

# Anatomic Joints

## Dorsal View

- defined by a joint cavity
- all bones of a structural joint share the same synovial fluid

**Medial**

**Distal**

**Lateral**

**Lisfranc's Ligament / Medial Interosseous**

**Tarsometatarsal Ligament**

- separates the great tarsal joint from the medial tarsometatarsal joint

**First Cuneometatarsal Joint / Medial Tarsometatarsal Joint**

- articulation between the medial cuneiform and the 1st metatarsal
- capsule attaches at the articular margins and is lined with synovium
- a synovial planar (gliding) joint
- a functional diarthrosis joint

**Great Tarsal Joint**

- also called the great tarsal synovial cavity
- articulation of most bones of the midfoot
- the joint capsule is continuous for all surfaces participating in the great tarsal joint, is lined with synovium, and reinforced by many ligaments
- synovial planar (gliding) joint
- a functional diarthrosis
- separated from other structural joints by 4 interosseous ligaments

**Talocalcaneonavicular Joint (TCN joint)**

- articulation of the talus with the navicular, the anterior and middle facets of the talus with the anterior and middle facets of the calcaneus, and the talus with the plantar calcaneonavicular ligament / spring ligament; all articulations with the head of the talus
- the joint capsule is irregular and strengthened by many ligaments
- a multi-axial synovial joint
- functional diarthrosis joint

**Lateral Interosseous Tarsometatarsal Ligament**

- separates the great tarsal joint from the lateral tarsometatarsal joint

**Lateral Tarsometatarsal Joint / Cuboideo-metatarsals 4 and 5 Joint**

- articulations between the cuboid and the 4th metatarsal, the cuboid and the 5th metatarsal, and the 4th and 5th metatarsal bases
- synovial planar (gliding) articulations
- a functional diarthrosis joint

**Interosseous Cuneocuboid Ligament**

- separates the great tarsal joint from the lateral tarsometatarsal joint

**Interosseous Cuboideonavicular Ligament**

- separates the great tarsal joint from the functional midtarsal joint

**Calcaneocuboid Joint (CC joint)**

- articulation between the calcaneus and the cuboid
- the joint capsule attaches near the articular margins of both surfaces, is lined with synovium, and reinforced by ligaments
- a synovial sellar (saddle) joint so it allows adduction and abduction or flexion and extension
- a functional diarthrosis

**Subtalar Joint (STJ)**

- articulation between the posterior facet of the talus and the posterior facet of the calcaneus
- the joint capsule attaches near the articular margins of both facets, is lined with synovium, and reinforced by several ligaments
- a synovial, planar (gliding) joint, structurally
- a diarthrotic joint, functionally

**Proximal**

**Cuneonavicular joints**

- proximal facets of the 3 cuneiforms with the distal surface of the navicular
- planar synovial articulations

**Intercuneiform joints**

- between the (lateral surface of the) medial cuneiform and the (medial surface of the) intermediate cuneiform, and between the (lateral surface of the) intermediate cuneiform and the (medial surface of the) lateral cuneiform
- planar synovial articulations

**Cuneocuboid joint**

- between the (lateral surface of the) lateral cuneiform and the (medial surface of the) cuboid
- planar synovial articulation

**Intermetatarsal joint 2 / Second intermetatarsal joint**

- between the bases of the 2nd metatarsal (laterally) and the 3rd metatarsal (medially)
- planar synovial articulation

**Second and Third cuneometatarsal joints / Intermediate tarsometatarsal joint**

- between the medial cuneiform and the base of the 2nd metatarsal, between the intermediate cuneiform and the base of the 2nd metatarsal, between the lateral cuneiform and the base of the 2nd metatarsal, and between the lateral cuneiform and the base of the 3rd metatarsal
- planar synovial articulations

**Cuboideonavicular joint (50% present)**

- between the cuboid and the navicular
- when present as a planar synovial articulation is part of the great tarsal joint
- is often a fibrous syndesmotic joint; joined by a very strong interosseous ligament

**Third Intermetatarsal Joint / Intermetatarsal joint of the 3rd and 4th**

- between the base of the 3rd metatarsal and the 4th metatarsal base
- often communicates with the great tarsal joint
- planar synovial articulation

# Functional Joints

## Plantar View

Lateral

Distal

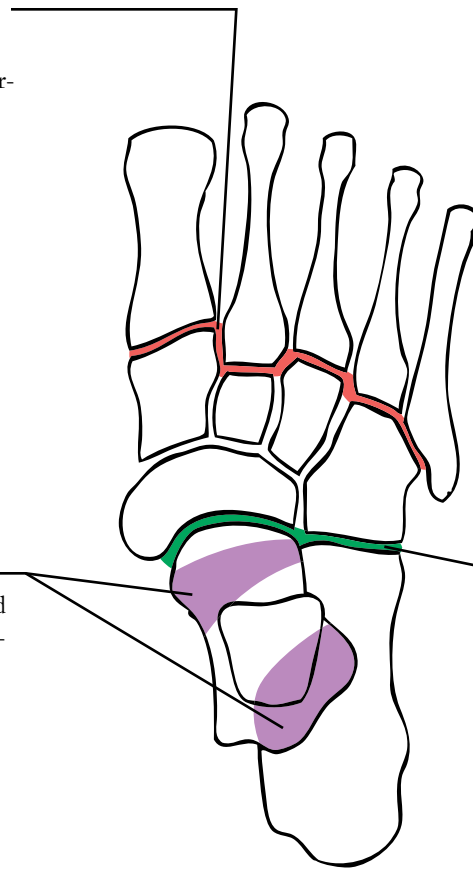
Medial

### Tarsometatarsal Joint / Lisfranc's Joint

- includes the articulation of each metatarsal proximally with a cuneiform or the cuboid (the medial, intermediate and lateral tarsometatarsal joints)
- a biplanar joint
- little motion present normally
- **movement:** adduction/abduction and dorsiflexion/plantar flexion

### Subtalar Joint (STJ)

- includes the anatomic subtalar joint, and the talocalcaneal part of the talocalcaneonavicular joint (the inferior aspect of the head of the talus with the anterosuperior aspect of the calcaneus and with the spring ligament)
- a tri-planar joint (has movement in all 3 cardinal body planes)
- **Movement:** *pronation* (eversion, dorsiflexion and abduction of the foot) and *supination* (inversion, plantar flexion and adduction of the foot)



### Midtarsal Joint (MTJ) / Transverse Tarsal Joint or Chopart's Joint

- includes the calcaneocuboid joint and the talonavicular part of the talocalcaneonavicular joint (the head of the talus with the navicular)
- forms the Cyma line on lateral view radiographs
- normally a single smooth S-shaped curve
- a tri-planar joint
- **movement:** pronation and supination

Proximal

- anatomic joints that work together as a unit
- the clinical classification

# Interosseous Foot Ligaments

## Dorsal View

- interosseous ligaments are the strongest of the foot ligaments

**Medial**

**Distal**

**Lateral**

**Interosseous Tarsometatarsal Ligaments**  
- 3 ligaments that prevent separation of the bones united by each

**Lisfranc's Ligament / Medial (First) interosseous tarsometatarsal ligament**  
- the strongest of these three  
- passes from the non-articular part of the lateral surface of the medial cuneiform to the non-articular medial surface of the base of the 2nd metatarsal  
- lies plantar to the 2nd dorsal tarsometatarsal ligament  
- an important ligament  
- provides stability to Lisfranc's joint  
- forms a boundary for the great tarsal joint  
- severe functional problems are possible with an undiagnosed rupture

