Chapter 5
The Hand and Wrist

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Anatomy and Function

Figures 5.1, 5.2, and 5.3 illustrate the surface anatomy of the proximal wrist. The wrist is composed of the distal radius and ulna, which articulate with each other to form the radioulnar joint. The distal radius also articulates with the scaphoid and lunate bones [1]. The distal ulna articulates with the triangular fibrocartilage complex (TFCC), which functions much like the meniscus of the knee. The TFCC also has ligamentous attachments to the lunate, capitate, and triquetrum [1]. The distal wrist is composed of the eight carpal bones arranged in two rows. The proximal carpals (scaphoid, lunate, triquetrum, and pisiform) are closely approximated to the radius, while the distal carpals (trapezium, trapezoid, capitate, and hamate) are closely associated with the metacarpal bones. When the wrist deviates radially or

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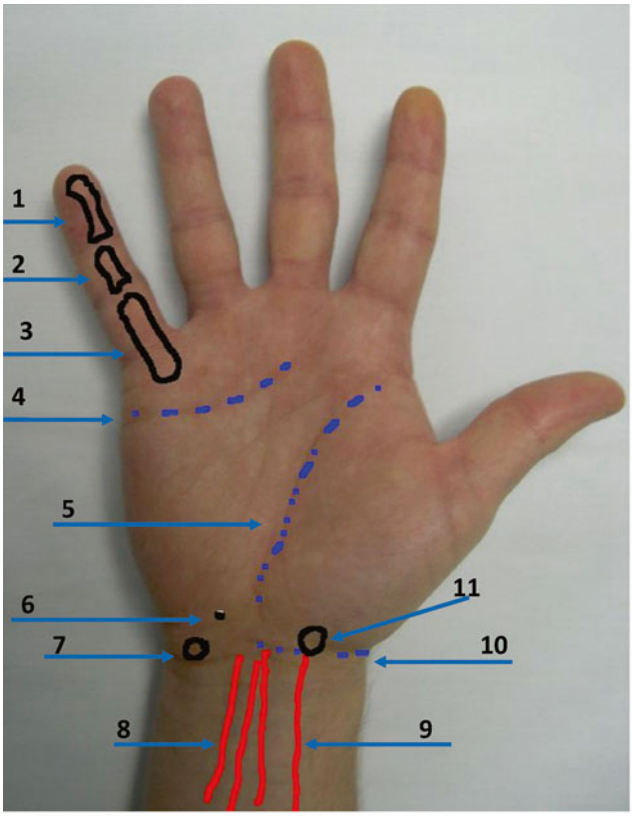
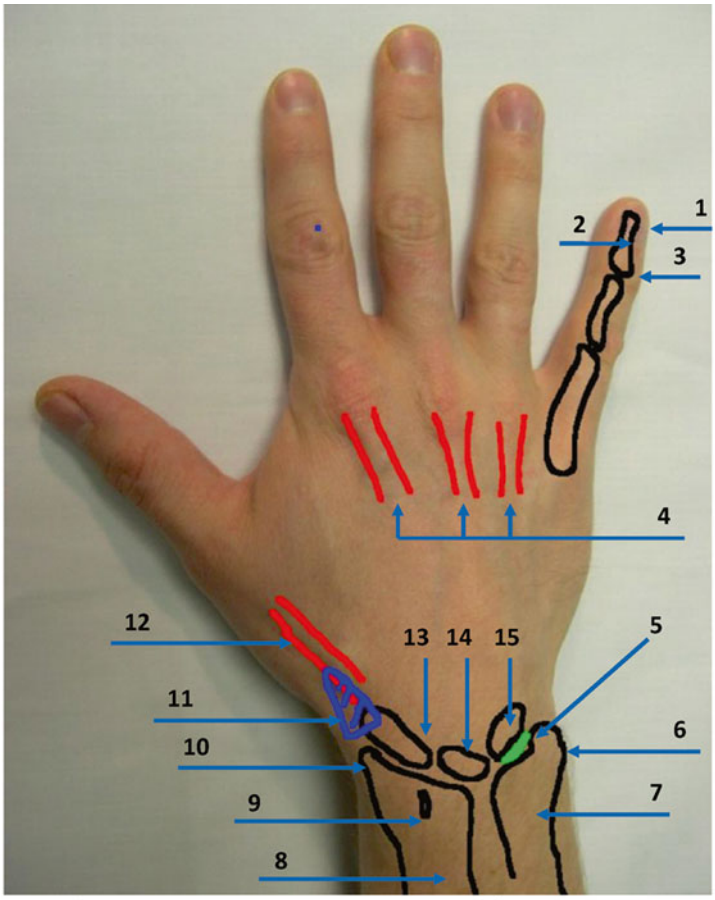


