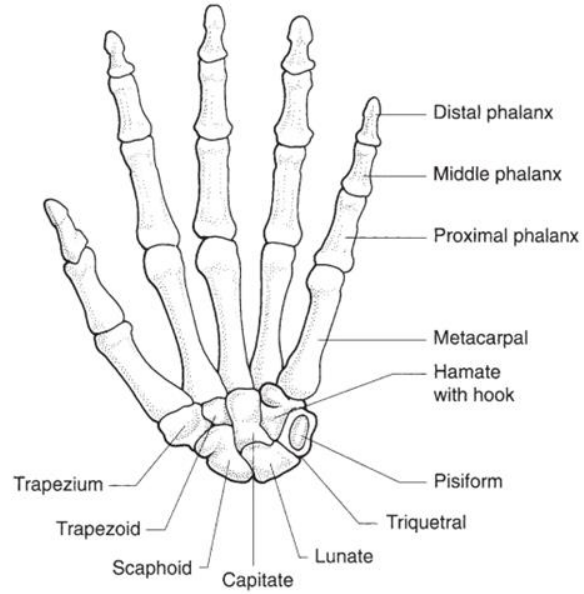
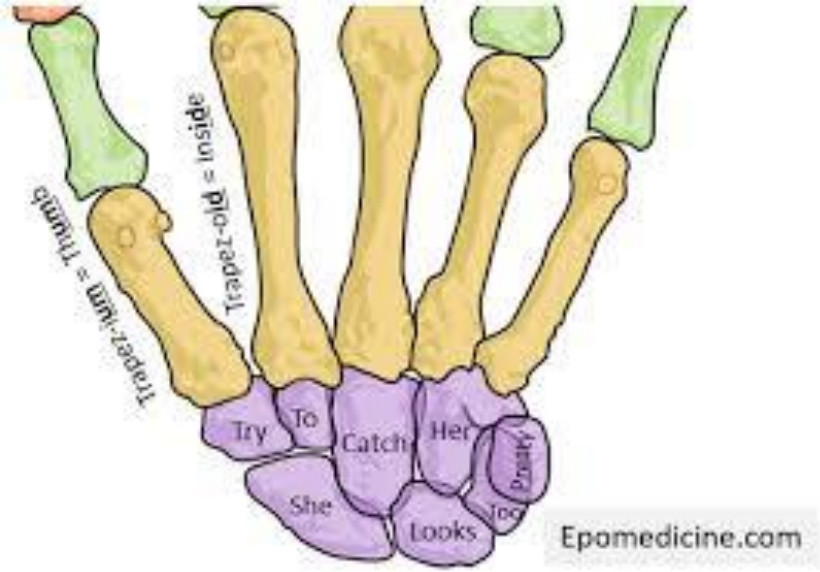
The carpal bones

Dr. Paiman Jamal

carpal bones

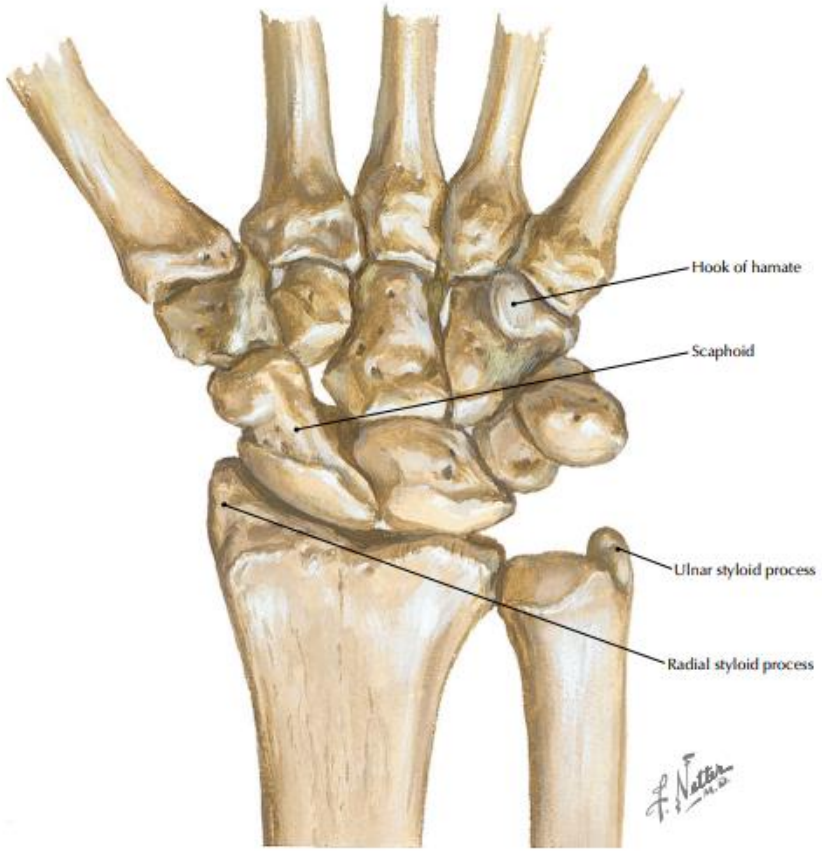
- The carpal bones are arranged in two rows of four each
- In the proximal row, from lateral to medial, are the scaphoid, lunate and triquetral bones, with the pisiform on the anterior surface of the triquetral
- Distal row, the trapezium, trapezoid, capitate and hamate
- Together the carpal bones form an arch, with its concavity situated anteriorly





- The flexor retinaculum converts the arch of bones into a tunnel, the carpal tunnel, which conveys the superficial and deep flexor tendons of the fingers and the thumb

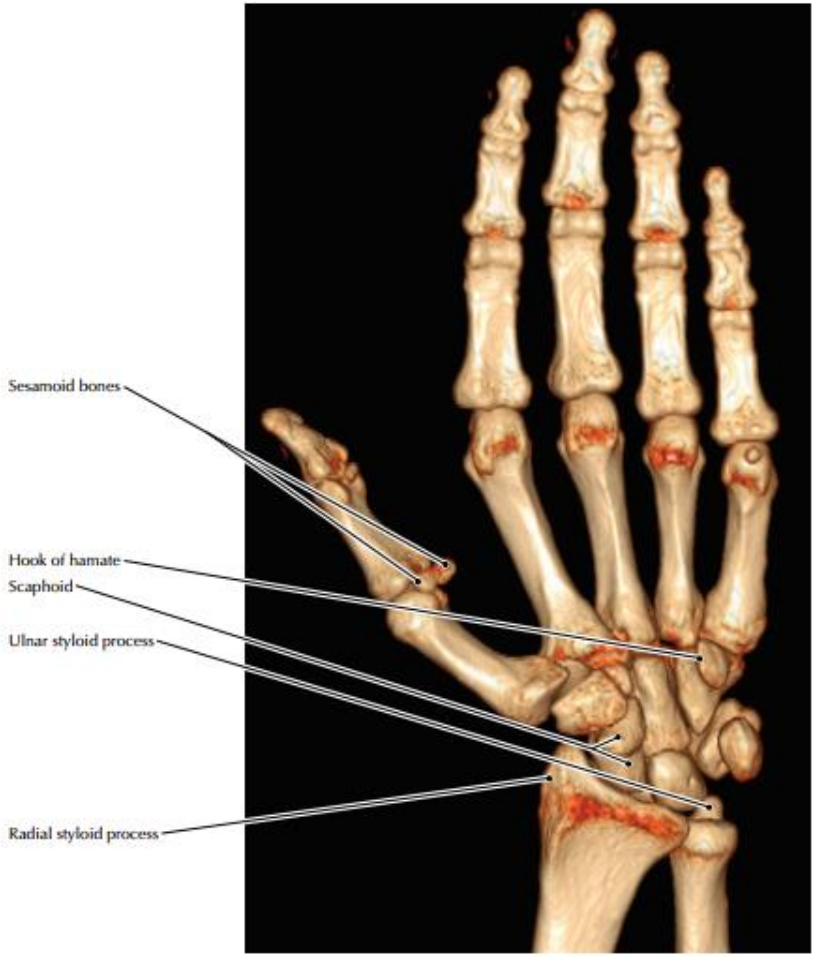
- The extensor retinaculum on the dorsum of the wrist



Palmar view of the bones of the wrist *(Atlas of Human Anatomy, 6th edition, Plate 439)*

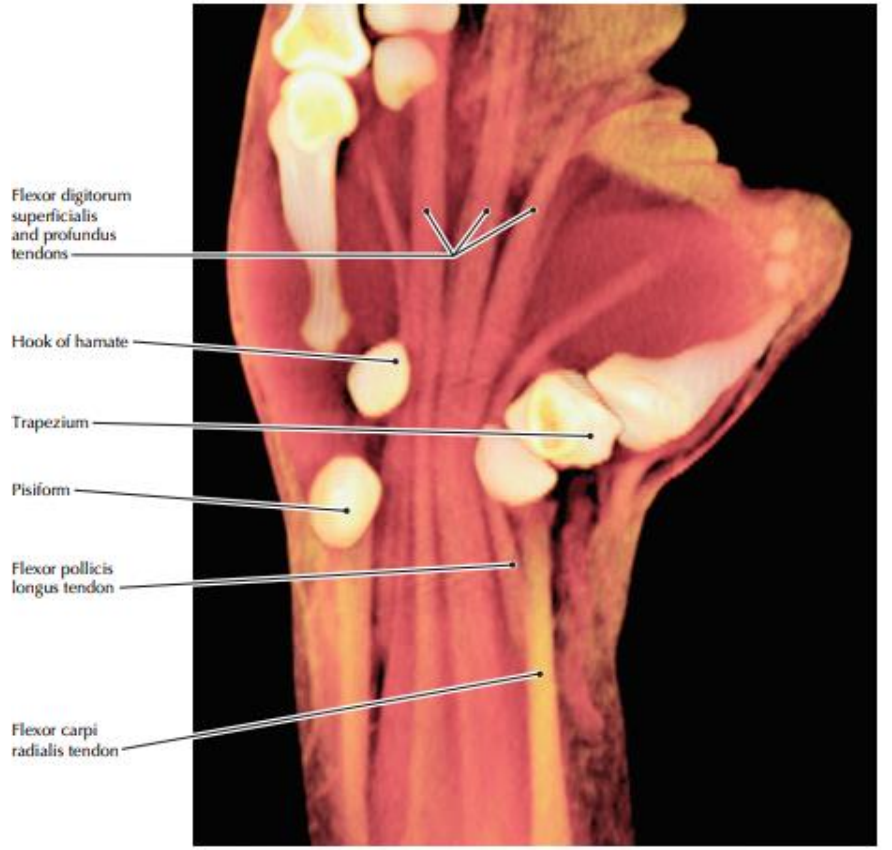
Clinical Note

- The hook of the hamate is easily fractured.
- This injury is most commonly associated with golf (“golfer’s wrist”).
- The fracture is usually a hairline fracture that may be missed on plain radiographs.
- Symptoms are pain aggravated by gripping and tenderness over the hamate.



Clinical Note

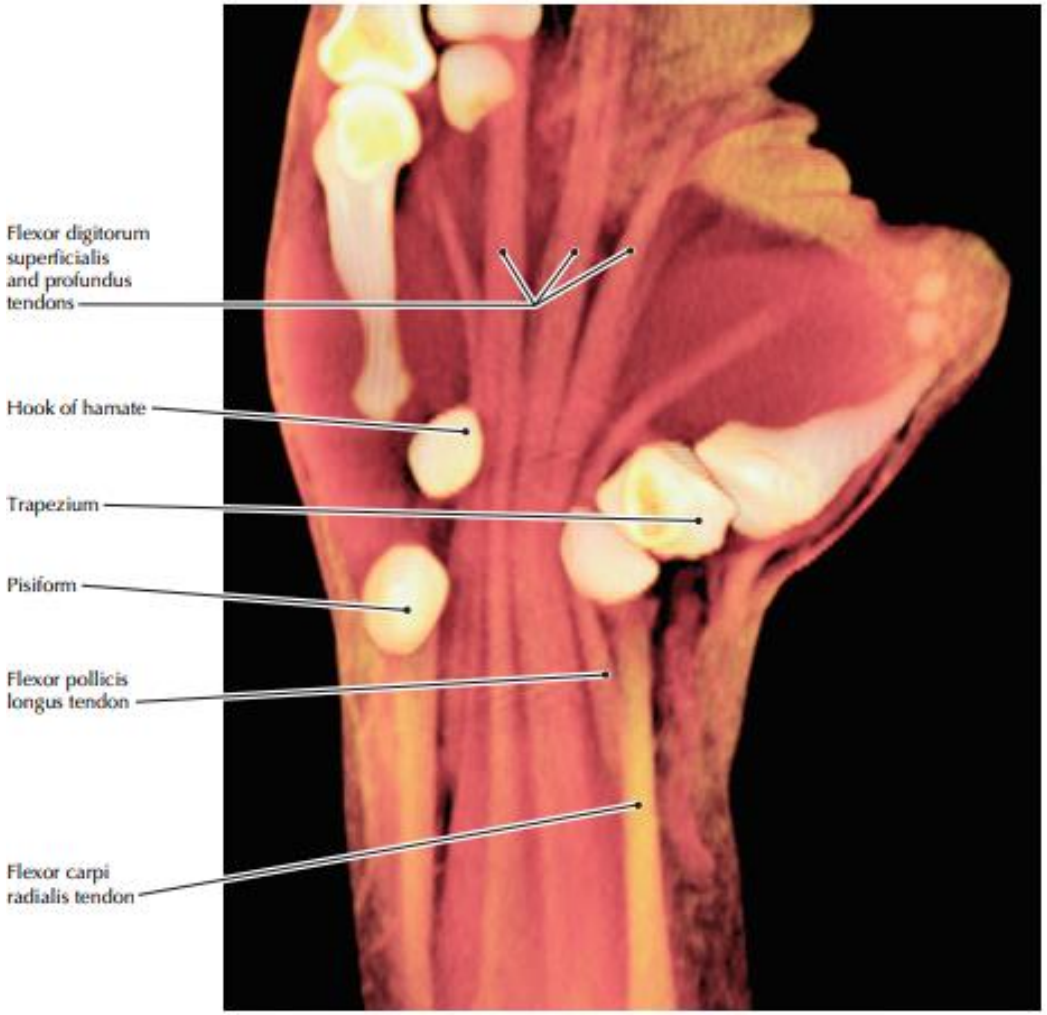
- Nine tendons pass through the carpal tunnel, surrounded by synovial sheaths.
- Tenosynovitis of these sheaths can cause carpal tunnel syndrome



Thin slab, volume rendered display, CT of the wrist

Clinical Note

- The carpal bones are not arranged in two flat rows, but rather form a curved “floor” of the carpal tunnel.
- • The sesamoid bones in the tendons of the flexor pollicis brevis can be mistaken for fracture fragments.
- • The styloid process of the radius extends further distally than that of the ulna, limiting radial deviation of the hand, relative to ulnar deviation

