# Chapter 6
# The Fingers

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## Functional Anatomy

Digits 2 through 5 (index, middle, ring, and small) all have a distal, middle, and proximal phalanx. Digit 1, the thumb, has a distal and proximal phalanx only. A neurovascular bundle is on each side of the finger. Each of the five digits has both flexor and extensor tendons. There are six dorsal extensor tendons of the wrist. The extensor tendon inserts on the base of the distal phalanx of the finger and broadens out to a wider "hood" that laps over the PIP joint (proximal interphalangeal joint). Each finger has two flexor tendons – the profundus or deep tendon inserts on the base of the proximal aspect of the distal phalanx, while the superficial flexor tendon inserts on the base of the middle phalanx. Figure 6.1 demonstrates how to check both the profundus and superficial tendons.

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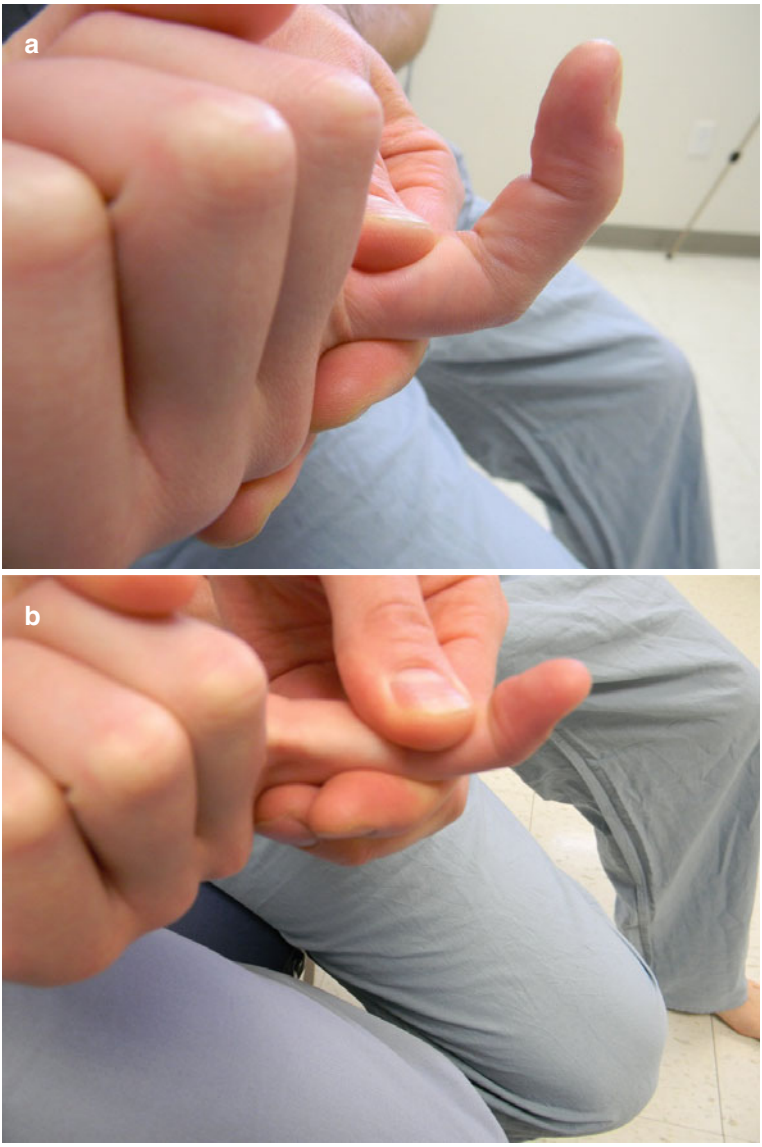


**Fig. 6.1** Testing the superficial and deep flexor tendons. (**a**) Test the superficial flexor tendon by immobilizing the base of the finger and have the patient flex the PIP joint. (**b**) Test the profundus or deep flexor tendon by immobilizing the finger just distal to the PIP joint and have the patient flex the DIP