1 – Distal Phalange
2 – Middle Phalange
3 – Proximal Phalange
4 – Distal Transverse Palmar Crease
5 – Radial Longitudinal Crease
6 – Hook of Hamate
7 – Pisiform
8 – Palmaris Longus
9 – Flexor Carpi Radialis
10 – Distal Wrist Crease
11 – Scaphoid

Fig. 5.1 Surface anatomy of the hand – palmar aspect

dorsiflexes, the scaphoid flexes palmarly, which puts it in a precarious position to be injured when a patient falls, particularly when the patient falls on an outstretched hand [2]. Figure 5.4 shows the basic anatomy of the wrist.

Each of the digits has two neurovascular bundles, one on the radial side and the other on the ulnar side, which contain an artery, vein, and nerve [3]. The extensor tendons, which originate on the lateral dorsal forearm, insert on the dorsal hand. The flexor tendons from the medial forearm insert on the palm of the wrist and hand [4]. The superficial flexor tendon on each phalynx inserts at the base of the middle phalynx, while the deep flexor tendon inserts on the base of the distal phalynx. Figure 5.5 and Table 5.1 demonstrate the extensor and flexor tendons of the fingers.



1 – Head
2 – Shaft
3 – Base
4 – Common Extensor Tendons
5 – Triagnular Fibrocartilage Complex (TFCC)
6 - Ulnar Styloid
7 – Distal Ulna
8 – Distal Radius
9 – Lister's Tubercle
10 – Radial Styloid
11 – Anatomical Snuffbox
12 – Extensor Pollicis Brevis Tendon
13 – Scaphoid
14 – Lunate
15 - Triquetrum

Fig. 5.2 Surface anatomy of the hand – dorsal aspect

The metacarpal–phalangeal (MCP) joint of the thumb differs from the usual "ball and socket" joints of the other digits. Instead, it is a "saddle" joint, which allows for the pincer grip. This joint is largely supported by soft tissue and is therefore easily injured.

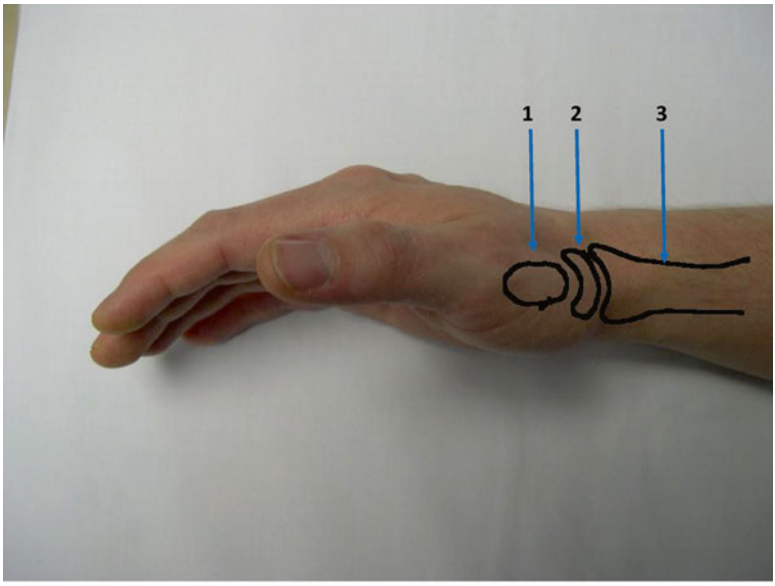


Fig. 5.3 Surface anatomy of the wrist– lateral view

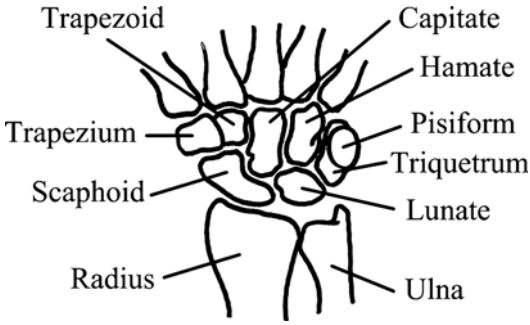


Fig. 5.4 Skeletal anatomy of the wrist – palmar aspect

Red Flags

Several hand and wrist conditions should be urgently investigated or referred due to potential serious sequelae.