**Second (Intermediate) interosseous tarsometatarsal ligament**  
- passes from the non-articular part of the medial surface of the lateral cuneiform to the non-articular lateral aspect of the 2nd metatarsal base

**Interosseous Intercuneiform Ligaments**  
- both strong ligaments to prevent separation of the bones united by each  
- support the transverse arch of the foot

**First interosseous intercuneiform ligament**  
- from the non-articular lateral surface of the medial cuneiform to the non-articular medial surface of the intermediate cuneiform

**Second interosseous intercuneiform ligament**  
- from the non-articular lateral surface of the intermediate cuneiform to the non-articular medial surface of the lateral cuneiform

**Interosseous Intermetatarsal Ligaments**  
- 3 ligaments that prevent separation of the bones united by each  
- pass from the groove on the lateral aspect of the base of one metatarsal to the non-articular part of the medial aspect of the base of the adjacent metatarsal  
- the strongest intermetatarsal ligaments

**First interosseous intermetatarsal ligament**  
- from the groove of the 2nd metatarsal base, laterally, to the non-articular part of the 3rd metatarsal base, medially

**Second interosseous intermetatarsal ligament**  
- from the groove of the 3rd metatarsal base, laterally, to the non-articular part of the 4th metatarsal base, medially

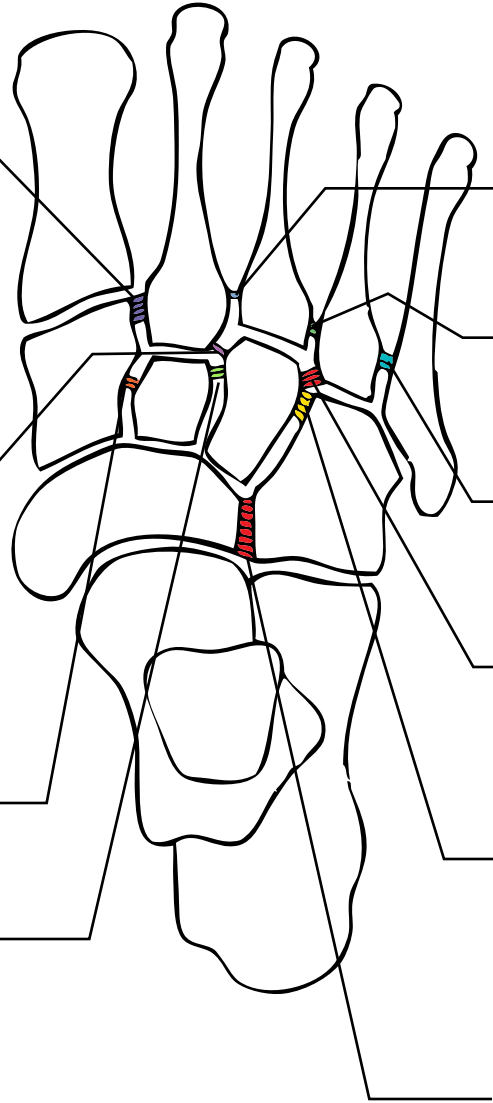
**Third interosseous intermetatarsal ligament**  
- from the groove of the 4th metatarsal base, laterally, to the non-articular part of the 5th metatarsal base, medially

**Lateral (Third) interosseous tarsometatarsal ligament**  
- passes from the non-articular lateral surface of the lateral cuneiform to the non-articular medial aspect of the 4th metatarsal base  
- is a boundary for the great tarsal joint

**Interosseous Cuneocuboid Ligament**  
- from the non-articular lateral surface of the lateral cuneiform to the non-articular medial surface of the cuboid (distal placement)  
- prevents separation of the lateral cuneiform and cuboid bones  
- supports the transverse arch of the foot  
- forms a boundary for the great tarsal joint

**Interosseous Cuboideonavicular Ligament**  
- from the lateral surface of the navicular to the medial surface of the cuboid  
- present when this joint is fibrous, not present or partially present when this joint is synovial  
- very strong, short ligament to prevent separation of the cuboid and navicular  
- forms a boundary of the great tarsal joint

**Proximal**



Many ligaments support the structural and functional joints of the foot. Without these ligaments, the foot would be a poor supportive mechanism for even the muscles. These ligaments are very important in preventing/reducing injury caused by moderate forces.

# Dorsal Foot Ligaments

## Dorsal View

### Medial

#### Dorsal Intercuneiform Ligaments

- reinforce these parts of the great tarsal joint, dorsally

**First** - from the lateral dorsal surface of the medial cuneiform to the medial dorsal surface of the intermediate cuneiform

**Second** - from the lateral dorsal surface of the intermediate cuneiform to the medial dorsal surface of the lateral cuneiform

#### Dorsal Cuneonavicular Ligaments

- reinforce their respective parts of the great tarsal joint, medial and/or dorsal

**Medial** - from the proximal dorsomedial surface of the medial cuneiform to the distal dorsomedial surface of the navicular

**Intermediate** - from the proximal dorsal surface of the intermediate cuneiform to the distal dorsal surface of the navicular

**Lateral** - from the proximal dorsal surface of the lateral cuneiform to the distal dorsal surface of the navicular

#### (Dorsal) Talonavicular Ligament

- from the superior aspect of the navicular to the superior aspect of the neck of the talus  
- reinforces the talonavicular part of the talocalcaneonavicular joint

#### Bifurcate Ligament / Chopart's Ligament

- located in the sinus tarsi

##### Calcaneonavicular part

- from the anterior process of the calcaneus to the dorsolateral edge of the navicular  
- reinforces the calcaneonavicular part of the talocalcaneonavicular joint, laterally

##### Calcaneocuboid part

- from the anterior process of the calcaneus to the dorsomedial aspect of the cuboid  
- reinforces the calcaneocuboid joint, medially

#### Lateral Talocalcaneal Ligament

- from the lateral process of the talus to the lateral surface of the calcaneus  
- reinforces the subtalar joint, laterally

#### Posterior Talocalcaneal Ligament

- from the posterior process of the talus (usually the lateral tubercle) to the superior surface of the calcaneus  
- reinforces the subtalar joint, posteriorly

### Distal

### Lateral

#### Dorsal Intermetatarsal Ligaments

- 3 ligaments

- reinforce these joints, dorsally

- fibers blend with the interosseous intermetatarsal ligament fibers

**First** - from the dorsolateral 2nd metatarsal base to the dorsomedial 3rd metatarsal base

**Second** - from the dorsolateral 3rd metatarsal base to the dorsomedial 4th the dorsomedial 4th metatarsal base

**Third** - from the dorsolateral 4th metatarsal base to the dorsomedial 5th metatarsal base

#### Dorsal Tarsometatarsal Ligaments (1 thru 7)

- all ligaments pass from the dorsum of one of the lesser tarsal bones to the dorsum of one or two of the metatarsal bases

