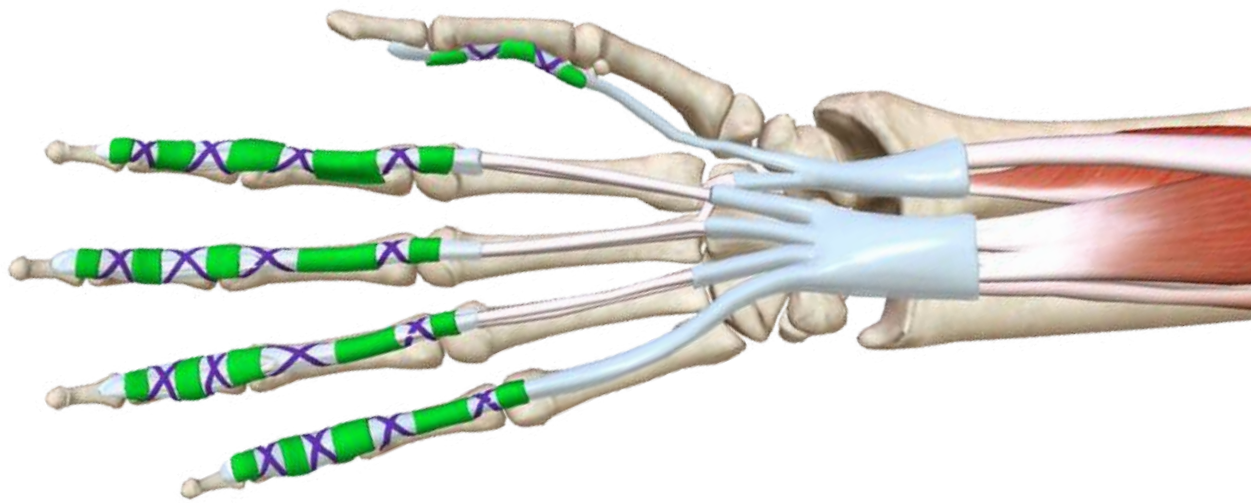


Course Handbook

Wrist and Hand Anatomy BootCamp

Lesson 4: Other Soft Tissue Structures



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Course Presenter



Khalid Maidan
Specialist MSK Physio



Dr. Jack Hurley
Medical Doctor



Mr. Ray Chari
Consultant
Orthopaedic Surgeon

Overview: Other Soft Tissue

Introduction

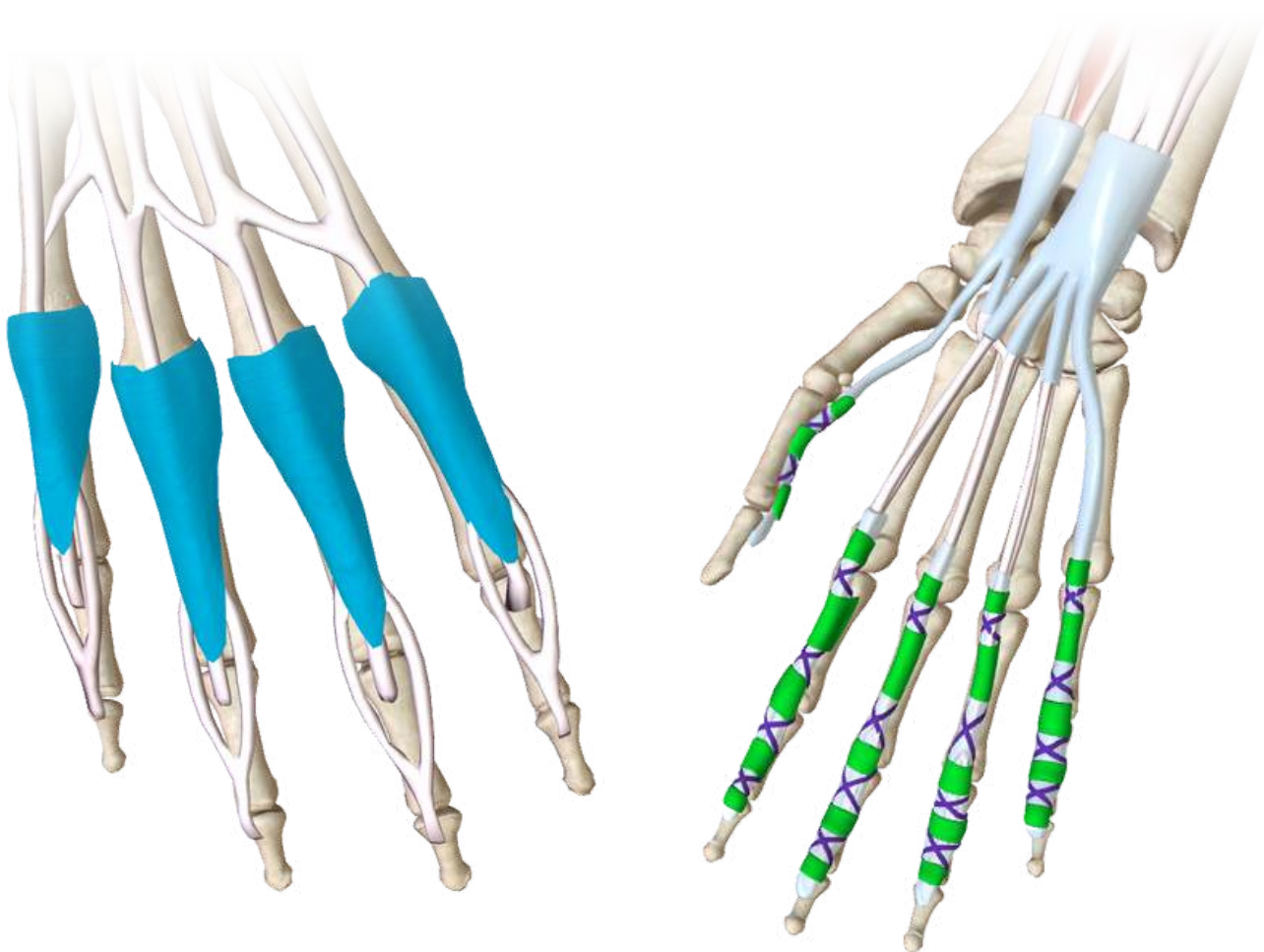
In lesson 3, we looked at the key ligaments of the wrist and hand.