Compound fracture. Any compound fracture should be urgently referred to a specialist. Active or profuse bleeding should be controlled with pressure; no attempts at exploration should be made.

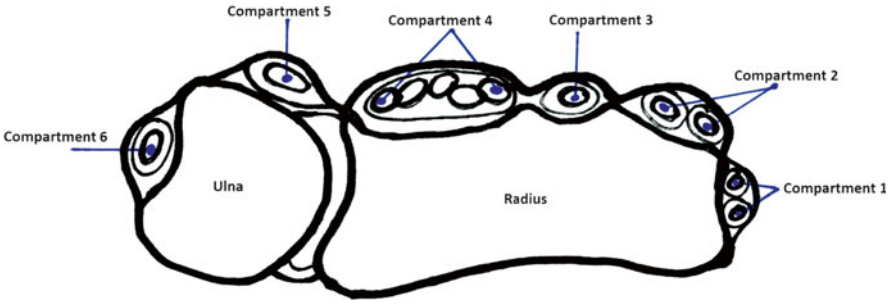


Fig. 5.5 Flexor and extensor tendons

Table 5.1 Flexor and extensor tendons

Compartment	Structure in compartment	Common pathologies	Clinical findings
1	Extensor pollicis brevis	DeQuervain's tenosynovitis	Fibrosis of the synovium around the first dorsal compartment; pain, crepitus radial aspect of the wrist
	Abductor pollicis longus		
2	Extensor carpi radialis brevis	Intersection syndrome	Fibrosis of intersection between the first and second dorsal compartment, approximately 4 cm proximal from Lister's tubercle on the radial aspect of the wrist
	Extensor carpi radialis longus		
3	Extensor pollicis longus	Rupture with distal radius fracture	Degenerative tear of the extensor pollicis longus tendon
		Drummer boy palsy	Patient cannot extend the thumb
4	Extensor digitorum communis	Tendinopathy	Tendinopathy and pain on dorsal aspect of the wrist with wrist extensor
	Extensor indicis proprius		
	Posterior interosseous nerve		
5	Extensor digitorum minimi	Vaughn–Jackson syndrome	Rupture of the extensor digitorum minimus and sometimes the extensor carpi ulnar. Patient has weakness extending the index finger and small finger
6	Extensor carpi ulnaris	Snapping wrist	Extensor carpi ulnaris tears or subluxation on ulnar when ulnar retinaculum is damaged. Causes painful snapping on ulnar aspect of wrist

"*Fight bite*." A fight bite occurs when the fist strikes a tooth of another person, usually over the knuckles of the ring or little fingers. This type of injury carries high risk of penetration of tendon or even bone, and even a very small mark on the skin may overlie a more serious injury. These injuries are at high risk for infection and should be referred for surgical exploration.

Burns. Severe burns, especially on the palmar side of the hand or wrist, carry risk of underlying tendon injury and should be referred for management.

Injury from high-pressure tools. Air and paint guns can cause high-pressure injury to underlying structures with only a small entry point in the skin and should be referred.

Tendon lacerations. Wounds involving tendon laceration should not be explored in the office; bleeding should be controlled and the patient immediately referred to the appropriate specialist.

"*No man's land*" *lacerations*. Lacerations in the area between the PIP joint and the proximal palm are likely to injure the numerous nerves, tendons, and arteries in this area and should be referred for evaluation.

General Approach to the Patient with Hand Pain

Hand complaints are very common. Many are overuse-type injuries and can be managed conservatively. The challenge of the primary care provider is identifying those with pathology that requires intervention to prevent harmful sequelae.

History should include location and duration of symptoms, inquiry about any trauma or mechanism of injury, and, in the case of overuse injuries, questioning about occupation and/or daily activities. Inquiry should be made regarding the presence of any neurologic or radicular symptoms, which may be referred from the neck or arm.

The "primary" physical examination should be performed on all patients presenting with hand and wrist complaints [5]. Based on history findings as well as these primary examination findings, appropriate secondary examination can be performed.

Primary Hand Examination

Observe the hand in the "safe hand position" as pictured in Fig. 5.6.

