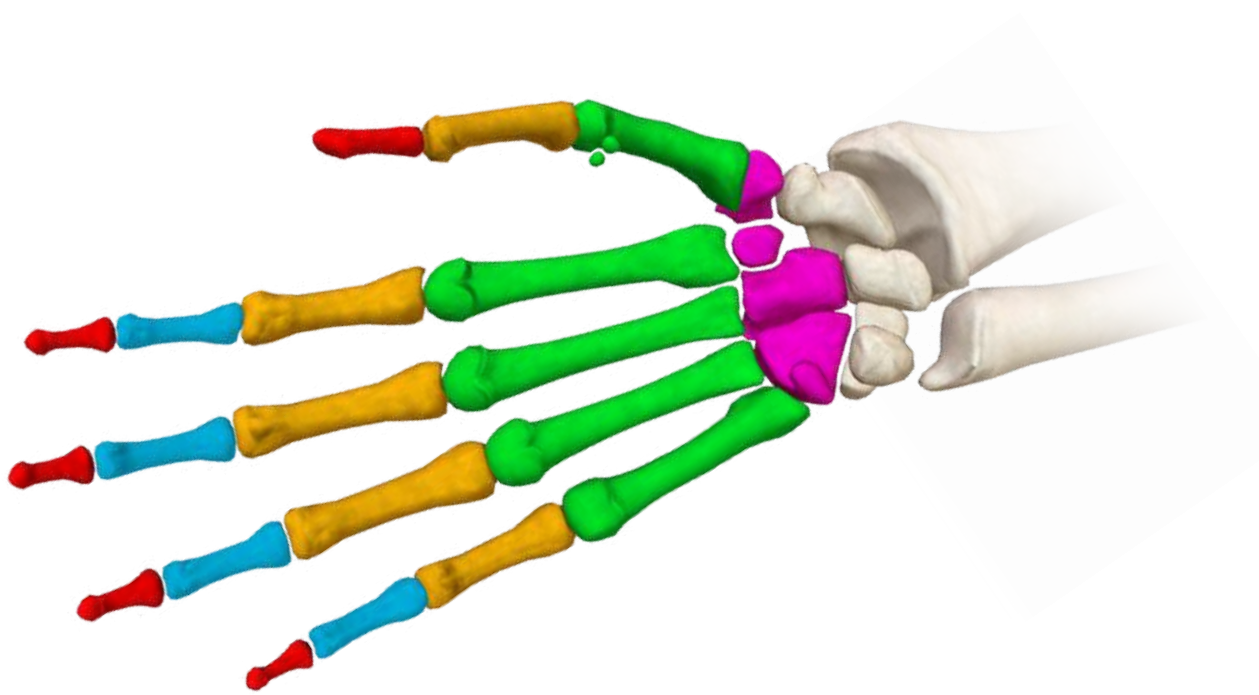


Course Handbook

Wrist and Hand Anatomy BootCamp

Lesson 2: Bony Anatomy of the Hand



Contents

2: Hand Overview

3-5: Joints of the Wrist

- 3: Carpometacarpal Joints
- 4: Metacarpophalangeal Joints
- 5: PIPJ's and DIPJ's