- all reinforce the tarsometatarsal joint (Lisfranc's joint), dorsally

**First** - medial cuneiform to 1st metatarsal base

**Second** - medial cuneiform to 2nd metatarsal base  
- fibers blend with Lisfranc's ligament

**Third** - intermediate cuneiform to 2nd metatarsal base

**Fourth** - lateral cuneiform to 2nd metatarsal base  
- fibers blend with 2nd interosseous tarsometatarsal ligament

**Fifth** - lateral cuneiform to 3rd metatarsal base  
**Sixth** - dorsomedial cuboid to 3rd and 4th metatarsal bases

**Seventh** - dorsolateral cuboid to 5th metatarsal base

#### Dorsal Cuneocuboid Ligament

- from the lateral dorsal surface of the lateral cuneiform to the medial dorsal surface of the cuboid  
- reinforces this part of the great tarsal joint, dorsally

#### Dorsal Cuboideonavicular Ligament

- from the lateral dorsal surface of the navicular to the medial dorsal surface of the cuboid  
- reinforces this area of the great tarsal joint if this articulation is synovial  
- blends with the fibers of the interosseous cuboideonavicular ligament when this joint is a fibrous joint

#### Lateral Calcaneocuboid Ligament

- from the distal lateral surface of the calcaneus to the proximal lateral surface of the cuboid  
- reinforces the calcaneocuboid joint, laterally

#### Dorsal Calcaneocuboid Ligament

- from the distal dorsal calcaneal surface to the proximal dorsal surface of the cuboid  
- reinforces the calcaneocuboid joint, dorsally

### Proximal

# Foot Ligaments

## Medial View

Anterior

Superior

Posterior

### Spring Ligament / Plantar Calcaneonavicular Ligament

- passes from the distal aspect of the sustentaculum tali to the navicular tuberosity and the tubercle for the spring ligament on the plantar navicular
- very strong
- *forms a joint surface of the talocalcaneonavicular joint; There is articular cartilage on the dorsal surface of this ligament.*
- *supports the head of the talus*
- *helps support the medial longitudinal arch of the foot*
- blends with the tibionavicular ligament distomedially; these fibers are called the tibiospring ligament

### Medial Dorsal Cuneonavicular Ligament

### Medial Plantar Cuneonavicular Ligament

- passes from the plantar medial aspect of the navicular to the plantar medial aspect of the medial cuneiform
- the most medial (superior) fibers blend with those of the medial dorsal cuneonavicular ligament
- stronger than the dorsal ligament
- reinforces this part of the great tarsal joint

### Interosseous Talocalcaneal Ligament (Ligament of the Tarsal Canal)

- passes from the sulcus tali to the sulcus calcanei, fibers directed inferolaterally
- *located within the canalis tarsi, therefore is within the sinus tarsi*
- forms the border between the capsules of the anatomic subtalar joint and the talocalcaneonavicular joints
- very strong to prevent separation of the talus and calcaneus
- *limits eversion of the calcaneus*

### Medial Talocalcaneal Ligament

- passes from the medial tubercle of the posterior process of the talus to the posterior edge of the sustentaculum tali and the adjacent medial surface of the calcaneus
- reinforces the anatomic subtalar joint, medially

### Posterior Talocalcaneal Ligament

### Long Plantar Ligament (Long Plantar Calcaneocuboid Ligament)

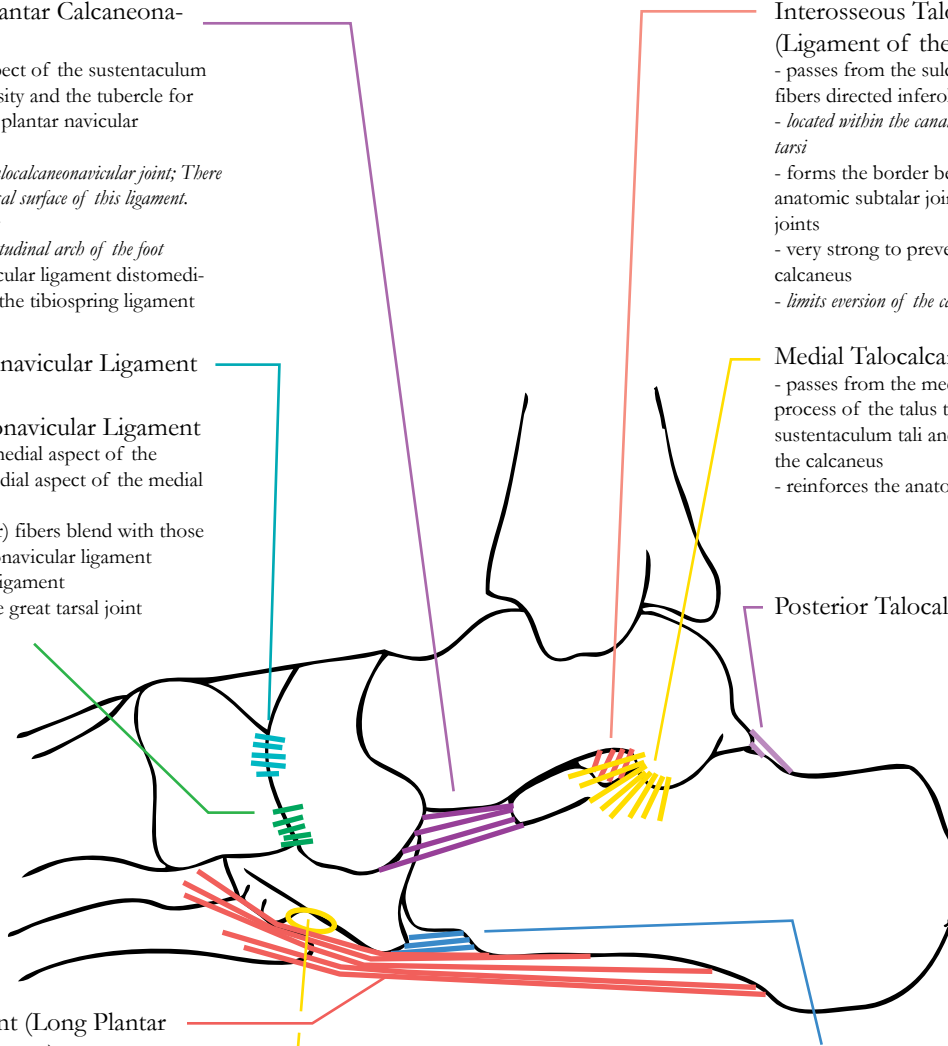
- passes from the calcaneal trigonum plantare to the peroneal ridge of the cuboid and to the bases of the 4 lesser metatarsals (all plantar)
- the proximal attachment separates the heads of the quadratus plantae muscle
- reinforces the calcaneocuboid joint, plantarly
- *helps maintain the lateral longitudinal arch*

### Short Plantar Ligament / Plantar Calcaneocuboid Ligament

- passes from the calcaneal anterior tubercle to the calcaneal process and the posterior edge of the cuboid
- reinforces the calcaneocuboid joint, plantarly
- *helps maintain the lateral longitudinal arch*

### Fibular canal / peroneal canal

- an osseofibrous tunnel for passage of the peroneus longus muscle tendon
- formed by the attachment between the peroneal ridge of the cuboid and the metatarsal bases



