

Approach to traumatic hand injuries for primary care physicians

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Abstract

Objective To review the initial management of common traumatic hand injuries seen by primary care physicians.

Sources of information Current clinical evidence and literature identified through MEDLINE electronic database searches was reviewed. Expert opinion was used to supplement recommendations for areas with little evidence.

Main message Primary care physicians must routinely manage patients with acute traumatic hand injuries. In the context of a clinical case, we review the assessment, diagnosis, and initial management of common traumatic hand injuries. The presentation and management of nail bed injuries, fingertip amputations, mallet fingers, hand fractures, tendon lacerations, bite injuries, and infectious tenosynovitis will also be discussed. The principles of managing traumatic hand injuries involve the reduction and immobilization of fractures, obtaining post-reduction x-ray scans, obtaining soft tissue coverage, preventing and treating infection, and ensuring tetanus prophylaxis.

Conclusion Proper assessment and management of traumatic hand injuries is essential to prevent substantial long-term morbidity in this generally otherwise healthy population. Early recognition of injuries that require urgent or emergent referral to a hand surgeon is critical.

Case presentation

A 35-year-old, right-hand-dominant industrial labourer presents to your walk-in clinic after sustaining a work-related injury to his right middle finger while using a paint gun the afternoon before. He reports that the pain in his finger has been increasing steadily. Capillary refill is poor and moving 2-point discrimination is not obtainable. A photograph of the injury is presented in **Figure 1**. X-ray scans do not reveal evidence of a fracture.

Traumatic hand injuries are an important aspect of primary care practice. Delayed recognition or improper management of hand injuries can have long-term consequences for patients' quality of life, function, and work productivity. The purpose of this paper is to present some common traumatic hand injuries that primary care physicians might face in their daily practices.

Figure 1. Right middle finger injury following an accident with a paint gun.



Sources of information

Searches of the MEDLINE electronic database were performed using the following key words and MeSH terms: *hand injury, finger injury, tendon injury, hand fracture, animal bites, hand infection, and suppurative flexor tenosynovitis*. Articles were reviewed for relevance and quality of evidence. Studies were graded based on their level of evidence: level I evidence originated from randomized controlled trials, systematic reviews, or meta-analyses; level II evidence originated from other comparison trials; and level III evidence was based on expert opinion or consensus. Expert opinion was

EDITOR'S KEY POINTS

- Primary care physicians must routinely care for patients with traumatic hand injuries.
- If not appropriately assessed and managed, traumatic hand injuries can have considerable long-term consequences for patients' quality of life and function in an otherwise healthy population.
- Primary care physicians should be comfortable managing common traumatic hand injuries and recognize those that require urgent referral to hand surgeons.



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used to supplement current recommendations in areas for which there was little evidence.

Main message

General principles. The first step with all hand injuries is to perform a thorough history and physical examination. Important items that need to be assessed and documented are outlined in **Box 1**; these include the mechanism and time of injury, hand dominance, tetanus status, and the patient's occupation and baseline function. During physical examination, a thorough inspection with comparison to the uninjured hand should be performed. Abnormal positioning, angulation or rotational deformity, or scissoring should be noted. Motor function should be documented, and independent tests of tendons and ligaments should be performed. Assessment of neurovascular status should include testing capillary refill and moving 2-point discrimination, depending on the nature of the injury. Anterior-posterior, lateral, and oblique x-ray scans might be required to rule out fractures, dislocations, and foreign bodies.

The principles of managing traumatic hand injuries involve the reduction and immobilization of fractures, obtaining post-reduction x-ray scans, obtaining soft tissue coverage, preventing and treating infection, and ensuring tetanus prophylaxis.

Nail bed injuries. Nail bed injuries are commonly sustained as a result of high-force crush (eg, from car or home doors) or high-speed laceration (eg, from band saws). Fingernails originate from the germinal matrix, and injury to this structure can result in permanent nail deformity. When assessing fingertip injuries, it is important to note the size and level of the defect as well as the presence or absence of exposed bone.