6: Bony Anatomy of the Metacarpals

7: Bony Anatomy of the Phalanges

8: Membership Resources

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Hand Overview

Introduction

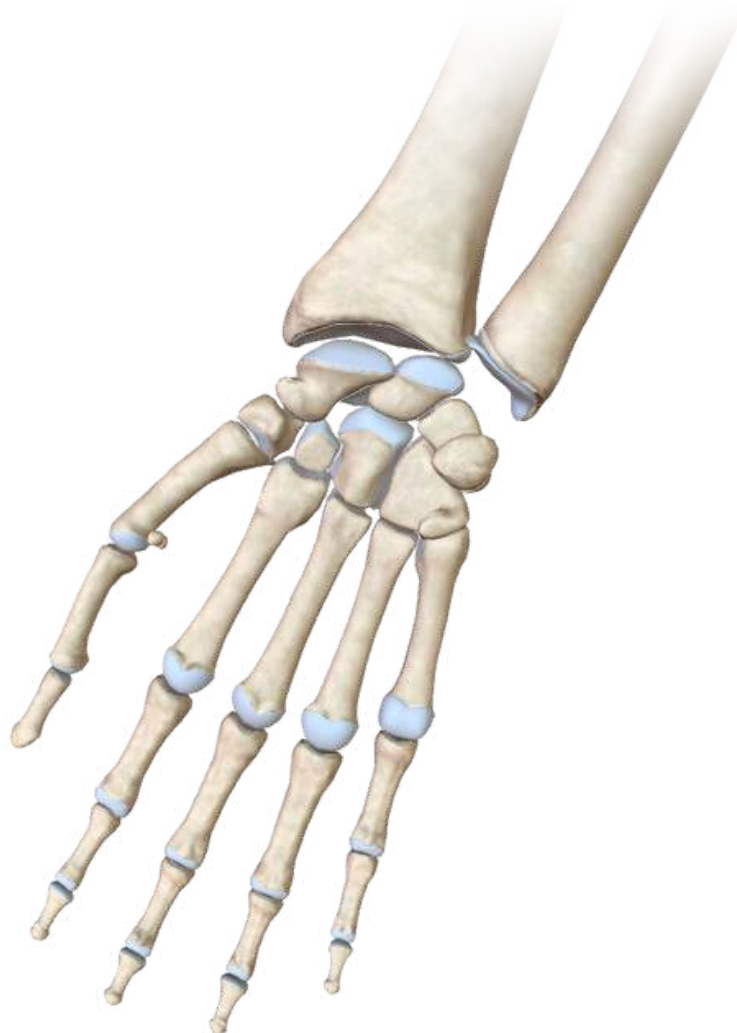
In this tutorial, we are going to analyse the different bony structures of the hand, including a refresher of the carpal bones, and with more focus on:

- The Metacarpophalangeal Joints (MCPJ's)
- The Proximal Interphalangeal Joints (PIPJ's)
- The Distal Interphalangeal Joints (DIPJ's)
- The Interphalangeal Joint of the thumb (IPJ)

and the key bones that make up these joints including:

- The Carpals Bones
- The Metacarpal Bones
- The Proximal Phalanges
- The Middle Phalanges
- The Distal Phalanges

We will explore the key anatomical features of each of these bones to help with your anatomy learning, and in the main tutorial we will discuss how fractures around the hand relate to the anatomy to link clinical practice into this knowledge.



Joints of the Hand

The key joints of the hand include:

- The Carpometacarpal Joints (CMCJ's)
- The Metacarpophalangeal Joints (MCPJ's)
- The Proximal Interphalangeal Joints (PIPJ's)
- The Distal Interphalangeal Joints (DIPJ's)
- The Interphalangeal Joint of the thumb (IPJ)

Carpometacarpal Joints (CMCJ's)

- The CMCJ's are the joints between the distal row of carpal bones and the proximal bases of the metacarpal bones of each digit.
- These joints are ellipsoid-shaped, where you have an oval shaped bone (the carpals) fitting into an elliptical shape cavity (the metacarpal bases).
- It's important to note that there is a big difference between the 1st CMC joint, and those for digits 2-5, in that the 1st CMC Joint has a much greater range of movement than the others.
- Whilst the CMC's of digits 2-5 can only provide a small amount of movement through gliding of one surface onto the other, the 1st CMC can engage in flexion, extension, abduction, adduction, opposition and circumduction.
- The articulations of the different CMCJ's are as follows:
 - 1st CMCJ: 1st metacarpal and the Trapezium
 - 2nd CMCJ: 2nd metacarpal and Trapezoid
 - 3rd CMCJ: 3rd metacarpal and Capitate
 - 4th CMCJ: 4th metacarpal and Hamate
 - 5th CMCJ: 5h metacarpal and Hamate