## Red Flags

1. *High-Pressure Injury*. If the patient is working with any power equipment with air or liquid substance under pressure, this injury can occur. The patient may only complain of a stinging or burning sensation. A very small puncture wound may be observed, but no discernable wound sometimes occurs with these injuries. These injuries require urgent consultation. Even if left untreated for a few hours, a great deal of damage can occur to the affected finger.
2. *Bites*. Any type of bite requires special care. In the wrist chapter, there was discussion on the "fight bite." Bites may occur from any mammalian, marina, or insect to the finger or hand. Upon close inspection, one should determine if there is any retained foreign body. Table 6.1 (Daniels 2004) reviews the evaluation and treatment of uncomplicated puncture wounds from animal bites.
3. *Tendon Injuries*. Figure 6.2 shows the appearance of a lacerated flexor or extensor tendon. The profundus flexor tendon (deep tendon) which attaches to the base of the distal phalanx may be avulsed when a patient's hand or finger is forced into extension. The common term for this is called "jersey finger," and it occurs most often on the ring and small finger. Commonly, the mechanism of injury occurs when a player grabs a jersey during a football game and the finger is partially extended when the opposing player runs away. These conditions must be identified and treated quickly to avoid major dysfunction of that phalanx.

**Table 6.1** Evaluation and treatment of uncomplicated puncture wounds

| Clinical situation | Antibiotic prophylaxis |
|---|---|
| Low-risk, traumatic injuries (clean wounds with easily demarcated borders, no devitalized tissue) | None |
| Injuries in immunocompromised patients (e.g., patients with human immunodeficiency virus infection, diabetes) | Gram-positive cocci coverage |
| Wounds with devitalized tissue | Gram-positive cocci coverage if wound tendon or joint space is contaminated[a] |
| Animal and human bites (other than superficial abrasions) | First-generation cephalosporin. In patients with bites that may contain *Pasteurella multocida* or *Eikenella corrodens*, consider penicillin or amoxicillin-clavulanate potassium (Augmentin). In immunocompromised patients, consider erythromycin or amoxicillin-clavulanate. In patients with sepsis and petechial rash, consider intravenous ciprofloxacin (Cipro) and clindamycin (Cleocin)[b] |
| Puncture wounds | Case-by-case decision |

Information from (Daniels 2004)
[a]If the wound is contaminated, debridement is required
[b]Patients with sepsis or petechial rash should be hospitalized