Box 1. History and physical examination for hand injuries

History

- Mechanism of injury
- Time of injury
- Clean or dirty wound
- Tetanus status
- Hand dominance
- Patient occupation and baseline function

Physical examination

- Thorough inspection
- Comparison to contralateral hand
- Abnormal positioning
- Open wounds
- Capillary refill
- Moving 2-point discrimination
- Active and passive range of motion
- Joint instability

A common injury seen by primary care physicians is an incomplete avulsion of the nail plate through the eponychial surface. The proximal nail plate lies on top of the eponychial surface. This injury might signify laceration of the underlying nail matrix and, possibly, fracture of the distal phalanx. In this case, the nail plate is removed and the underlying nail bed is sutured with a fine absorbable suture (level III evidence).¹ The original nail plate is then washed and replaced as a "free nail plate splint." In 2 to 4 months, a newly grown nail will push this out.

Fingertip amputations. Fingertip amputations can be classified according to the level of amputation with respect to the distal phalanx. Although these injuries might look terrible, they often do not require immediate attention even if bone is exposed. They can be cleansed and dressed, and patients can be referred for specialist assessment within a few days to provide definitive treatment.

Principles of managing fingertip amputations involve providing durable coverage, preserving finger length and sensation, and minimizing pain and donor-site morbidity (level III evidence).² In the absence of exposed bone, healing might occur by secondary intention for defects less than 1 cm in size (**Figure 2**). All wounds should be thoroughly irrigated and debrided of nonvitalized tissue. Hemostasis should be obtained; local direct pressure is often sufficient.

On many occasions the bone might protrude beyond the soft tissue wound margin. Treatment in such cases is

Figure 2. Fingertip injury: A) Dorsal view; healing might occur by secondary intention. B) Healed fingertip 3 months later.



straightforward. The bone is trimmed proximally with a bone rongeur until the soft tissue wound margin extends beyond the bone. The wound is then dressed daily until the soft tissues contract over the next 2 to 3 weeks, covering the bone and re-epithelializing the wound.

Numerous techniques for obtaining soft tissue coverage have been described. These include V-Y advancement flaps, cross-finger flaps, and pedicled flaps.^{2,3} These procedures need to be managed by hand surgeons.

Daily dressing changes of open wounds at the fingertip are particularly painful. After the initial debridement under a metacarpal or digital block, the open wound is dressed with a single layer of petrolatum gauze, followed by a saline compress and dry gauze. At the next visit, 48 to 72 hours later, the external dressing is soaked and removed, leaving the underlying petrolatum gauze in place. This alleviates the pain of future dressings and facilitates epithelialization of the wound. After the first dressing change, the patient is instructed to bathe the finger in warm salt or magnesium sulfate baths daily for 1 to 2 minutes and then to dress the wound with dry gauze. The daily baths minimize the bacterial count on the wound and prevent infection. After 2 weeks, the small wound epithelializes under the petrolatum gauze dressing, lifting it off.

Mallet injury. A mallet finger deformity is a flexion deformity of the distal interphalangeal (DIP) joint caused by the disruption of the extensor mechanism, and is often the result of a direct end-on impact to the finger while in extension.⁴ Mallet finger deformity can also occur with the most trivial injuries that might not be immediately reported to the physician. X-ray scans should be obtained, as mallet fingers can be associated with avulsion fractures of the base of the distal phalanx where the extensor tendon inserts (**Figure 3**). Management of mallet finger deformities involves uninterrupted splinting of the DIP joint in hyperextension for 6 to 8 weeks, followed by another 4 weeks of night splinting.^{4,5} A 1.25-cm aluminum splint applied to the dorsum of the DIP joint prevents flexion of the DIP joint but permits flexion of the proximal interphalangeal joint.⁴ An alternative splint is the stack splint; however, this might not be superior to an aluminum splint (level I evidence).⁵ Most patients are able to return to work wearing the splint. We recommend that individuals keep the finger and splint dry, as moisture can macerate the skin. If the tape holding the splint in place becomes dirty, we advise leaving it in place and covering it with clean tape. Repeated removals of the splint increase the risk of recurrence of the mallet finger and should be discouraged. Referral should be considered if there is a bony avulsion involving more than one-third of the articular surface or if reduction is inadequate.^{5,6}