Joints of the Hand

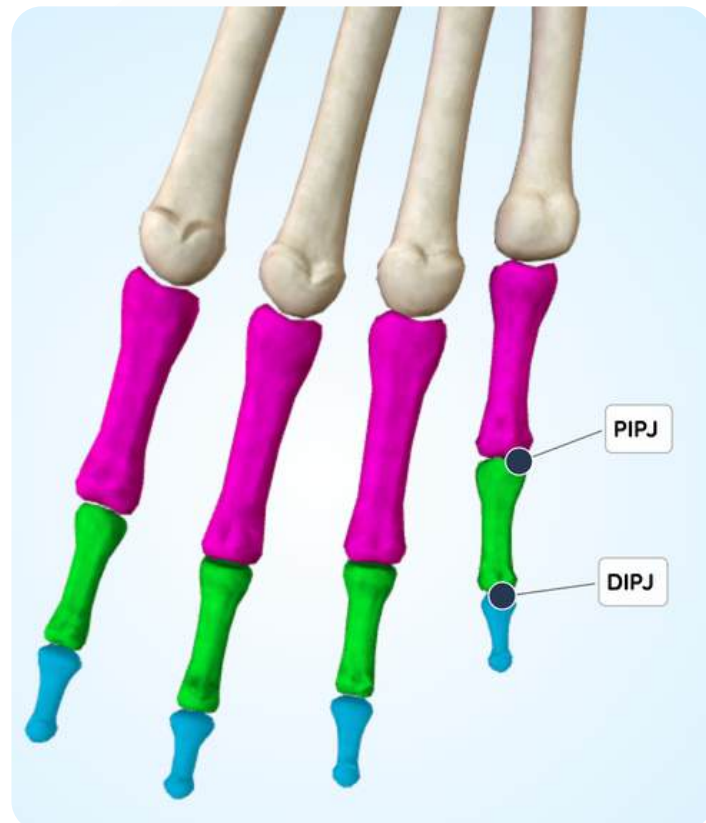
Metacarpophalangeal Joints (MCPJ's)

- The MCPJ's are the joints between the metacarpal of each digit, and the proximal phalanx of each digit
- Notice how the bases of each proximal phalanx are concave in shape, to receive the very convex-shaped heads of each metacarpal



PIPJ's and DIPJ's (Digits 2-5)