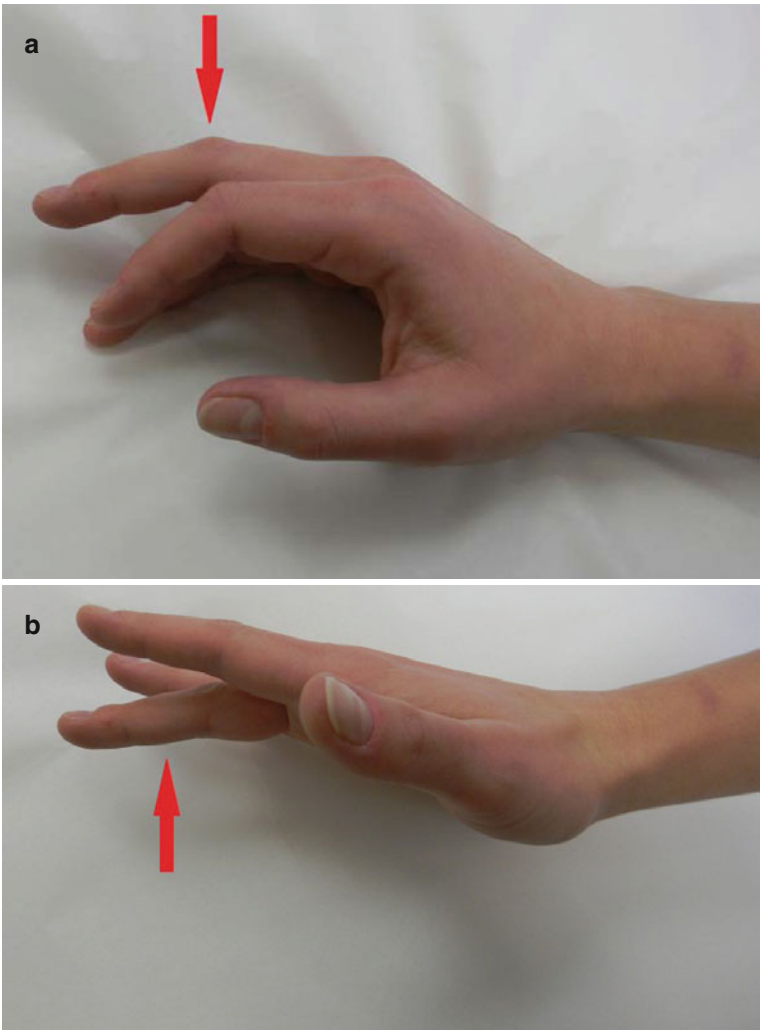


**Fig. 6.2** Testing for lacerated flexor or extensor tendon. (**a**) Lacerated flexor tendon. (**b**) Lacerated extensor tendon

4. *Unstable Fractures*. Any open fracture is a medical emergency, and prompt consultation of a hand surgeon is necessary. Many fractures with benign appearance on radiograph can oftentimes be unstable. A general rule of thumb is if over one-third of the joint is involved with the fracture, it is unstable. Radiographs of any traumatized phalanx should be obtained as some fractures can cause malalignment of the fingers. Figure 6.3 reviews how this can easily be checked.
5. *Septic Tenosynovitis*. The flexor tendon has a sheath that can be punctured and become infected. The sheath becomes inflamed and fills up with purulent material. Kanavel's cardinal signs occur. This includes slight digital flexion, uniform

volar swelling, flexor tendon sheath tenderness, and pain on extension. It is not necessary for all four of these signs to be present to make the diagnosis. Purulent tenosynovitis should highly be suspected with increased swelling after puncture wound or on the volar surface of the hand.