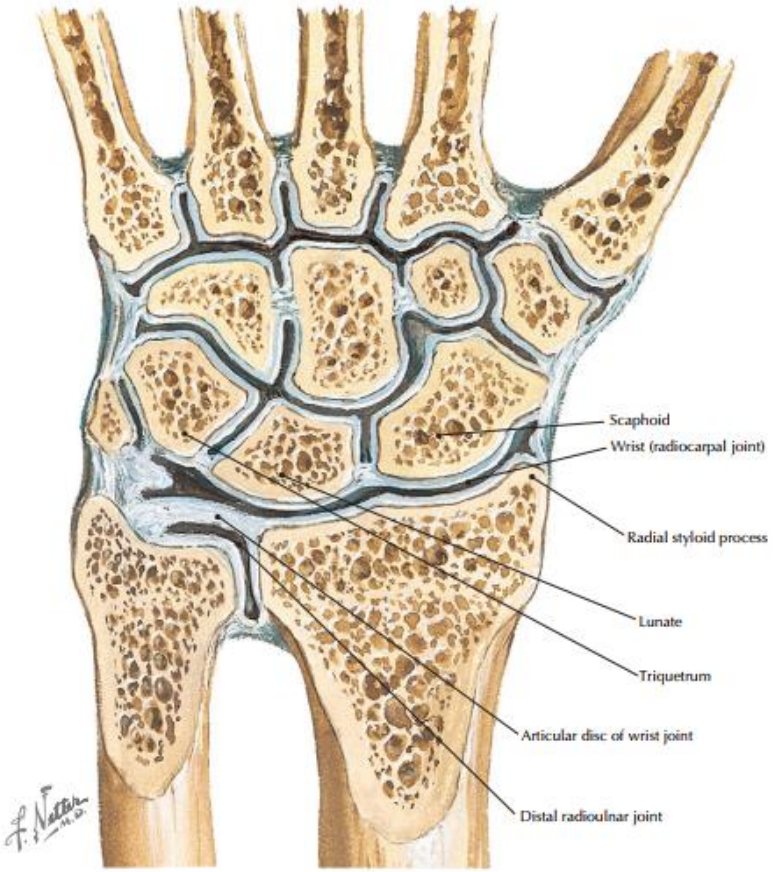


Thin slab, volume rendered display, CT of the wrist

Clinical Note

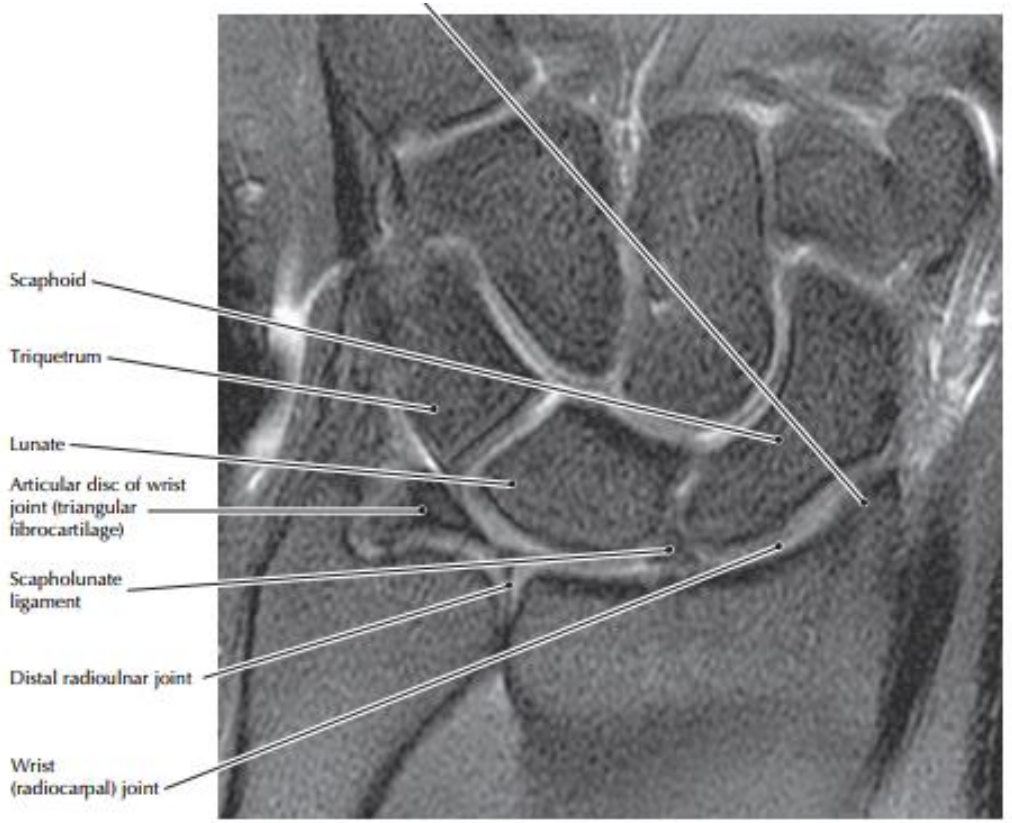
The scaphoid is the most frequently fractured carpal bone, often resulting from a fall on the palm with an abducted hand.
Pain is felt in the anatomical snuff-box.

Because the blood supply to the scaphoid enters the bone distally, midscaphoid lesions may result in avascular necrosis of the proximal segment.



Coronal section of the wrist, dorsal view *(Atlas of Human Anatomy, 6th edition,*

- • When the scapholunate ligament is torn, plain radiographs may demonstrate a widening of the space between the scaphoid and lunate bones.

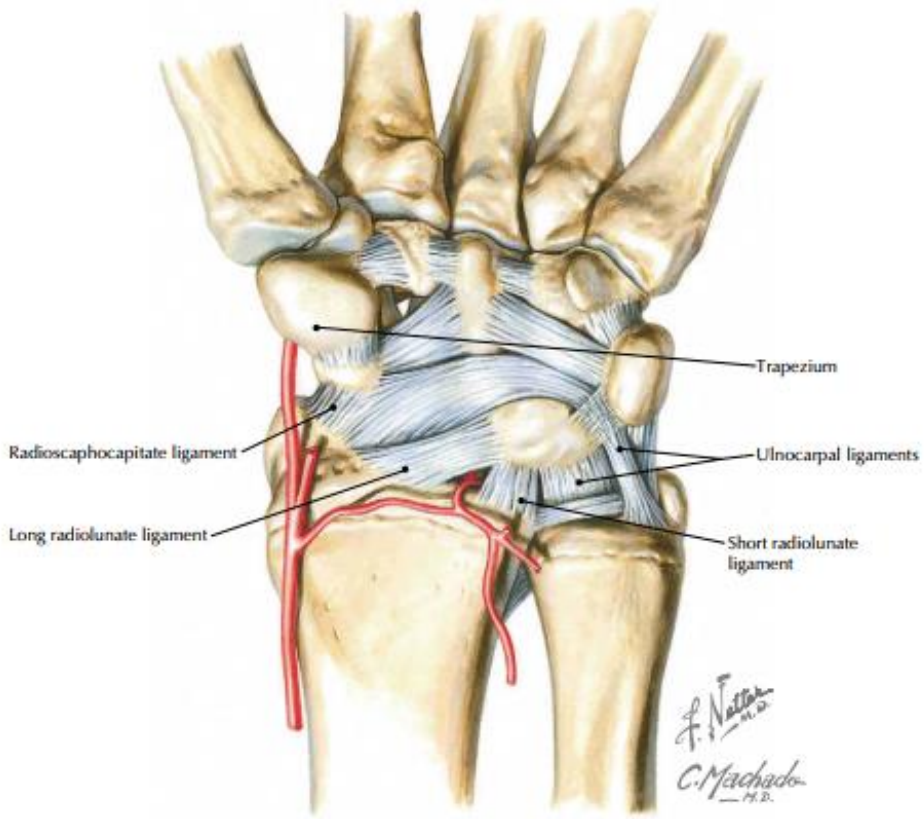


Coronal T2 MR image of intrinsic wrist structures *(From Ramnath RR: 3T MR imaging of the musculoskeletal system (part II): Clinical applications. Magn Reson Imaging Clin N Am*

Clinical Note

- The palmar ligaments provide relatively little support for the lunate on the palmar side of the wrist.
- Thus, when it dislocates, it typically moves in a palmar direction, causing carpal tunnel compression

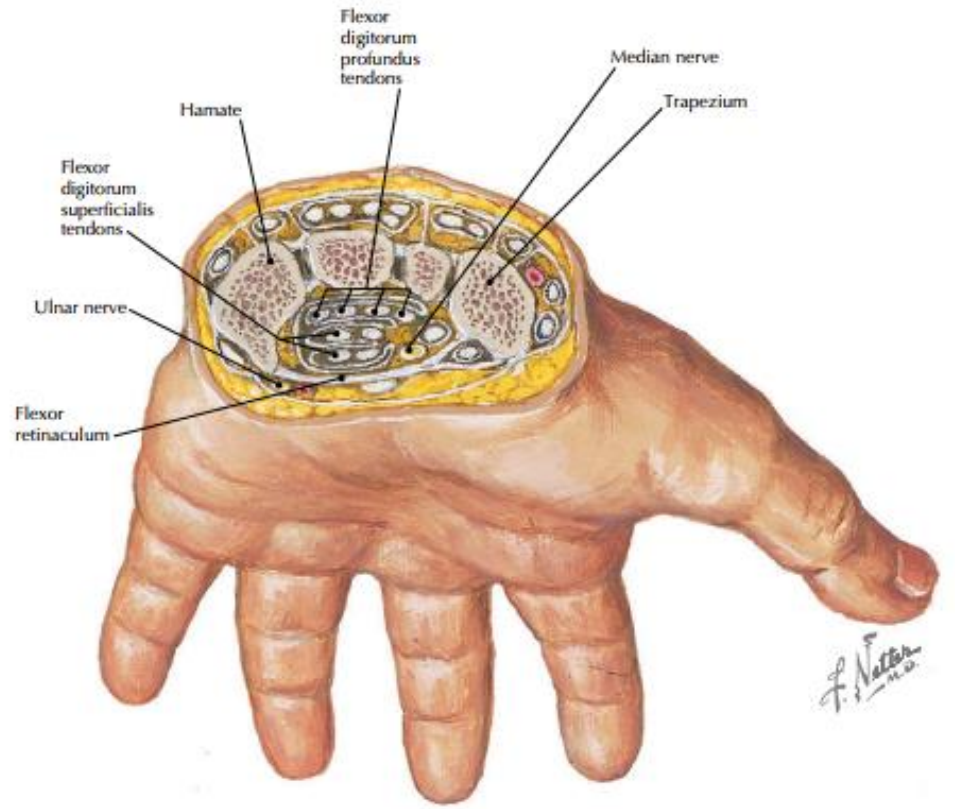
- The dorsal ligaments are less important structurally than the palmar ligaments. However, the dorsal radiocarpal ligament is considered important for stability of the carpal bones during motion.



Ligaments of the palmar wrist *(Atlas of Human Anatomy, 6th edition, Plate 441)*

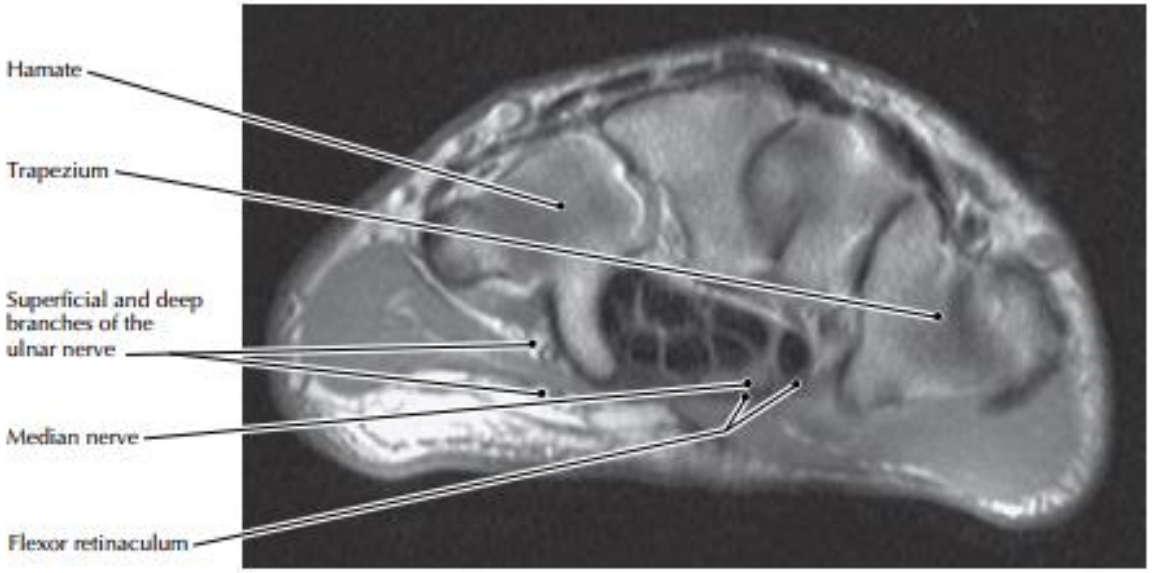
Clinical Note

- The ulnar nerve does not run within the carpal tunnel (as does the median nerve), so carpal tunnel syndrome does not affect the function of the ulnar nerve.



Transverse section through the carpal tunnel *(Atlas of Human Anatomy, 6th edition, Plate 449)*

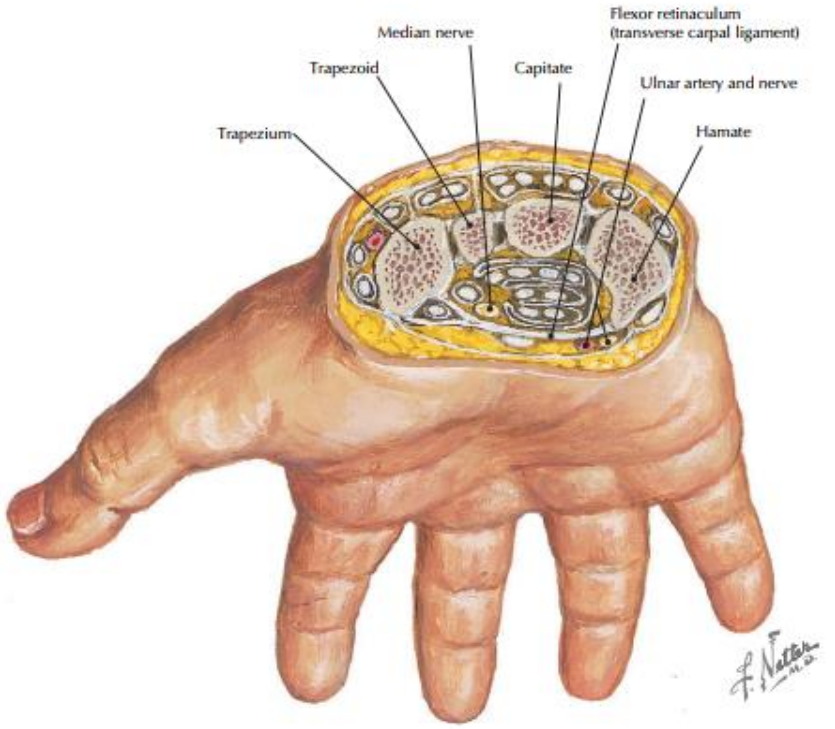
- The median nerve is seen as a flat ovoid structure immediately deep to the flexor retinaculum.
- • The deep and superficial flexor tendons have a low signal and are closely packed.
- • The flexor retinaculum may be surgically transected to relieve excessive pressure on the median nerve within the carpal tunnel.



Axial T1 MR image through the carpal tunnel *(From Hochman MG, Zilberfarb JL: Nerves in a pinch: Imaging of nerve compression syndromes. Radiol Clin North Am 42(1):221-245, 2004)*

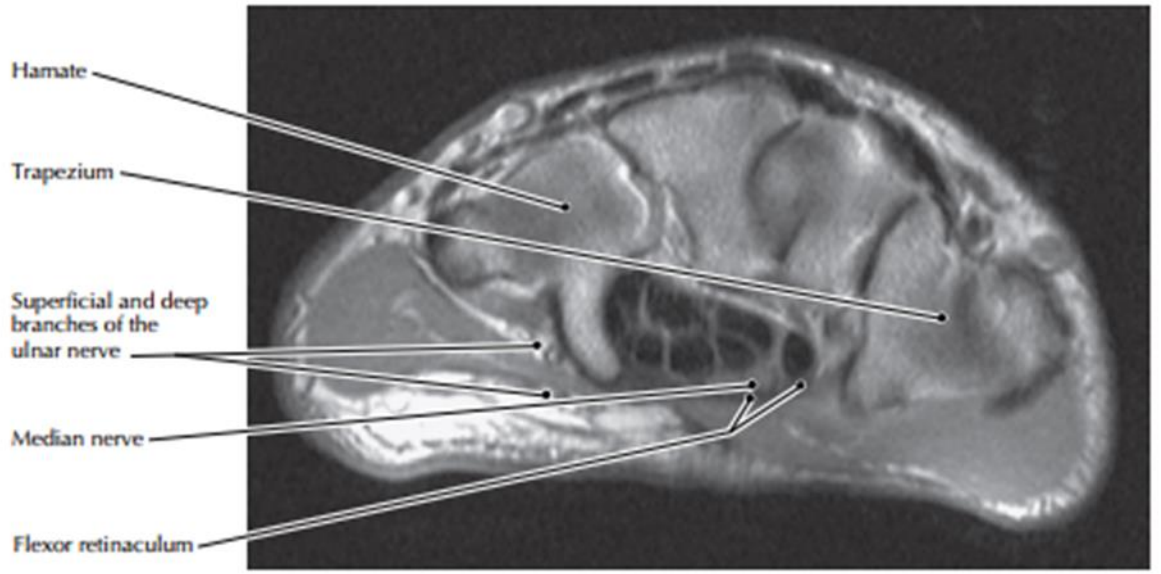
Clinical Note

- Any pathology that expands the contents of the tunnel (e.g., tenosynovitis) or diminishes space within the tunnel (e.g., anterior dislocation of a carpal bone) will compress the enclosed median nerve (carpal tunnel syndrome).