Inferior

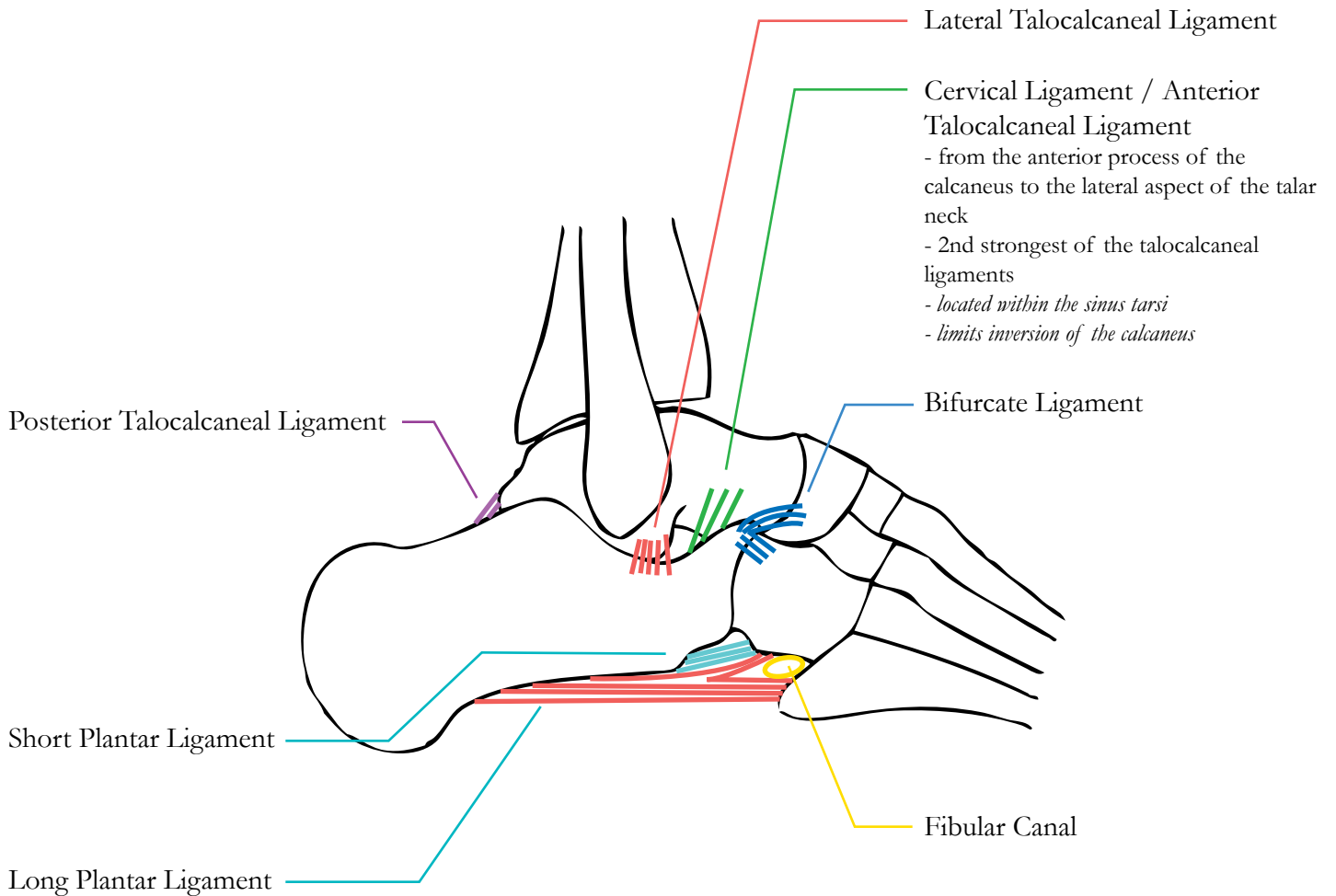
# Foot Ligaments

## Lateral View

Posterior

Superior

Anterior



Inferior

# Plantar Foot Ligaments

## Plantar View

- plantar ligaments are stronger than dorsal ligaments, generally

Lateral

Distal

Medial

### Plantar Intermetatarsal Ligaments

- 3 ligaments
- stronger than dorsal intermetatarsal ligaments
- fibers blend with fibers of the interosseous intermetatarsal ligaments

- First** - from the plantar 2nd metatarsal base to the plantar 3rd metatarsal base
- Second** - from the plantar 3rd metatarsal base to the plantar 4th metatarsal base
- Third** - from the plantar 4th metatarsal base to the plantar 5th metatarsal base

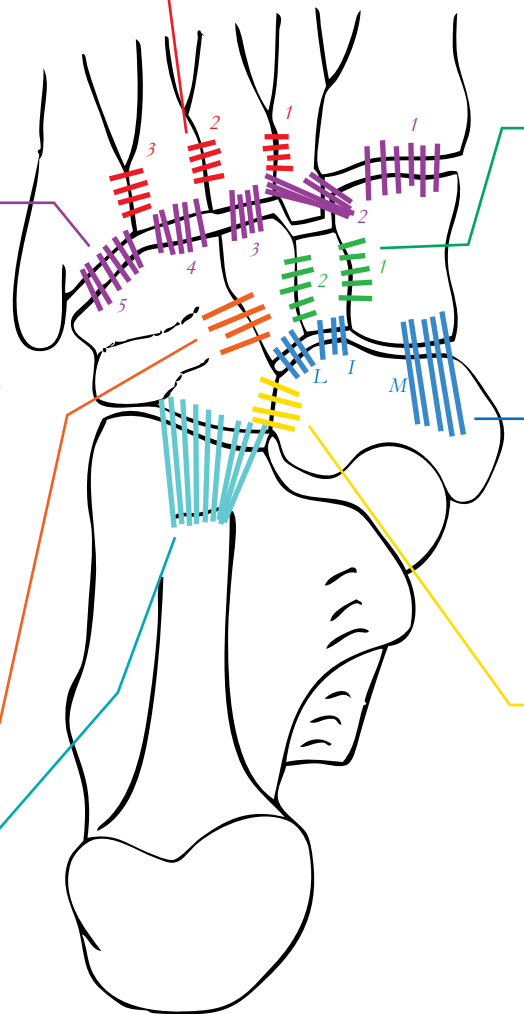
### Plantar Tarsometatarsal Ligaments

- 5 ligaments
- generally, stronger than the dorsal tarsometatarsal ligaments
- none to the intermediate cuneiform
- First** - from the distoplantar medial cuneiform to the proximoplantar 1st metatarsal base
- Second** - from the distoplantar medial cuneiform to the proximoplantar 2nd and 3rd metatarsal bases
  - fibers to the 2nd metatarsal base follow the course of and blend with Lisfranc's ligament
- Third** - from the distoplantar lateral cuneiform to the proximoplantar 3rd metatarsal base
- Fourth** - from the distoplantar cuboid, medially to the proximoplantar 4th metatarsal base
- Fifth** - from the distoplantar cuboid laterally to the proximoplantar 5th metatarsal base

### Plantar Cuneocuboid Ligament

- from the posterior apex of the lateral cuneiform to the medial edge of the fibular ridge of the cuboid
- helps to support the transverse arch of the foot
- fibers blend with fibers of the interosseous cuneocuboid ligament