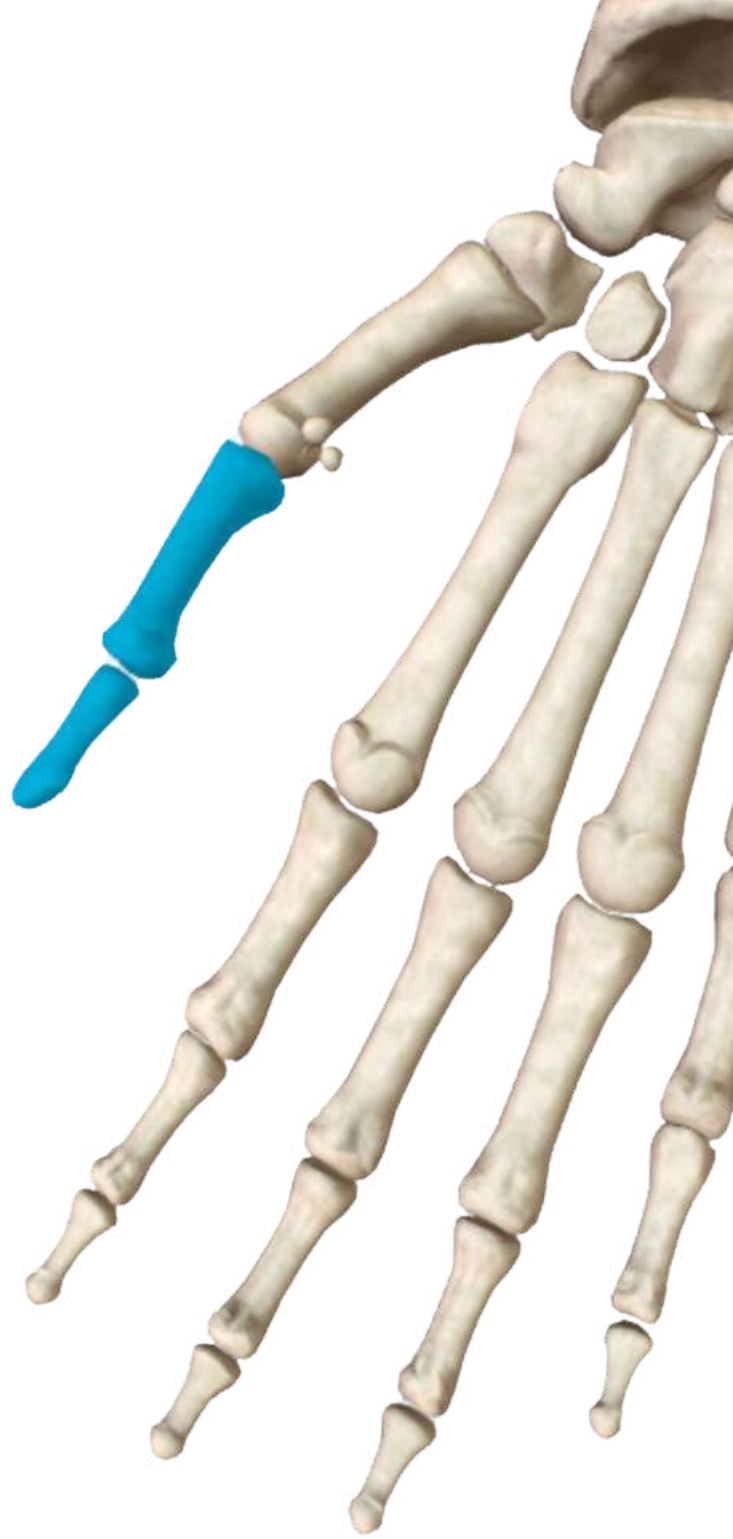
- For digits 2-5, there are 2 sets of interphalangeal joints:
 - PIPJ's: Proximal Interphalangeal Joints
 - DIPJ's: Distal Interphalangeal Joints
- The PIPJ's are the joints between the proximal phalanges (pink) and the middle phalanges (green)
- The DIPJ's are the joints between the middle phalanges (green) and the distal phalanges (blue)



Joints of the Hand

Interphalangeal Joint of the Thumb

- The thumb only has 2 phalanges as shown here in blue; a proximal phalanx and a distal phalanx
- As a result, the thumb only has one interphalangeal joint

