

How to Treat

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Soft tissue

Injuries of the hand

Background

WHETHER patients are young or old, the injury acute and severe or old and minor, good management of hand injuries really makes a difference, resulting in a quicker resumption of all activities and lessening long-term discomfort and restrictions.

Many soft tissue injuries, including some acute injuries, may be treated with excellent results in a general practice setting. Other injuries are helped by assessment and appropriate early referral for

specialised treatment.

The most common preventable problems arising from hand injuries are stiffness from inappropriate or unnecessarily prolonged immobilisation or unduly tentative mobilisation, and hyperaesthesia due to inadequate desensitisation. Hence the importance of the hand therapist, who is responsible for making splints, providing specific instructions for mobilisation, advising how to massage scars and providing emotional support to the patient.

Functional anatomy

CLINICAL tests of continuity or function of ligaments, tendons and nerves give clues to the diagnosis and depend on a detailed understanding of the anatomy and function of the structure being tested.

Common tendon and ligament injuries

The digital extensor expansion — boutonnière, swan-neck and mallet deformities

The extension expansion of the finger covers the dorsal aspect of the metacarpophalangeal joint and inserts on the base of the middle and distal phalanx. The anatomy is illustrated in figure 1. Sharp division or avulsion of the middle slip of the extensor expansion is common. In this injury, the lateral bands of the expansion slip laterally and, when the proximal interphalangeal joint flexes, they slip forward holding the proximal joint flexed and pulling the distal joint into hyperextension, thus causing a boutonnière (button hole) deformity (figure 2a).

When the small muscles of the hand are contracted or hyperactive, as occurs in rheumatoid arthritis or cerebral palsy, the proximal interphalangeal joints of the fingers hyperextend, which causes compensatory flexion of the distal interphalangeal joints by the flexor digitorum profundus tendons, thus producing swan-neck deformities (figure 2b).

Similarly, when the terminal attachment of the extensor expansion is divided or avulsed, a mallet deformity results, which tends to cause compensatory hyperextension of the proximal interphalangeal joint and thus an associated mild-swan neck deformity.

Tendon compression (stenosing tenosynovitis)

De Quervain's tenosynovitis results from compression of the tendons of the abductor pollicis longus and extensor pollicis brevis against the lower end of the radius within the first compartment beneath the extensor retinaculum of the wrist. The affected part of the extensor retinaculum becomes markedly thickened, forming a palpable, and often visible, slightly tender lump. Ulnar and radial deviation of the wrist produces palpable crepitus, and gentle ulnar deviation of the wrist with the thumb adducted causes pain (Finklestein's test, figure 3).

The tightness causing trigger finger and thumb usually occurs only at the extreme proximal end of the digit's fibrous flexor sheath. Marked triggering is obvious but many patients feel the site of the abnormality is at the proximal interphalangeal joint, as the abnormal move-

Figure 1: Diagrammatic representation of the digital extensor expansion. A. Extensor tendon. B. Tendons of interosseous and lumbrical muscles. C. Middle slip. D. Lateral slips.

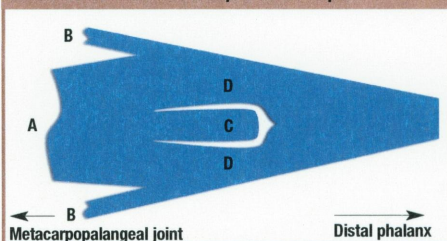


Figure 2: Abnormalities of the digital extensor expansion. A. Boutonnière (button hole) deformity due to division or rupture of the middle slip. B. Swan-neck deformity due to contracture or spasm of the intrinsic muscles.

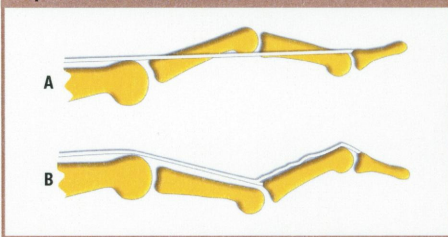


Figure 3: Finklestein's test for de Quervain's stenosing tenosynovitis: pain is felt on gentle ulnar deviation of the wrist with the thumb adducted.



Good digital function depends upon adequate sensory discrimination at the tips of the digits, not upon sensitivity to pain.

ment occurs at this joint. An uncommon early presentation is a tender swelling at the proximal end of the fibrous flexor sheath of a finger or thumb, associated with discomfort on flexion and extension but without obvious crepitus or triggering.