### Short Plantar Ligament



### Plantar Intercuneiform Ligaments

- help to support the transverse arch of the foot
- fibers blend with the fibers of the interosseous intercuneiform ligaments

- First** - from the lateral plantar aspect of the medial cuneiform to the medial plantar aspect of the intermediate cuneiform
- Second** - from the lateral plantar aspect of the intermediate cuneiform to the medial plantar aspect of the lateral cuneiform

### Plantar Cuneonavicular Ligaments

- stronger than dorsal cuneonavicular ligaments
- all help reinforce the great tarsal joint
- medial (first)**
- intermediate (second)** - from the plantar navicular surface to the plantar aspect of the intermediate cuneiform
- lateral (third)** plantar cuneonavicular ligament
- from the plantar aspect of the navicular to the plantar aspect of the lateral cuneiform

### Plantar Cuboideonavicular Ligament

- from the lateral plantar aspect of the navicular to the medial plantar aspect of the cuboid
- blends with fibers of the interosseous cuboideonavicular ligament when this is a syndesmosis

Proximal

# Plantar Foot Ligaments

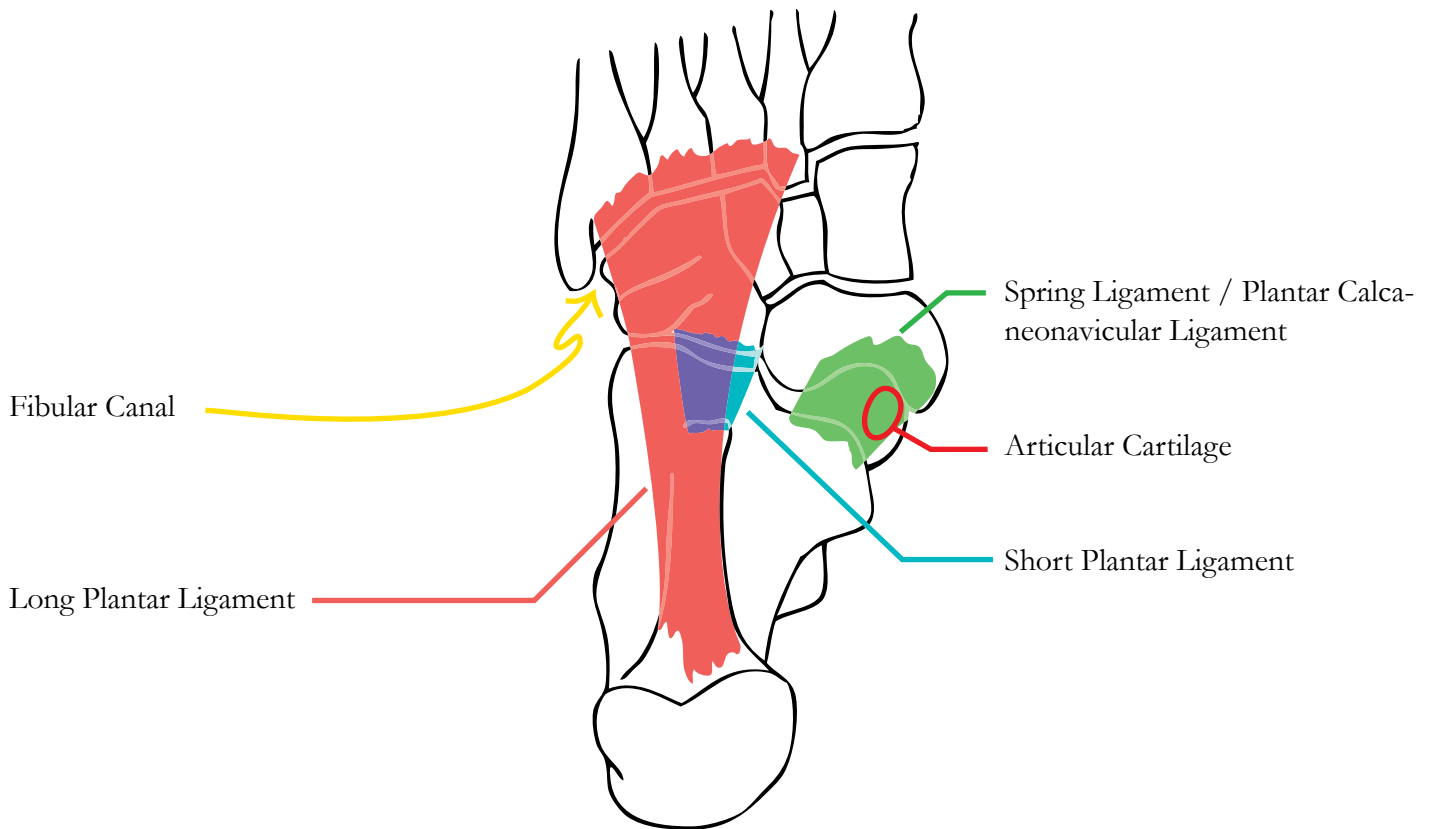
## Plantar View

- plantar ligaments are stronger than dorsal ligaments, generally

Lateral

Distal

Medial



Proximal

## ARTHROLOGY/SYNDESMOLOGY of the FOREFOOT

It is important to know the joint structure and ligamentous support for distal forefoot joints. This is where the majority of podiatrists perform surgery. An understanding of these joints and the soft tissue structures that surround them will provide a basis for selection and performance of surgical procedures.

### I. ARTHROLOGY

#### A. Metatarsophalangeal Joints (MTPJs)

- articulation of a rounded metatarsal head with the respective concave base of a proximal phalanx, ex. The 2<sup>nd</sup> metatarsal head articulates with the 2<sup>nd</sup> proximal phalangeal base, etc.
- the sesamoids are included for the 1<sup>st</sup> metatarsophalangeal joint
  - they allow posterior gliding of the 1<sup>st</sup> metatarsal head during propulsion (more effective lever)
- each is a separate anatomic and functional joint
- structural synovial ellipsoid joints
- functional diarthrotic joints
- **movement:** allow *abduction/adduction, flexion/extension and circumduction*

##### 1. Capsule

- attaches near the articular margins (encloses most of the metatarsal head)
- lined with synovium
- supported by ligaments

#### B. Interphalangeal Joints (IPJs)

- proximal and distal interphalangeal joints are identical
- capsules attach at the articular margins, are lined with synovium, and supported by ligaments
- all are anatomic and functional joints
- structural synovial ginglymus (hinge) joints
- functional diarthrotic joints
- **movement:** allow *plantar flexion and dorsiflexion*

##### 1. Proximal Interphalangeal Joints (PIPJs)

- articulation of the bicondylar convex head of a proximal phalanx with the respective bicondylar concave base of a middle phalanx, ex. the 3<sup>rd</sup> proximal phalangeal head articulates with the middle phalangeal base of the 3<sup>rd</sup> toe, etc.

##### 2. Distal Interphalangeal Joints (DIPJs)

- articulation of the bicondylar convex head of a middle phalanx with the bicondylar concave base of a distal phalanx, ex. the middle phalangeal head of the 5<sup>th</sup> toe articulates with the base of the distal phalanx of the 5<sup>th</sup> toe, etc.

