & Tendons



- The movements of the foot are **very complex** and are produced by numerous muscles. The muscles of the leg are typically divided into **extrinsic muscles** (those originating outside the foot and inserting within the foot), and **intrinsic muscles** (those originating and inserting within the foot)

Anatomy: The Foot





Anatomy: The Foot

- The muscles of the foot are divided into four layers.
- In Sports Medicine 15, we only look at the superficial extrinsic muscles.
- There are 12 muscles we look at, examining their muscle origin, muscle insertion and what actions they perform.

Anatomy: The Foot

- There are 12 extrinsic muscles of the foot and ankle that are contained in **4 well-defined compartments of the lower leg**: 4 muscles in the anterior compartment, 2 in the lateral, 3 in the superficial posterior and 3 in the deep superficial comp'ts.

Anterior compartment (4):

1. Tibialis Anterior

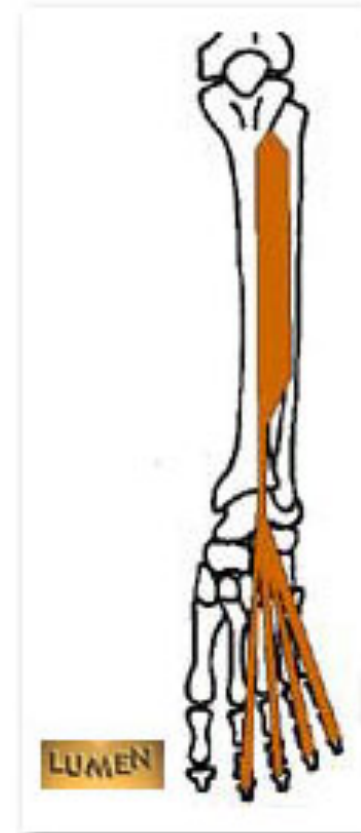
- **Origin**: lateral side of Tibia.
- **Insertion**: Medial side of Cuneiform bone.
- **Muscle action**: Contraction of this muscle causes **Dorsiflexion** and **Inversion** of the foot.



Anatomy: The Foot

2. Extensor Digitorum Longus

- ***Muscle origin:*** lateral part of Tibia and the top three-quarters of the Fibula.
- ***Muscle insertion:*** Expansion of lateral four toes.
- ***Muscle action:*** Extends toes and extends foot at ankle.



Anatomy: The Foot

3. Extensor Hallucis Longus

- ***Muscle origin:***
Middle half of anterior shaft of Fibula.
- ***Muscle insertion:***
Base of distal Phalanx of great toe.
- ***Muscle action:***
Extends big toe and foot.
Inverts foot and tightens **Subtalar** joints.



Anatomy: The Foot

- **The Peroneals**

4. Peroneus Tertius

- ***Muscle origin:*** lower third of the Fibula.
- ***Muscle insertion:*** fifth Metatarsal bone.
- ***Muscle action:*** Dorsiflexion and Eversion of the ankle joint.

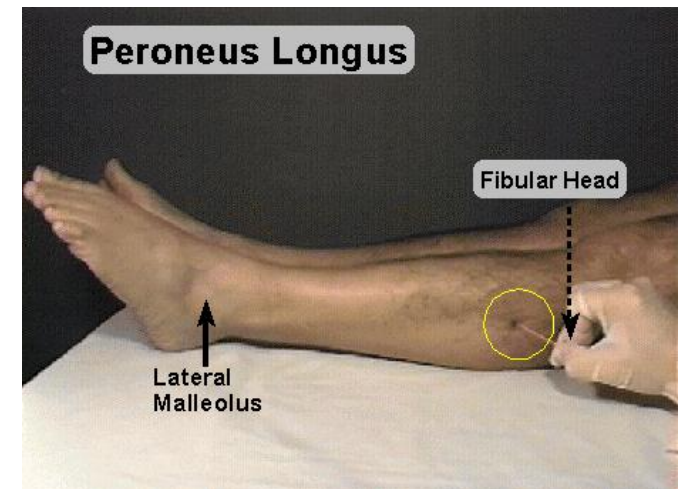


Anatomy: The Foot

Lateral compartment (2 muscles):

1. Peroneus Longus

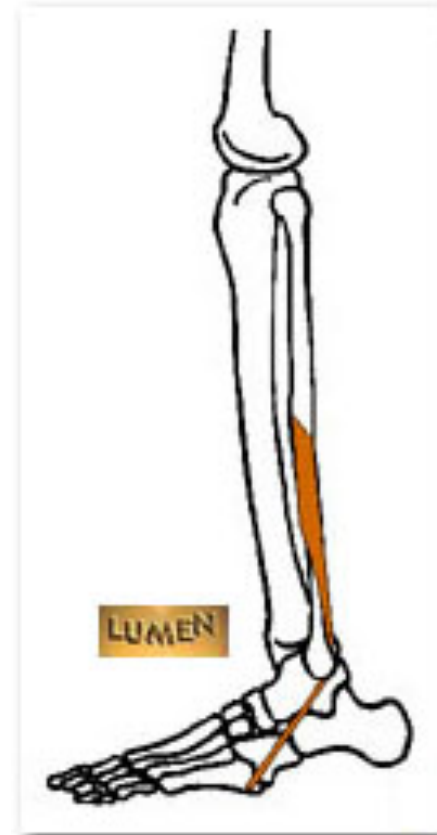
- **Muscle origin:** lateral aspect of the Fibula and Tibia.
- **Muscle insertion:** medial Cuneiform and first Metatarsal bones.
- **Muscle Action:** Plantar flexion and Eversion of the ankle joint.