A patient may present without any history of triggering because a finger or thumb cannot be fully extended: it is common for babies and young children to present with the interphalangeal joint of a thumb jammed in flexion without their parents having been aware of prior triggering. This is treated by division of the tight part of the fibrous flexor sheath.

Flexor digitorum profundus tendons of the middle, ring and little fingers — quadregia effect

These tendons are partly joined in the forearm. Because of the tendinous interconnections, after a stabbing injury to the forearm, a flexor digitorum profundus tendon that has been completely divided may still have some action. However, if the divided tendon is not recognised and repaired, the fine tendinous interconnections responsible for persisting function may later

Figure 4: The palmar plate of a digital interphalangeal joint. A. The palmar plate. B. The more proximal phalanx. C. The more distal phalanx. D. The fibrous flexor sheath.

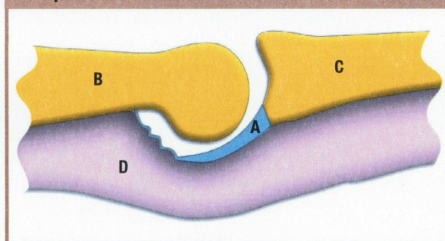


Figure 5: Testing for two-point discrimination with a bent paperclip.

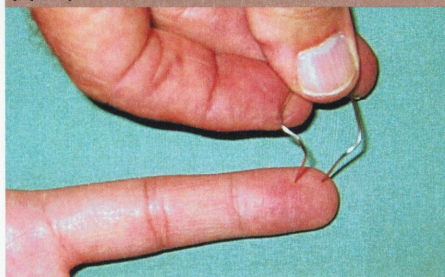


Figure 6: Froment's sign, resulting from loss of function of the deep branch of the ulnar nerve.



stretch, reducing the strength and possibly also the range of flexion of the affected finger.

The interconnections between the flexor digitorum profundus tendons of the middle, ring and little fingers allow testing of the continuity of the superficialis tendons of these fingers. If any two of these fingers are held fully extended, the third finger can only be actively flexed if the superficialis tendon is intact, in which case only the proximal interphalangeal joint flexes. (Note, however, the superficialis tendon of the little finger is often poorly connected to an independent muscle belly and so may have little ability to act independently.)

The flexor digitorum profundus tendon should be left free when a finger is amputated proximal to the proximal interphalangeal joint, because attaching the tendon to the proximal phalanx may restrict movement of the adjacent fingers: this is the quadregia (Roman four-horse chariot) effect.

The palmar plates of the interphalangeal joints

Like the glenoidal labrum of the shoulder, the palmar plates of the interphalangeal joints effectively extend the

distal articular surfaces, with each side of each palmar plate forming a check ligament, which limits extension of the joint (figure 4). Also, the palmar parts of the collateral ligaments are attached to the sides of the palmar plates.

Hyperextension avulses the distal attachments of the palmar plates and continuation of this force ruptures the collateral ligaments, leading to dorsal dislocation of the more distal phalanx. This happens most often at the proximal interphalangeal joint of a finger.

The collateral ligaments of the finger metacarpophalangeal joints

Because these ligaments are tightest with the metacarpophalangeal joints flexed and loosest with these joints extended, prolonged immobilisation should usually hold these joints flexed. If the hand has been swollen and the metacarpophalangeal joints have been immobilised in extension, flexion of these joints is difficult to regain.

Remember: wrist flexion weakens finger flexion. Try it yourself — flex your wrist fully and then flex your fingers: flexion of your fingers will be weak and possibly painful and yet, when asked

to flex the fingers of an injured hand, a person usually flexes the fingers and wrist together. When assessing the range and strength of finger flexion and when the fingers are actively exercised, the wrist should be held extended while the fingers are actively flexed.

Nerve injuries

Digital nerves, their dorsal branches and two-point discrimination

The absence of pain sensation, as determined by pinprick testing, confirms complete sensory loss; however, good digital function depends upon adequate sensory discrimination at the tips of the digits, not upon sensitivity to pain.

Sensory discrimination at the palmar aspects of the tips of the digits is best tested by two-point discrimination. A young person whose fingertip keratin is not callused has sensory discrimination of 2-3mm on most digits. A small instrument may be purchased to test two-point discrimination but a bent paper clip suffices (figure 5).