In this tutorial, lesson 4, we are going to analyse some of the additional soft tissue structures that are crucial and fundamental to hand function including:

- Articular Cartilage and the Joint Capsules
- The Palmar Aponeurosis
- Flexor Tendon Sheaths and Bursae
- The Flexor Pulley System of the Fingers
- The Extensor Mechanism of the Fingers

The intricacies of hand function are incredible! For us to be able to use our hand with such high dexterity, there needs to be a number of different anatomical structures to help facilitate movement in the best way possible. These structures above truly help us to utilise our hands to the full in every day life, and thus it is very important that we understand them.

We will of course explain these structures through the course of the tutorial videos, and in the discussion points at the end of the webinar.



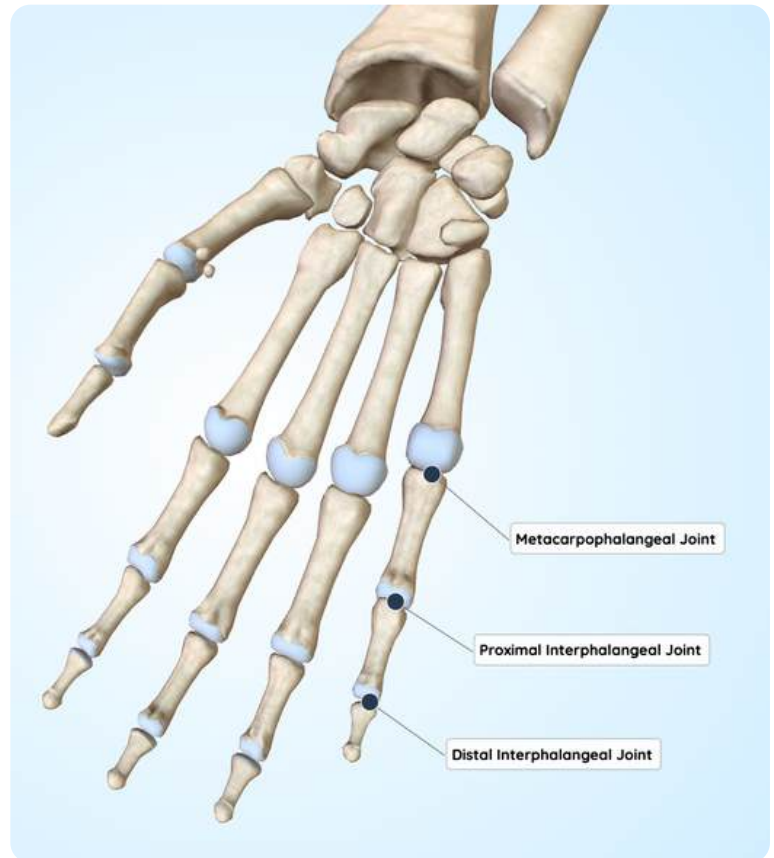
Cartilage and Joint Capsules

Articular Cartilage

When we think about the digits of the hands, the main joints to consider are the metacarpophalangeal joints, the proximal interphalangeal joints and the distal interphalangeal joints.

