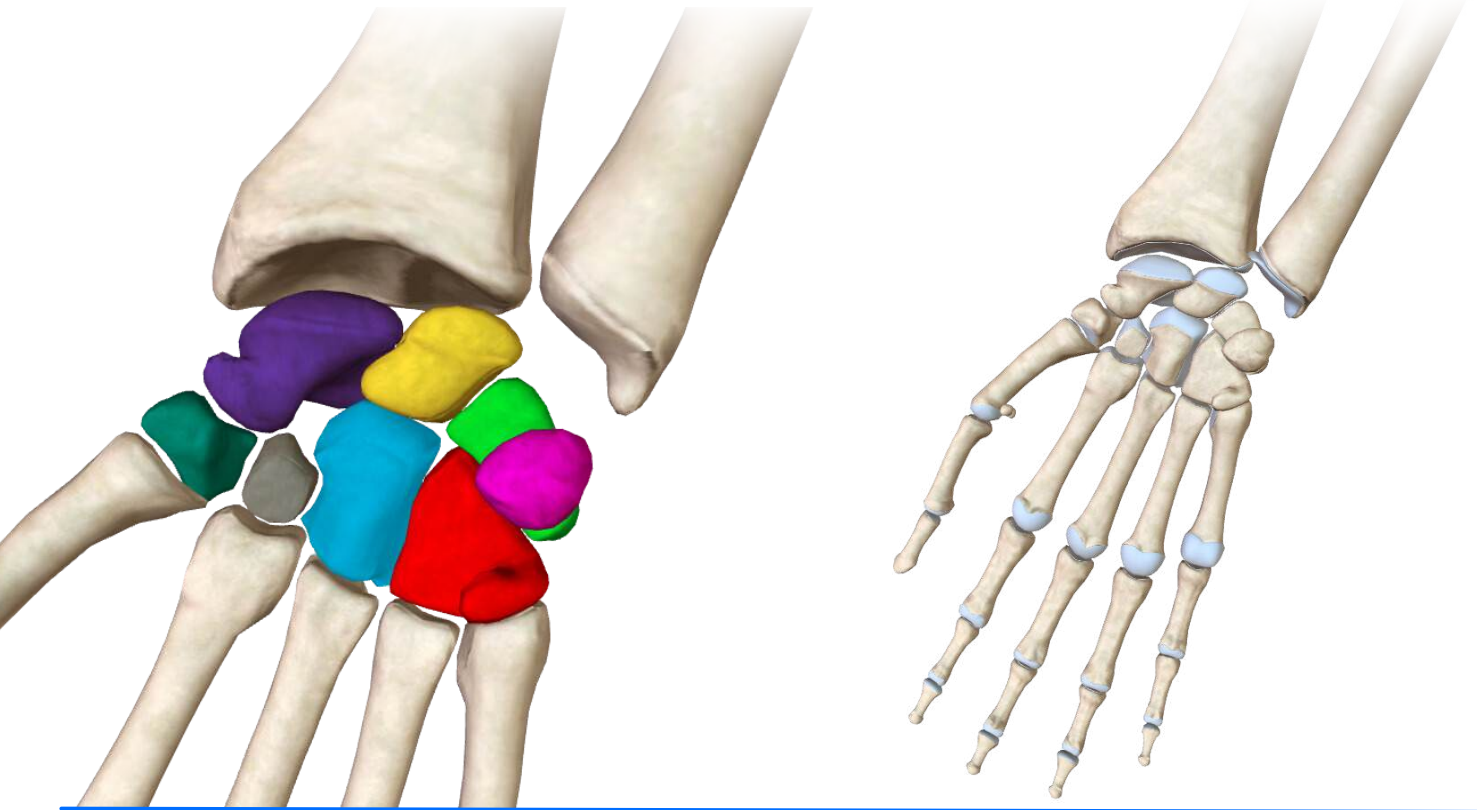


Course Handbook

Wrist and Hand Anatomy BootCamp

Lesson 1: Bony Anatomy of the Wrist



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Wrist Overview

Introduction

In this tutorial, we are going to analyse the different bony structures of the wrist, including the joints of the wrist, the radius, the ulna and the carpal bones.

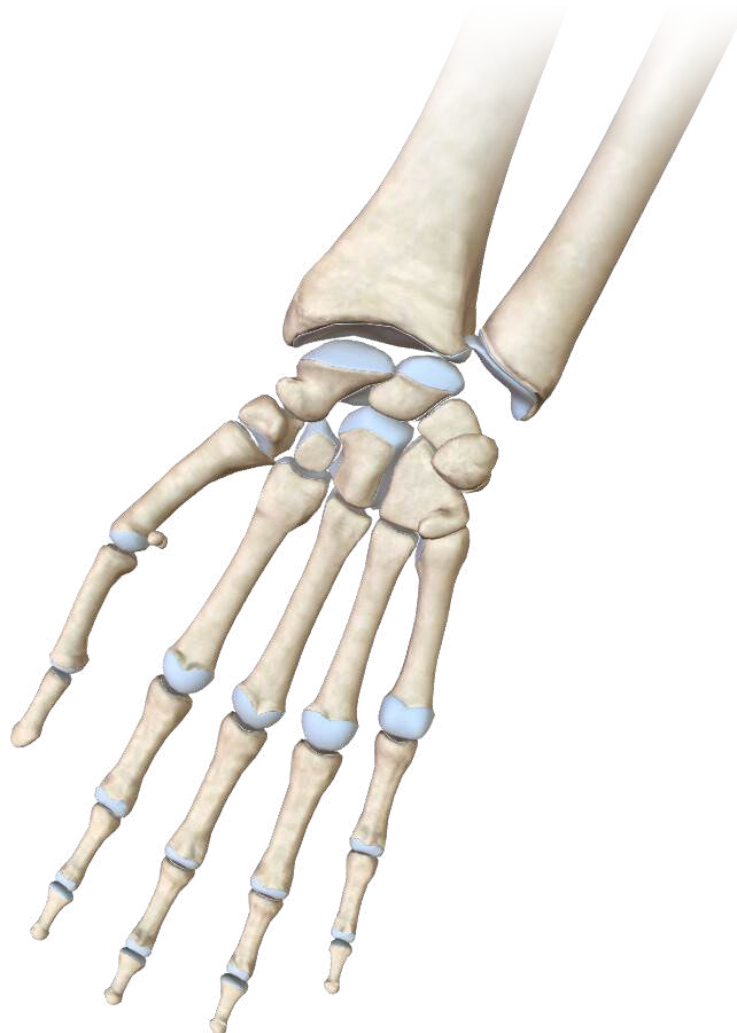
The wrist is a complex area made up of a number of different joints including:

- The Distal Radio-Ulnar Joint (DRUJ)
- The Radiocarpal Joint (wrist joint proper)
- The Ulnocarpal Joint

In this tutorial we are going to explore the key bones that make up these joints including:

- Radius
- Ulna
- and the 2 rows of carpal bones

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 wrist relate to the anatomy to link clinical practice into this knowledge.



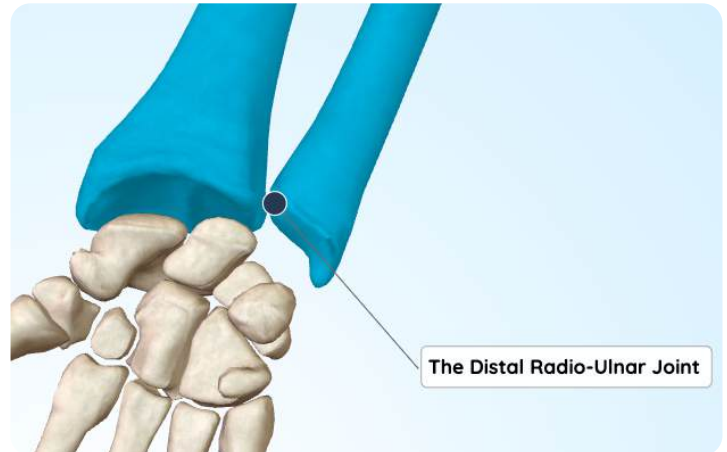
Joints of the Wrist

The wrist is a complex area made up of a number of different joints including:

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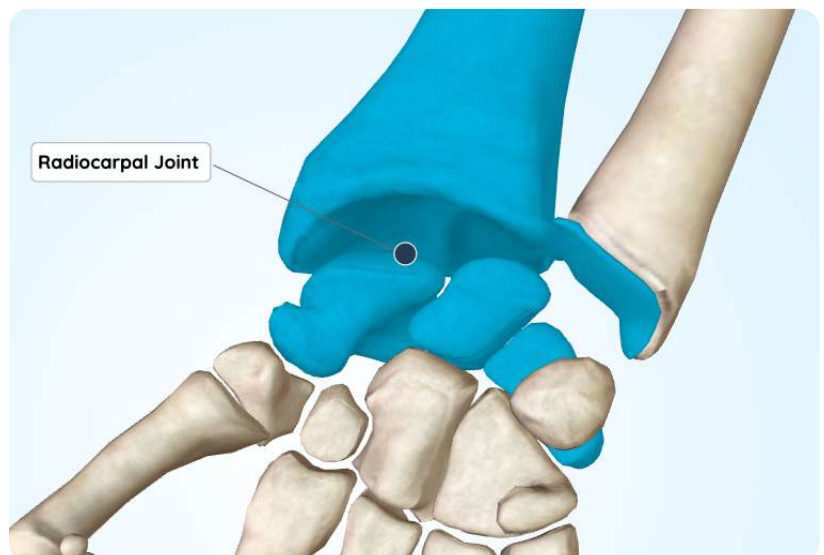
Distal Radio-Ulnar Joint (DRUJ)

- The DRUJ is the joint between the distal radius and the ulna
- This is a synovial joint
- It is a **pivot joint**, and is **uniaxial**, meaning it only has one plane of movement.
- This plane of movement allows for **supination and pronation of the distal forearm**