Hand fractures. As a general principle, all fractures need to be reduced to their anatomic position and

Figure 3. Mallet finger deformity with associated avulsion fracture: Clinical photo (left) and lateral x-ray scan (right).



protected with some type of splint or fixation until they heal (level III evidence).⁷ Management of closed fractures involves reduction and splinting for 3 to 4 weeks.⁸ An open fracture requires immediate referral to a hand surgeon. The wound should be irrigated, debrided, and loosely closed until the patient can be seen by a hand surgeon for definitive management.

Fractures of the middle and proximal phalanx might involve the shaft, condyles, or base. Unicondylar and bicondylar fractures are inherently unstable, and patients with such fractures should be referred to hand surgeons (**Figure 4**). Fractures of the shaft might be transverse, oblique, or spiral in nature (**Figure 5**). Nondisplaced fractures can be treated with splinting with the metacarpophalangeal joints in flexion and the interphalangeal joints in extension to prevent contractures.⁸ Closed reduction should be attempted for displaced, angulated, or rotated fractures. Transverse fractures of the phalanges are inherently unstable and

Figure 4. Unicondylar fracture of the proximal phalanx



Figure 5. Oblique fracture of the proximal phalanx: Anterior-posterior (left) and lateral (right) views.



require weekly x-ray scans if they are splinted to ensure that they have not displaced between visits. Patients with fractures that cannot be reduced or that involve the articular surface require referral for surgical fixation.⁸

Boxer's fractures are fractures of the neck of the fourth or fifth metacarpal. They are commonly seen as the result of a punch or closed-fist injury. Open injuries caused by teeth should be ruled out, as wound infections could lead to septic arthritis.⁹⁻¹¹ Boxer's fractures and fractures of metacarpal shafts can be managed by closed reduction and splinting. If angulation, scissoring, or shortening persist following attempted closed reduction, patients with these fractures should be referred to hand surgeons. Angulation less than 40°, 30°, 20°, and 10° for the little, ring, middle, and index finger metacarpals, respectively, is generally acceptable (level III evidence).¹²

Patients with intra-articular fractures should be referred if the articular surface reveals a step of more than 1 mm. Intra-articular fractures involving the base of the thumb metacarpal are known as *Rolando* or *Bennett fractures* and often require surgical fixation.¹³

Examination of patients with hand trauma should not be limited to the affected hand. Additional injuries including injuries to the wrist and upper extremity should also be ruled out. Scaphoid fractures are commonly seen in falls on the outstretched hand and might be diagnosed clinically with anatomic snuffbox tenderness or axial loading of the thumb.^{14,15} Scaphoid fractures commonly have delayed radiographic presentation. Therefore, clinical suspicion should warrant immobilization with a thumb spica splint and early orthopedic referral with follow-up x-ray films in 10 to 14 days.

Tendon lacerations. Extensor tendon lacerations might be the result of direct laceration, crush injury, avulsion,

burn, bite, or deep abrasion. Tendon lacerations are often easily visualized with manipulation of the joint and overlying skin. Closed-fist injuries involving teeth or "fight bites" are often missed because the laceration is proximal to the skin wound owing to the position of the clenched fist. An open wound over a knuckle should be considered a human bite until proven otherwise. These wounds should be left open and allowed to heal by secondary intention. Septic arthritis is a very serious complication of a human bite that requires urgent referral. An x-ray scan of the joint should be taken to rule out the presence of a broken tooth in the joint.