Anatomy: The Foot

2. Peroneus Brevis

- ***Muscle origin:*** lower half of the lateral aspect of the Fibula.
- ***Muscle insertion:*** the base of the fifth Metacarpal.
- ***Muscle action:*** Plantar flexion and Eversion of the ankle joint.



Anatomy: The Foot

*Superficial posterior compartment
(3 muscles): muscles of the calf.*

1. Gastrocnemius

- **Muscle origin:** two headed muscle, both lateral and medial sides of the Femur.
- **Muscle insertion:** the Achilles Tendon attaches the muscle to the posterior surface of the Calcaneus.
- *Crosses both the knee and the ankle joint.*
- **Muscle Action:** Plantar Flexion of the ankle; knee flexion combined with Dorsiflexion can cause the strain of the Achilles Tendon.



Anatomy: The Foot

2. **Plantaris** – *look at in more detail in SM 35*

3. Soleus

- **Muscle origin:** Posterior aspect of the Fibula and the middle third of the posterior aspect of the Tibia.
- **Muscle insertion:** Calcaneus via the Achilles Tendon (same as Gatroc.)
- **Muscle Action:** Plantar flexion of the ankle.



Anatomy: The Foot

Deep posterior compartment (3 muscles):

1. Tibialis Posterior

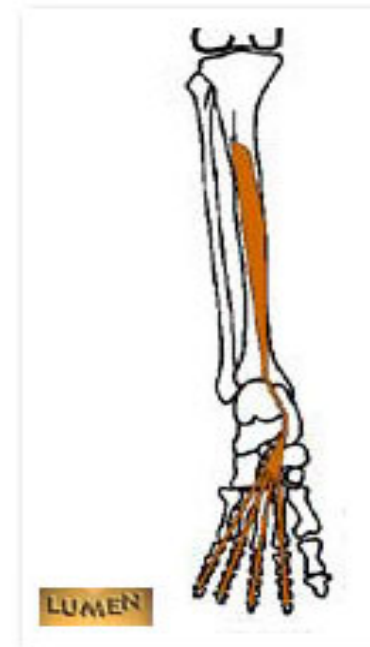
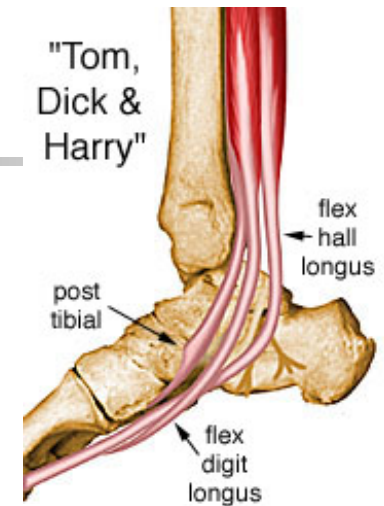
- **Muscle origin:** middle third of the posterior aspect of the Tibia, and the medial aspect of the Fibula.
- **Muscle insertion:** plantar surfaces of the Navicular and Cuneiform bones and the bases of the 2nd, 3rd, 4th, and 5th Metatarsal bones.
- **Muscle action:** Plantar Flexion and Inversion of the ankle joint.



Anatomy: The Foot

2. Flexor Digitorum Longus

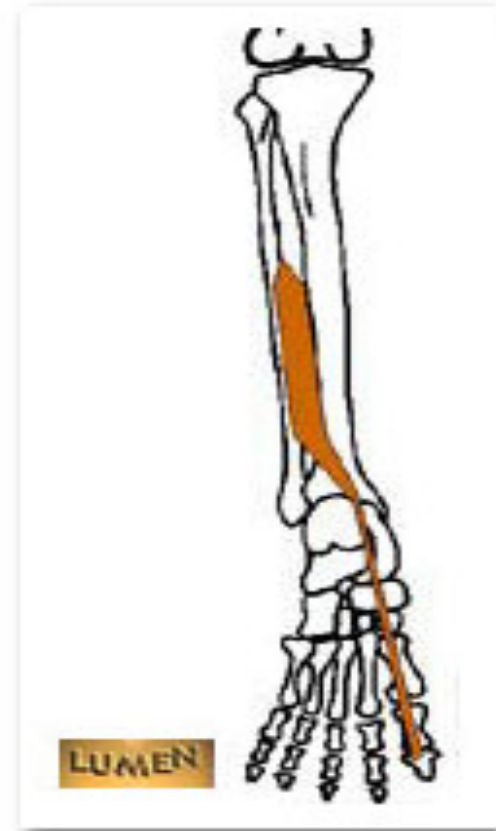
- **Muscle origin:** lower two-thirds of the posterior aspect of the Tibia.
- **Muscle insertion:** bases of the distal Phalanges of the four lateral toes.
- **Muscle action:** Making your toes curl into a ball; Plantar Flexion and Inversion of the foot, and flexion of the joints of the four lateral toes.



Anatomy: The Foot

3. Flexor Hallucis Longus

- ***Muscle origin:*** lower two thirds of the posterior aspect of the Fibula.
- ***Muscle insertion:*** base of the distal Phalanx of the great toe.
- ***Muscle action:*** Plantar Flexion and Inversion of the ankle joint and flexion of the great toe.



Anatomy – The Ankle Joint

Ankle joint problems:

- Any of the ligaments of the ankle can be sprained. However spraining the ATF (**Anterior Tibiofibular ligament**) is by far the most common.
- “Rolling over” an ankle (turning the foot excessively towards the other) places tremendous stress on the ATF.
- *Inversion Sprain*
- Volleyball, basketball....