Transverse section through the carpal tunnel *(Atlas of Human Anatomy, 6th edition, Plate 449)*

- The hook of the hamate forms the medial border of the carpal tunnel.
- • The median nerve is distinct in MR images of the carpal tunnel as a structure with a higher-intensity signal than the surrounding tendons.



Axial T1 MR image through the carpal tunnel *(From Hochman MG, Zilberfarb JL: Nerves in a pinch: Imaging of nerve compression syndromes. Radiol Clin North Am 42(1):221-245, 2004)*

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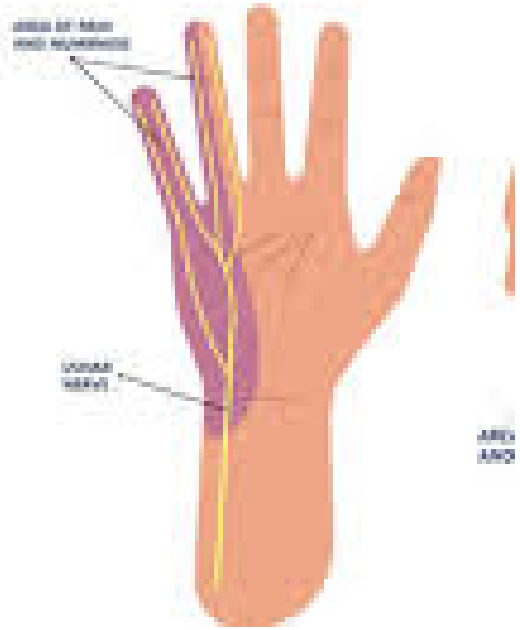
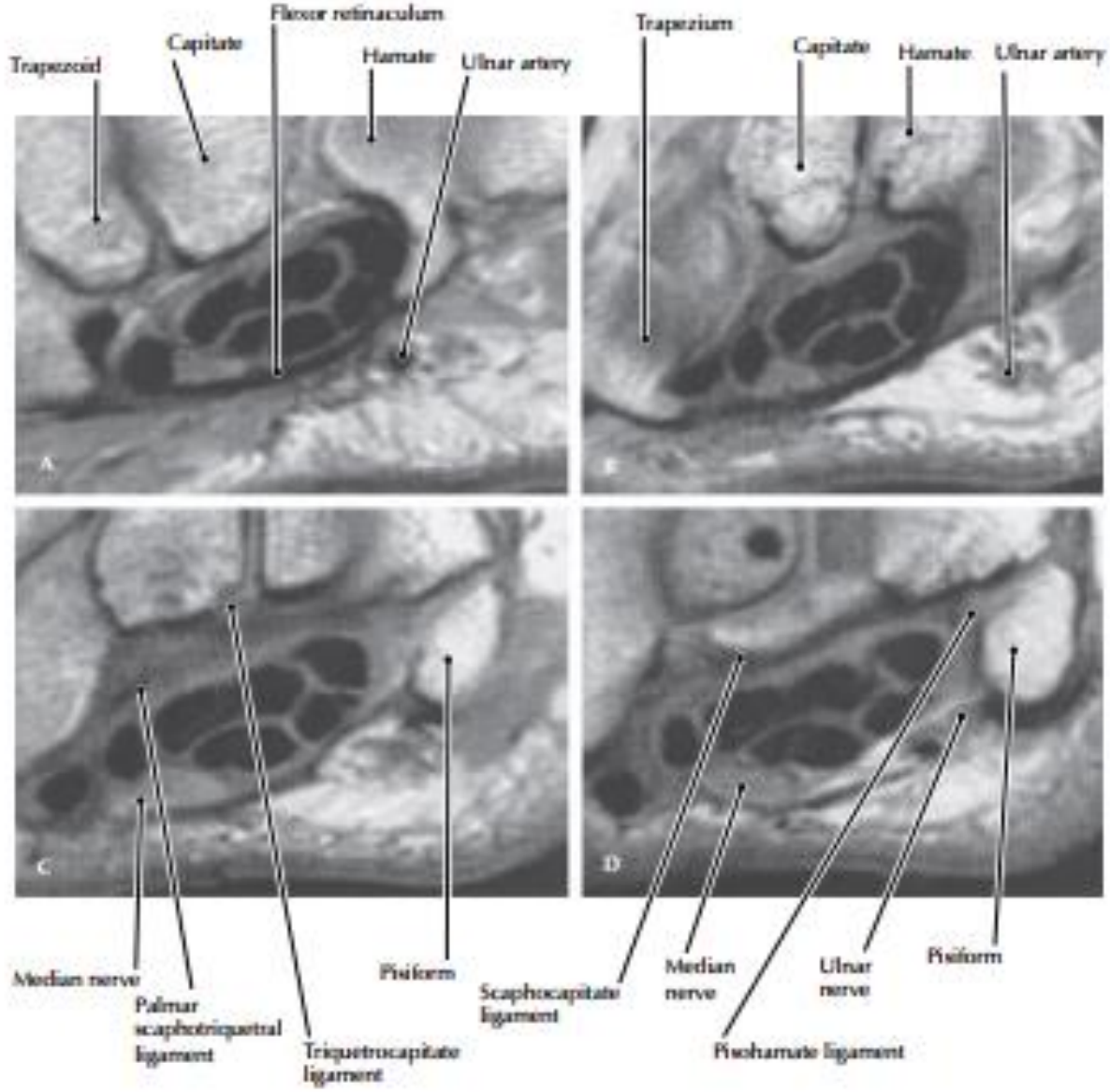
- • Guyon’s canal (ulnar canal) is a potential space at the wrist between the pisiform and hamate bones through which the ulnar artery and nerve pass into the hand.
- It is converted into a tunnel by the palmar carpal ligaments (ventrally) and the pisohamate ligament (dorsally).

- Compression of the ulnar nerve within this space results in a paresthesia in the ring and little fingers. This may be followed by decreased sensation and eventual weakness and clumsiness in the hand as the intrinsic muscles of the hand become involved

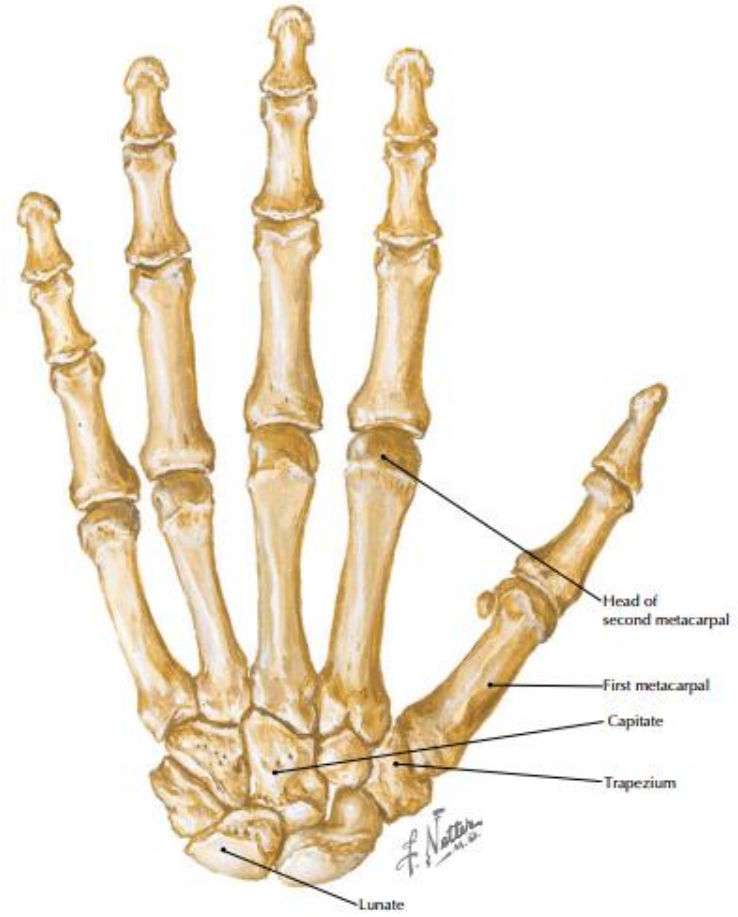




Axial MR images of the carpal tunnel and Guyon's canal (*A* most distal, *D* most proximal) *(From Yu JS, Habib PA: Normal MR imaging anatomy of the wrist and hand. Radiol Clin North Am 44(4):569-581, 2006)*

Clinical Note

- The capitate is typically well protected by its central location within the wrist, but severe hyperextension can result in fracture of both the scaphoid and capitate (Fenton syndrome).



sal view of the bones of the hand and wrist *(Atlas of Human Anatomy, 6th edition,*

Radiological features of the carpal bones

Radiography

These are radiographed in the anteroposterior, lateral and oblique positions

- Carpal tunnel views are obtained by extending the wrist and taking an inferosuperior view that is centered over the anterior part of the wrist

Figure 7.7 • AP radiograph of the wrist and hand.

1. Distal radius
2. Styloid process of radius
3. Distal ulna
4. Styloid process of ulna
5. Distal radioulnar joint
6. Radiocarpal joint
7. Scaphoid
8. Lunate
9. Triquetral
10. Pisiform
11. Hamate
12. Hook of hamate
13. Capitate
14. Trapezoid
15. Trapezium
16. First metacarpophalangeal joint
17. Base of fourth metacarpal
18. Shaft of fourth metacarpal
19. Head of fourth metacarpal
20. Fourth metacarpophalangeal joint
21. Shaft of proximal phalanx, ring finger
22. Proximal interphalangeal joint, little finger
23. Middle phalanx, middle finger
24. Distal interphalangeal joint, index finger
25. Distal phalanx, thumb
26. Sesamoid bone
27. Soft tissues overlying distal phalanx of middle finger

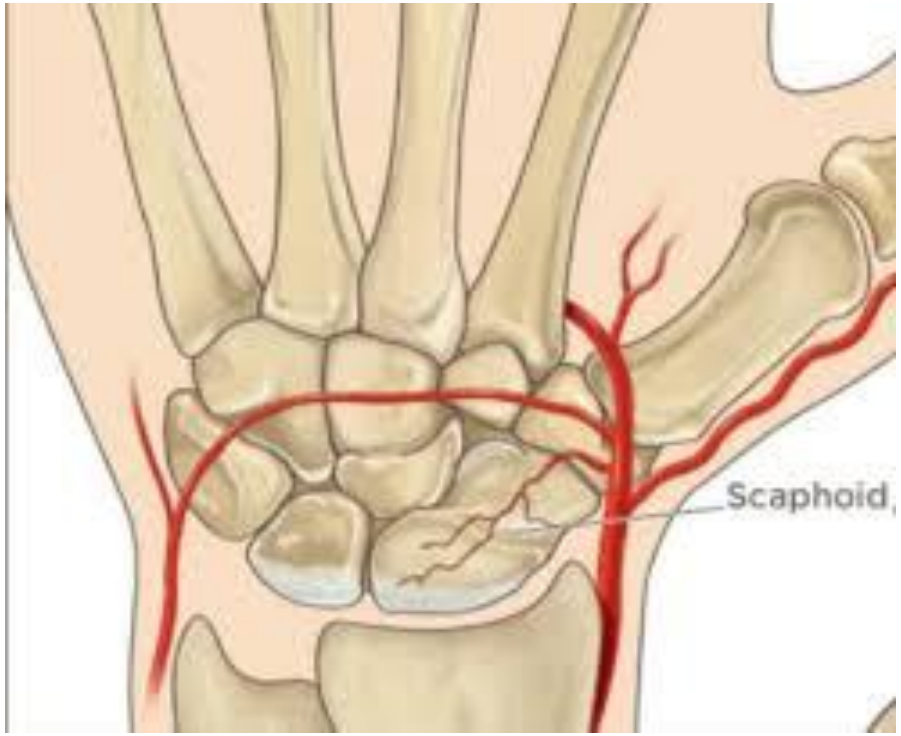
Supernumerary bones

These may be found in the wrist and include the os centrale found between the scaphoid, trapezoid and capitate, which may represent the tubercle of the scaphoid that has not fused with its upper pole, and the os radiale externum, which is found on the lateral side of the scaphoid distal to the radial styloid

Nutrient arteries of the scaphoid

In 13% of subjects these enter the scaphoid exclusively in its distal half
If such a bone fractures across its midportion, the blood supply to the proximal portion is cut off and ischemic necrosis is inevitable

This occurs in 50% of patients with displaced scaphoid fractures



Ossification of the carpal bones

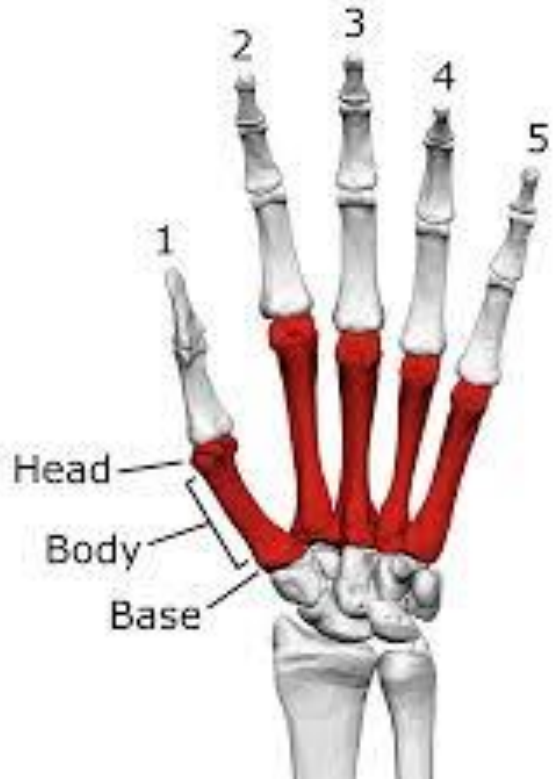
These ossify from a single center each

The capitate ossifies first and the pisiform last, but the order and timing of the ossification of the other bones is variable Excluding the pisiform, they ossify in a clockwise direction from capitate to trapezoid as follows: the capitate at 4 months; the hamate at 4 months; the triquetral at 3 years; the lunate bone at 5 years; and the scaphoid, trapezium and trapezoid at 6 years The pisiform ossify es at 11 years of age