1. Note any fingers that are abnormally flexed or extended. This may indicate tendon disruption.

2. Have the patient flex the fingers toward the palm. All of the fingers should be pointing toward the scaphoid bone. Overlapping or crossing of fingers may indicate a fracture with rotational deformity of the finger.
3. Look closely at the distal digits for skin color change or loss of sweating ability, which can involve the whole digit or only a portion of the finger. This finding indicates distal nerve injury.
4. Test capillary refill. In the distal finger, blanching that lasts more than 2 s may indicate microvascular compromise.
5. Test 2-point discrimination of the distal fingertip. The patient should be able to discriminate two points 5 or more millimeters apart. Failure indicates neurologic compromise.
6. Grasp the patient's hand in a handshake. If the patient is able to grasp your hand without significant pain, (s)he is unlikely to have a wrist or hand pathology that requires urgent evaluation [5, 6].

Based on findings in the history and above primary examination, the examiner then performs the appropriate secondary examination focusing on the area(s) in question. See Table 5.2. Simple palpation for tenderness can oftentimes assist in obtaining a diagnosis.

Fig. 5.6 Safe hand position

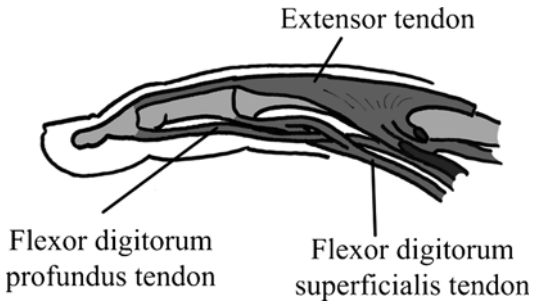


Table 5.2 Secondary hand and wrist exam

Exam technique	Abnormal result	Possible pathology
While shaking hands with examiner, patient attempts to pronate and supinate against examiner's resistance	Cannot complete or has pain with the movement	Distal ulnar joint pathology or
		TFCC pathology (if no radiographic findings)
Palpate the small bony prominence on the ulnar aspect of palm in the palmar crease area	Tenderness	Pisiform trauma

(continued)

Table 5.2 (continued)

Exam technique	Abnormal result	Possible pathology
Palpate hook of hamate by placing IP joint of examiner's thumb on pisiform, then direct thumb toward patient's index finger. When the patient flexes the wrist, the hook of the hamate can be felt with the tip of the thumb	Tenderness	Fracture of hook of hamate
Follow the flexor carpi radialis tendon distally where it intersects the palmar crease, then palpate the small protuberance	Tenderness	Fracture of scaphoid tubercle
Palpate the depression between the distal extensor pollicis longus and abductor pollicis longus tendons (anatomical snuff-box)	Tenderness	Fracture of distal pole of scaphoid (may be present even with negative X-ray)
Examiner's thumb is placed on scaphoid tubercle while the wrist is in ulnar deviation, then the patient radially deviates while the examiner exerts pressure on the tubercle	Pain	Fractured scaphoid
	Pain with clunk	Scapholunate instability
Patient folds thumb under fingers and ulnarly deviates wrist (Finkelstein's test)	Pain or "catching" reproduced along radial side of forearm over tendons	DeQuervain's tenosynovitis (DQT)
Examiner taps over carpal tunnel area (Tinel sign) and/or has patient perform prolonged forced wrist flexion (Phalen test)	Reproduces pain or paresthesias to the thumb, index, and middle finger areas	Carpal tunnel syndrome (CTS)

Adapted from Ref. [5]

Common Clinical Presentations

Trauma

All patients with wrist and hand complaints who have a history of significant trauma should have X-ray evaluation done as part of their workup. Any fracture or bony anomaly seen on X-ray with the exception of the specific diagnoses listed on the flow sheet should be referred to a specialist for management. In the case of negative X-ray findings with negative clinical examination for worrisome pathology, most patients can be conservatively managed using the flow diagram found in the appendix.

Acute Nontraumatic Hand and Wrist Pain (<8 Weeks Duration)

Most patients who have no history of trauma but have pain that has been present for days to weeks will have overuse-type injuries. After doing appropriate secondary examination to rule out major pathology, the clinician can usually manage these conservatively; however, the clinician should consider X-ray if there is any suspicion of underlying bony pathology, as sometimes, traumatic incidents are forgotten by the patient.