The Radiocarpal Joint

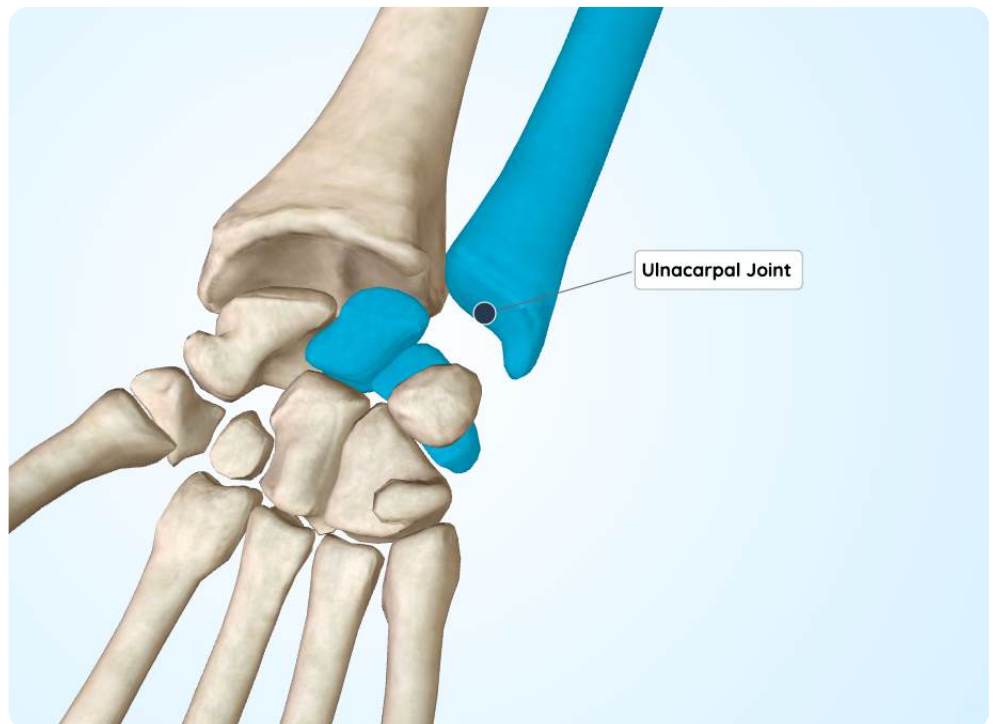
- The radiocarpal joint is considered to be the “wrist joint proper” and is the key joint when we consider the movement and function of the wrist, creating the movements of:
 - **Wrist flexion**
 - **Wrist extension**
 - **Radial deviation**
 - **Ulnar deviation**
- Crucially, this joint is **not suggested to include the ulna bone** and instead is made up of:
 - Articular disc sitting over the distal ulna
 - Radius
 - Scaphoid
 - Lunate
 - Triquetrum
- It is an **ellipsoid joint** (a joint where an oval-shaped bone fits into an ellipsoid/moon-shaped cavity)
- We can see this shape demonstrated by the fact that the 3 carpal bones mentioned above form a convex semi-circle shape around the concave distal radius



Joints of the Wrist

Ulnacarpal Joint

- The ulnacarpal joint is not suggested to be a part of the wrist joint proper, as mentioned previously
- This joint is made up from the distal ulna, the lunate and the triquetrum
- The reason for considering this joint is that it often gets sprained, which is why it is important to mention in this tutorial



Bony Anatomy of Radius

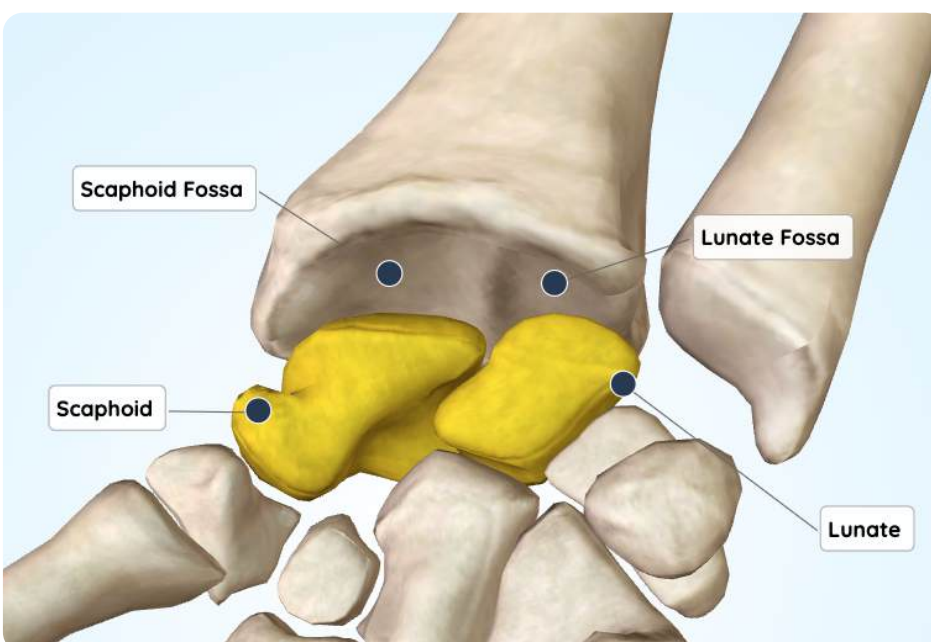
The radius bone runs down the lateral/radial aspect of the forearm, and is a pivotal bone to the wrist joint.

We can see in the image on the right how the radius (blue) lines up perfectly with the carpal bones (red), which is no coincidence, as it allows for stability of the hand, and a natural transmission of load from the forearm to the hand.



The most notable and palpable part of the radius is its distal, lateral edge, referred to as the radial styloid.

This creates a lip over the lateral side of the wrist so that it can deepen the fossa that the scaphoid sits in, and thus improve stability of the radiocarpal joint.



If we look at the very distal end of the radius, we can see that there are 2 small depressions on its intra-articular surface.

These are the **scaphoid fossa** on the lateral side, which is where the scaphoid sits and articulates with the radius, and the **lunate fossa** on the medial side where the lunate bone sits and articulates with the radius.