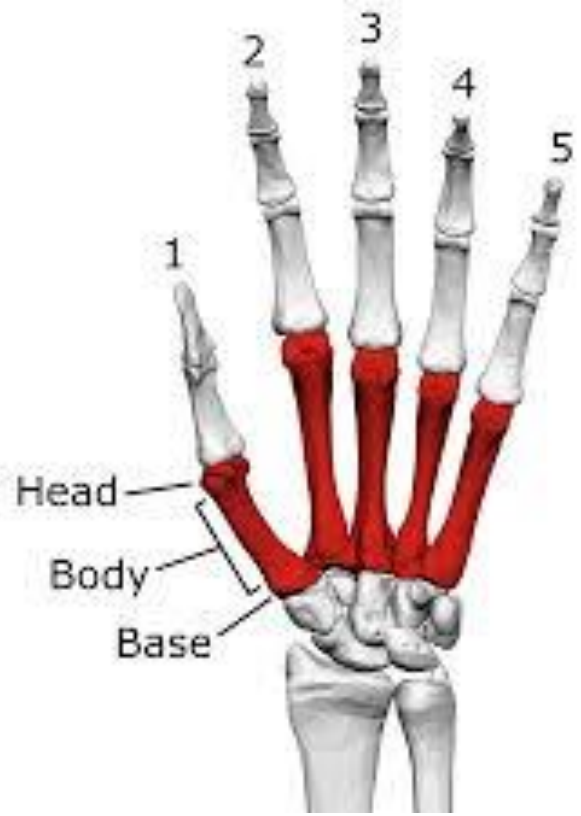
The metacarpals and phalanges

The five metacarpals are numbered from the lateral to the medial side Each has a base proximally that articulates with that of the other metacarpals, except in the case of the first metacarpal, which is as a result more mobile and less likely to fracture

The third metacarpal has a styloid process extending from its base on the dorsal aspect Each metacarpal has a rounded head distally, which articulates with the proximal phalanx



The phalanges are 14 in number, three for each finger and two for the thumb Like the metacarpals, each has a head, a shaft and a base The distal part of the distal phalanx is Bones of the hand expanded as the tuft of the distal phalanx



Radiological features of the metacarpals and phalanges

Bone age

A radiograph of the left hand is used in the determination of

bone age Standards of age determined by epiphyseal appearance and fusion have been compiled for the left hand and wrist

The metacarpal sign

A line tangential to the heads of the fourth and fifth metacarpals does not cross the head of the third metacarpal in 90% of

normal hands – this is called the metacarpal sign This line

does, however, cross the third metacarpal head in gonadal

dysgenesis

The carpal angle

This is formed by lines tangential to the proximal ends of the scaphoid and lunate bones In normal hands the average angle is 138 ° It is reduced to an average 108 ° in gonadal dysgenesis

The metacarpal index

This is calculated by measuring the lengths of the second, third, fourth and fifth metacarpals and dividing by their breadths taken at their exact midpoint The sum of these divided by four is the metacarpal index, which has a normal range of 5 4 – 7 9 An index greater than 8 4 suggests the diagnosis of arachnodactyly

Sesamoid bones

Two sesamoid bones are found related to the anterior surface of the metacarpophalangeal joint of the thumb in the normal radiograph

A single sesamoid bone in relation to this joint in the little finger is seen in 83% of radiographs, and at the interphalangeal joint of the thumb in 73% These are occasionally found at other metacarpal and distal interphalangeal joints The incidence of sesamoid bones is increased in acromegaly

Ossification of the metacarpals and phalanges

These ossify between the ninth and twelfth fetal weeks Secondary ossification centers appear in the distal end of the metacarpals of the fingers at 2 years and fuse at 20 years of age Secondary centers for the thumb metacarpal and for the phalanges are at their proximal end and appear between 2 and 3 years, and fuse between 18 and 20 years of age

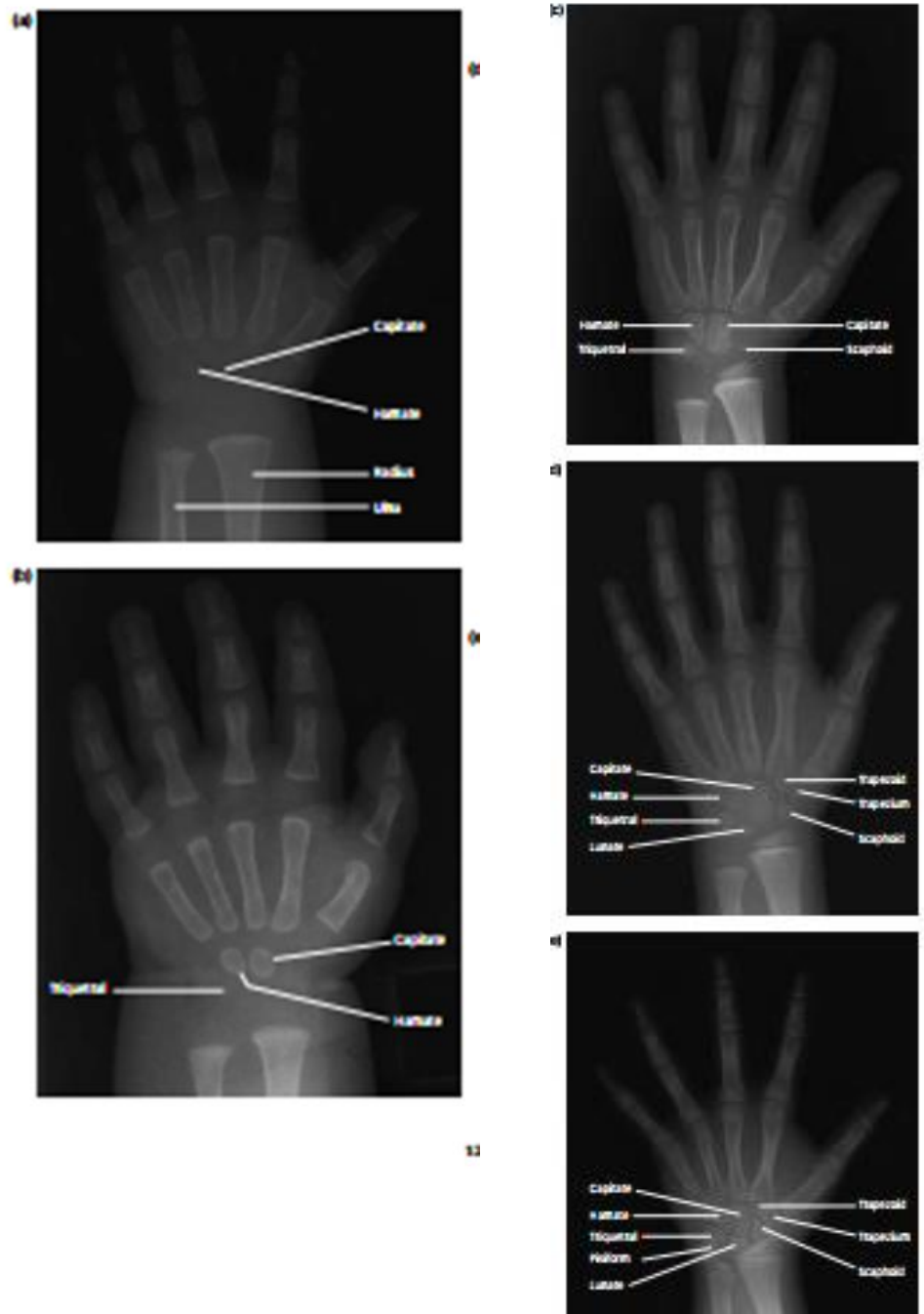
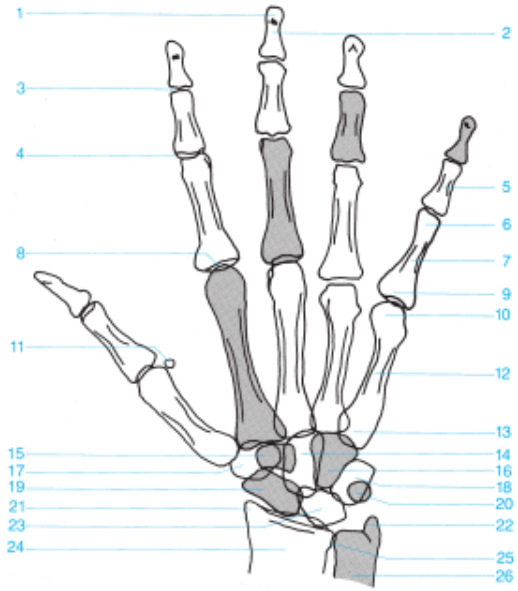
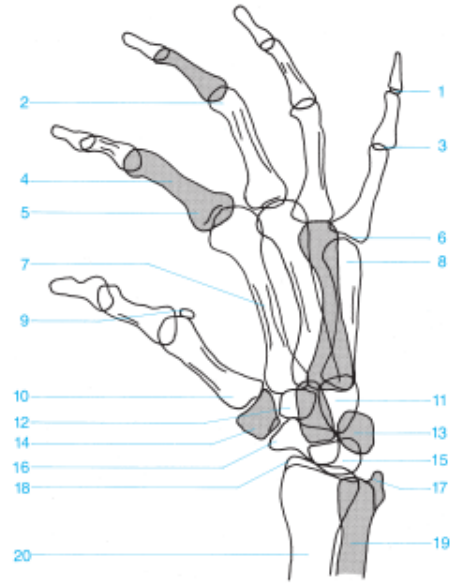


Fig. 12.15. Radiographs of the carpal bones in the growing child, demonstrating ossification of the carpal bones during the first 12 years of life: (a) 1 year, (b) 3 years, (c) 5 years, (d) 7 years,

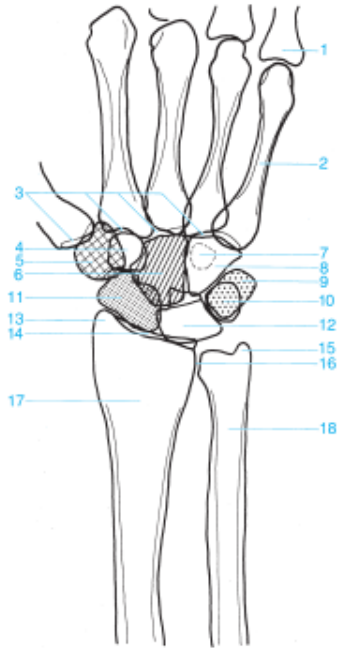


1	Distal phalanx (tuft)	14	Capitate
2	Distal phalanx	15	Trapezoid
3	Distal interphalangeal joint	16	Hamate
4	Proximal interphalangeal joint	17	Trapezium
5	Middle phalanx	18	Triquetrum
6	Head of the proximal phalanx	19	Scaphoid
7	Proximal phalanx	20	Pisiform
8	Metacarpophalangeal joint	21	Radial styloid
9	Base of the proximal phalanx	22	Ulnar styloid
10	Metacarpal head	23	Lunate
11	Sesamoid	24	Distal radius
12	Metacarpal	25	Distal radioulnar joint
13	Metacarpal base	26	Distal ulna

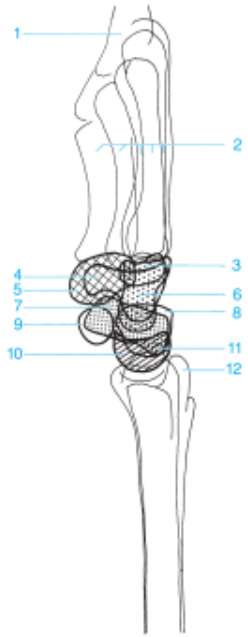


1	Distal interphalangeal joint	11	Capitate and hamate
2	Head of the proximal phalanx	12	Trapezoid
3	Proximal interphalangeal joint	13	Triquetrum
4	Proximal phalanx	14	Trapezium
5	Base of the proximal phalanx	15	Lunate
6	Metacarpophalangeal joint	16	Scaphoid
7	Metacarpal	17	Ulnar styloid
8	Metacarpal head	18	Radial styloid
9	Sesamoid	19	Distal ulna
10	Metacarpal base	20	Distal radius

Anterior-Posterior View of the Wrist

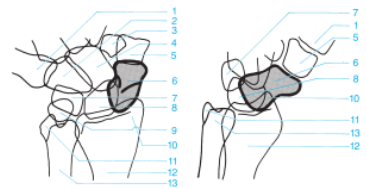


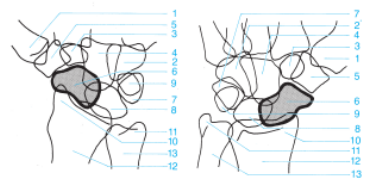
1	Proximal phalanx	10	Pisiform
2	Fifth metacarpal	11	Scaphoid
3	Carpometacarpal joint	12	Lunate
4	Trapezoid	13	Radial styloid
5	Trapezium	14	Radiocarpal joint
6	Capitate	15	Ulnar styloid
7	Hook of the Hamate	16	Radioulnar joint
8	Hamate	17	Radius
9	Triquetrum	18	Ulna



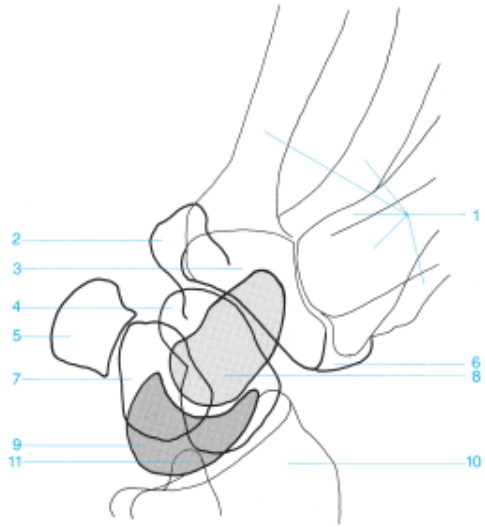
1 Proximal phalanx
2 Metacarpals
3 Trapezoid
4 Hook of the Hamate
5 Trapezium
6 Capitate
7 Scaphoid
8 Triquetrum
9 Pisiform
10 Lunate
11 Radial styloid
12 Ulnar styloid

1 Pisiform
2 Trapezium
3 Hook of the hamate
4 Triquetrum
5 Scaphoid
6 Lunate
7 Capitate
8 Trapezoid
9 Hamate

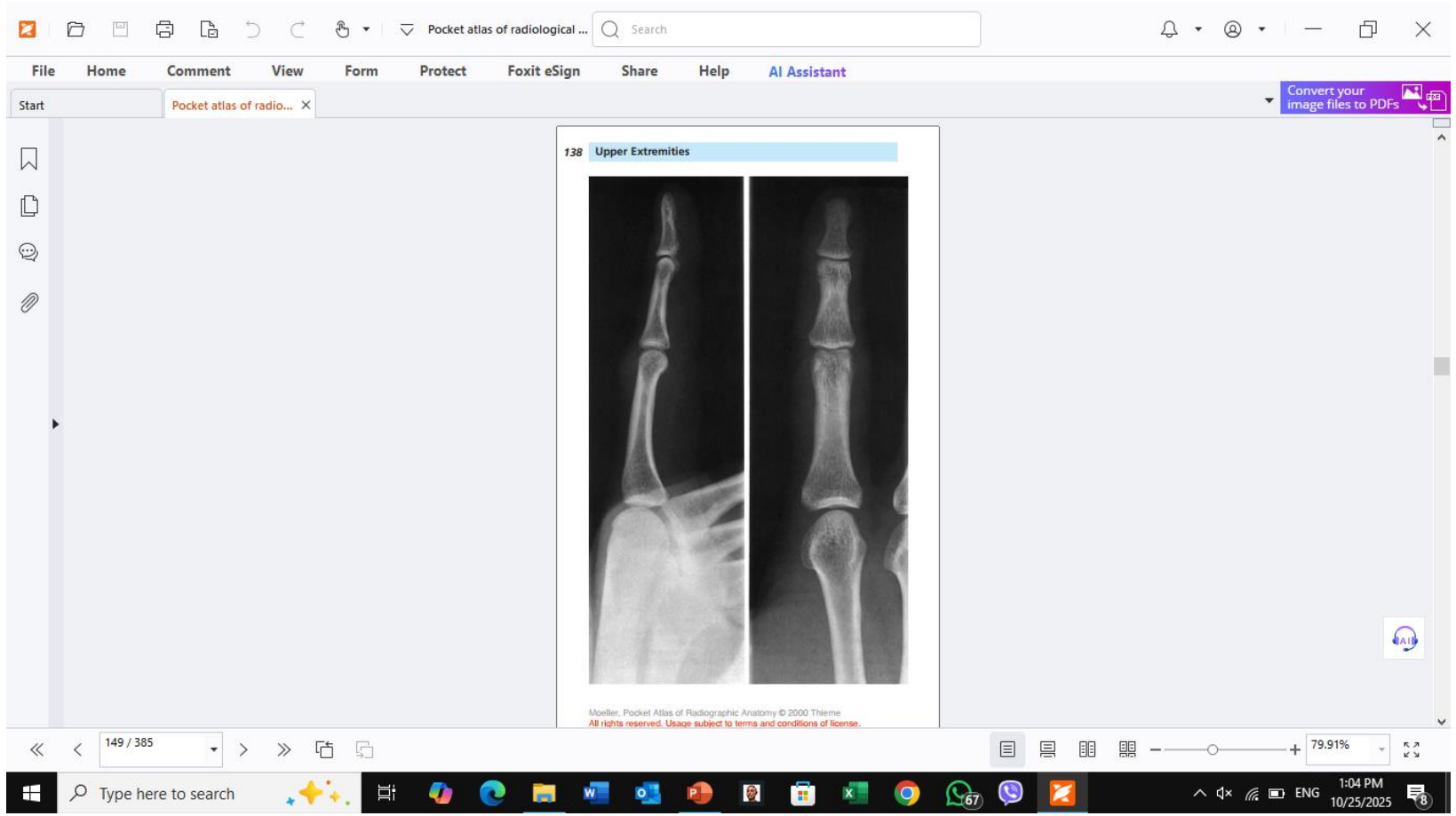




1 Metacarpal
2 Hamate
3 Trapezoid
4 Capitate
5 Trapezium
6 Scaphoid
7 Triquetrum
8 Lunate
9 Pisiform
10 Radial styloid
11 Ulnar styloid
12 Radius
13 Ulna