These patients will generally fall into either an easily diagnosable condition, such as DeQuervain's tenosynovitis (DQT), carpal tunnel syndrome (CTS), or will have nonspecific but benign hand or wrist complaints. The former two conditions can be managed appropriately in the primary care setting following the flow diagram. The latter can be managed via the RICE protocol (rest, ice, compression, elevation) and reevaluated. If pain persists after RICE therapy or appropriate treatment, X-ray should be performed, if not already done. If X-ray findings are negative, conservative management can be continued for a short time, but referral should be made if symptoms persist.

Chronic Nontraumatic Hand and Wrist Pain (>8 Weeks Duration)

Pain present for 8 or more weeks at first assessment should usually receive radiologic evaluation. Exceptions may be made for classically presenting CTS and DQT, which may be diagnosed clinically without the use of X-ray, as long as the provider carefully rules out other pathologies. Any positive findings on X-ray can then be appropriately managed, but those with chronic undiagnosed wrist and hand pain should be referred to a specialist for evaluation. Similarly, those with DQT and CTS who have continued symptoms after appropriate treatment should be referred.

The flow sheet which follows can help the provider in the appropriate evaluation and management of common hand and wrist complaints. It is by no means exhaustive but represents the most common pathologies encountered in the primary care setting. In general, the primary care provider should err on the side of caution when evaluating hand and wrist complaints, as misdiagnosis or lack of diagnosis and correct management can have potentially disastrous consequences.

Please refer to Fig. 5.7 for the Hand and Wrist Meaningful Use form.

CC: ☐ Right ☐ Left ☐ Both

HPI:
Onset: _____
Mechanism of Injury: _____
Relieving Factors: _____
Exacerbating Factors: _____

PMH: Chronic Medical Conditions: _____
_____
Occupation/Sport /Position: _____
Handedness: ☐ Right ☐ Left ☐ Both

Red Flags:

1. Compound Fracture
2. Fight Bite
3. Burn
4. High pressure injury
5. Injury "no man's" land
6. Severe pain with no definitive diagnosis
7. Pain continues after 3-4 weeks

Q1. Is this a medical emergency?
a) Any limb threatening injury
b) Infection
c) Compound fracture
d) Burn
e) Deglove or injury in "no man's" land
f) Deep infection

Q2. Why is this patient here on this particular day?
a) Missed emergency?
b) Chronic problem?
c) Undiagnosed pathology?

Q3. How to treat?
a) Thumb spica splint
b) Ulnar gutter splint
c) Consult
d) Radiograph
e) Immunization

Common and Don't Miss Conditions:

- See Red Flags
- Ligament instability
- Nerve entrapment
- Fracture
- Tendon disruption
- Tenosynovitis of 1st dorsal compartment (DeQuervain's Tenosynovitis)
- Intersection Syndrome (2nd and 3rd dorsal compartment)
- TFCC injury

Fig. 5.7 The Hand and Wrist Meaningful Use Form

TREAT APPROPRIATELY	Hand/Finger Pain ..... 719.44 Forearm/Wrist Pain ..... 719.43 Wrist Sprain/Strain ..... 842.00 Finger or Hand Sprain/Strain ..... 842.10 DeQuervain's Tenosynovitis ..... 727.04 Carpal Tunnel Syndrome ..... 354.0 Cubital Tunnel Syndrome 354.2
TREAT WITH CLOSE FOLLOW-UP (< 1 week f/u)	Tender Anatomical Snuffbox with normal x-ray Decreased ROM of wrist with normal x-ray
CALL CONSULTANT THAT DAY	Fight bite High pressure injury Palmar burn Compound fracture Flexor tendon disruption Suspected joint infection
CONSULT OR REFER	Distal radius fracture Scaphoid fracture Pain in wrist >8wks Persistent anatomic snuffbox tenderness after 2 wks with neg x-ray

Plan:
☐ Xray / Imaging What: _____
☐ Laboratory Eval What: _____
☐ NSAIDs _____
☐ Acetaminophen _____
☐ Other _____
☐ PRICE Protocol
☐ Physical Therapy

Disposition:
☐ Treatment initiated: Follow-up _____ weeks
☐ Treatment / Work up Initiated: Follow-up ≤ 1 week _____ days
☐ Immediate call to Dr. _____
☐ Consultation initiated with Dr. _____
☐ Referral to Dr. _____

Fig. 5.7 (continued)

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Suggested Readings

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