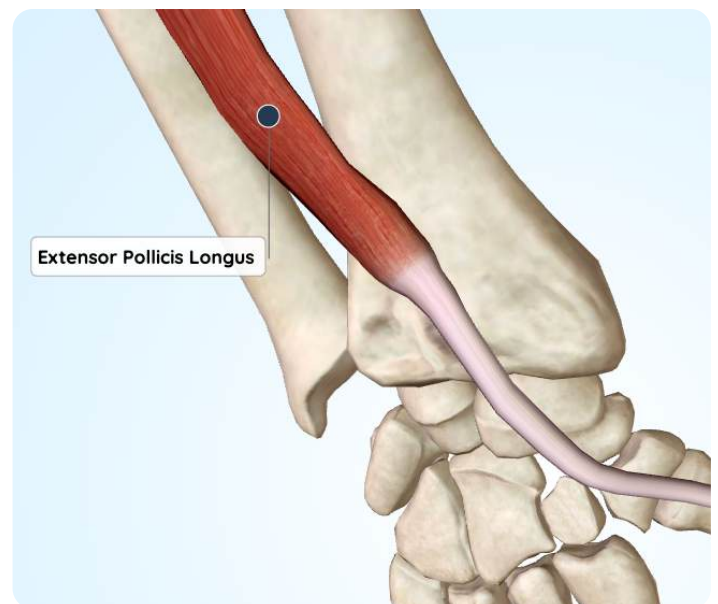
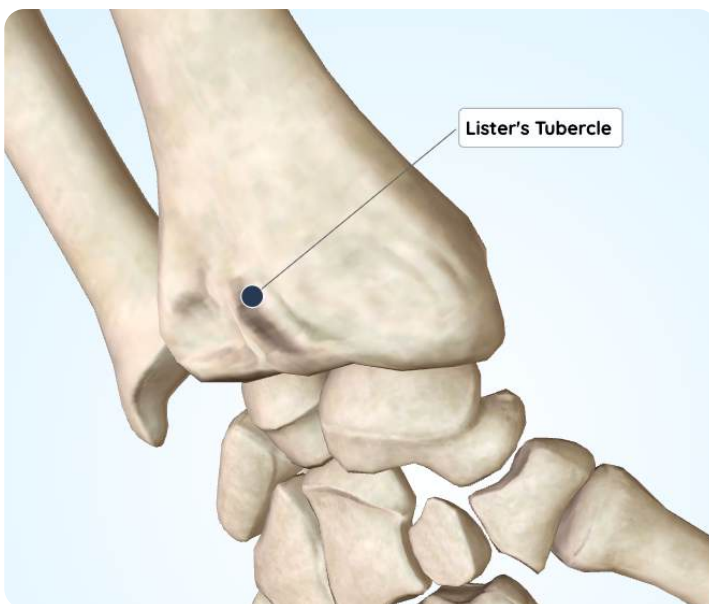
Bony Anatomy of Radius

On its medial side, we can see that the radius has an additional small depression which referred to as the **Ulna notch**, or the Sigmoid notch.

This notch is where the ulna bone effectively sits in, as a part of the Distal Radio-Ulnar Joint.



On the posterior side of the radius, we have a small bony prominence called **Lister's Tubercle**, which you can palpate relatively clearly on yourself. The reason for this tubercle is linked to the **Extensor Pollicis Longus** tendon, which as can you see almost wraps around the tubercle on the medial side. The tubercle therefore acts as a point of leverage or a pulley for the tendon meaning that it can function to extend the thumb.



Bony Anatomy of Ulna

If we look at the distal ulna, we can see a couple of important features. We can see that it is a lot more narrow than the distal radius, and does not spread as far across the distal forearm.

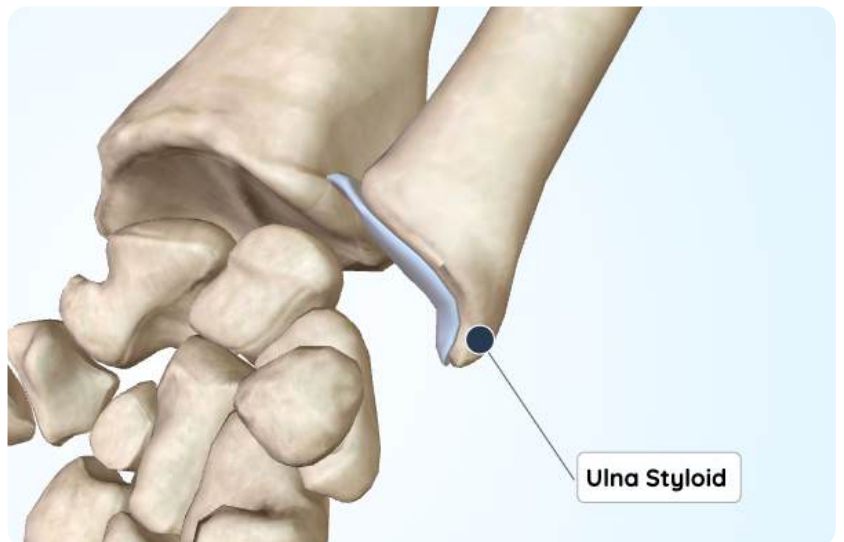
We can see that it has also has a concave distal head so that it can house the **articular disc** of the radiocarpal joint.



The other key distinct feature of the ulna is the rounded protuberance on its medial side, which is referred to as the **ulnar styloid**.

This is akin to the radial styloid on the distal radius.

It serves to form a point of attachment for soft tissue like the ulnar collateral ligament.