1 Metacarpals
2 Hamate
3 Trapezoid
4 Scaphoid
5 Pisiform
6 Trapezium
7 Triquetrum
8 Capitate
9 Lunate
10 Radius
11 Ulnar styloid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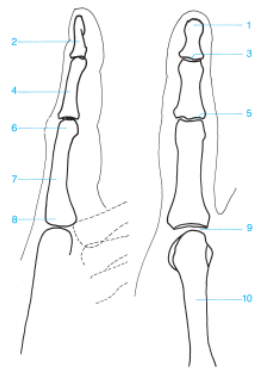
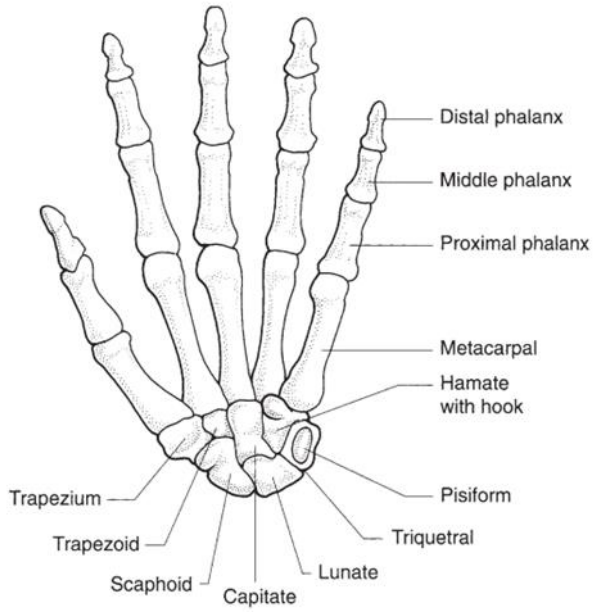
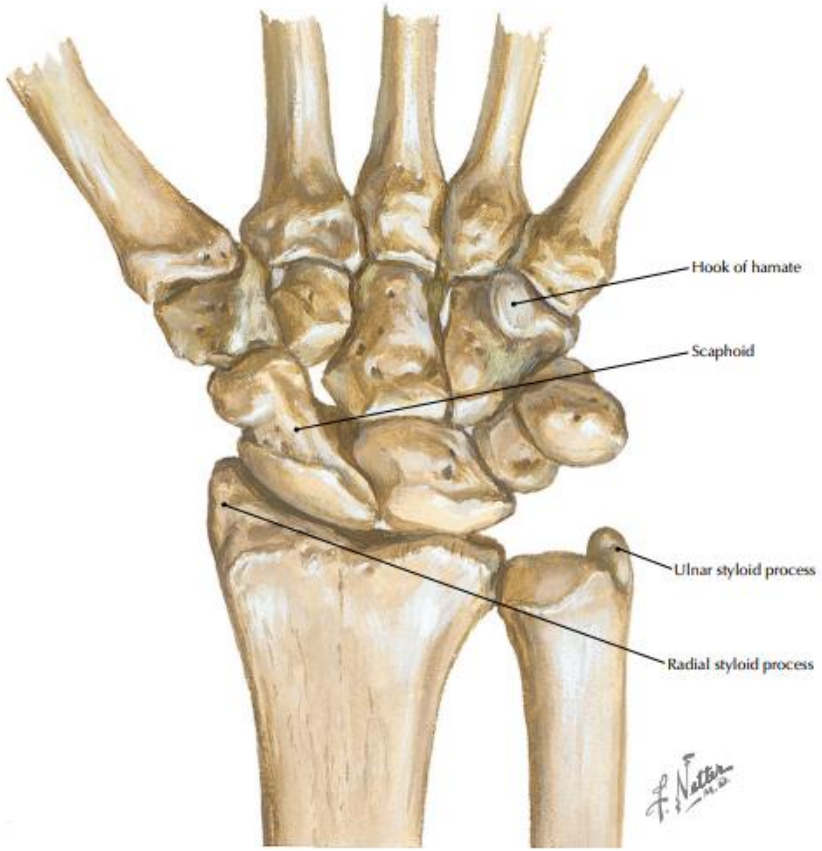


1 Distal phalanx (tuft)
2 Distal phalanx
3 Distal interphalangeal joint
4 Middle phalanx
5 Proximal interphalangeal joint
6 Head of the proximal phalanx
7 Proximal phalanx
8 Base of the proximal phalanx
9 Metacarpophalangeal joint
10 Metacarpal

- The carpal bones are arranged in two rows of four each
- In the proximal row, from lateral to medial, are the scaphoid, lunate and triquetral bones, with the pisiform on the anterior surface of the triquetral
- Distal row, the trapezium, trapezoid, capitate and hamate
- Together the carpal bones form an arch, with its concavity situated anteriorly



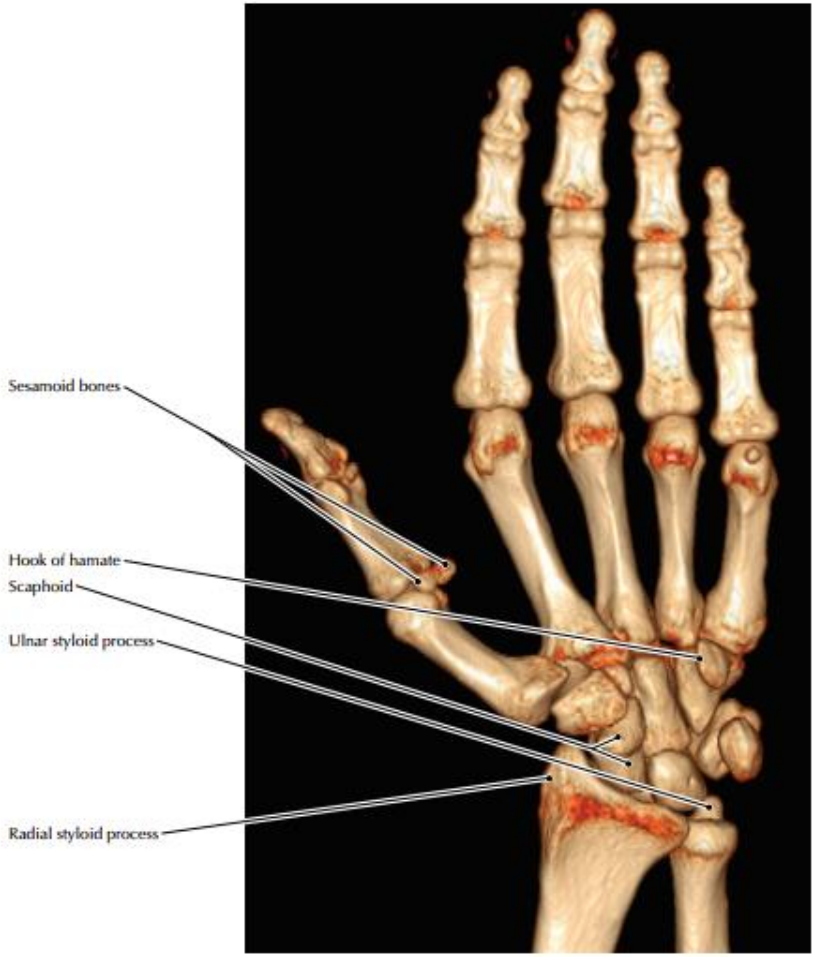
- The flexor retinaculum is attached laterally to the scaphoid and the ridge of the trapezium,
- Medially to the pisiform and the hook of the hamate
- It converts the arch of bones into a tunnel, the carpal tunnel, which conveys the superficial and deep flexor tendons of the fingers and the thumb
- The extensor retinaculum on the dorsum of the wrist attaches to the pisiform and triquetrum medially and the radius laterally Six separate synovial sheaths run beneath it



Palmar view of the bones of the wrist *(Atlas of Human Anatomy, 6th edition, Plate 439)*

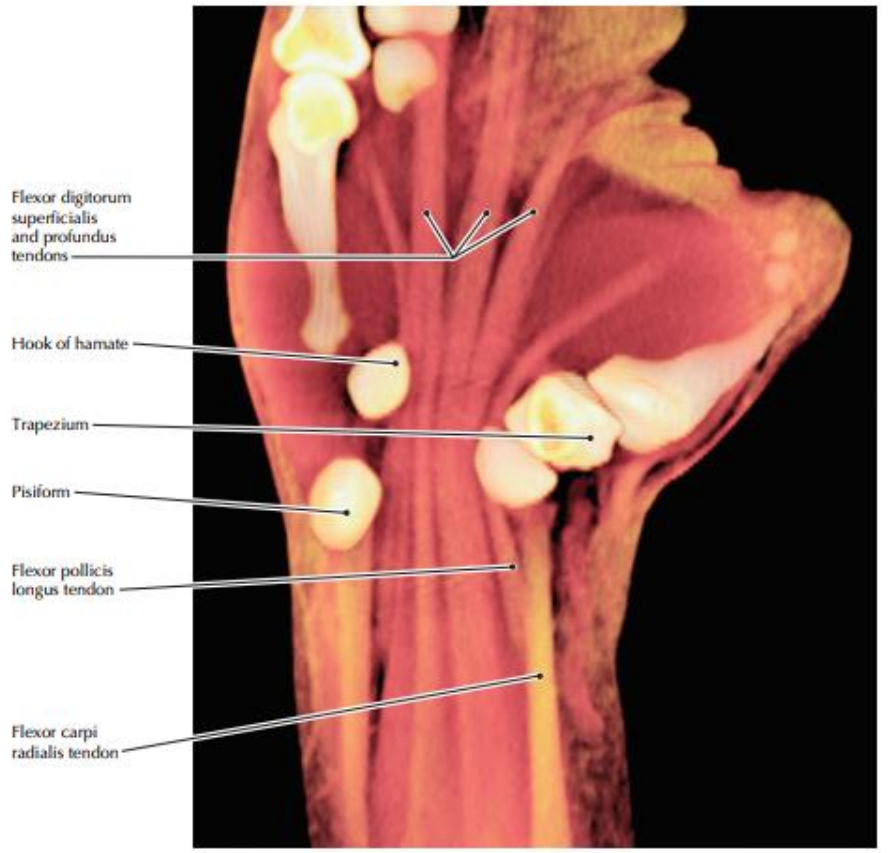
Clinical Note

- The hook of the hamate is easily fractured. This injury is most commonly associated with golf (“golfer’s wrist”). The fracture is usually a hairline fracture that may be missed on plain radiographs. Symptoms are pain aggravated by gripping and tenderness over the hamate.



Clinical Note

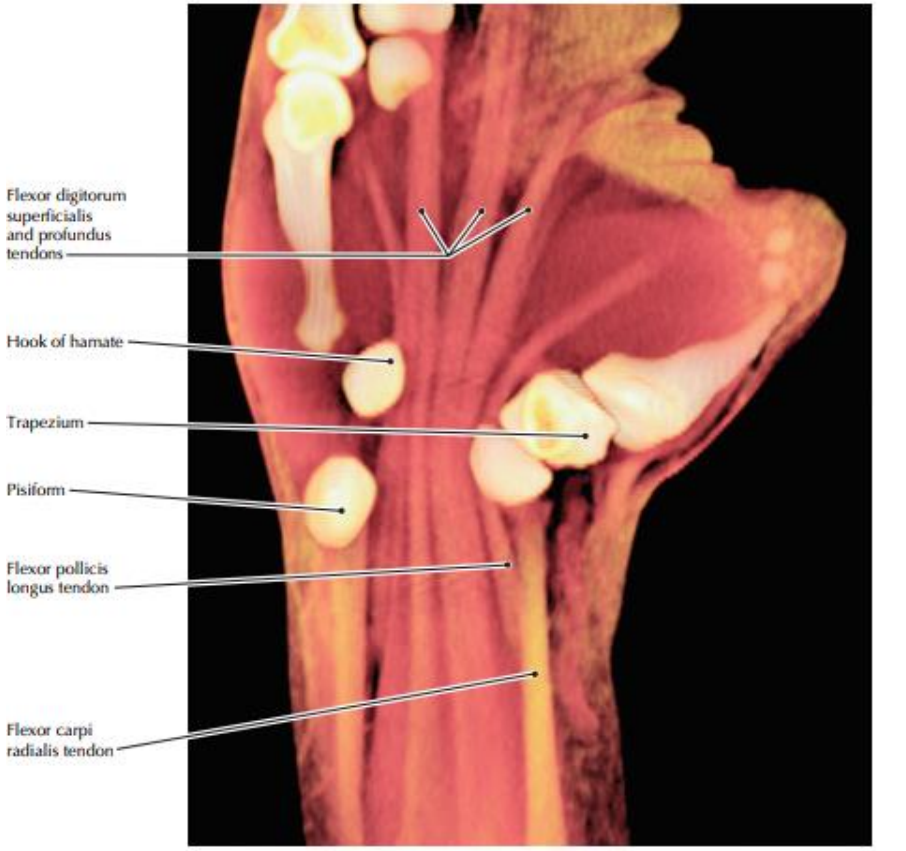
- Nine tendons pass through the carpal tunnel, surrounded by synovial sheaths. Tenosynovitis of these sheaths can cause carpal tunnel syndrome