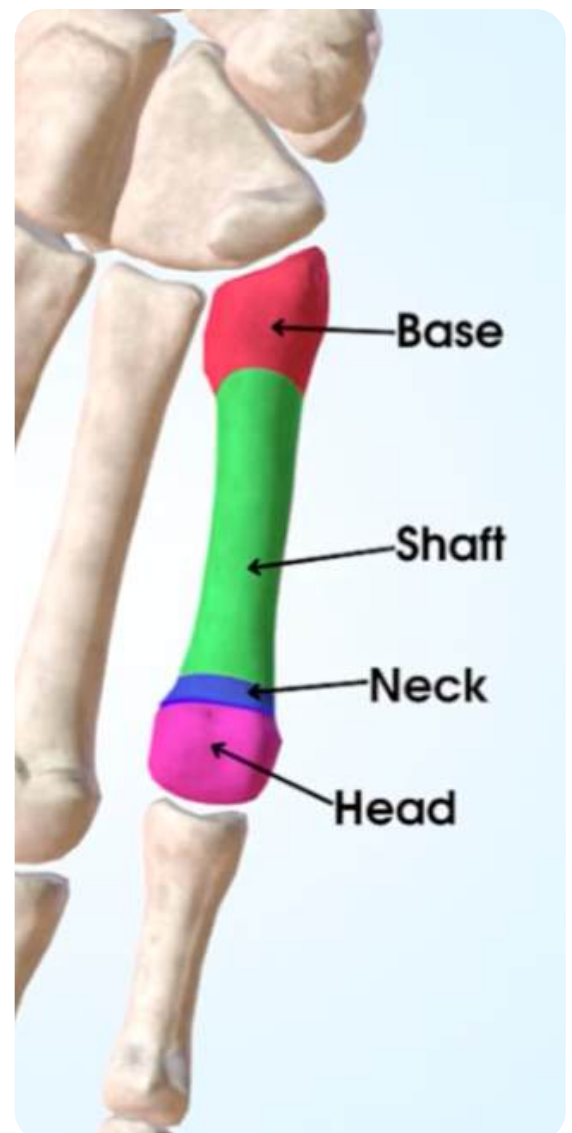
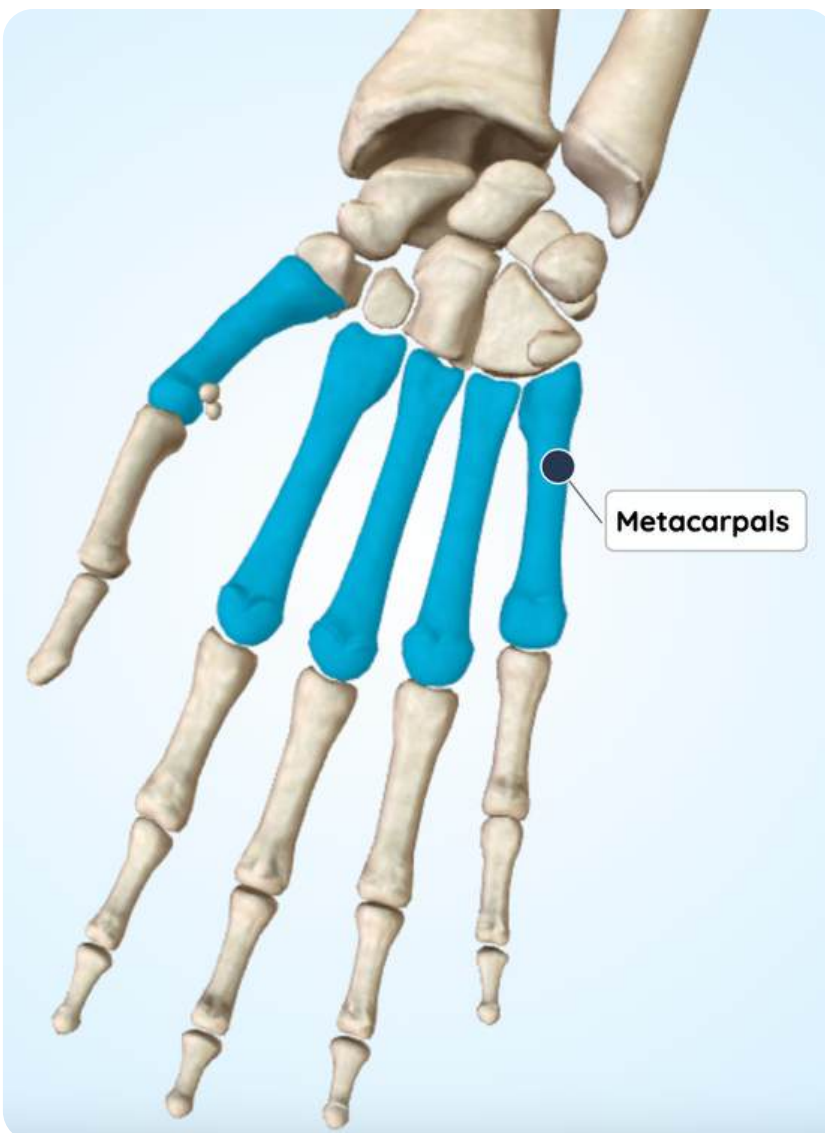


Bony Anatomy of Metacarpals

The metacarpals are present in each digit, and run from the carpal bones to the proximal phalanx of each digit. As you can see, they are the longest bones in the hand.