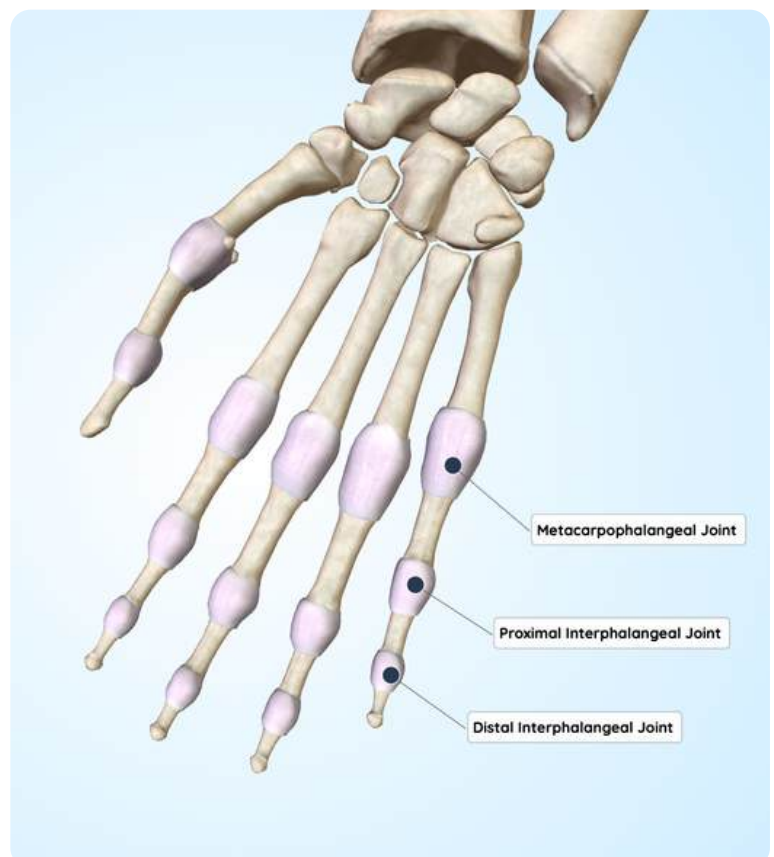
For the thumb, we simply have one interphalangeal joint.

Each of the articular surfaces for these joints are all lined with articular cartilage. This allows for smooth movement between each bone during movement.



Joint Capsule

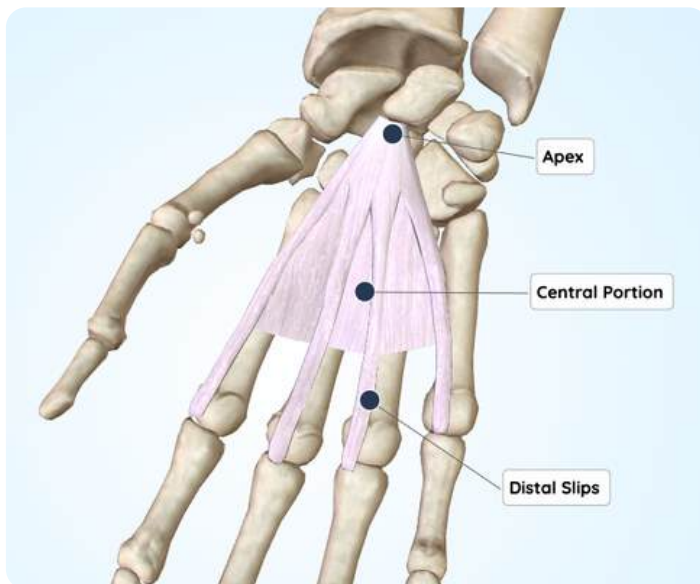
Then, like all synovial joints, we can see how each of the joints for each digit is surrounded by a synovial joint capsule, which keeps the joint stable, but also provides a membrane for the synovial fluid to lubricate the joint.



Palmar Aponeurosis

The palmar aponeurosis is a triangular shaped connective fascia situated in the palm, on the anterior surface of the hand.

Its key role is to protect the flexor tendons, and neurovascular structures within the hand which run deep or underneath it.



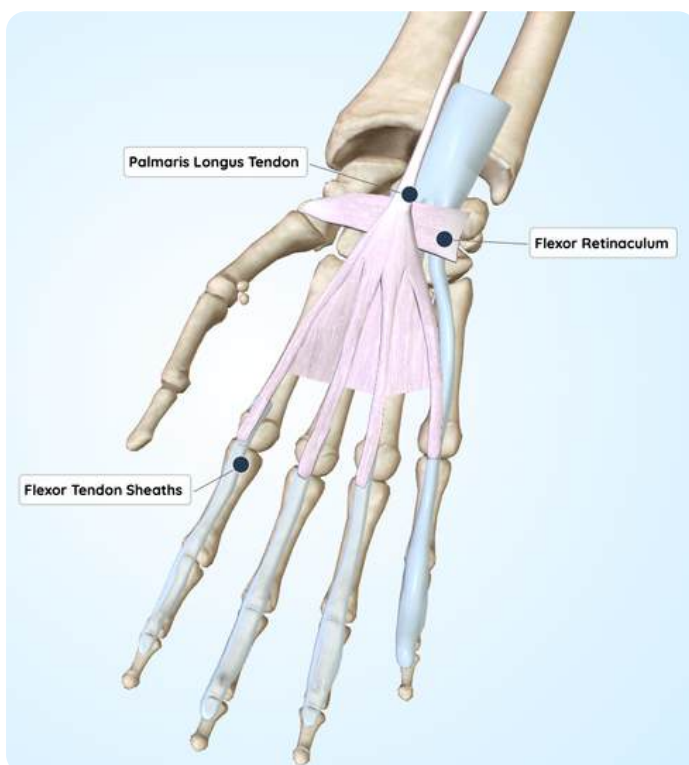
The palmar aponeurosis is sometimes described in 3 sections:

- The Apex
- The Central portion
- The Distal Slips

The **Apex** lies just superficially to the capitate bone, and is continuous with the flexor retinaculum. The **palmaris longus tendon** actually inserts into the Apex (see lower picture).