Thin slab, volume rendered display, CT of the wrist

Clinical Note

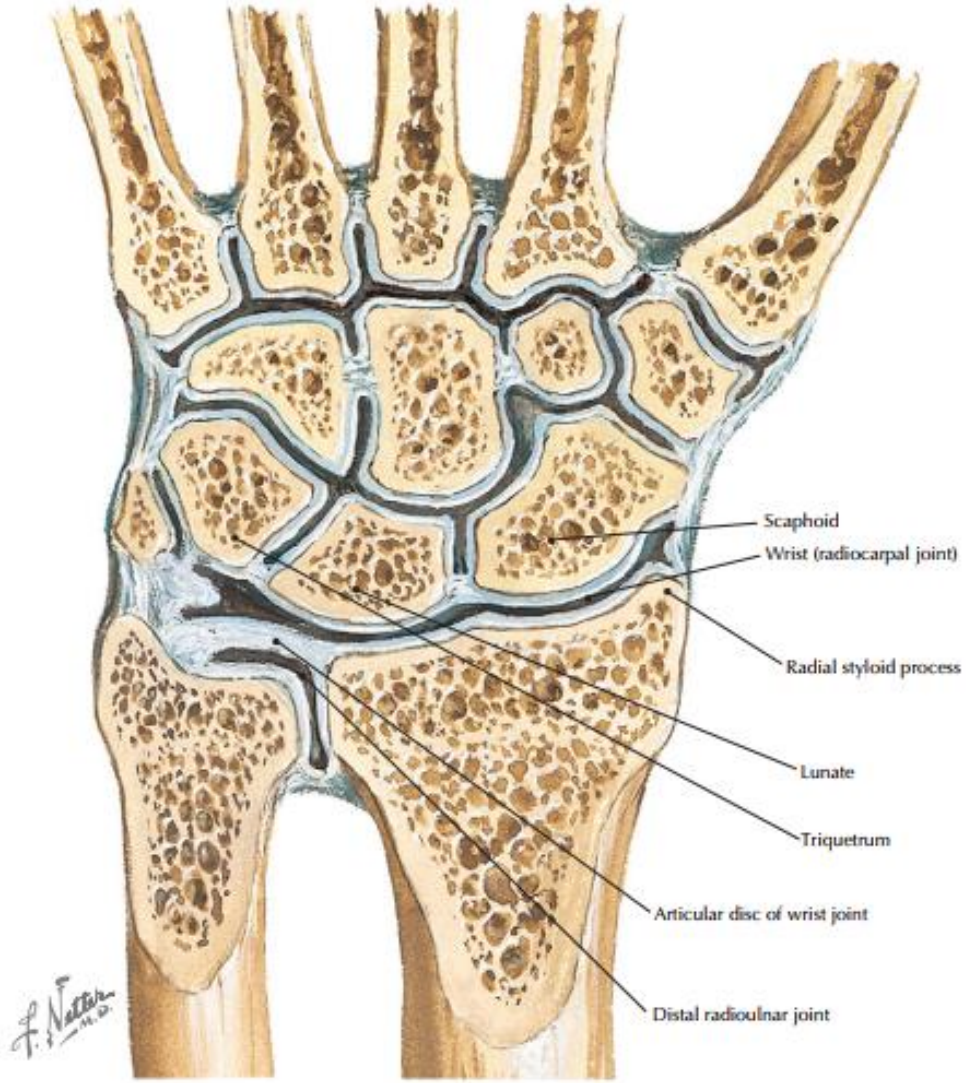
- The carpal bones are not arranged in two flat rows, but rather form a curved “floor” of the carpal tunnel.
- • The sesamoid bones in the tendons of the flexor pollicis brevis can be mistaken for fracture fragments.
- • The styloid process of the radius extends further distally than that of the ulna, limiting radial deviation of the hand, relative to ulnar deviation



Thin slab, volume rendered display, CT of the wrist

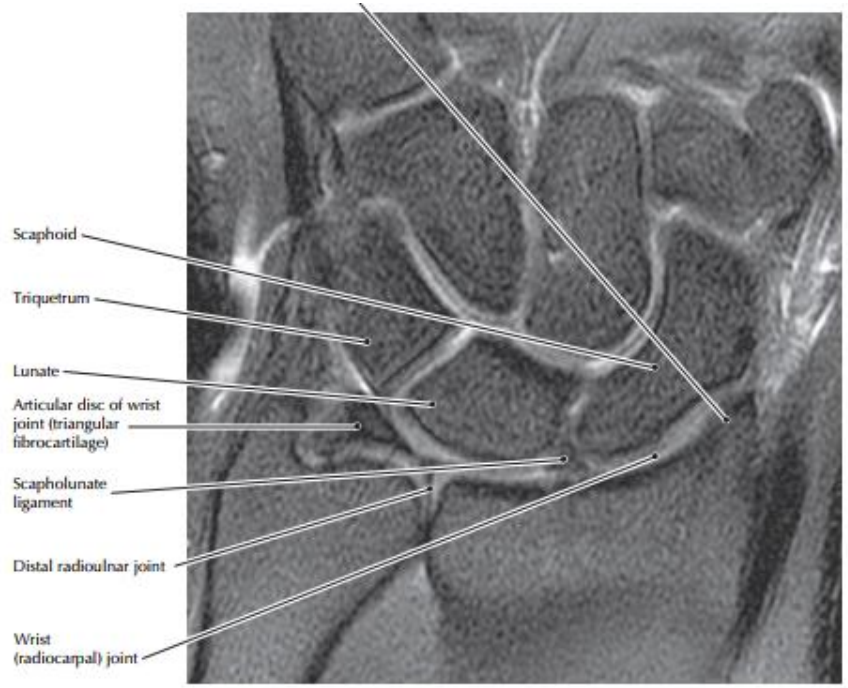
Clinical Note

The scaphoid is the most frequently fractured carpal bone, often resulting from a fall on the palm with an abducted hand. Pain is felt in
the anatomical snuff-box. Because the blood supply to the scaphoid enters
the bone distally, midscaphoid lesions may result in avascular necrosis of the
proximal segment.



Coronal section of the wrist, dorsal view *(Atlas of Human Anatomy, 6th edition,*

- An intact triangular fibrocartilage complex (TFCC) separates the joint compartments of the radiocarpal joint from the distal radioulnar joint. Therefore when, after an injection of contrast material into one of those compartments, the material appears in the other compartment, the TFCC must be perforated.
- • When the scapholunate ligament is torn, plain radiographs may demonstrate a widening of the space between the scaphoid and lunate bones.

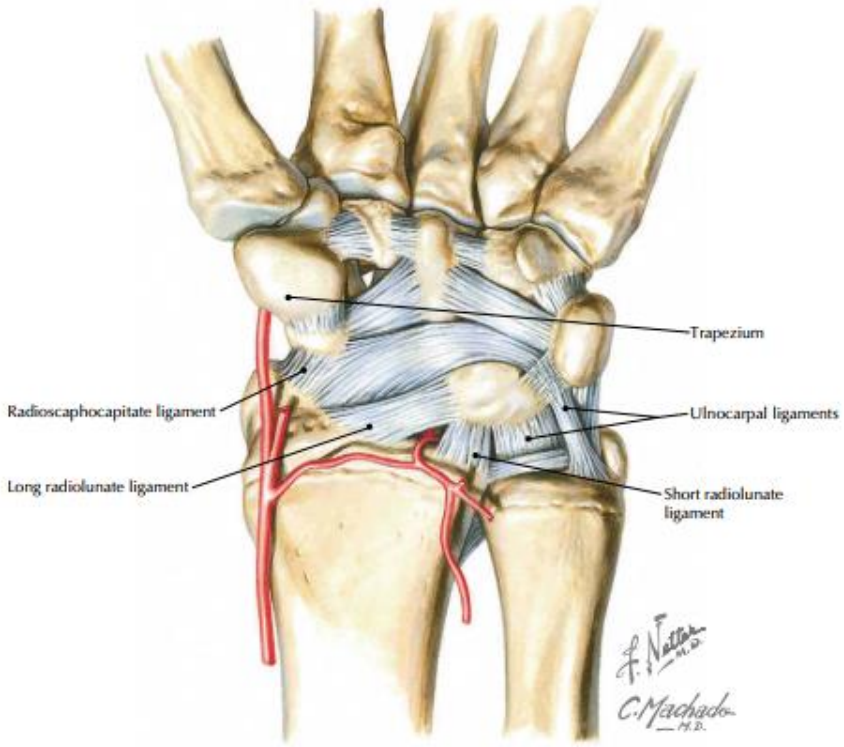


Coronal T2 MR image of intrinsic wrist structures *(From Ramnath RR: 3T MR imaging of the musculoskeletal system (part II): Clinical applications. Magn Reson Imaging Clin N Am*

Clinical Note

- The palmar ligaments provide relatively little support for the lunate on the palmar side of the wrist.
- Thus, when it dislocates, it typically moves in a palmar direction, causing carpal tunnel compression

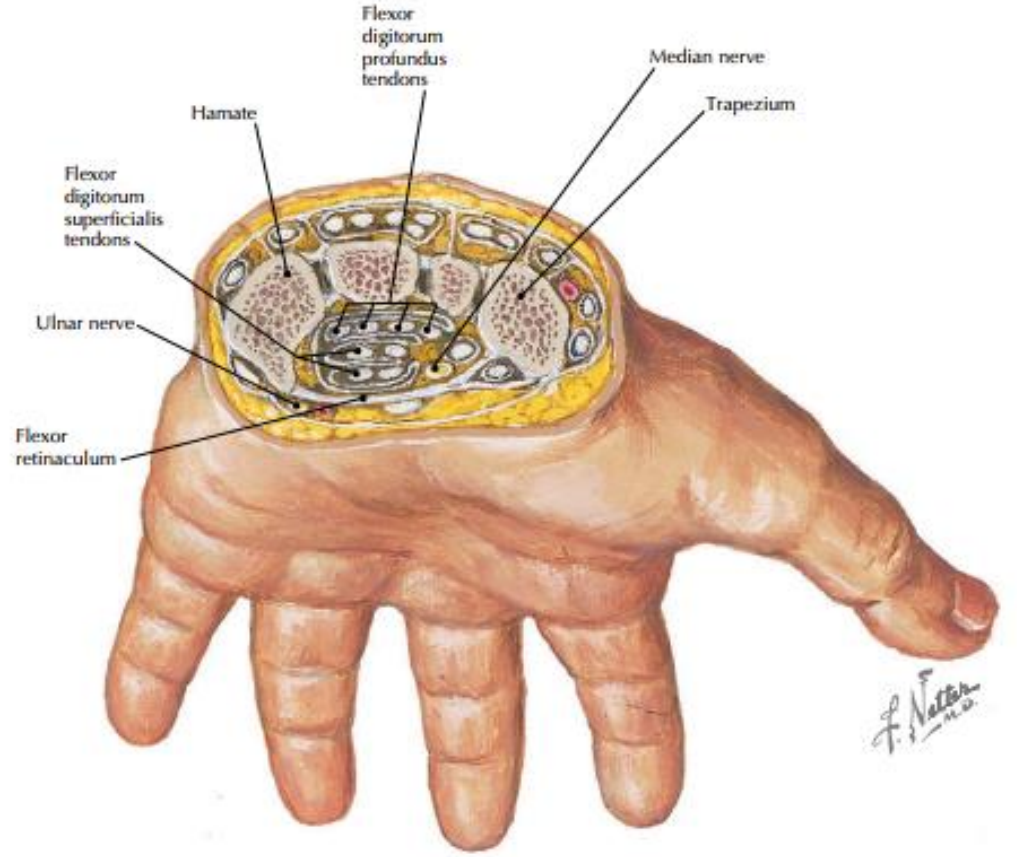
- The dorsal ligaments are less important structurally than the palmar ligaments. However, the dorsal radiocarpal ligament is considered important for stability of the carpal bones during motion.



Ligaments of the palmar wrist *(Atlas of Human Anatomy, 6th edition, Plate 441)*

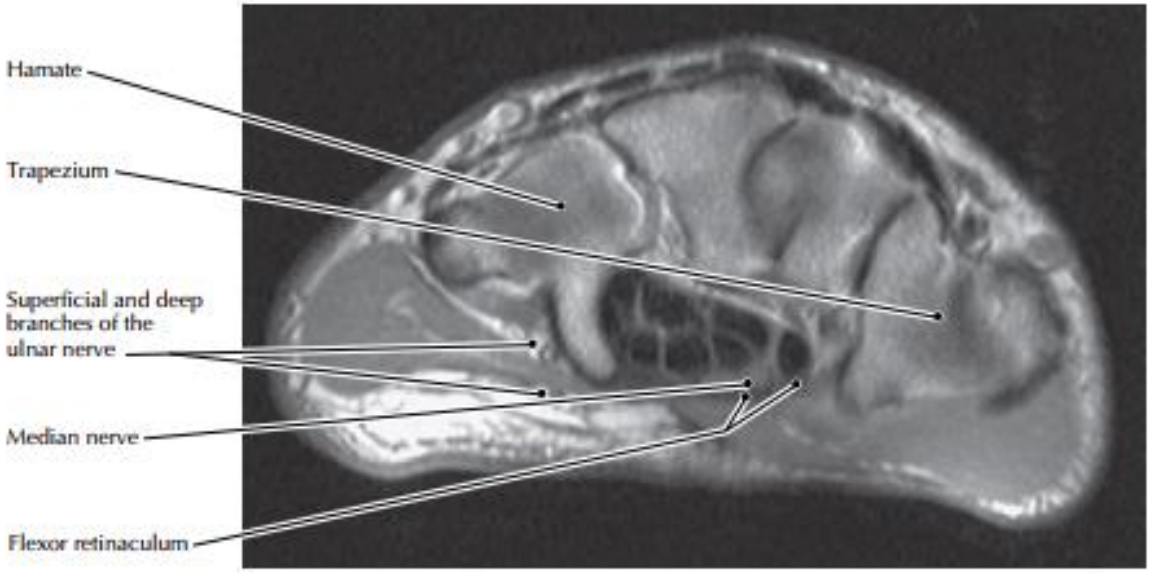
Clinical Note

- The ulnar nerve does not run within the carpal tunnel (as does the median nerve), so carpal tunnel syndrome does not affect the function of the ulnar nerve.



Transverse section through the carpal tunnel *(Atlas of Human Anatomy, 6th edition, Plate 449)*

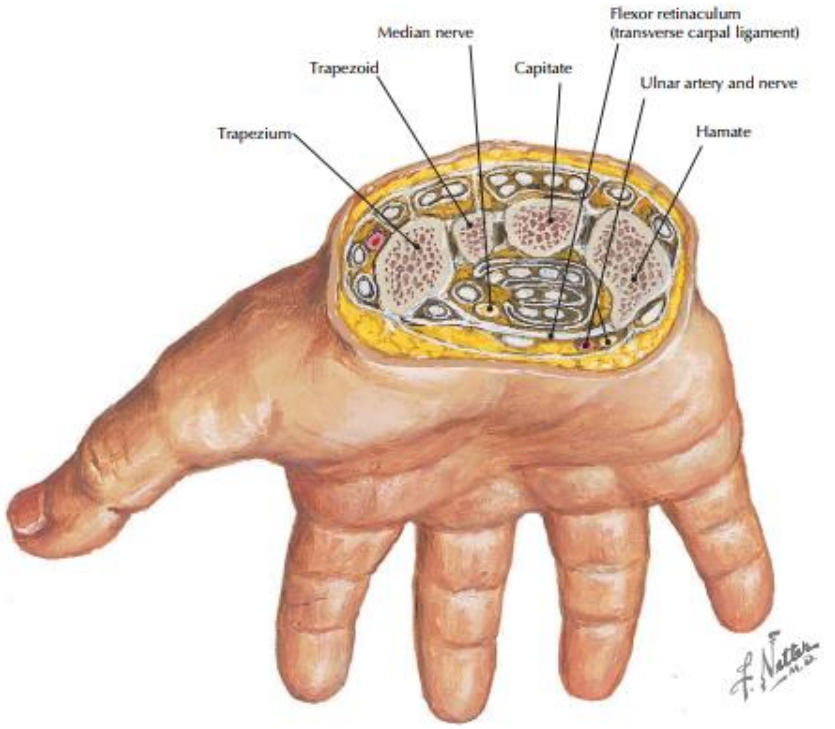
- The median nerve is seen as a flat ovoid structure immediately deep to the flexor retinaculum. Small, rounded nerve fascicles, uniform in size, can be seen within the nerve.
- • The deep and superficial flexor tendons have a low signal and are closely packed.
- • The flexor retinaculum may be surgically transected to relieve excessive pressure on the median nerve within the carpal tunnel.