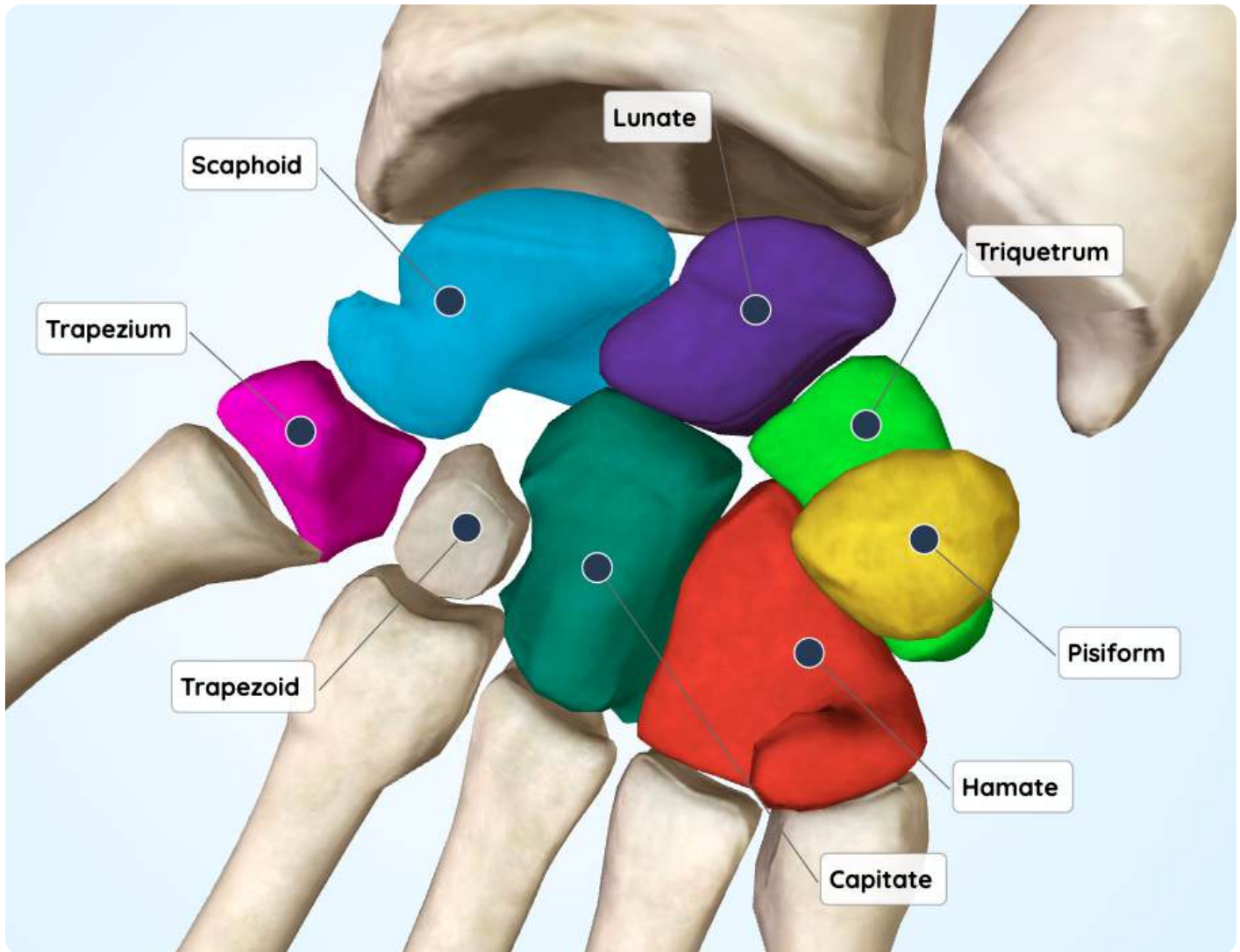
Sometimes we may see patients who may have an **excessively long ulnar styloid**. This may cause pain if it contacts and compresses the triquetrum bone above it, which is known as **ulnar styloid impaction syndrome**.

Another issue that can be more commonly seen is **Ulnar Variance**, which refers to the varying length of the ulnar at its distal point compared to the radius. Effectively the inner or interosseous borders of the radius and ulna should be approximately in line at their most distal point.

Negative Ulnar Variance represents where the ulna is shorter than the radius.

Positive Ulnar Variance represents where the ulna is longer than the radius, sometimes referred to as radial shortening. This can sometimes cause painful symptoms, because the extra length on the ulna causes it to interact and articulate with the triquetrum, which it shouldn't do.

Bony Anatomy of Carpal Bones



We have 2 rows of carpal bones: a proximal row and a distal row.

The proximal row includes the **Scaphoid**, **Lunate**, **Triquetrum** and the **Pisiform**.

The distal row includes the **Trapezium**, **Trapezoid**, **Capitate** and **Hamate**.

There are various different mnemonics that are used to try and remember these and the order in which they sit including:

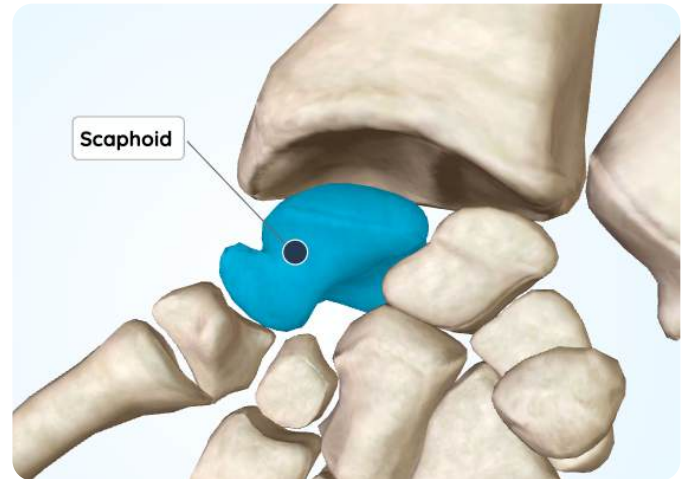
- **Scaphoid Lunate Triquetrum Pisiform Trapezium Trapezoid Capitate Hamate**
- **Some Lovers Try Positions That They Can't Handle**
- **Some Lovers Take Positions That They Can't Handle**
- **Sally Left The Party To Take Cathy Home**
- **She Likes To Play To Catch Her**