Note that loss of sensation in the distribution of the dorsal branch of a palmar digital nerve is of little consequence (but may be associated with troublesome hyperaesthesia).

The deep branch of the ulnar nerve and Froment's sign

The deep branch of the ulnar nerve burrows deeply alongside the hook of the hamate bone to supply the interosseous muscles, adductor pollicis and the ulnar part of the flexor pollicis brevis. A positive Froment's sign is flexion of the interphalangeal joint of the thumb when 'key' grip is attempted (figure 6). This occurs because, with the loss of action of the adductor pollicis, adduction of the thumb depends upon the flexor pollicis longus.

Loss of action of the interosseous muscles may be demonstrated by testing active radial and ulnar deviation of the extended fingers (but beware of the independent action of the two extensor tendons of the index finger, which may achieve weak lateral movements of this finger).

An injury to the proximal palm occasionally results in an isolated injury to the deep branch of the ulnar nerve. More often the axons contributing to this small motor nerve are injured at a higher level (ie, by injury to the ulnar nerve).

Nerve compression

The carpal tunnel is by far the most common site of

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nerve compression affecting the hand. When describing the symptoms of carpal tunnel syndrome, some patients report an accurate median nerve distribution of sensory change, but many say that all their fingers are affected.

Carpal tunnel syndrome is episodic and, at least initially, nocturnal or mainly nocturnal because of swelling of the hand and wrist with redistribution of the body's fluids. Minor degrees of carpal tunnel syndrome often pass unrecognised and, in elderly people, even severe carpal tunnel syndrome may escape notice.

The cubital tunnel lies behind the medial epicondyle. This is by far the most common site of problems affecting the ulnar nerve but compression alone is seldom responsible for the symptoms of ulnar neuritis. Tension caused by elbow flexion, irritation caused by gliding movements and minor direct trauma also appear to be important: therefore, when treating ulnar neuritis, the ulnar nerve may be better transposed than simply decompressed.

The ulnar nerve lies outside the

Figure 7: Wasting of the abductor pollicis brevis due to median nerve compression in the carpal tunnel.



relieve ulnar nerve compression at this site.

Enthusiasm for separate decompression of Guyon's canal has lessened because of possible undesirable postoperative effects of the wider dissection — greater tenderness and hyperaesthesia and, rarely, reflex sympathetic dystrophy (regional pain syndrome).

Wasting of the abductor pollicis brevis

Wasting of the small abductor pollicis brevis muscle (figure 7) is the only objective clinical sign of carpal tunnel syndrome. Severe longstanding carpal tunnel syndrome always causes an obvious elongated snuffbox-like depression immediately adjacent to the shaft of the first metacarpal.

In very many patients with carpal tunnel syndrome, careful palpation of this part of the thenar eminence discloses a slight depression of sufficient severity to warrant surgery. When carpal tunnel syndrome is suspected, if you always feel for wasting of the abductor pollicis brevis muscle you will be surprised how often you find it.

carpal tunnel but a few fibres of the flexor retinaculum pass over it, forming Guyon's canal. Carpal tunnel syndrome may be associated with compression of the ulnar

nerve in Guyon's canal, but division of the mid-part of the flexor retinaculum to decompress the carpal tunnel ordinarily takes sufficient tension off these fibres to

Clinical assessment

Background information

AN understanding of the patient's general health (eg, knowledge about diabetes, hypertension and respiratory problems relevant to anaesthesia) and of the patient's work and social circumstances should be built up as the consultation proceeds.

In particular, injuries at work may have complex psychological associations. Anxious patients are often troubled by pain, which may delay recovery of function. Living alone or providing care to another may be difficult with a hand injury.

Mechanism of injury

For lacerations, knowing the shape and sharpness of the responsible object is often helpful, eg, beneath a small skin laceration caused by a narrow shard of glass an important nerve or tendon may be cut, sometimes a long way from the surface wound, whereas a screwdriver often bruises or crushes rather than divides a nerve.

For closed injuries, analysis of the magnitude and direction of the forces involved may predict the likely damage, eg, the flexor digitorum profundus tendon of the ring finger of the non-dominant hand is frequently avulsed by grabbing an opponent's jersey while playing Australian rules football.

Clinical examination of the injured hand

The following relates to soft tissue injuries only. (For skeletal injuries see the How to Treat by Dr Anthony

Beard, *Australian Doctor*, 26 September 2003).