##### 3. Interphalangeal Joint of the Hallux

- articulation of the bicondylar convex head of the hallucal proximal phalanx with the bicondylar concave base of the 1<sup>st</sup> distal phalanx

# First Metatarsal and Hallux

## Lateral View

### Dorsal

#### Metatarsosesamoid (Suspensory)

##### Ligaments

- pass from a sesamoid to the tubercle near the head of the first metatarsal

#### Lateral metatarsosesamoid (suspensory) ligament

- passes from the lateral aspect of the lateral sesamoid / fibular sesamoid to the 1st metatarsal head's lateral tubercle

#### Collateral Ligaments

- pass from a tubercle near the dorsal aspect of the metatarsal head to the plantar aspect of the proximal phalangeal base

#### Lateral collateral ligament of 1st metatarsophalangeal joint (1st lateral metatarso-phalangeal ligament)

- passes from the lateral tubercle of the 1st metatarsal head to the lateral tubercle of the base of the proximal phalanx

#### Medial collateral ligament of 1st metatarsophalangeal joint / 1st medial metatarso-phalangeal ligament

- passes from the medial tubercle of the 1st metatarsal head to the medial tubercle of the base of the proximal phalanx

#### Lateral Collateral Ligament of the Hallucal Interphalangeal Joint

- pass from the lateral tubercle of a phalangeal head, dorsally, to the lateral tubercle of the articulating phalangeal base, plantarly

#### Sesamophalangeal Ligaments

- pass from a sesamoid to the base of the proximal phalanx (plantarly)

#### Lateral Sesamophalangeal Ligament

- passes from the lateral sesamoid (fibular sesamoid) to the lateral tubercle of the proximal phalangeal base

#### Medial Sesamophalangeal Ligament

- passes from the medial sesamoid (tibial sesamoid) to the medial tubercle of the base of the proximal phalanx

#### Plantar Interphalangeal Ligament of the Hallucal (1st) Interphalangeal Joint

- pass from the head of one phalanx, plantarly, to the base of the articulating phalanx, plantarly

## Cross Section

### Lateral

### Medial

#### Lateral metatarsosesamoid (suspensory) ligament

#### Intersesamoid Ligament

- passes from the lateral surface of the tibial sesamoid to the medial surface of the fibular sesamoid

#### Medial metatarsosesamoid ligament (suspensory) ligament

- passes from the medial aspect of the medial sesamoid / tibial sesamoid to the medial tubercle of the 1st metatarsal head

The metatarsophalangeal joint of the hallux has more ligaments than those of the lesser pedal digits due to the presence of sesamoids.

### Plantar

## **Lesser Digit**

### **a. Plantar Metatarsophalangeal Ligaments**

- passes from the metatarsal head, plantarly, to the plantar aspect of the base of the respective proximal phalanx, ex. the 4<sup>th</sup> plantar metatarsophalangeal ligament passes from the 4<sup>th</sup> proximoplantar metatarsal head to the plantar 4<sup>th</sup> proximal phalangeal base, etc.

- replaces the sesamophalangeal ligaments

### **b. Collateral Ligaments / Metatarsophalangeal Ligaments**

- pass from the tubercle near the head of a metatarsal to the tubercle of the base of the respective proximal phalanx

#### **i. Medial Collateral Ligament of the ? Metatarsophalangeal Joint**

- pass from the medial tubercle of the head of a metatarsal, dorsally, to the medial tubercle of a proximal phalangeal base, plantarly; ex. the 2<sup>nd</sup> medial metatarsophalangeal ligament passes from the medial tubercle of the 2<sup>nd</sup> metatarsal head to the medial tubercle of the 2<sup>nd</sup> proximal phalangeal base, etc.

#### **ii. Lateral Collateral Ligament of the ? Metatarsophalangeal Joint**

- pass from the lateral tubercle of the head of a metatarsal, dorsally, to the lateral tubercle of a proximal phalangeal base, plantarly; ex. the 4<sup>th</sup> lateral metatarsophalangeal ligament passes from the lateral tubercle of the 4<sup>th</sup> metatarsal head to the lateral tubercle of the 4<sup>th</sup> proximal phalangeal base, etc.

## **Interphalangeal Joints**

- proximal and distal interphalangeal joints have the same ligaments with slightly different names

### **1. Collateral Ligaments / Interphalangeal Ligaments**

- from the tubercle near one phalangeal head (dorsally) to the tubercle of the articulating phalangeal base (plantarly)

#### **a. Medial Collateral Ligament of the ? ? Interphalangeal Joint**

- pass from the medial tubercle of a phalangeal head, dorsally, to the medial tubercle of the articulating phalangeal base, plantarly; ex. the 5<sup>th</sup> medial proximal interphalangeal ligament passes from the medial tubercle of the 5<sup>th</sup> proximal phalangeal head to the medial tubercle of the middle phalangeal base of the 5<sup>th</sup> toe, etc.

#### **b. Lateral Collateral Ligament of the ? ? Interphalangeal Joint**

- pass from the lateral tubercle of a phalangeal head, dorsally, to the lateral tubercle of the articulating phalangeal base, plantarly; ex. the 2<sup>nd</sup> lateral distal interphalangeal ligament passes from the lateral tubercle of the middle phalangeal head of the 2<sup>nd</sup> toe to the lateral tubercle of the 2<sup>nd</sup> distal phalangeal base, etc.

### **2. Plantar Interphalangeal Ligament of the ? Interphalangeal Joint**

- pass from the head of one phalanx, plantarly, to the base of the articulating phalanx, plantarly; ex. the 3<sup>rd</sup> plantar distal interphalangeal ligament passes from the plantar middle phalangeal base of the 3<sup>rd</sup> toe to the 3<sup>rd</sup> plantar distal phalangeal base, etc.

# Extensor Expansion - Metatarsal and Digit

## Dorsal View

- Metatarsal 3 or 4

Medial

### Plantar Interossei Tendons

- pass deep to the medial aspect of the sling portion of the extensor expansion to insert onto the deep side of the extensor sling and the medial aspect of the proximal phalangeal bases of the 3rd through 5th pedal digits

### Dorsal Interossei Tendons (removed on Medial side this drawing)

- pass within the extensor sling
- 1st dorsal interosseous tendon passes within the medial aspect of the sling portion of the extensor hood of the 2nd toe and inserts onto the medial aspect of 2nd proximal phalangeal base
- 2nd, 3rd and 4th dorsal interosseous tendons pass within the lateral aspect of the sling portion of the extensor hood and insert onto the lateral aspect of the proximal phalangeal bases of the 2nd, 3rd and 4th toes, respectively

### Extensor Digitorum Longus Tendon

### Extensor Digitorum Brevis Tendon

- passes into the extensor sling just lateral to the extensor digitorum longus tendon before inserting into the lateral aspect of the extensor digitorum longus tendon

### Dorsal Interosseous Muscle

### Extensor Sling

- the sling portion of the extensor expansion
- the proximal part
- transversely arranged fibers that pass around the metatarsophalangeal joint and attach to the deep transverse metatarsal ligament

### Extensor Wing

- the wing portion of the extensor expansion
- the distal part
- obliquely oriented fibers that attach to the distal aspect of the sling portion and encase the extensor tendons at the dorsal aspect of the shaft of the proximal phalanx