Proximal Carpal Bones

Scaphoid

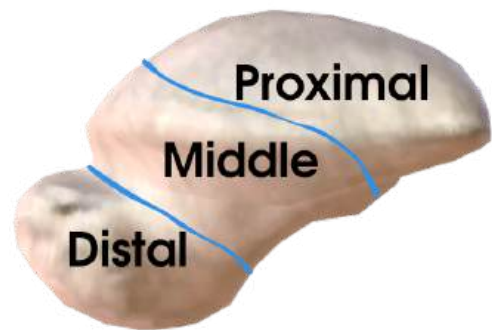
The **scaphoid** bone sits on the most **radial side of the first carpal row**. This bone as you can see is relatively **large** in comparison to the other carpal bones, and is one of the **more commonly fractured carpal bones**.

Thus, if you have a patient who has pain on palpation of the anatomical snuff box after a fall, you may consider a scaphoid fracture.



The scaphoid bone is often split into thirds where it has a:

- **Proximal third** (articulates with radius)
- **Middle third**
- **Distal third** (articulates with trapezium)



This is really important when we consider fractures of the scaphoid, as the scaphoid bone has a **retrograde blood supply**, where only the distal end of the bone receives blood (as you can see on the right hand image).

What this means is that if we see a fracture of the middle or proximal thirds, the fractured part of the scaphoid struggles to receive blood supply in order to heal. As a result, we see very high rates of malunion or non-union for scaphoid fractures, which is why it is considered to be so important to monitor patients who experience these fractures.



Proximal Carpal Bones

Lunate

The **lunate** bone sits in the middle of the proximal carpal row.

It articulates with the radius proximally where it sits in the lunate fossa of the distal radius.

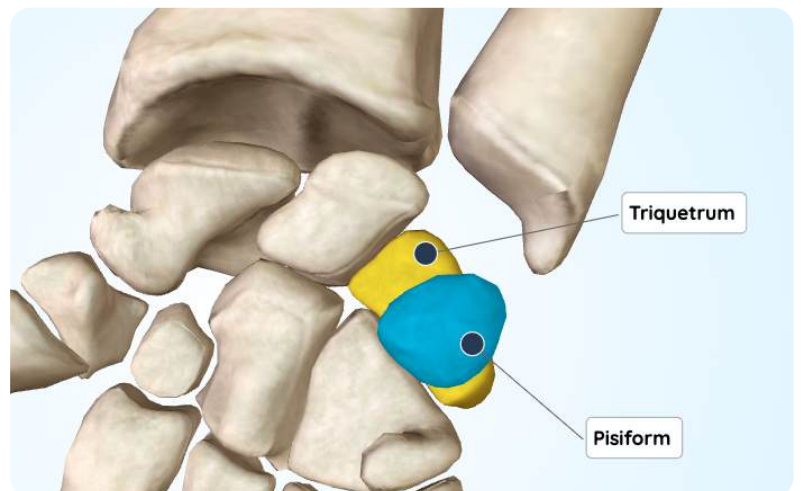
Distally it articulates with the capitate, and importantly, it forms a small depression on its distal end which the capitate bone sits in.



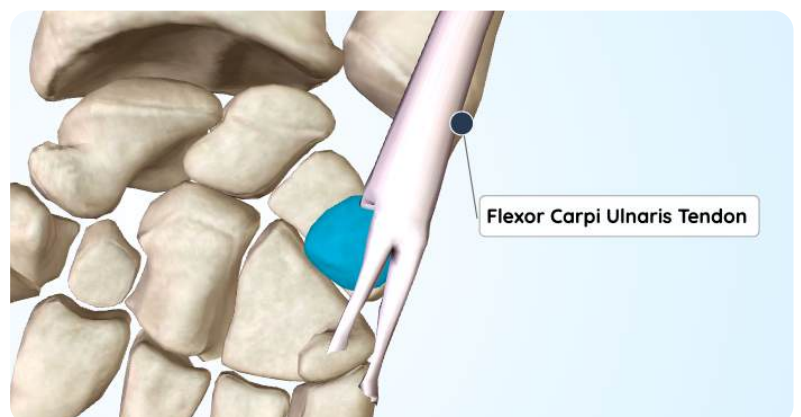
Triquetrum and Pisiform

The **triquetrum** and **pisiform** bones sit on the medial or ulnar side of the first carpal row.

The **triquetrum** is longer and thinner in its shape, with curved edges on both its proximal and distal ends. As we mentioned earlier, this bone can incorrectly articulate with the ulna when a patient has positive ulnar variance.



The **pisiform** bone is a sesamoid bone (a bone which is embedded in a tendon). Here we can see how the pisiform is embedded in the tendon of the flexor carpi ulnaris muscle.