Lacerations

First decide whether the lacerations are superficial or deep and assess damage to the skin edges and wound surfaces. Then consider the possibility of damage to underlying nerves, blood vessels, tendons, ligaments, bones and, less importantly, muscles. Also assess injuries to nails and parts other than the hand. Measure two-point discrimination at the tips of lacerated digits.

Observe the resting posture of the fingers with the wrist flexed and then extended. If the patient can co-operate, proceed to test the continuity of possibly divided tendons by requesting isolated active movements. Then test for abnormal passive joint movement, including gliding movement.

Closed injuries

Ask the patient to point to the most painful part or parts and further localise tenderness or deformity by gentle palpation. Ask the patient to actively move the injured parts. Test the continuity of tendons and ligaments. Minor degrees of ligamentous injury can be detected by the presence of pain when the ligament is stressed.

If only a limited initial clinical examination is possible, X-rays may be arranged immediately or, alternatively (providing the hand has not been severely injured), a resting splint that holds the wrist and digits in a position of function can be applied,

together with a sling. The patient can be seen again a day or two later, at which time a thorough clinical examination can be performed, usually followed by radiological examination.

Foreign bodies

Thorough gentle palpation may disclose more information than anticipated, eg, the far end of a linear foreign body may be detected by gently rocking the foreign body by pressure over the site of entry. (See also Radiological examination and Ultrasound examination, below).

Tendon injuries

Extensor tendon injuries: The middle slip of the extensor expansion of a finger is most easily divided over the dorsal aspect of the proximal interphalangeal joint. Because it develops slowly, the boutonnière deformity that results from this injury is liable to be missed.

Gently retract the edges of a finger laceration to inspect the extensor expansion but remember that, over the proximal part of the dorsum of the hand, the ends of completely cut extensor tendons often retract widely. Significant extensor tendon injuries over the dorsum of the hand are recognised by testing isolated active movements.

Flexor tendon injuries: Inspection is less often helpful, although some partially divided flexor tendons may be recognised by inspection. Test isolated active movement of all possibly injured tendons.

Special investigations



Plain X-rays are indicated when a bone could be damaged or a foreign body present.

Radiological examination

DEFENSIVE medicine aside, there is little excuse for neglecting plain X-rays when a bone could be damaged or a foreign body could be present. Splints and dressing materials may obscure bone detail or foreign bodies and, when practicable, should be removed before X-ray. 'Soft' (low penetrating) X-rays are appropriate for foreign bodies and a tangential view should be included. The site of entry should be marked.

CT scans have little application for soft tissue injuries, and MRI examinations, if required, are better arranged by the specialist. Bone scans are seldom specifically useful for soft tissue injuries.

Ultrasound examination

Except for detecting foreign bodies, ultrasound examination seldom adds more to the assessment of a soft tissue hand injury than a thorough physical examination by an experienced doctor.

Nerve conduction studies

Nerve conduction studies confirm the diagnoses of carpal tunnel syndrome and ulnar neuritis. A nerve conduction study showing severe or moderately severe changes consistent with median nerve compression in the carpal tunnel is pathognomic of carpal tunnel syndrome. If it shows only minor changes, an experienced surgeon may rely more upon clinical assessment.

Managing common injuries

The bleeding hand — what should I do?

WHILE offering reassurance, show the patient to a couch, put on gloves, lie the patient down, elevate the hand and stop the bleeding by firm, accurately localised pressure over a small well-rolled-up pad of gauze. Even bleeding from a large artery can be stopped in this way.

Sometimes the need for immediate referral is apparent at a glance, eg, very extensive lacerations, a missing digit, or digits in abnormal postures. If the patient is to be referred, gently approximate the skin edges when possible. Once the bleeding has stopped, sterile adhesive strips may help support the wound edges for transfer to a specialist but, especially in a rural area, a few skin sutures (not tight) may be desirable.

Apply a non-stick layer, an absorptive dressing and a firm elasticised bandage. The edges of cuts to the flexor aspects of the fingers and wrist are further supported by maintaining flexion with a padded dorsal splint: the reverse applies to dorsal injuries. Elevate the hand in a sling and refer the patient with clear, legible notes describing your assessment, including tetanus status and a record of analgesics, anaesthetics and antibiotics you have administered. Remember to tell the patient not to eat or drink anything. Also remember that ambulances are usually a slow means of transport for patients with 'minor injuries'.