The aponeurosis then appears to separate in the **Central Section** into 4 slips, each one spreading to each of the digits 2-5. It is said that the slips, and the webbing between the slips, actually sends strands which run to the skin of the palm and fingers, so that there is attachment between the two.

The **Distal Slips** is where the 4 individual slips spread to each of the digits 2-5 and insert into the flexor tendon sheaths of digits 2-5 (see lower picture). The distal slips are also said to be stabilised by the deep and superficial transverse metacarpal ligaments.



Flexor Tendon Sheaths and Bursae

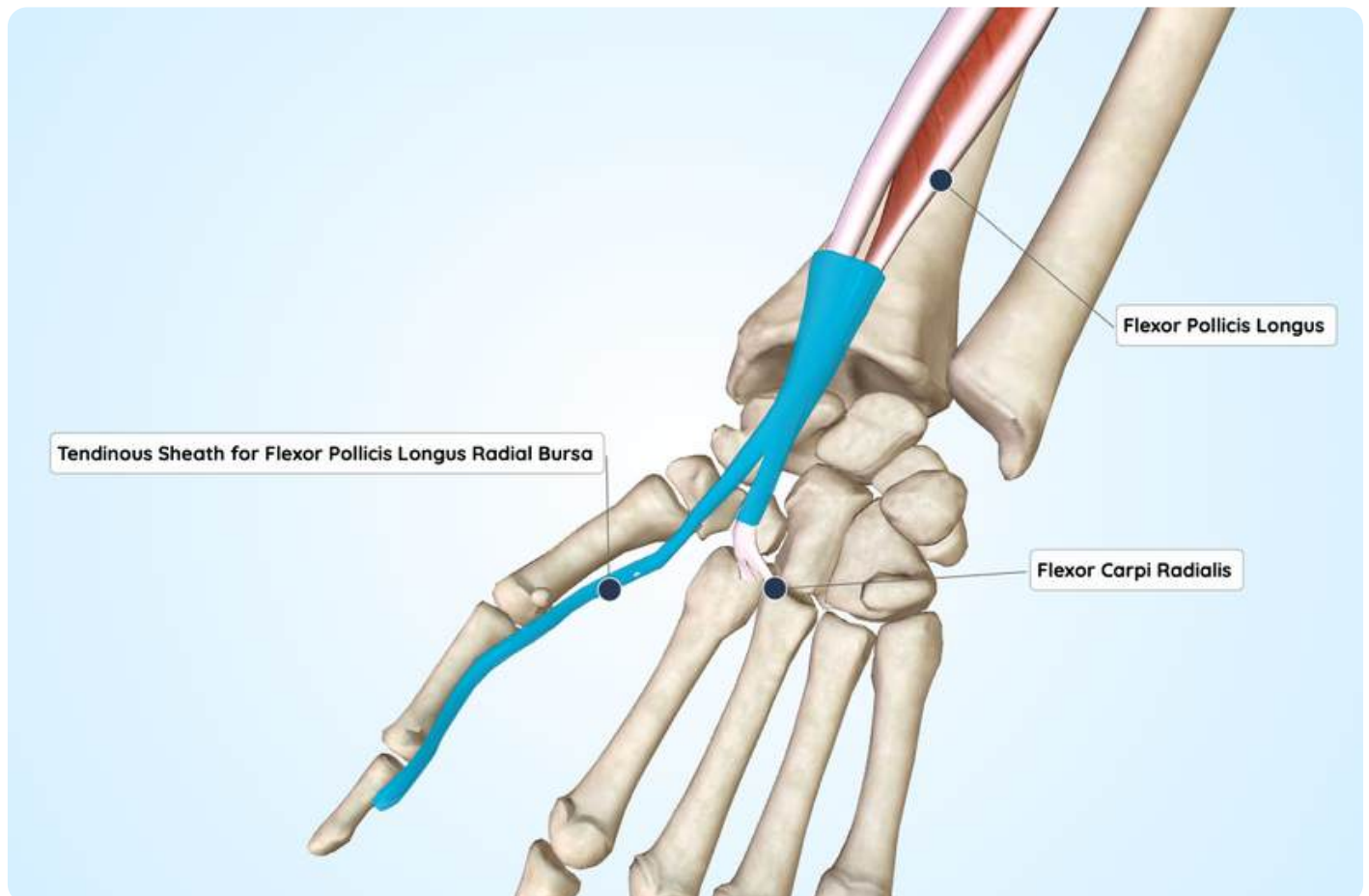
Around the hand, we have different flexor tendon sheaths, some of which also provide a secondary role as a bursa.