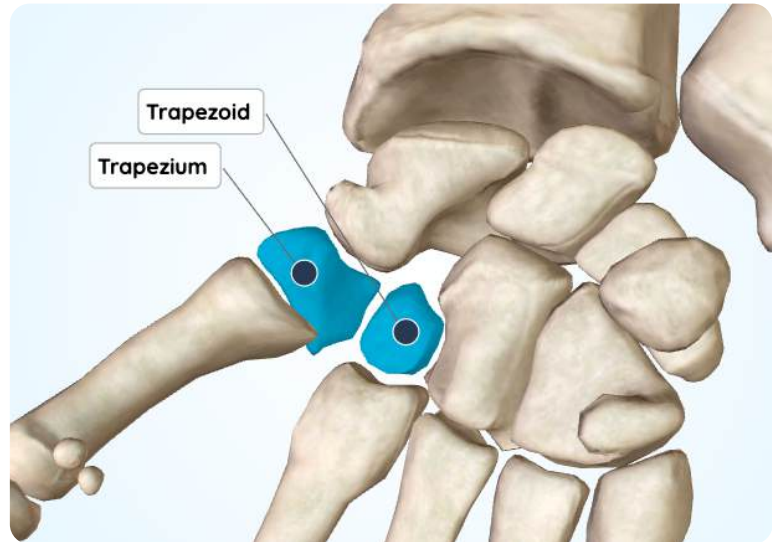


Distal Carpal Bones

Trapezium and Trapezoid

The **trapezium** and **trapezoid** bones sit on the radial or lateral side of the distal (second) carpal row. The trapezium articulates with the 1st metacarpal bone, and the trapezoid articulates with the 2nd metacarpal bone.

We can remember the phrase “**the trapezium sits under the thumb**” to remember these locations.

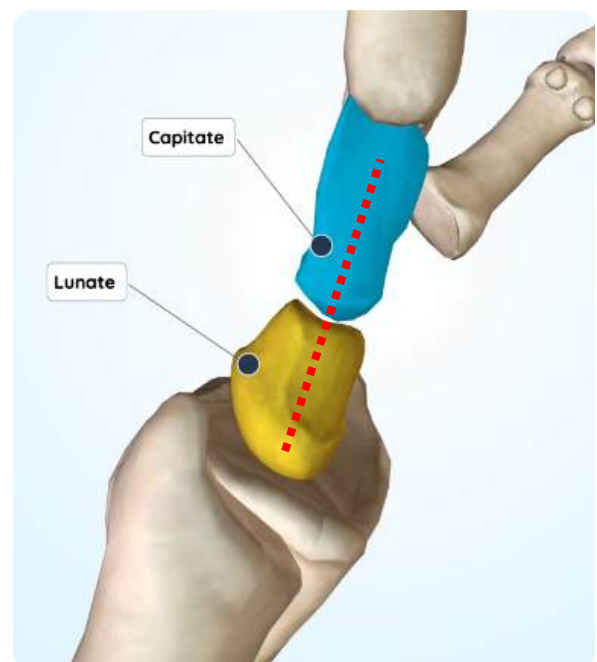


Capitate

The **capitate** bone is a large bone which sits in the middle of the distal carpal row. This tall bone has a really important feature in that it sits in a depression created by the lunate bone as we highlighted earlier.

We can sometimes see when a patient has had a carpal dislocation because the capitate appears not to be sitting in the depression made by the lunate.

The capitate also articulates distally with the 3rd metacarpal.

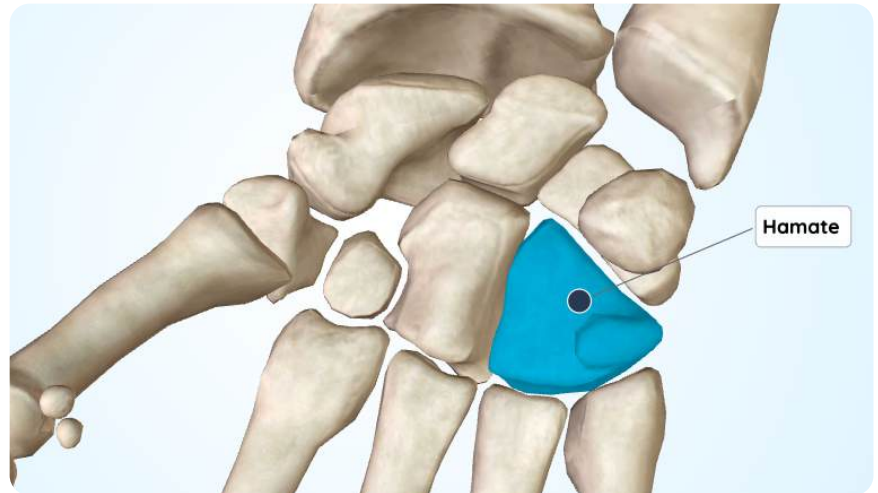


Distal Carpal Bones

Hamate

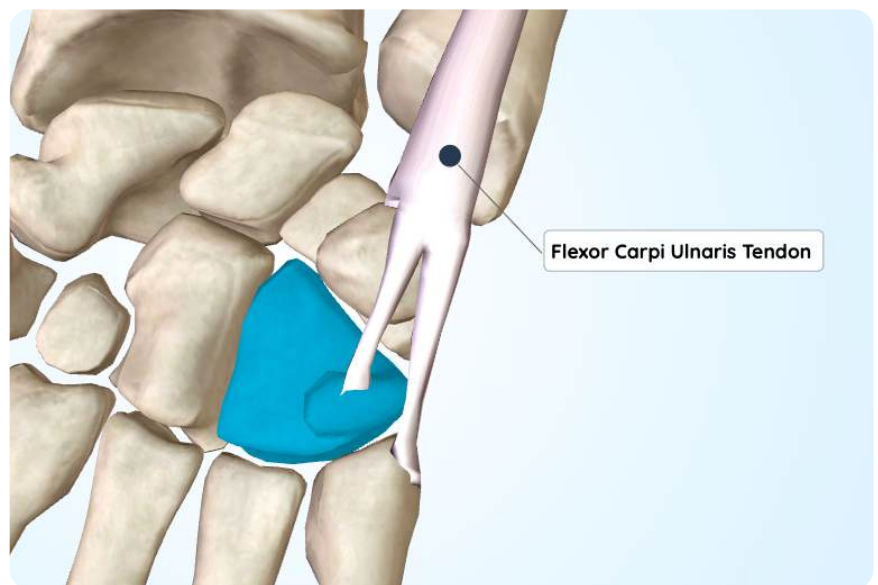
The **hamate** bone sits on the ulnar or medial side of the distal (second) carpal row.