Lateral

## Medial View

- digit 3, 4 or 5

Dorsal

### Dorsal Interosseous Muscle (attachment)

- only present from this view if second digit
- passes within the extensor sling to insert onto the medial aspect of the base of the proximal phalanx of the second digit

### Plantar Interosseous Muscle

- only digits 3 through 5
- passes from its origin on the shaft and base of the metatarsal to its insertion on the base of the proximal phalanx and the deep part of the extensor sling
- the tendon passes deep to the extensor sling

### Lumbrical Muscle

- passes from its origin on the flexor digitorum longus tendon to its insertion into the wing portion (along the distal edge) of the extensor expansion
- the tendon passes plantar to the deep transverse metatarsal ligament

### Extensor Sling

### Extensor Wing

### Extensor Digitorum Longus Tendon

- passes into the extensor sling at the dorsal central aspect, exits the extensor wing at the head of the proximal phalanx and splits into 3 slips
- the central slip inserts onto the base of the middle phalanx
- the 2 lateral slips pass distally then merge and insert on the base of the distal phalanx
- passes dorsally along the bones and within the extensor expansion

Plantar

The extensor expansion is a fibrous sheath that encloses several tendons that pass across the metatarsophalangeal joints. The extensor expansion has 2 parts that together cover the metatarsophalangeal joint and extend to the proximal interphalangeal joint. The extensor expansion is sometimes referred to the extensor hood or the extensor hood apparatus. The extensor expansion may be absent at the 1st metatarsophalangeal joint.

# Extensor Expansion - Head of Metatarsal

## Cross Section

- Metatarsal 3 or 4

Lateral

Dorsal

Medial

**Extensor Digitorum Brevis Tendon**  
 - passes lateral to extensor digitorum longus tendon at the metatarso-phalangeal joint, prior to entering the extensor sling and inserting into the extensor digitorum longus tendon  
 - toes 2 through 4, usually

**Dorsal Interosseous Tendon**  
 - the 2nd, 3rd and 4th pass lateral to the metatarsal head for toes 2, 3 and 4  
 - the 1st passes medial to the metatarsal head for pedal digit 2  
 - passes within the extensor expansion before inserting onto the proximal phalangeal base

**Deep Transverse Metatarsal Ligament**

**Plantar Plate**

**Flexor Digitorum Longus Tendon**  
 - at the metatarsophalangeal joint, it is more dorsal, then it passes through the flexor digitorum brevis tendon near midshaft of the proximal phalanx

**Extensor Digitorum Longus Tendon**  
 - passes within the extensor expansion (both wing and sling portions) dorsally

**Extensor Sling**

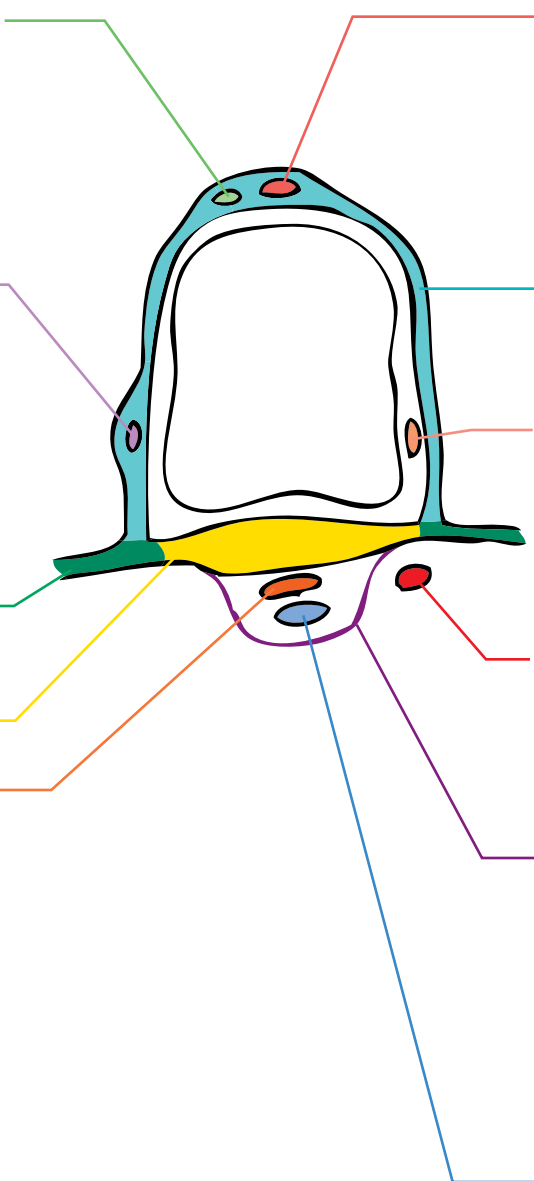
**Plantar Interosseous Tendon**  
 - pedal digits 3 through 5  
 - passes along the medial side, deep to the extensor expansion, before inserting onto the extensor sling and the medial aspect of the proximal phalangeal base

**Lumbricale Tendon**  
 - passes plantar medial to metatarsophalangeal joint and plantar to the deep transverse metatarsal ligament before inserting into the extensor wing

**Flexor Sheath**  
 - formed by the deep layer of the central band of the plantar aponeurosis as it divides into medial and lateral slips that attach to the deep and superficial transverse metatarsal ligaments as they pass along the flexor tendons and then insert onto the bases of the proximal phalanges

**Flexor Digitorum Brevis Tendon**  
 - at the metatarsophalangeal joint, it is more plantar, then it splits to allow the tendon of flexor digitorum longus to pass through

Plantar



# Foot - Superficial and Deep Fascia

## Cross Section

This is a cross section of the foot at the level of the metatarsal shafts.

**Medial**

**Dorsal**

**Lateral**

### Proper Dorsal Digital Nerve 1

- a branch of the medial dorsal cutaneous nerve from the superficial peroneal (superficial fibular) nerve
- often just dorsomedial to the 1st metatarsal

### Medial Marginal Vein

- along the dorsal aspect of the 1st metatarsal
- arises at the junction of the proper dorsal digital vein of the hallux and the dorsal venous arch

### Fascia Dorsalis Pedis

- the deep fascia of the dorsum of the foot
- attaches to the dorsal surface of each metatarsal bone, the medial surface of the 1st metatarsal bone and the lateral surface of the 5th metatarsal bone
- splits to surround each of the structures and creates four layers of structures on the dorsum of the foot

### Common Dorsal Digital Nerves 1 through 3

- from branches of the superficial fibular (superficial peroneal) nerve

### First common dorsal digital nerve

- from the **medial** dorsal cutaneous nerve
- near the 2nd intermetatarsal space

### Second common dorsal digital nerve

- from the **intermediate** dorsal cutaneous nerve
- near the 3rd intermetatarsal space

### Third common dorsal digital nerve

- from the **intermediate** dorsal cutaneous nerve
- near the 4th intermetatarsal space