In this section we will explore:

- The Tendinous Sheath for Flexor Pollicis Longus Radial Bursa
- The Common Flexor Sheath Ulna Bursa
- The Flexor Tendon Sheaths

The Tendinous Sheath for Flexor Pollicis Longus Radial Bursa

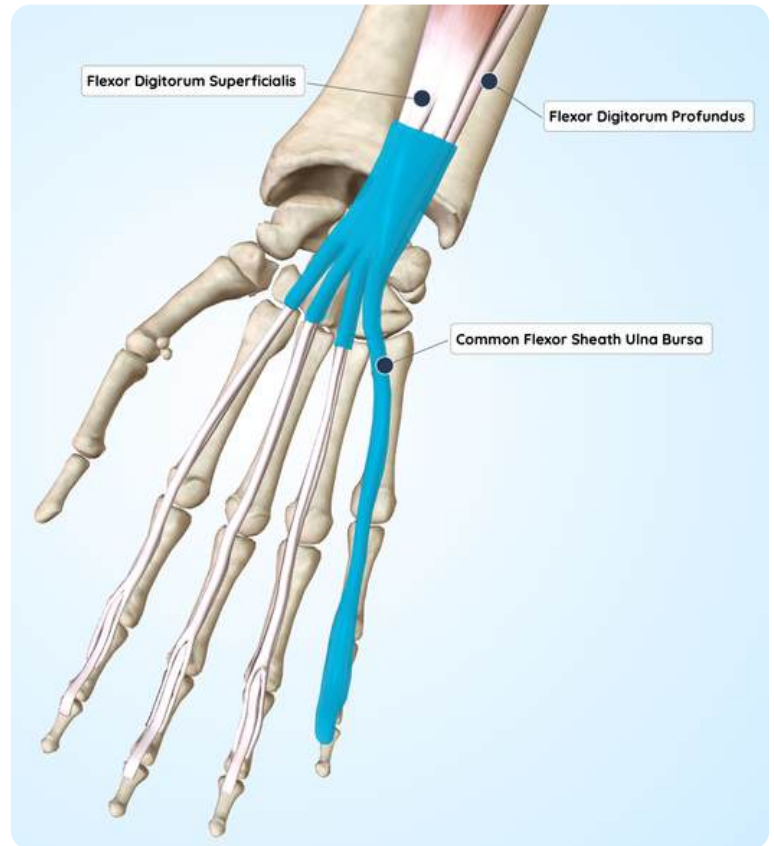
- This structure (with an incredibly long name!) doubles up as a tendon sheath and a bursa
- The Radial Bursa actually surrounds the **Flexor Pollicis Longus** tendon, acting as both a bursa to reduce friction of movement, and also act as a sheath to protect the tendon (on the image below, this tendon runs all the way through the lateral half of the bursa to the distal phalanx of the thumb).
- We can also see a small second strand to this bursa which provides some protection to the **Flexor Carpi Radialis** tendon as you can see below.



Flexor Tendon Sheaths and Bursae

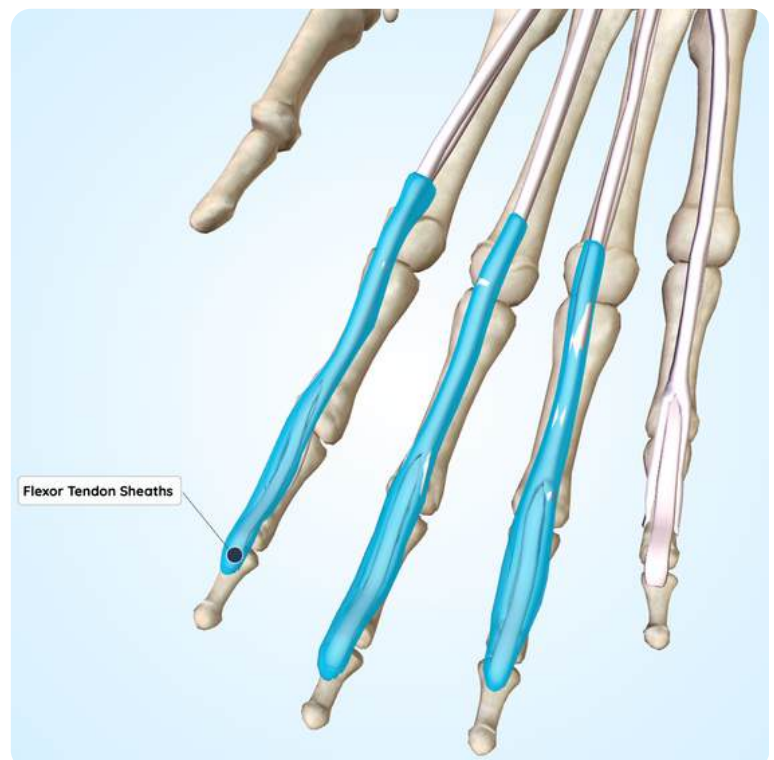
The Common Flexor Sheath Ulna Bursa

- This structure also doubles up as a tendon sheath and a bursa
- The whole structure is sometimes referred to as just the **Ulna Bursa**, to explain its role as a bursa in allowing for smooth movement with less friction.
- However, it also acts as a tendon sheath to the **proximal ends of the Flexor Digitorum Superficialis and Profundus tendons for Digits 2-4...**
- ... and it also acts as a tendon sheath for the **whole of the Flexor Digitorum Superficialis and Profundus Tendons for the 5th digit**