It articulates with the triquetrum proximally, and both the 4th and 5th metacarpals distally.



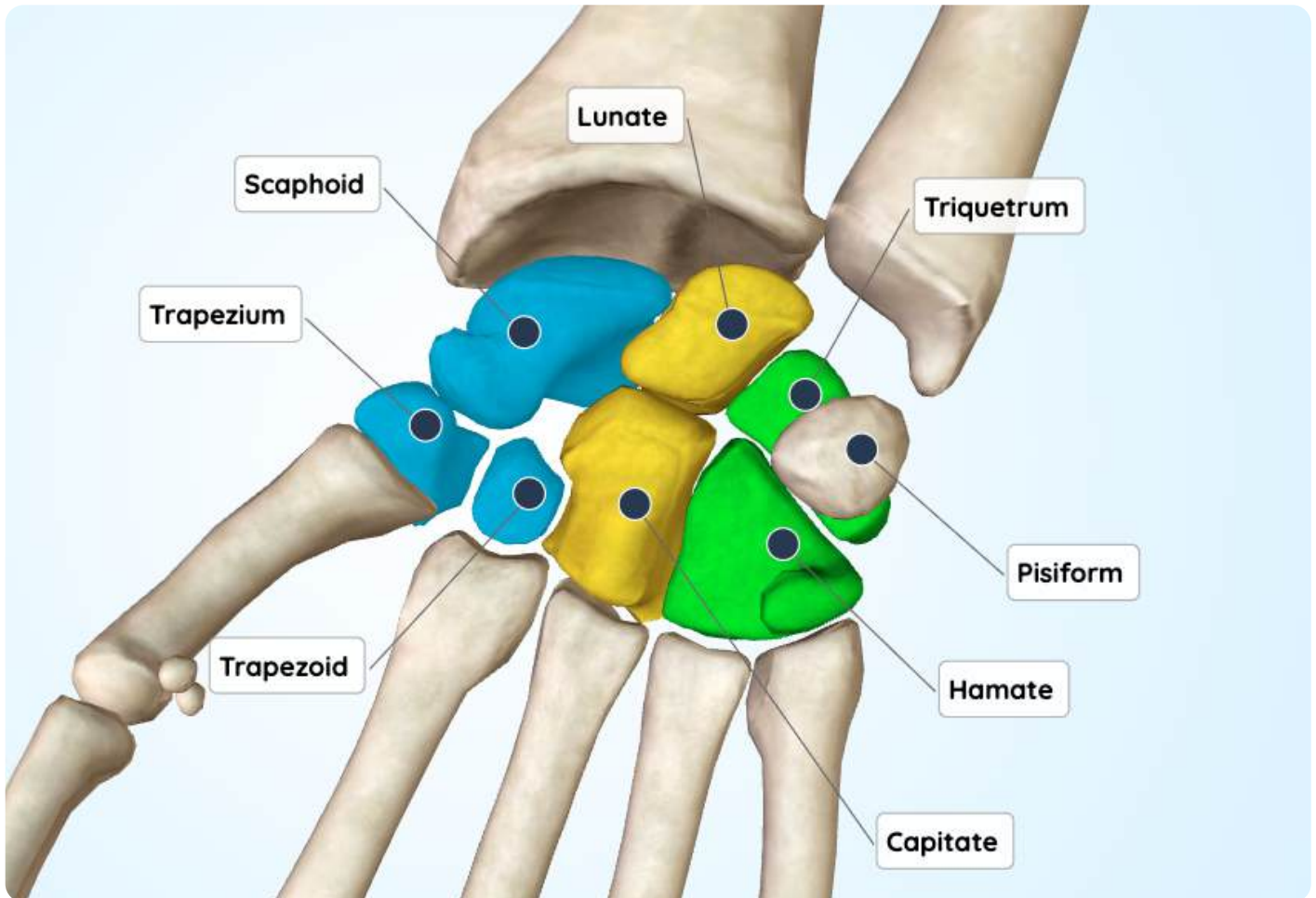
The other key feature of this bone is the hook shaped appearance on its most medial end, which is where the flexor carpi ulnaris muscle attaches to.

You will commonly hear of this landmark being referred to as the "**Hook of Hamate**".



Carpal Bone Columns

As well as describing the carpal bones in 2 rows, they are sometimes also described in 3 longitudinal columns, which sometimes can help us think about how weight is more likely to be transferred through the hand in each column.



- We have the **Radio-Scaphoid Column** (blue) on the radial side, which includes the **scaphoid, trapezium and trapezoid**
- Then the **Lunate Column** (yellow) in the centre: Including the **lunate** and **capitate**
- And then the **Ulnar-Triquetral Column** (green) on the ulnar side: including the **triquetrum** and the **hamate**

You may notice that the pisiform is not included in this list because effectively the pisiform is a sesamoid bone embedded in the flexor carpi ulnaris tendon as we said previously.

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