Mapping the remarkable structure and movement of the wrist

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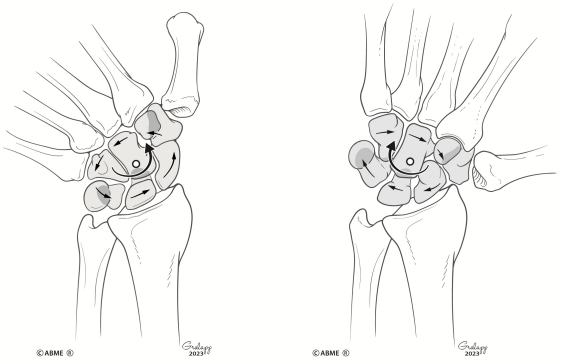
The purpose of this new ABME image is to show how the wrist bones are organized and how they move to generate remarkably fluid movements including radial and ulnar deviation which are shown here. The eight bones of the wrist are organized in two rows, a proximal and distal row. These two rows of bones are congruent with each other and also with the distal radius, much like the bowls of three spoon stacked together. Imagine the bottom spoon is the distal head of the radius and that the middle and top spoons are the proximal and distal rows of wrist bones. The middle spoon can slide in the bottom as the top spoon can simultaneously slide in the middle.



Ulnar Deviation Radial Deviation

To better understand ulnar deviation, consider the hand (everything distal to the radius: carpals, metacarpals and phalanges) as a structural unit. The movement we call ulnar deviation is actually a rotational motion around an axis in the capitate bone. When the metacarpals and fingers are being moved towards the ulna (rolling), the carpals are sliding towards the thumb, actually making the thumb longer. Ulnar deviation can reasonably be called thumb lengthening. Conceiving of, and cueing the motion this way, produces a free and powerful motion.

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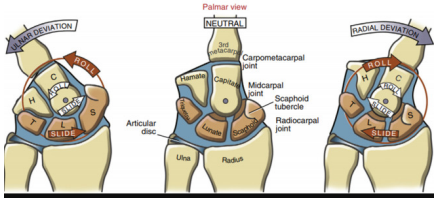
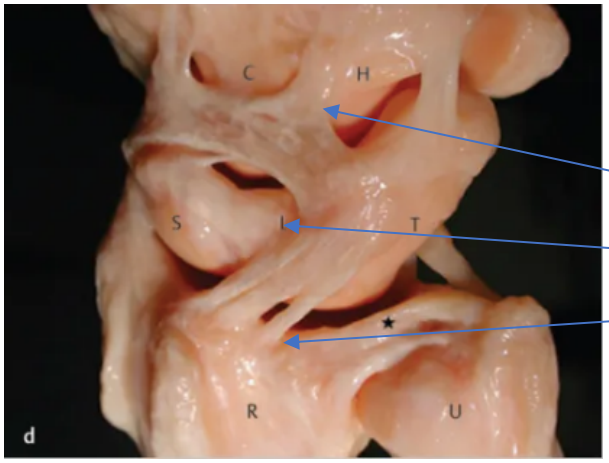
- **The wrist is made up of two joints working in parallel**
  - Two rows of wrist bones with nested concave/convex relationship
    - Distal radius (concave)
    - Proximal row of wrist bones (convex/concave)
    - Distal row of wrist bones (convex)
  - Two joints
    - Midcarpal joint
    - Radiocarpal joint

  - Distal row of  wrist bones
  - Proximal row of wrist bones
  - Articular surface of distal radius



All fit together like three nested spoons



Consider this dissection showing the three nested structures that create the functional articulations of the wrist.

- Distal row of wrist bones
- Proximal row of wrist bones
- Distal Radius

Glide and Roll

The image on the left shows ulnar deviation.

- The upper arrow in the image shows movement (**roll**) towards the ulna.
- The proximal row of wrist bones is **gliding** in the opposite direction.

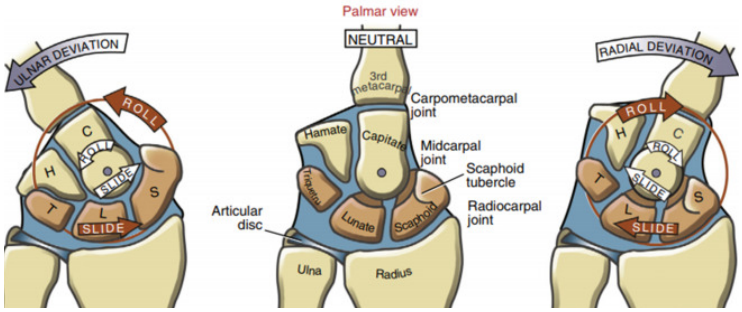
- There is gliding towards the radius at the **radiocarpal joint.**
- There is gliding towards the radius at the **midcarpal joint.**

This movement that can *appear* hinge-like is actually **rotational**.