The Flexor Tendon Sheaths

- The final sheaths to show you are those which cover the distal flexor tendons of **Flexor Digitorum Superficialis** and **Flexor Digitorum Profundus** of **digits 2-4**
- These 3 individual sheaths are commonly referred to as just the **Flexor Tendon Sheaths** or **Synovial Tendon Sheaths**, and as you can imagine, have a role in protecting these tendons specifically at their distal ends



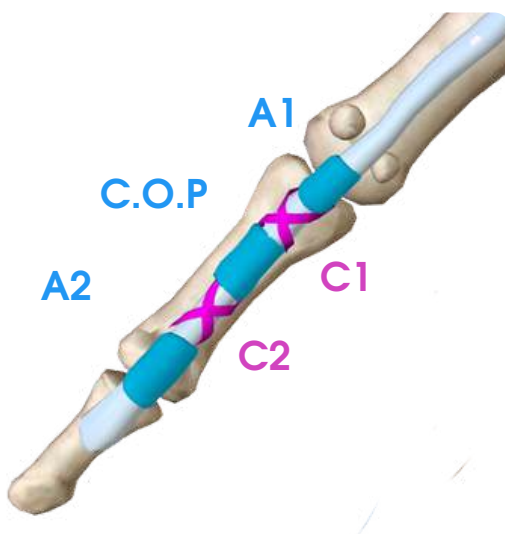
Flexor Pulley System

The **Flexor Pulley System** is a series of soft tissue small ligaments which are designed to improve the movement of the Flexors of the Fingers.

Remember that the Flexor Digitorum Superficialis and Profundus tendons create flexion at all joints of the fingers (MCPJ, PIPJ, DIPJ). How do they do this when they only insert into the middle and distal sections, and how do they allow for flexion at all joints simultaneously?

The answer is due to the Pulley system, which keeps the tendons down against the bones of the digits, and is strategically positioned to allow for flexion at each joint.

In this diagram, you can see a series of longer circumferential ligaments called **Annular Pulleys** (blue), and thinner shorter cross-shaped ligaments called the **Cruciate Pulleys** (pink). The Annular pulleys are named as A-pulleys, and the Cruciate pulleys are named as C-pulleys as you will see below.



Thumb

At the thumb, from proximal to distal, we have

- **A1** (1st Annular Ligament) over the MCPJ
- We then have **C1 and C2** (Cruciate 1 and Cruciate 2) sitting either side of the **Central Oblique Pulley** which sits in the middle of the proximal phalanx of the thumb.
- We then have **A2** or the second Annular ligament at the most distal point over the Interphalangeal joint.
- Notice how the pulleys overlap the tendon sheath for the flexor pollicis longus tendon showing how they influence any movement initiated by this muscle

Flexor Pulley System

Digits 2-5

For Digits 2-5, we have more pulleys, as there are more joints at these digits.

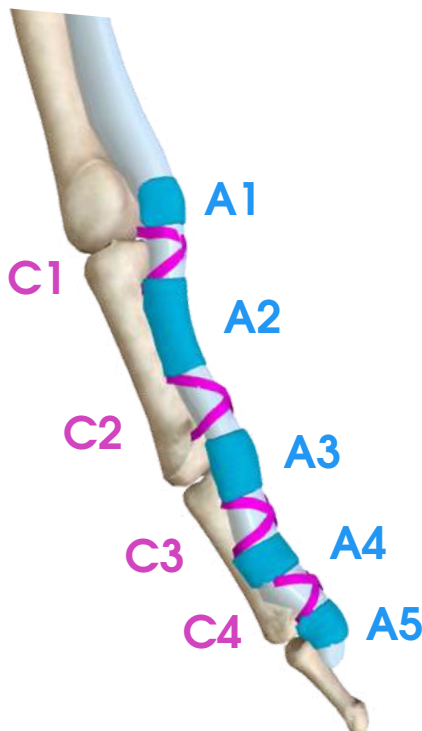
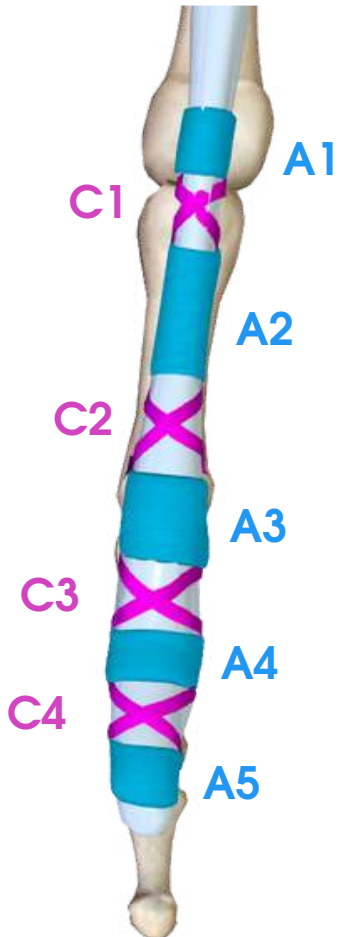
We have 5 Annular Pulleys:

- **A1** at the Distal Metacarpal
- **A2** in the middle of the Proximal Phalanx
- **A3** over the PIPJ
- **A4** over the middle of the middle phalanx
- **A5** at the DIPJ

Then we have 4 Cruciate Pulleys:

- **C1** which is between A1 and A2
- **C2** which is between A2 and A3
- **C3** which is between A3 and A4
- **C4** which is between A4 and A5

All the Annular and Cruciate Pulleys wrap around and are thus superficial to the Tendon Sheaths of each digit for Digits 2-5, meaning that they fully influence the movement of the Flexor Tendons of the Fingers.