Axial T1 MR image through the carpal tunnel *(From Hochman MG, Zilberfarb JL: Nerves in a pinch: Imaging of nerve compression syndromes. Radiol Clin North Am 42(1):221-245, 2004)*

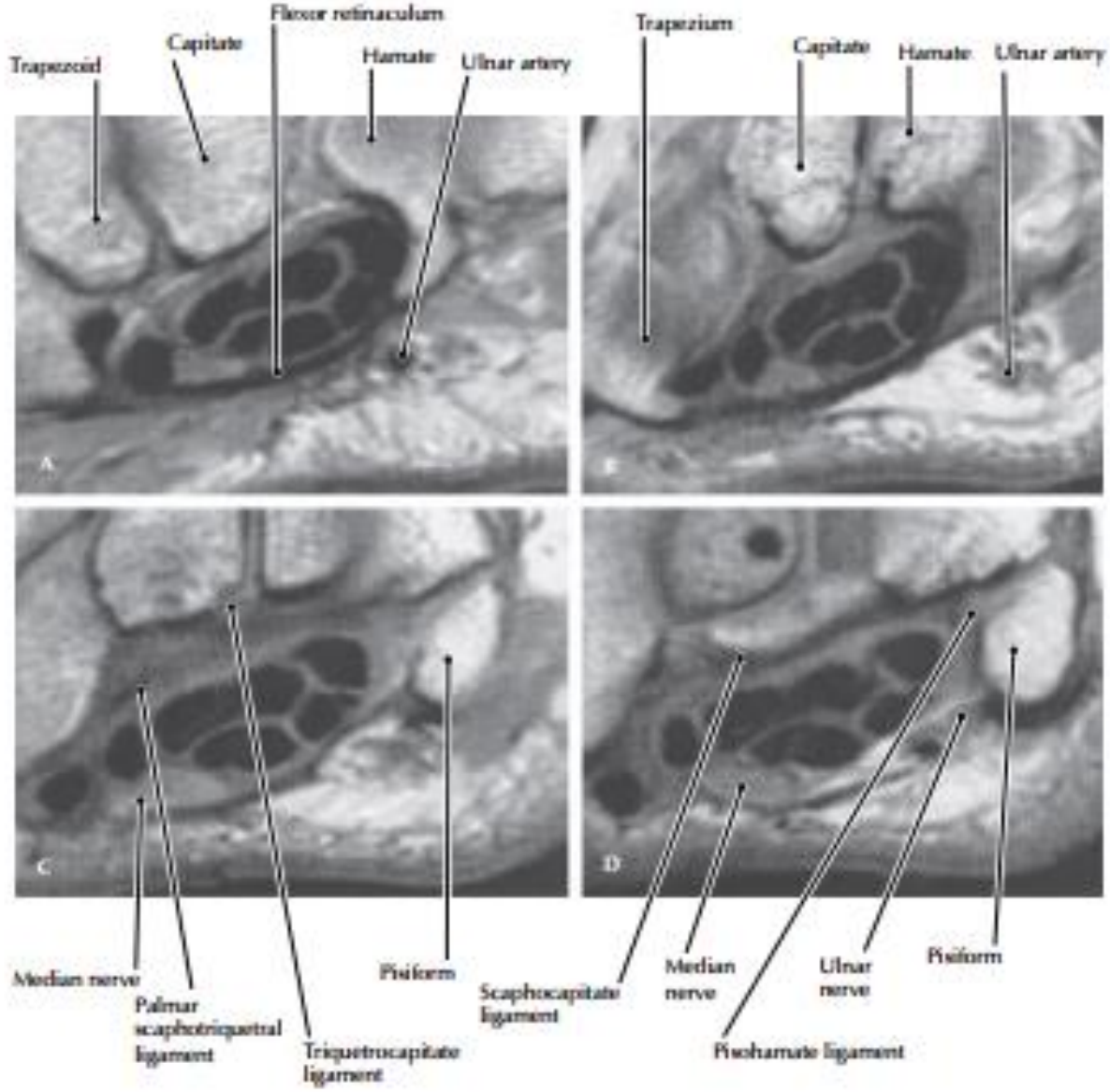
Clinical Note

- Any pathology that expands the contents of the tunnel (e.g., tenosynovitis) or diminishes space within the tunnel (e.g., anterior dislocation of a carpal bone) will compress the enclosed median nerve (carpal tunnel syndrome).



Transverse section through the carpal tunnel *(Atlas of Human Anatomy, 6th edition, Plate 449)*

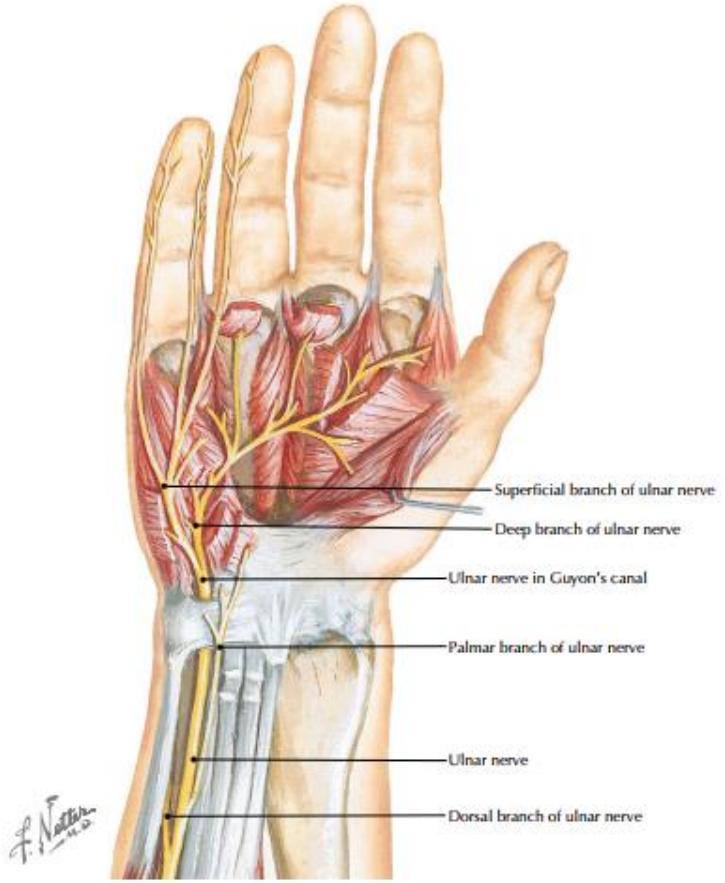
- The hook of the hamate forms the medial border of the carpal tunnel.
- • The median nerve is distinct in MR images of the carpal tunnel as a structure with a higher-intensity signal than the surrounding tendons.
- • Guyon’s canal (ulnar canal) is a potential space at the wrist between the pisiform and hamate bones through which the ulnar artery and nerve pass into the hand.
- It is converted into a tunnel by the palmar carpal ligaments (ventrally) and the pisohamate ligament (dorsally).
- Compression of the ulnar nerve within this space results in a paresthesia in the ring and little fingers. This may be followed by decreased sensation and eventual weakness and clumsiness in the hand as the intrinsic muscles of the hand become involved.



Axial MR images of the carpal tunnel and Guyon's canal (*A* most distal, *D* most proximal) *(From Yu JS, Habib PA: Normal MR imaging anatomy of the wrist and hand. Radiol Clin North Am 44(4):569-581, 2006)*

Clinical Note

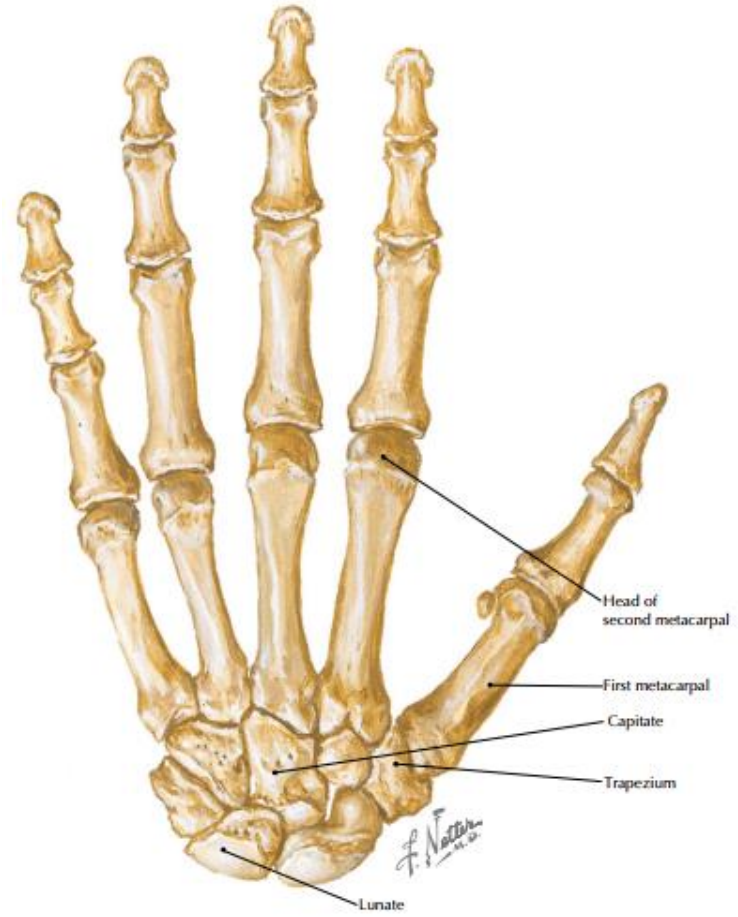
- The ulnar nerve can be damaged within Guyon's canal.
- If sensation is intact from the palmar or dorsal branches of the nerve, which are both cutaneous nerves, a lesion proximal to the canal can be ruled out.



Ulnar nerve at the wrist *(Atlas of Human Anatomy, 6th edition, Plate 464)*

Clinical Note

- The capitate is typically well protected by its central location within the wrist, but severe hyperextension can result in fracture of both the scaphoid and capitate (Fenton syndrome).



sal view of the bones of the hand and wrist *(Atlas of Human Anatomy, 6th edition,*

Radiological features of the carpal bones

Radiography

These are radiographed in the anteroposterior, lateral and oblique positions

- Carpal tunnel views are obtained by extending the wrist and taking an inferosuperior view that is centred over the anterior part of the wrist

Figure 7.7 • AP radiograph of the wrist and hand.

1. Distal radius
2. Styloid process of radius
3. Distal ulna
4. Styloid process of ulna
5. Distal radioulnar joint
6. Radiocarpal joint
7. Scaphoid
8. Lunate
9. Triquetral
10. Pisiform
11. Hamate
12. Hook of hamate
13. Capitate
14. Trapezoid
15. Trapezium
16. First metacarpophalangeal joint
17. Base of fourth metacarpal
18. Shaft of fourth metacarpal
19. Head of fourth metacarpal
20. Fourth metacarpophalangeal joint
21. Shaft of proximal phalanx, ring finger
22. Proximal interphalangeal joint, little finger
23. Middle phalanx, middle finger
24. Distal interphalangeal joint, index finger
25. Distal phalanx, thumb
26. Sesamoid bone
27. Soft tissues overlying distal phalanx of middle finger

Supernumerary bones

These may be found in the wrist and include the os centrale found between the scaphoid, trapezoid and capitate, which may represent the tubercle of the scaphoid that has not fused with its upper pole,

The os radiale externum, which is found on the lateral side of the scaphoid distal to the radial styloid

Nutrient arteries of the scaphoid

In 13% of subjects these enter the scaphoid exclusively in its distal half If such a bone fractures across its midportion, the blood supply to the proximal portion is cut off and ischaemic necrosis is inevitable This occurs in 50% of patients with displaced scaphoid fractures

Ossification of the carpal bones

These ossify from a single centre each The capitate ossifi es fi rst and the pisiform last, but the order and timing of the ossifi cation of the other bones is variable Excluding the pisiform, they ossify in a clockwise direction from capitate to trapezoid as follows: the capitate at 4 months; the hamate at 4 months; the triquetral at 3 years; the lunate bone at 5 years; and the scaphoid, trapezium and trapezoid at 6 years The pisiform ossifi es at 11 years of age

The metacarpals and phalanges

The five metacarpals are numbered from the lateral to the medial side Each has a base proximally that articulates with that of the other metacarpals, except in the case of the first metacarpal, which is as a result more mobile and less likely to fracture The third metacarpal has a styloid process extending from its base on the dorsal aspect Each metacarpal has a rounded head distally, which articulates with the proximal phalanx

The phalanges are 14 in number, three for each fi nger and two for the thumb Like the metacarpals, each has a head, a shaft and a base The distal part of the distal phalanx is Bones of the hand expanded as the tuft of the distal phalanx

Radiological features of the metacarpals and phalanges

Bone age

A radiograph of the left hand is used in the determination of

bone age Standards of age determined by epiphyseal appearance and fusion have been compiled for the left hand and wrist

by Greulich and Pyle, and by Tanner and Whitehouse (TW2

method)

The metacarpal sign

A line tangential to the heads of the fourth and fifth metacarpals does not cross the head of the third metacarpal in 90% of normal hands – this is called the metacarpal sign

This line does, however, cross the third metacarpal head in gonadal

dysgenesis

The carpal angle

This is formed by lines tangential to the proximal ends of the scaphoid and lunate bones In normal hands the average angle is 138 ° It is reduced to an average 108 ° in gonadal dysgenesis

The metacarpal index

This is calculated by measuring the lengths of the second, third, fourth and fi fth metacarpals and dividing by their breadths taken at their exact midpoint The sum of these divided by four is the metacarpal index, which has a normal range of 5 4 – 7 9 An index greater than 8 4 suggests the diagnosis of arachnodactyly

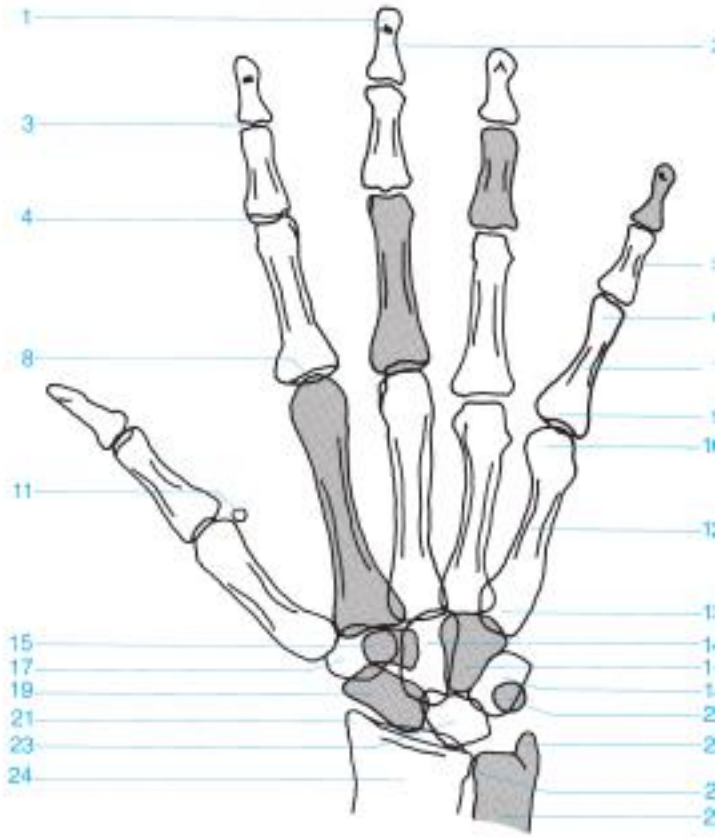
Sesamoid bones

Two sesamoid bones are found related to the anterior surface of the metacarpophalangeal joint of the thumb in the normal radiograph A single sesamoid bone in relation to this joint in the little finger is seen in 83% of radiographs, and at the interphalangeal joint of the thumb in 73% These are occasionally found at other metacarpal and distal interphalangeal joints The incidence of sesamoid bones is increased in acromegaly

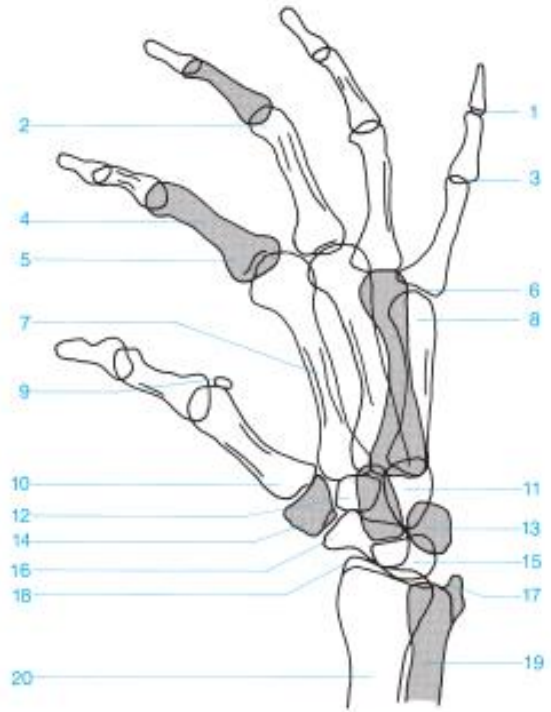
Ossification of the metacarpals and phalanges

These ossify between the ninth and twelfth fetal weeks Secondary ossification centers appear in the distal end of the metacarpals of the fingers at 2 years and fuse at 20 years of age Secondary centers for the thumb metacarpal and for the phalanges are at their proximal end and appear between 2 and 3 years, and fuse between 18 and 20 years of age

Fig. 12.15. Radiographs of the carpal bones in the growing child, demonstrating ossification of the carpal bones during the first 12 years of life: (a) 1 year, (b) 3 years, (c) 5 years, (d) 7 years, (e) 12 years.