Less severe injuries require careful assessment to decide whether to treat or refer (see below). Most injuries to significant deep structures necessitate referral for further assessment and treatment, sometimes more because of the necessary aftercare than because of the complexity of the required surgical procedure.

The bleeding hand — what shouldn't I do?

- Don't apply a tourniquet as a first-aid measure (except for a short time for very severe bleeding).
- Don't use any tourniquet that can crush tissues or can be accidentally left on, eg, a rolled-up glove finger tourniquet.
- Don't apply artery forceps unless you really know what you're doing because you may further damage an artery or a nerve or injure a nerve that was not previously injured.
- Don't give a large initial dose of an opioid analgesic.
- Don't inject a local anaesthetic before trying to test nerve function, especially sensory function.
- Don't take dog, cat and human bites lightly because severe infection may result. Small wounds may contain tooth debris. Refer wounds resulting from a punch onto another person's upper teeth.
- Don't forget to put on sterile or at least surgically clean gloves.

Tetanus immunisation

If the immune status is incomplete (ie, less than three doses) or unknown, tetanus toxoid should be given for all wounds but, if the wound is not clean or is of major extent, immunoglobulin should be considered.

For patients who have had adequate immunisation at some stage, no treatment is required if the last dose was within five years, or within 10 years for minor wounds. Tetanus toxoid should be given for at-risk wounds if the last dose was within 5-10 years or for all wounds if the last dose was more than 10 years ago. Note that there is no indication for immunoglobulin in an adequately immunised person.

Use of antibiotics¹

For clean and minor wounds an antibiotic is unnecessary. For deeper wounds or wounds with a suspected underlying fracture, anti-staphylococcal cover with oral dicloxacillin, flucloxacillin or cephalixin is indicated, 500mg 6-hourly for 5-7 days. An initial IV dose of flucloxacillin or cephalothin 50mg/kg up to 2g can be given before referral. For children, a single intravenous dose of 50mg/kg, up to a maximum of 2g, may be given.

For bite wounds or clenched-fist wounds, oral amoxicillin-clavulanate (eg, Augmentin Duo Forte) 875mg/125mg 12-hourly for five days should be administered. For children, the dose is up to 22.5mg/3.2mg/kg every 12 hours, up to a maximum of 875mg/125mg every 12 hours, for five days. For moderately severe wounds IV antibiotics including metronidazole are desirable.

Clavulanate broadens the antibacterial spectrum of amoxicillin to include anaerobic cover so that addition of metronidazole is not required. For patients with immediate penicillin hypersensitivity, a regimen consisting of oral ciprofloxacin 500mg every 12 hours plus metronidazole 400 mg every 12 hours for five days is an alternative. For children, the dose of oral metronidazole is 10mg/kg (up to 400mg) every 12 hours; the dose of ciprofloxacin for children is 10mg/kg (up to 500mg) orally every 12 hours.

Simple lacerations

Even when the laceration is small, every structure that could possibly be divided should be tested. After making it clear to the patient that nothing sharp will be used, I initially test two-point discrimination with a bent paperclip. It is important to perform the test without giving unintended clues, eg, by reg-



The opportunity to prevent infection after a minor injury is often lost because of a late presentation.

ularly alternating between one and two points.

The continuity of tendons should be tested by observing the resting posture of the fingers with the wrist flexed and then extended (especially when examining a small child who cannot be expected to perform requested active movements) and by testing the active function of each nearby tendon.

When suturing lacerations, lie the patient down and encourage them to look away. Preferably, rest the hand on a small table beside which you sit. Clean the skin and infiltrate local anaesthetic through the wound edges or insert digital blocks. Apply a finger tourniquet if possible, with caution (see the Bleeding hand — what shouldn't I do?). Inspect and debride all wounds thoroughly. (A pneumatic tourniquet may be applied for a very short time on the upper arm or forearm without anaesthetising the arm.)

Insert fine monofilament (eg, 5/0 nylon) 'square' sutures or, occasionally, horizontal mattress sutures to avoid interrupting the skin edges. A palmar plaster of Paris splint may be applied to support the hand and wrist in a position of function.

Small children are difficult to examine but, in any case, repairing a small child's hand or wrist laceration requires the services of an anaesthetist, which allows a thorough exploration of the

wound using a pneumatic tourniquet.