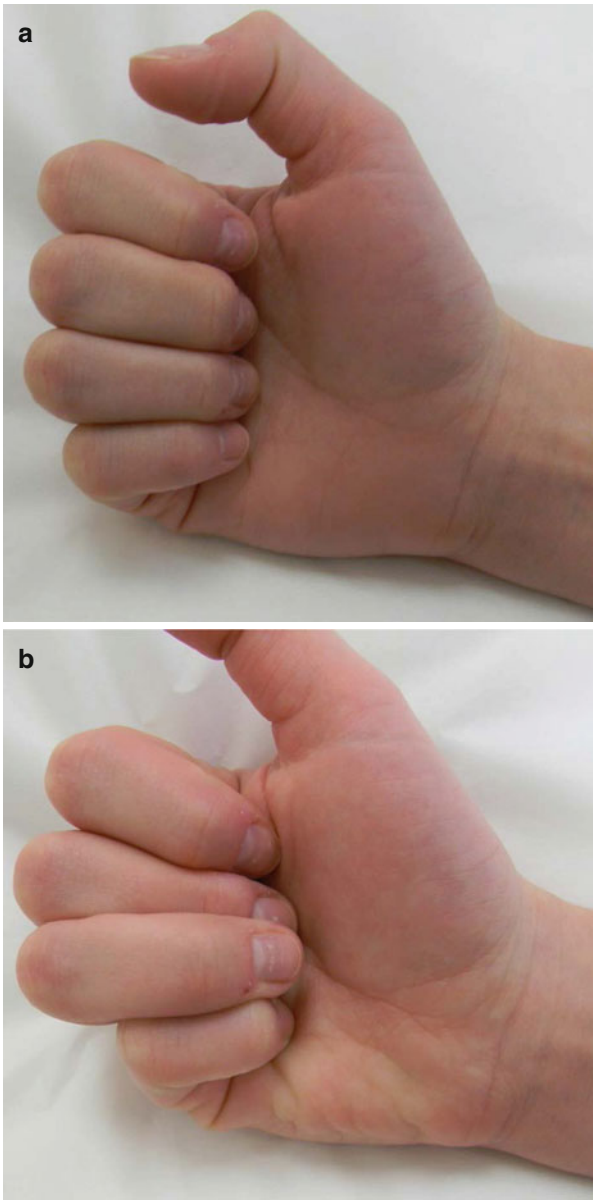


**Fig. 6.3** Malalignment of fingers. (**a**) Demonstrates the patient flexing their fingers and there is no scissoring. (**b**, **c**) Demonstrates how the patient's fingers will scissor or crossover when they flex


**Fig. 6.3** (continued)

**Table 6.2** Indications and contraindications for attempted reattachment of an amputated finger or hand

| Indications | Relative contraindications | Absolute contraindications |
|---|---|---|
| Amputations occurring in children | Amputations that are due to severe crush or avulsion injuries | Life-threatening medical problem or injury that precludes surgery or transfer |
| Clean amputations of the hand, wrist, or distal forearm | Heavily contaminated amputations | Patient refusal to fully abstain from smoking for 3 months post-implantation |
| Multiple digit injury (amputated digit with other digits partially severed) | Patient has a significant smoking history | Psychiatric patient who has intentionally self-amputated the extremity |
| Thumb amputations | Single amputations between the metacarpal and proximal phalangeal joints, especially border digits (index and fifth fingers) in adults | Severe multilevel injury of the amputated part |

Information from (Daniels 2004)

6. *Acute Trauma*. The area on the palmar surface of the hand between the MP joint and the carpal bones has been referred to in the past as "no man's land." There are a large number of intrinsic and extrinsic tendons in this area that can be damaged. Any patient with a deep laceration to this part of the hand should have a surgical consultation. Finger amputation or maceration is also a medical emergency. Table 6.2 reviews the indications/contraindications for reattachment of an amputated digit. The residual finger should be gently cleansed and irrigated with saline and wrapped in nonadherent petroleum gauze and bulky dressing put in place. The amputated digit should be wrapped in nonadherent gauze, moistened with saline, and put into a sterile container or tied-off plastic bag. The amputated

part should not be manipulated or submerged in water. The plastic bag or container should be placed in a larger container with ice. No tissue of any type should be removed or debrided prior to consulting the replant surgeon.

## General Approach to the Patient with Finger Injuries

The patient's age, occupation, and handedness should be recorded. Description of the injury or mechanism of injury should be obtained as it is often helpful in ascertaining the patient's diagnosis. Any type of jewelry should be removed before examining the digit. The vascular condition of the digit should be obtained by gently pressing on the patient's finger and counting. The area should blanch and there should have pink capillary refill within 2 s. A digital nerve injury can be identified if part of the affected finger has a different skin color (blanched or hyperemic) or lacks the ability to sweat. The use of blunt calipers or paper clip can be used to determine two-point discrimination. The patient should be able to distinguish this at least to 5 mm. See Fig. 5.6 for the normal anatomic position of the hand, also known as the "safe hand" position.

If the patient is holding the affected hand with their opposite hand above their head, this can indicate a more severe injury. If the patient can easily flex and extend their finger and grasp the examiner's hand with a handshake, this is reassuring that no major injury has occurred. The extensor tendon and both flexor tendons should be evaluated, and if there is any history of trauma, it is highly recommended that a radiograph be obtained of the digit. Interphalangeal fractures that can become unstable can easily be missed without radiographic evaluation. In an emergent situation (red flags described above), referrals to the emergency department or consultation with a hand surgeon is necessary. Many injuries, however, can be treated with ice, elevation, and dorsal splinting of the digit in a "safe hand" position. Fingers should never be splinted in complete extension. This is discussed in Chap. 15.