Management of extensor tendon lacerations should include tetanus prophylaxis and x-ray scans to rule out possible fractures and foreign bodies. After thorough irrigation and debridement, tendon lacerations should be repaired if the laceration is more than 50% of the tendon width, as these lacerations are at risk of delayed rupture.⁶

Flexor tendon injuries can be closed or open injuries. Avulsion of the flexor digitorum profundus at the distal phalanx is known as *Jersey finger*. Clinical diagnosis can be made based on the inability to flex the DIP joint.¹⁶ Patients with flexor tendon injuries should be urgently referred to specialists because of the complex anatomy, proximity of the neurovascular bundles, and importance of a low-friction repair to ensure unrestricted tendon glide.

Bite injuries. Bite injuries might be either direct injuries caused by animal or human bites, or indirect injuries caused by a closed-fist injury from someone's mouth.^{9-11,17} Dog bites are often high-force trauma and might be associated with fractures. Cat bites are similar to puncture wounds and are associated with a high risk of infection or flexor tenosynovitis. X-ray scans should be obtained to rule out foreign bodies or fractures. Initial management of bite injuries involves thorough irrigation and debridement. Prophylaxis for tetanus (and rabies if warranted) must be initiated. Wounds should be left open and cleansed frequently to minimize bacterial load. Prophylactic antibiotics should be started. Antibiotics should cover common organisms including *Staphylococcus aureus*, *Streptococcus viridans*, and *Bacteroides* species. Animal-specific organisms such as *Pasteurella multocida* (cat), *Pasteurella canis* (dog), and *Eikenella corrodens* (human) should also be covered. Amoxicillin-clavulanic acid is a reasonable first-line antibiotic (level III evidence).¹⁸ Patients with compromised immune systems, such as those with asplenic, underlying hepatic disease, or diabetes mellitus, should receive antibiotic prophylaxis and close monitoring to prevent potentially life-threatening infections.

Infectious tenosynovitis. Infectious flexor tenosynovitis is a serious infection of the flexor tendon sheath that has

been classically described by Kanavel signs: pain with passive extension, finger held in flexed position, fusiform swelling, and pain with palpation along the flexor sheath.¹⁹ This condition can arise from minor injuries such as a puncture of the skin during gardening or sewing. Injuries commonly occur at the digital creases, where the distance between the skin and the flexor sheath is only 1 to 2 mm. Clinical diagnosis of flexor tenosynovitis requires urgent referral for incision and drainage of the flexor sheath and commencement of intravenous antibiotics.

Case resolution

The 35-year-old industrial labourer presents with a history and clinical examination findings consistent with a high-pressure injection injury to his right middle finger. The progressively worsening pain, poor capillary refill, and unobtainable moving 2-point discrimination raises concern for impending digital ischemia. Emergent referral to a hand surgeon is essential. High-pressure injection injuries are most commonly work-related injuries involving industrial grease, oil, hydraulic grease, or paint (Figure 6).²⁰ They might initially appear innocuous, thus leading to a delayed presentation. Increasing pain, discoloration, and swelling are the hallmarks of this injury. These injuries require prompt surgical consultation for exploration, irrigation, and debridement owing to the high risk of digital ischemia, necrosis, and loss of the digit (level III evidence).^{12,20,21}



Conclusion

Traumatic hand injuries are common in otherwise healthy patients. We have discussed some of the common and uncommon hand injuries seen by primary care physicians and outlined the management and indications for referral. Initial management by the primary care physician is important to ensure a timely recovery and minimize long-term morbidity. Recognition of injuries that require urgent referral to hand surgeons is critical. For such an injury, direct telephone contact between the primary care physician and the hand surgeon on call is essential to facilitate expeditious management.

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Contributors

All authors contributed to the literature review and preparing the article for submission.

Competing interests

None declared

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