Loss of terminal pulp

Especially with children, lost small areas of terminal pulp heal well spontaneously. This applies particularly to loss from the dorsal part of the fingertip. More extensive tissue loss requires repair by tissue rearrangement (ie, local flaps) or skin grafting.

Divided tendons and nerves

Refer people with these injuries, sometimes more for the necessary aftercare than because of the difficulty of the required surgical procedure.

Divided blood vessels

Having confirmed that there is no nerve injury, even single small arteries may not need to be repaired, eg, a single digital artery.

Foreign bodies

Palpable foreign bodies and superficial radio-opaque foreign bodies may be removed with local anaesthesia via a small well-placed incision. For a foreign body in the distal part of a finger, block both palmar digital nerves and apply a finger tourniquet (as there is no muscle, a tourniquet that does not crush the tissues could be left on a finger for several hours).

Refer patients with deep foreign bodies and foreign

bodies that can be detected only by ultrasound examination. (A deep non-absorbable suture may become an infected foreign body.)

Mallet fingers

Closed mallet fingers

When the skin is intact and the terminal attachment of the extensor expansion has been avulsed, a Stack mallet finger splint (or a custom made splint) can be used to hold the distal interphalangeal joint continuously extended or slightly hyperextended for 6-8 weeks, but the proximal interphalangeal joint should be left free. During removal of the finger splint for cleaning, the distal joint must be supported in extension: it must not be allowed to drop into flexion at any time over the 6-8-week period.

If the distal joint remains fully extended when the splint is removed at the end of the advised period, gentle active movement of the joint is advised, but continued use of the splint in bed for a further month or two is likely to improve the final result. The patient should be warned not to force the distal joint into flexion for three months. Especially when the initial extensor tendon avulsion is incomplete, full or nearly full active movement is likely to be regained eventually.

Open mallet fingers

When the extensor tendon and the overlying skin have been divided, referral to a specialist is preferable, as surgical repair of the extensor tendon may be appropriate. Subsequent management is as for a closed mallet finger.

Boutonnière deformities

When the patient is seen soon after the injury, the finger's flexed proximal interphalangeal joint can be extended passively. This joint should be continuously splinted in extension for about five weeks, after which the patient should be encouraged to gently flex the joint. The metacarpophalangeal and distal phalangeal joints should be left free throughout.

The patient should be encouraged to actively flex the distal joint (while the proximal interphalangeal joint is held extended) to draw the extensor expansion distally and so help the middle slip to heal and shorten.

When first seen weeks or months later, the proximal interphalangeal joint may no longer be able to be passively extended, ie, a fixed-flexion deformity is present. A dynamic extension splint may then correct the flexion contracture and, if satisfactory passive extension of the

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proximal interphalangeal joint is achieved, treatment continues as above. Surgical treatment is difficult and may not achieve a good outcome.

De Quervain's stenosing tenosynovitis

Symptoms may subside on stopping (or lessening of the frequency or intensity of) activities responsible for the condition. Performing tasks in a different manner may also allow the condition to subside and, in some cases, a hand therapist can fit a splint that supports the affected wrist and thumb.

Corticosteroid injections into the affected tendon sheath provide temporary and occasionally permanent relief but it is generally advisable to limit the number of injections to two or three to avoid the risk of rupture of the tendons. Surgical release of the first compartment beneath the extensor retinaculum of the wrist is a

simple day surgery procedure that permanently cures this often under-treated condition.

Trigger fingers and thumbs have similar causes to de Quervain's tenosynovitis and are treated similarly.

Carpal tunnel syndrome

Rarely, acute carpal tunnel syndrome follows a severe crushing or other injury to the hand or wrist. Mild delayed carpal tunnel compression complicates hand injuries and hand operations more often than is appreciated. Mild carpal tunnel syndrome after trauma usually subsides spontaneously but severe or persistent cases of any cause should be treated by a steroid injection or by surgical decompression.

Burns

A simple first-aid measure is to place the hand in a clean plastic bag, which may contain an agent such as silver sulphadiazine. Otherwise, in the first instance, apply a simple non-adherent absorbent

dressings. Refer all hand burns except localised partial-thickness burns. Electrical burns always need to be referred, as do chemical burns. Hydrofluoric acid burns must be referred urgently for treatment with calcium gluconate. (For information relating to the early management of burns see Dr Peter Haertsch's *How to Treat in Australian Doctor*, 1 August, 2003).