## Common Finger Injuries

### *Crush Injury to the Distal Phalanx*

Patients often present with crushed injury to the distal phalanx. The patient's neurovascular status should be checked as described above. The patient may or may not have a subungual hematoma. When it is present, it is important to drain the subungual hematoma as it is the cause of a lot of pain. There are a number of ways to do this. To accomplish this, it is important to note that it is not necessary to use cautery; an 18 gauge needle can be used to drain this. If the subungual hematoma is already draining from the nail edge, drainage is not necessary. The digit should be

radiographed. Many of these patients have a distal pulp fracture. Unless this is an open fracture, these can be treated conservatively. Recent studies have shown that it is safe to drain a subungual hematoma when a tuft fracture is present. It does not convert this to an "open fracture." The patient can be followed for a number of weeks, but the injury usually stabilizes within the month. These patients may be highly susceptible to ambient cold temperatures for the next year or so.

## *Volar Plate Injury*

Figure 6.4 shows the anatomy of a number of common injuries of the finger including an injury to the volar plate, which is a thick fiber band on the palmar aspect of the finger that connects the middle and proximal phalanx. When the finger is hyperextended, this structure can be torn. The finger, at times, can even be dislocated. The dislocation usually happens dorsally. If the dislocation happens ventrally, radiograph should be obtained before attempting to manipulate the finger. Unless the clinician is present when the injury occurs (sideline), most of these injuries present after the finger has been relocated, many times by the coach, therefore given the name "coach's finger." When these patients are evaluated after a relocation, there is usually an ecchymotic area on the palmar aspect of the hand in the crease between the proximal and middle phalanx. It is very important that radiographs be obtained to ensure that there is no fracture associated with this. There are collateral ligaments on each side of the joint and these should be stressed. If the collateral ligament is felt to be damaged along with the volar plate, this is an unstable situation and consultation should be obtained. For the most part, these patients can be splinted or

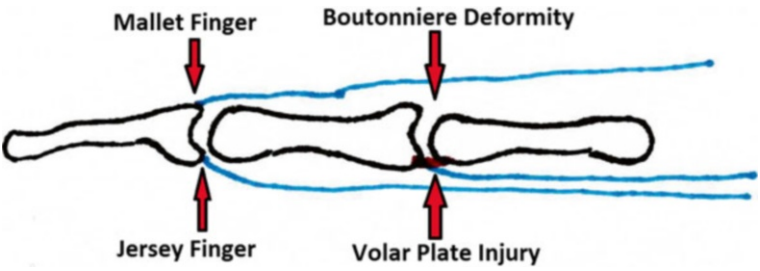


**Fig. 6.4** Anatomy of common finger injuries. Mallet finger injury: extensor tendon avulses from the base of the distal phalanx. Jersey finger injury: deep or profundus tendon avulses from the base of the distal phalanx. Boutonniere deformity: extensor tendon splits longitudinally and PIP joint protrudes through the tear. Volar plate injury: also known as coach's finger. The volar plate tears from a hyperextension injury

buddy-taped. The dorsal splint in the safe hand position can also be considered. It is very important that these injuries are not splinted with the joint in complete extension as this will cause a tightening of the collateral ligaments which is sometimes more difficult to treat than the original injury.

## *Extensor Tendon Injury*

The extensor hood inserts into the distal phalanx. When the extensor hood is disrupted, the DIP joint will fall into flexion. This is known as a "mallet finger." When these injuries occur, it is important that the integument along the dorsum of the hand is evaluated to make sure that there is no laceration, which may indicate an occult open fracture. An x-ray should be obtained, and if a fracture is distracted or if it affects more than one-third of the joint, these patients should be referred for consultation. These patients should all be splinted using a special STAX splint or O-Ring splint to keep the finger in complete extension. The patient should be warned not to remove the splint at all. These injuries can be treated conservatively by clinicians who feel comfortable and have the training to do so.

A Boutonniere injury occurs when the patient sustains a tear in the extensor hood. This most often occurs over the PIP joint where the extensor tendon is particularly wide. This tear can extend over time and open up like a "button hole" (Boutonniere means button hole in French) for which this injury was named. These injuries can present after trauma to the dorsum of the hand or after a patient forcefully flexes his finger against resistance. These injuries can be splinted by buddy-taping, and it is also strongly recommended that these injuries be referred to a hand surgeon. Splinting these injuries for prolonged periods of time can result in a condition that is more difficult to treat than the original injury.