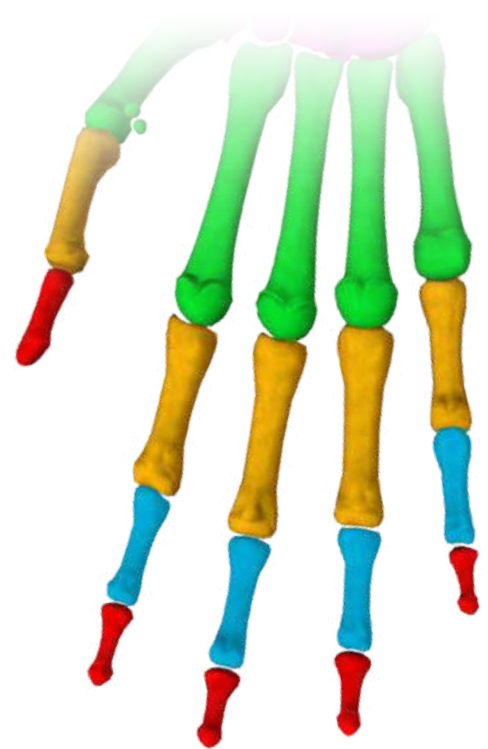
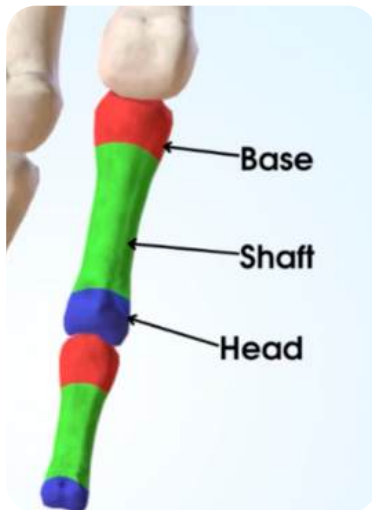
Each metacarpal has a **base**, a **shaft**, a **neck** and a **head**, as you can see from the diagrams below. This is important for when you see or read reports of a fracture of a metacarpal so that you can appreciate where the fracture has taken place.

It is also important to remember that we have the sesamoid bones of the thumb at the base of the 1st metacarpal. A sesamoid bone, is a bone encased within a tendon, and the 2 sesamoid bones at the thumb are encased in the adductor pollicis tendon and the flexor pollicis brevis tendons respectively. These bones are suggested to redistribute force and thus reduce excessive wear within these tendons.



Bony Anatomy of Phalanges

- There are 14 phalanges in the hand:
 - 2 in the thumb and 3 in digits 2-5
- The phalanges in the thumb are referred to as the **proximal and distal phalanges**
- The phalanges in digits 2-5 are referred to as the **proximal, middle and distal phalanges**
- Each phalanx comprises of:
 - **Base** (proximal end)
 - **Shaft** (in the middle)
 - **Head** (distal end)



Proximal phalanges (orange)
Middle phalanges (blue)
Distal phalanges (red)

Proximal Phalanges

If we observe the bases of the proximal phalanges, we can see that they are concave in their shape. This is so that the convex head of the digits corresponding metacarpal bone can form a congruent metacarpophalangeal joint. The head of each proximal phalanx has a fairly larger width and depth compared to the shaft, and that is to provide sufficient surface for the attachment of tendons and ligaments.

Middle Phalanges

These are only present in digits 2-5. They have similar anatomical features to the proximal phalanges with a more rounded and wider head to allow for tendon and ligaments, although it is important to say that far less muscles attach to the middle phalanges as the proximal and distal phalanges.

Distal Phalanges

Each of the distal phalanges as you can see are much shorter than the proximal and middle ones. We can see that their bases are their widest feature, again to provide attachment for tendons and ligaments, but they have much more narrow distal heads.



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