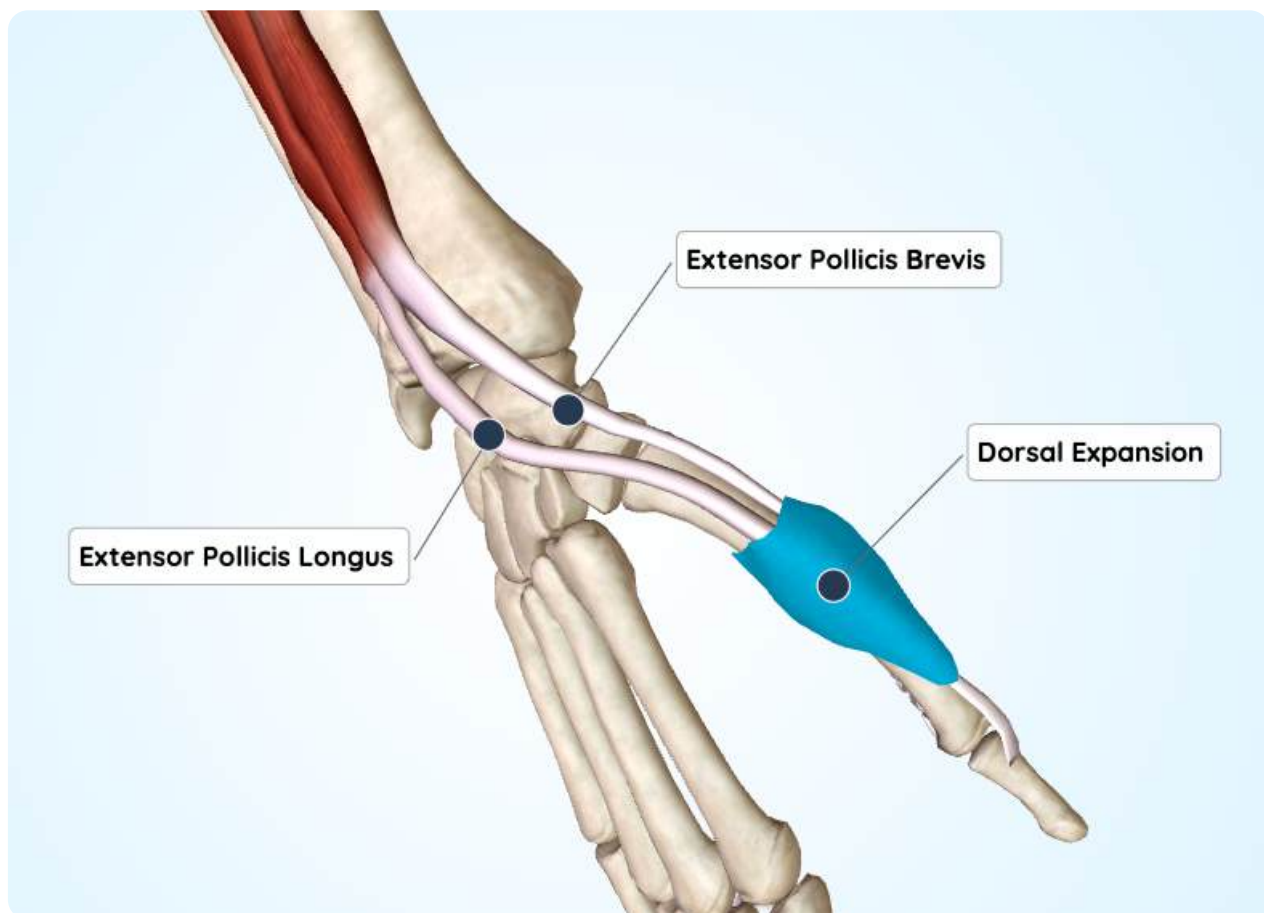


Extensor Mechanism

Whilst we have explored the extensor mechanisms for the digits in other tutorials, especially the ligaments and muscle tutorials, we thought it was appropriate to refresh our memory of it in this tutorial as well.

So let's start with **thumb**, which is quite simple in terms of extension.