1	Distal phalanx (tuft)	14	Capitate
2	Distal phalanx	15	Trapezoid
3	Distal interphalangeal joint	16	Hamate
4	Proximal interphalangeal joint	17	Trapezium
5	Middle phalanx	18	Triquetrum
6	Head of the proximal phalanx	19	Scaphoid
7	Proximal phalanx	20	Pisiform
8	Metacarpophalangeal joint	21	Radial styloid
9	Base of the proximal phalanx	22	Ulnar styloid
10	Metacarpal head	23	Lunate
11	Sesamoid	24	Distal radius
12	Metacarpal	25	Distal radioulnar joint
13	Metacarpal base	26	Distal ulna



1	Distal interphalangeal joint	11	Capitate and hamate
2	Head of the proximal phalanx	12	Trapezoid
3	Proximal interphalangeal joint	13	Triquetrum
4	Proximal phalanx	14	Trapezium
5	Base of the proximal phalanx	15	Lunate
6	Metacarpophalangeal joint	16	Scaphoid
7	Metacarpal	17	Ulnar styloid
8	Metacarpal head	18	Radial styloid
9	Sesamoid	19	Distal ulna
10	Metacarpal base	20	Distal radius

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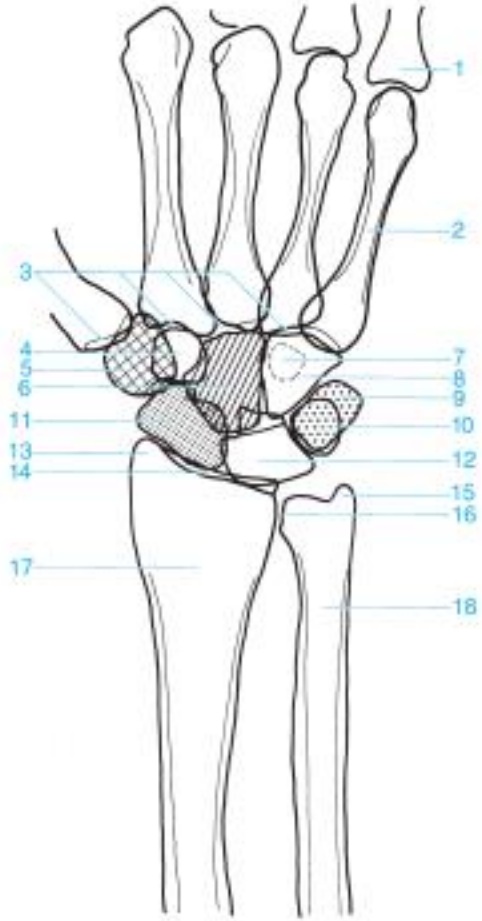
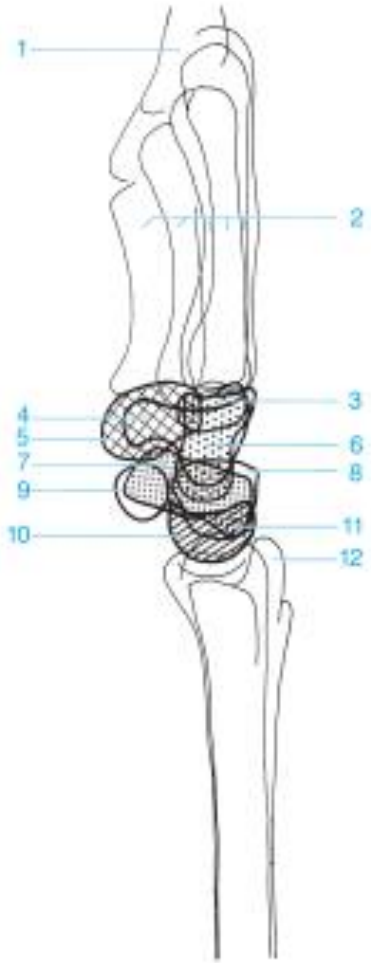


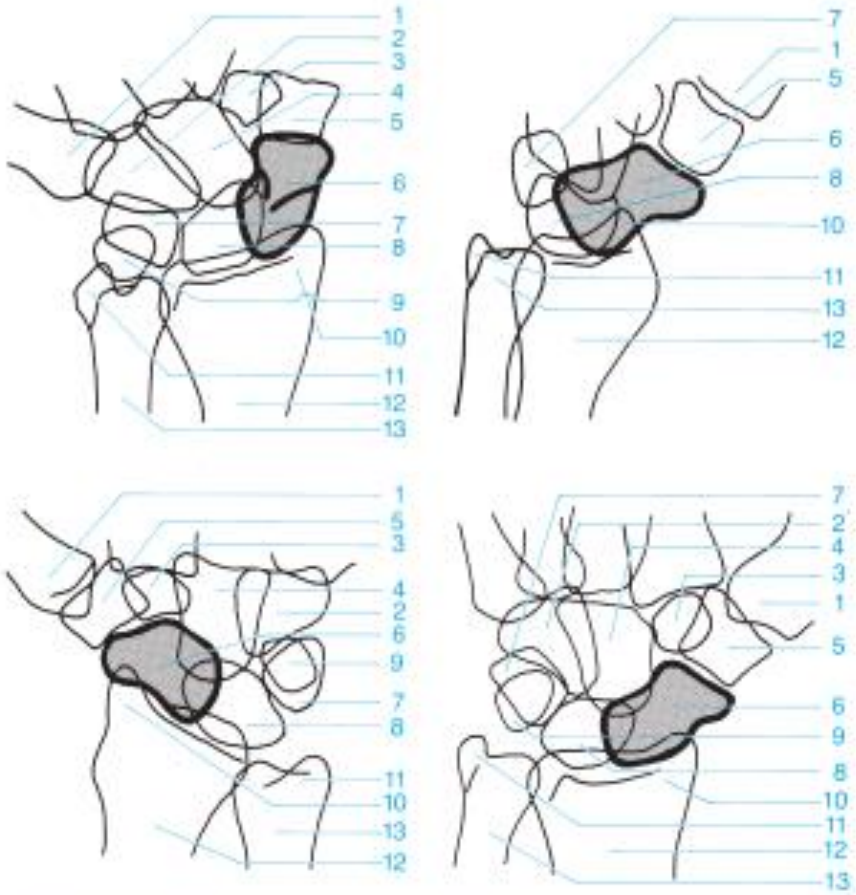
1 Proximal phalanx
2 Fifth metacarpal
3 Carpometacarpal joint
4 Trapezoid
5 Trapezium
6 Capitate
7 Hook of the Hamate
8 Hamate
9 Triquetrum
10 Pisiform
11 Scaphoid
12 Lunate
13 Radial styloid
14 Radiocarpal joint
15 Ulnar styloid
16 Radioulnar joint
17 Radius
18 Ulna



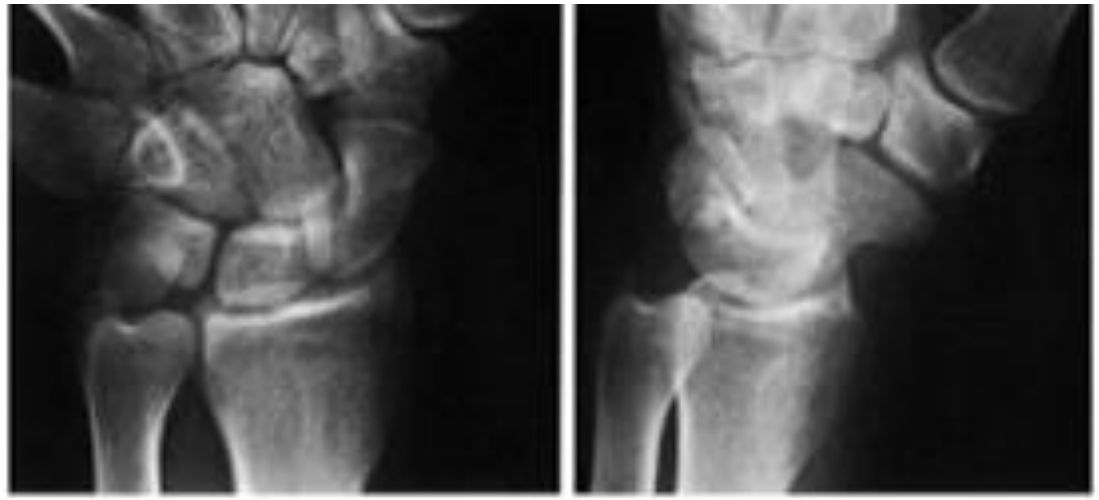
1 Proximal phalanx
2 Metacarpals
3 Trapezoid
4 Hook of the Hamate
5 Trapezium
6 Capitate
7 Scaphoid
8 Triquetrum
9 Pisiform
10 Lunate
11 Radial styloid
12 Ulnar styloid

Upper Extremities

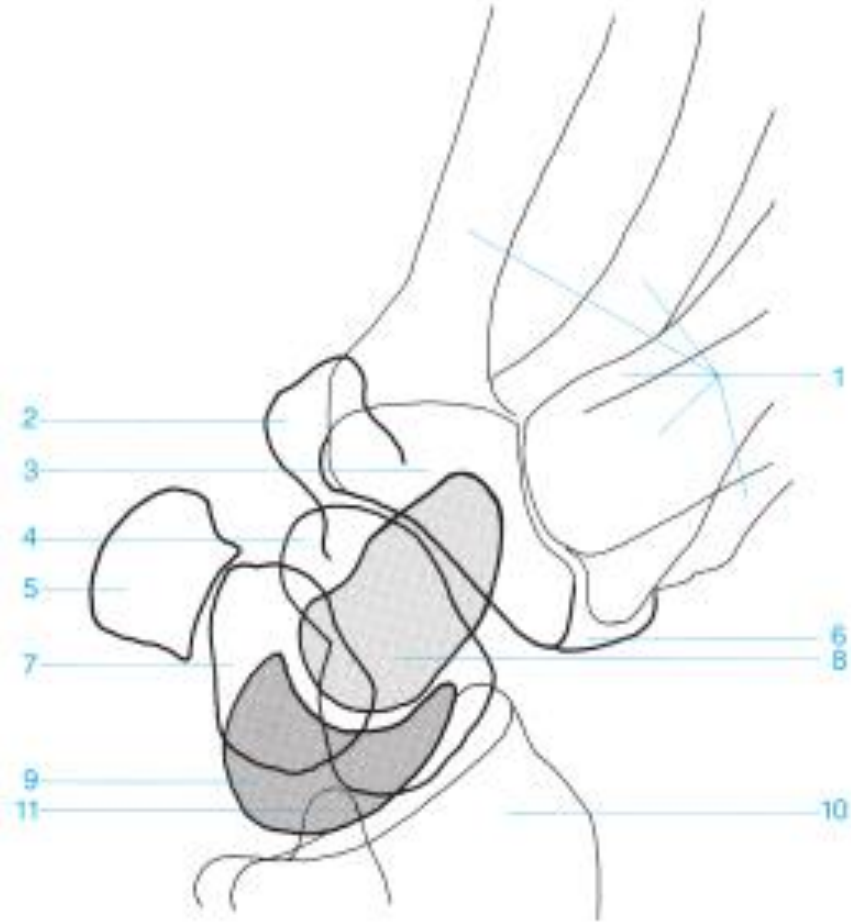
1 Pisiform
2 Trapezium
3 Hook of the hamate
4 Triquetrum
5 Scaphoid
6 Lunate
7 Capitate
8 Trapezoid
9 Hamate



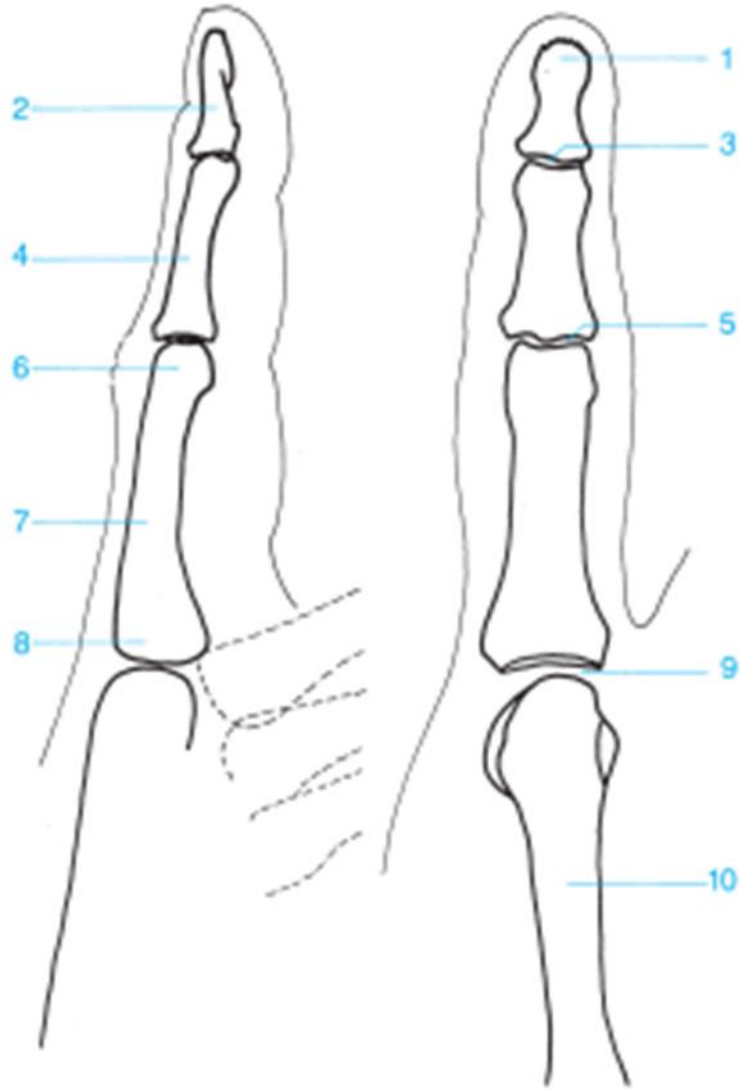
1 Metacarpal
2 Hamate
3 Trapezoid
4 Capitate
5 Trapezium
6 Scaphoid
7 Triquetrum
8 Lunate
9 Pisiform
10 Radial styloid
11 Ulnar styloid
12 Radius
13 Ulna



Special View of the Pisiform



1	Metacarpals	7	Triquetrum
2	Hamate	8	Capitate
3	Trapezoid	9	Lunate
4	Scaphoid	10	Radius
5	Pisiform	11	Ulnar styloid
6	Trapezium		



1 Distal phalanx (tuft)
2 Distal phalanx
3 Distal interphalangeal joint
4 Middle phalanx
5 Proximal interphalangeal joint
6 Head of the proximal phalanx
7 Proximal phalanx
8 Base of the proximal phalanx
9 Metacarpophalangeal joint
10 Metacarpal

- Thank you