Hand infections

Occasionally the cause of a hand infection cannot be determined, or is secondary to an existing localised infection such as paronychia. However, most hand infections follow a minor or severe injury, eg, puncture of the skin by a thorn or splinter or a superficial or deep laceration.

The opportunity to prevent infection after a minor injury is often lost because of a late presentation. The risk of infection of a laceration is greatly reduced by thorough debridement, including the removal of all foreign bodies, often with local

anaesthesia and a tourniquet such as a finger tourniquet. An infected or infection-prone wound, eg, a dog bite, should be left open or the skin edges tacked together with small sutures, leaving gaps between them.

For an infection-prone wound, eg, a dirty or neglected wound or a crushing or extensive laceration, at least one antibiotic should be administered. Penicillin alone is a poor choice (see page 37). For an animal or human bite, metronidazole should be considered to prevent infection with anaerobic organisms.

In addition to prescribing antibiotics, remember to immobilise the hand and wrist in a position of function using a plaster of Paris slab and to elevate the arm in a sling. Severe infections require appropriate IV antibiotic therapy and elevation of the immobilised hand.

Painful scars and neuromata — desensitisation is the key

Especially with anxious patients and those with workers' compensation

or third-party claims, injuries to nerves are likely to lead to painful neuromata and painful scars. Prior warnings about subsequent pain and tenderness help greatly after the procedure. Fingertip scars are especially likely to be hyperaesthetic.

Only wounds involving important nerve injuries (injuries to dorsal digital nerves and the dorsal branches of palmar digital nerves) should be treated at the primary care level. Approximating the divided ends of even a threadlike nerve lessens neuroma formation but, with respect to dorsal digital nerves, only the larger branches of the radial nerve over the wrist or the proximal part of the hand are commonly repaired.

Neat closure of subcutaneous tissue and skin over an injured nerve lessens subsequent tenderness. If a patient has learnt to partially desensitise a localised neuroma, the prospect of successful surgical treatment of the neuroma is greatly increased.

Aftercare

WHEN possible, dressings and splints applied at an operation of any complexity are best removed by someone who has knowledge of the procedure performed. This applies particularly to tendon injuries.

While problems relating to early aftercare after moderately severe injuries (eg, bleeding, pain, haematoma, infection, swelling and stiffness) are the most pressing and often the most worrying, later aftercare may be more difficult and more important. The outcome often depends more upon continuing aftercare than the initial treatment.

In both public and private settings, the most common, eminently preventable or treatable later conditions we see are hyperaesthesia and stiffness. Desensitisation involves frequent stimulation of the painful site by light or firm massage or by tapping the most tender part of a scar with a finger tip or, if it is the finger tip which is hypersensitive, by tapping a hard surface.

The scar should not be covered or protected except while performing manual work soon after an injury or when it is cold. Using the hand helps to desensitise a hand scar. Hand therapists have the necessary skills and are prepared to set aside the time to help anxious and often depressed patients who are troubled by hyperaesthesia and stiffness.

Hand therapy and splinting

GPs and specialists can refer patients to hand therapists, who have a background in occupational therapy or, less commonly, in physiotherapy. Common referrals from local doctors relate to overuse injuries and tendinitis, mallet finger injuries, palmar plate and/or collateral ligament injuries, treated simple fractures and dislocations, compression syndromes (carpal tunnel syndrome and ulnar neuritis) and rheumatoid arthritis.

X-ray examination is often desirable before referral for conditions involving bones and joints and, as hand therapists are not qualified to make complicated diagnoses, some patients are best referred in the first instance to a specialist.

Treatment by the hand therapist

The initial assessment provides a baseline against which progress is assessed, eg, by measuring ranges of movement of joints and strength of grip. The patient usually sits at a table opposite the hand therapist. Treatment commonly involves:

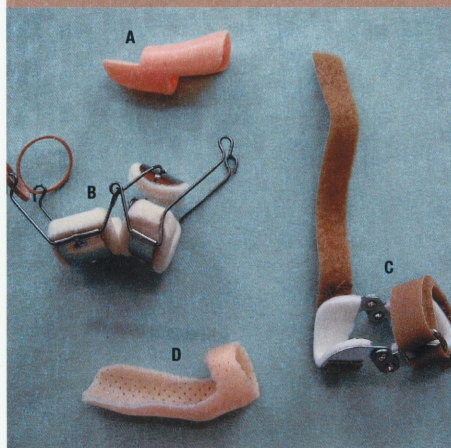
- Fabrication of static and mobile (lively) splints;
- Active and passive mobilisation;
- Scar management, including desensitisation;
- Oedema control, including measurement for pressure garments;
- Strengthening exercises;
- Advice on adaptive equipment;
- Liaison regarding return to work.