## *Jersey Finger*

As described in the Red Flag section earlier, this type of injury happens when the patients small or ring finger is flexed and is forcefully extended. The patient may or may not feel a pop, and the patient may just come in with a complaint of weakness in the hand. AP and lateral radiographs should be obtained. If musculoskeletal ultrasound is available, it could be valuable in identifying these injuries. If these injuries are identified and prompt referral is made, they can be easily fixed. Unfortunately, these injuries may not be appreciated resulting in treatment that has less than optimal outcomes.

### *Trigger Finger*

This injury is also known as stenosing flexor tenosynovitis. It has also been referred to as texting tendinitis or Gameboy thumb. This condition occurs when there is swelling of the flexor tendon sheath and constriction of the sheath and tunnel where the tendon flows through the metacarpal phalangeal joint. This often occurs at the site of the A1 pulley. The patient commonly experiences these symptoms in the ring finger following frequency by the thumb and second finger. The patient often experiences catching or triggering on awakening in the morning. At times they may complain that the finger is stuck in a flexed position. Patients may not recognize that the triggering is occurring at the palm of the hand around the metacarpal phalangeal joint. They may feel that the catching is up in the finger at the PIP joint. A clinician can easily palpate the palm of the hand right at the MCP joint and feel the triggering as the patient flexes and extends his finger. When the triggering starts, medication and splinting are typically not useful. Most clinicians agree that injection of the tendon sheath right at the A1 pulley is the treatment of choice. The sheath has two sections where it can become entrapped. This can easily be seen with musculoskeletal ultrasound if it is available in the office, and a higher success rate is obtained when injecting both sides of the pulley. Injection of the trigger finger can be performed by any clinician with proper training and comfort. Care should be made to injecting steroids in this area, as injecting medication into the wrong site can result in fat atrophy of the palm of the hand. Patients can be referred to a hand surgeon for an injection and/or pulley release.

Please refer to Fig. 6.5 for the finger meaningful use form.

**CC:** ☐ Right ☐ Left ☐ Both
☐ Thumb ☐ Index ☐ Middle ☐ Ring ☐ Small
☐ PIP ☐ DIP ☐ MP

**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. Severe burn, amputation, degloving injury
4. High pressure injury
5. Deep laceration (especially palmar aspect, tendon laceration)
6. Infection: Kanavel's Signs
7. Tendon rupture DIP (Jersey Finger)

**Q1.** Is this a medical emergency?
a) Any digit threatening injury
b) See Red Flags: Check each PIP, DIP, Flexion, Vascular, Kanavel's Signs

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

**Q3.** How to treat?
a) Dorsal splint
b) Mallet finger splint
c) Close follow up
d) Radiograph
e) Immunization

**Common and Don't Miss Conditions:**

- See Red Flags
- Mallet Finger
- Jersey Finger
- Coach's Finger
- Boutonniere Deformity
- Fracture
- Subungual hematoma
- Trigger Finger
- Dupuytren's Contracture

**Fig. 6.5** The fingers meaningful use form

| | |
|---|---|
| **TREAT APPROPRIATELY** | Hand/Finger Pain.....719.44<br>Finger or Hand Sprain/Strain.....842.10<br>Fracture, Finger.....816.00<br>Coach's Finger.....834.02<br>Mallet Finger..... 736.1 |
| **TREAT WITH CLOSE FOLLOW-UP (< 1 week f/u)** | Tender anatomical snuffbox with normal x-ray |
| **CALL CONSULTANT THAT DAY** | Fight bite<br>High pressure injury<br>Palmar burn<br>Flexor tendon disruption |
| **CONSULT OR REFER** | Extensor tendon disruption (splint, consult)<br>Gamekeeper's thumb<br>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. 6.5** (continued)

## Suggested Readings

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