- This rotational movement is called **roll.**
- The movement at the wrist joints is called **glide.**
- **The direction of the glide is opposite to the roll.**

Everything is reversed in the image on the right showing radial deviation

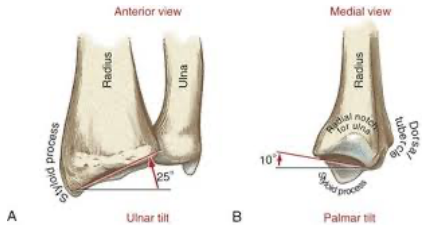
In **Ulnar Deviation**, the hand **rolls** towards the ulna as the result of the **glide/slide** at the wrist joints towards the radius.



In **Radial Deviation**, the hand **rolls** towards the radius as the result of the **glide/slide** at the wrist joints towards the ulna.

Ulnar Deviation, anatomical considerations

Structure of distal radius angled towards ulnar deviation by 25°



Radial deviation ROM: 15-20°
Ulnar deviation ROM: 35-40°

Ulnar deviation is very strong, functional position

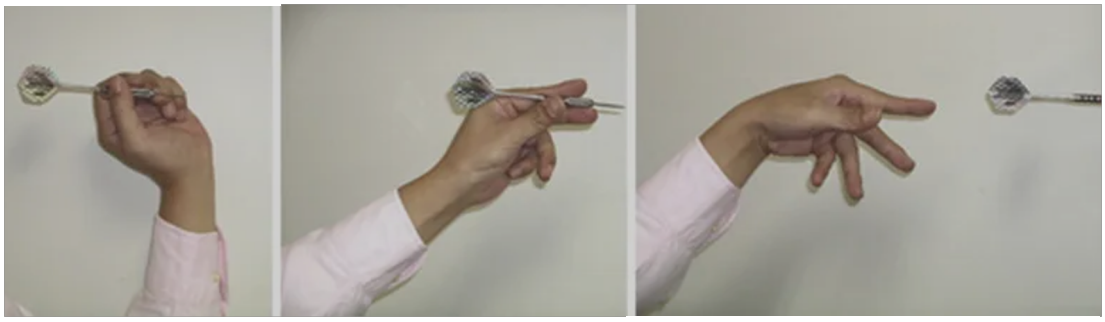
Screw Driver

Chef's Knife

Fencing

Dart throwing reflex

Wrist extension, radial deviation, finger flexion



Wrist flexion, ulnar deviation, finger extension

Mapping considerations for ulnar deviation

- How do you map ulnar deviation?
- How do you cue ulnar deviation?
- Do you picture everything in your hand/wrist, moving in the fifth finger direction, (like the trailer behind the car in this image)?

  - Do you picture a space closing between the carpals and ulna?
  - Do you imagine that if you continue to move in the direction of ulnar deviation it will jam, (like standing next to the trailer hitch)?
  - Or, can you imagine/feel the wrist bones sliding in the direction of your radius?
- Can you observe your thumb lengthening as the carpals slide towards the radius? (See images above.)
- Ulnar Deviation is only problematic if mis-mapped, mis-cued.
- Problematic ulnar deviation will cause jamming and locking of the wrist and upper limb.
- Ulnar Deviation that is free will naturally extend through the upper limb and ribs.

Neutral Wrist

- **Is** a relationship between radius wrist.
- **Is** a position of the radiocarpal joint
- If you have a sense that alignment of 5th finger and ulna represent a neutral wrist, consider how many degrees of separation there are between 5th finger and ulna.

- **Wrist Mis-mappings**
  - The wrist consists of one joint only
  - The wrist has three joints (Carpo-metacarpal joints not wrist joints)
  - The wrist is like a hinge
  - Ulnar deviation is weak, risky, problematic
  - 5th finger lined up with radius is a direct skeletal connection
  - Carpo-metacarpal joints are wrist joints

Carpo-Metacarpal Joints

- Carpo-Metacarpal (CMC) joints are finger joints, not wrist joints
- Not all CMC joints move
- CM 2-3 do not move, they provide a stable center for the palm/hand
- 1, 4-5 do move
- Collective function of CMP joints is modulating hand shape, flat hand to cupped hand
- Grip: hand shape and power