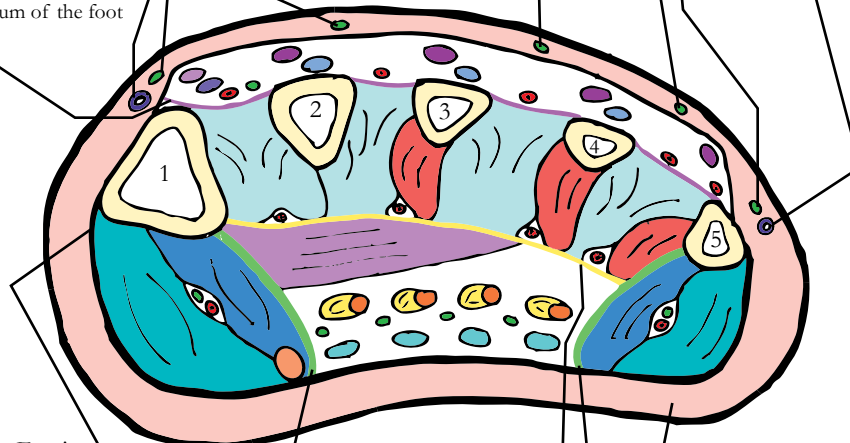
### Lateral Dorsal Cutaneous Nerve

- continuation of the sural nerve as it passes along the lateral aspect of the forefoot, lateral to the 5th metatarsal

### Proper Dorsal Digital Nerve 10

### Lateral Marginal Vein

- along the dorsolateral aspect of the 5th metatarsal
- arises at the junction of the proper dorsal digital vein of the 5th digit and the dorsal venous arch



### Plantar Aponeurosis / Plantar Fascia

- the deep fascia of the planta of the foot
- attaches to the metatarsal shafts 1 and 5, the proximal phalangeal bases 1 through 5, the calcaneal tuberosity and the skin of the sulcus
- sends vertical fibers to the skin at all levels

### Septae

- extensions of the plantar aponeurosis which divide the plantar aspect of the foot into 3 or 4 compartments

### Medial Pedal Intermuscular Septum (of the foot)

- an extension of plantar fascia which lies intermediate to abductor hallucis and flexor digitorum brevis muscle bellies and attaches to the calcaneus, navicular, medial cuneiform and first metatarsal base

### SUPERFICIAL FASCIA

- contains mostly adipose tissue
- is very dense plantarly and difficult to locate branches of nerves and arteries due to septae of plantar aponeurosis
- will look at dorsal contents here

### Lateral (Pedal) Intermuscular Septum of the Foot

- an extension of plantar fascia which lies intermediate to abductor digiti minimi and flexor digitorum brevis muscles bellies and attaches to the calcaneus, cuboid and fifth metatarsal base

### Interosseous Fascia

- an extension of the deep fascia which passes from the medial intermuscular septum of the foot or the first metatarsal to the lateral pedal intermuscular septum
- lies intermediate to the third and fourth plantar muscle layers

**Plantar**

# Foot - Dorsum

## Cross Section

This is a cross section of the foot at the level of the metatarsal shafts.

### Medial

- the fascia dorsalis pedis divides to surround the deeper structures of the dorsum of the foot

#### Extensor Digitorum Brevis Tendons [1]

- 3 tendons just deep and lateral to the extensor digitorum longus tendons for digits 2 through 4  
- may have a tendon to the 5th digit

#### Extensor Digitorum Longus Tendons [2]

- other 4 superficial tendons

#### Deep Fibular (Peroneal) Nerve [3]

- the medial terminal branch

#### Extensor Hallucis Brevis Tendon [4]

#### Extensor Hallucis Longus Tendon [5]

### Dorsal

### Lateral

#### Proper Dorsal Digital Artery 1

- not visible at this level as we are still, generally proximal to it

#### [6] Dorsal Metatarsal Arteries 1 through 4

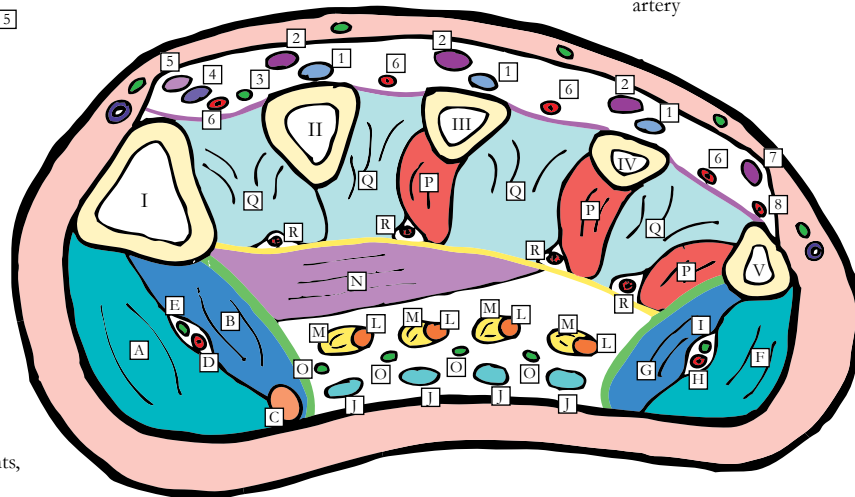
- one for each intermetatarsal space  
- each has venae comitantes

#### [7] Extensor digitorum longus tendon (4) and

Peroneus Tertius Tendon (not visible at this level as we are already distal to it)

#### [8] Proper Dorsal Digital Artery 10

- near where it arises from the 4th dorsal metatarsal artery



### Plantar

#### Compartments

- the foot is divided into 3 or 4 compartments, plantarly which contain muscles  
- important because infections usually spread within the compartment of origin

#### Medial Pedal Compartment

- flexor digitorum longus and tibialis posterior tendons along with the lateral plantar nerve and artery pass through the medial compartment's proximal end

#### [A] Abductor Hallucis Muscle

#### [B] Flexor Hallucis Brevis Muscle

#### [C] Flexor Hallucis Longus Muscle Tendon

#### [D] Proper Digital Plantar Artery 1

#### [E] Proper Digital Plantar Nerve 1

#### Lateral Pedal Compartment

- fibularis longus tendon passes through the lateral compartment proximal to this level

#### [F] Abductor Digiti Minimi (Quinti) Muscle

#### [G] Flexor Digiti Minimi (Quinti) Brevis Muscle

#### [H] Proper Digital Plantar Artery 10

#### [I] Proper Digital Plantar Nerve 10

#### Central Pedal Compartment

- tibialis posterior muscle inserts proximal to this level and fibularis longus muscle passes through proximal to this level

#### [J] Flexor Digitorum Brevis Muscle

- present at this level as tendons

#### Quadratus Plantae Muscle

- located proximal to this cut, but is part of the central compartment

#### [L] Flexor Digitorum Longus Muscle Tendons

#### [M] Lumbricale Muscles 1 through 4

#### [N] Adductor Hallucis Muscle

- the oblique head is seen more medially at this level and is deep to the flexor digitorum longus tendons  
- the transverse head is distal to this level

#### [O] Common Digital Plantar Nerves 1

through 4

#### Interosseous Compartment

- the 4th compartment  
- a subcompartment of the central compartment  
- separated from components of the central compartment by the interosseous fascia

#### [P] Plantar Interossei Muscles 1 through 3

- none with the 2nd metatarsal

#### [Q] Dorsal Interossei Muscles 1 through 4

#### [R] Plantar Metatarsal Arteries 1 through 4