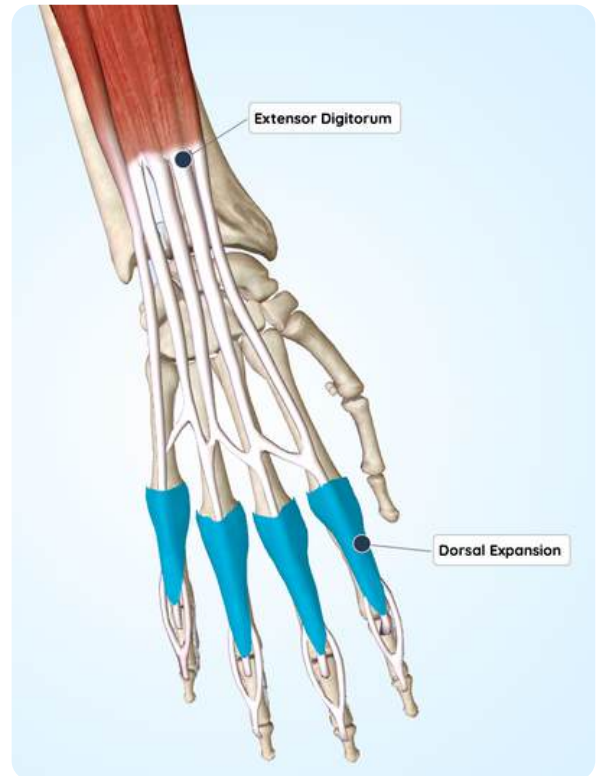
- We have the **Extensor Pollicis Brevis** tendon which inserts into the Proximal Phalanx of the thumb
- And we have the **Extensor Pollicis Longus** tendon which inserts into the Distal Phalanx of the thumb. These 2 tendons create extension at the thumb together,
- We have the **Dorsal Expansion** or Extensor Hood which covers over the 1st MCP Joint and the two tendons for protection.



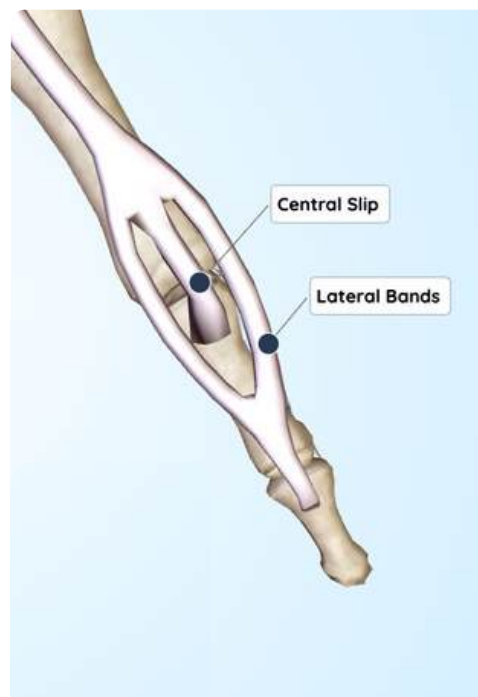
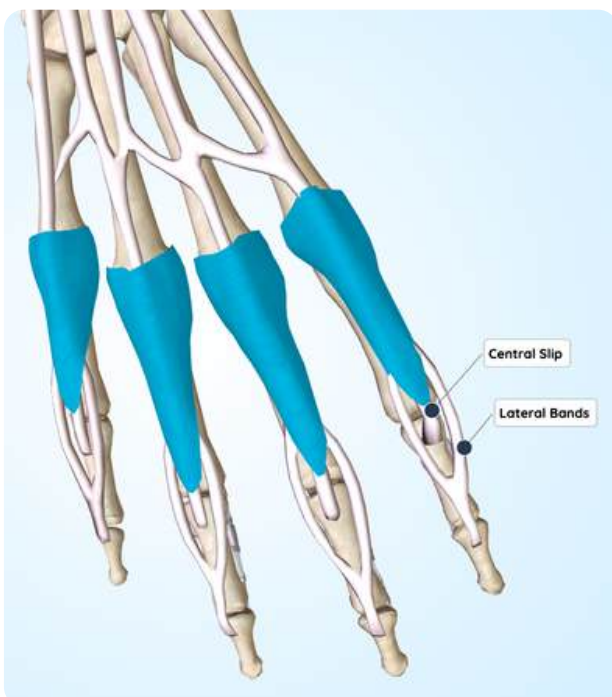
Extensor Mechanism

For Digits 2-5:

- The main extensor muscle for these digits is **Extensor Digitorum** (also known as **Extensor Digitorum Communis**)
- We can see that the main extensor digitorum tendon splits around the middle of the Metacarpals, creating its own small network of tendons with interconnectivity between each digit.
- We can see that each digit also has a **Dorsal Expansion** (extensor hood) which covers over the MCP joint
- The network then creates 4 individual tendons which run towards the distal tip of each finger, which is known as the Extensor Expansion for each tendon.



- We can see that Extensor Expansion comprises of the central tendon which then splits again into 3, around the proximal interphalangeal joint
- The Central Portion that runs over the Proximal Interphalangeal Joint is referred to as the **Central slip**, which then inserts into the middle phalanx to create **PIPJ extension**
- The two outer divisions of the tendon at the Distal end are known as the **Lateral Bands**, one which runs to the radial side, and one which runs to the ulnar side, before they reconnect together to insert into the distal phalanx to create **DIPJ extension**



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