Most patients attend weekly but some require treatment by the hand therapist 2-3 times a week.

Many patients require considerable reassurance. For example, they may be wrongly worrying that a wound is infected because of mild redness and itching that are part of normal healing or because of early scar hypertrophy.

Patients may cover and protect a healed scar and avoid use of a healed injured digit. They often hold an injured finger out straight in an unsuccessful attempt to keep it out of the way. Scars must be massaged very frequently (several times every hour) and

Hand and finger splints. A. Mallet finger splint. B. Reverse knuckle bender splint. C. Collateral ligament splint. D. Dorsal blocking splint.



Hand therapists have the necessary skills and are prepared to set aside the time to help anxious and often depressed patients.

injured fingers must be exercised frequently and used whenever possible.

Some patients are easily encouraged to move fingers that are becoming stiff whereas others are loathe to do so, in which case much effort is required to prevent permanent stiffness. Established stiffness is best managed, at least in the first instance, by a hand therapist.

The shoulder must not be allowed to become stiff. While wearing a sling, the patient should be advised to put the shoulder (and elbow) through a full range of movement several times each day to prevent a stiff shoulder and thus the shoulder-hand syndrome.

Severely hypertrophic (keloidal) scars and true keloids are best treated by intralesional corticosteroid injections and, occasionally, by excision, but pressure therapy often helps. Pressure garments may be custom made or prefabricated and are best removed only for

Take-home messages

- Leave fingertips exposed to monitor the circulation whenever possible. Considerable pain, persistent swelling and even tissue loss can be caused by tight dressings, and long-term stiffness can result.
- Minor hand injuries can lead to major disabilities.
- All nail-bed injuries (except quite minor injuries) are best referred to minimise permanent nail deformities.
- Fine monofilament sutures should usually be left in the hand and wrist for two weeks so that the fingers can be exercised without disrupting the sutured lacerations.
- Slings are useful for short periods but make sure that the shoulder is put through a full range of movement several times each day to prevent a frozen shoulder.
- Discourage patients from covering hypersensitive hand scars and from taking analgesics for painful scars. Desensitisation is required.
- Early return to work is beneficial, both physically and psychologically.
- MRI and CT scans are best arranged by the treating specialist.
- Infections not subsiding after one course of antibiotics should be referred to a specialist.

hygiene purposes. Silicone-gel sheeting may assist the even distribution of pressure applied by a pressure garment.

Return to work usually marks the near completion of hand therapy. Early return to work, if only on modified duties for reduced hours, usually helps maintain the worker's self esteem.

Driving

Inability to drive often causes serious difficulties after a hand injury. Permanent disabilities sometimes necessitate a driving assessment by an authorised occupational therapist.

Assessment of recovery of function

Recovery of function should be assessed by measuring the ranges of joint movement and by reproducible tests of function, eg, measurement of grip strength, the Jobson hand function test or the disability of the arm, shoulder and hand (DASH) assessment.

What else not to do!

- Don't inject local anaesthetics through the palm: dorso-radial injection via the dorsum of the hand hurts less.
- Don't suture hand wounds with large, coarse or multistrand sutures.
- Don't splint the hand flat, ie, the fingers should not be splinted straight.
- Don't use a 'frog' splint because these splints cannot be adjusted to suit different purposes, usually hold the fingers straight, and are bulky, uncomfortable and inconvenient.
- Don't take out all monofilament sutures supporting a hand wound at one week because of one or two small suture abscesses — if necessary remove just the affected sutures.
- Don't accept undue delay of a specialist appointment for a relatively urgent matter.

Author's case studies

Palmar plate of the proximal interphalangeal joint sprained or avulsed?

TWO months before I saw her, Ms X, 19, had sustained a painful hyperextension injury to her right middle finger while playing beach volleyball. When she first sought medical advice at six weeks, X-ray examination demonstrated a small avulsion fragment slightly displaced from the palmar aspect of the base of the middle phalanx. A straight splint was applied to the finger.

Although the splint had been removed three weeks after the injury, the finger's proximal interphalangeal joint was still stiff in extension but gentle testing confirmed that the palmar plate had been sprained rather than avulsed as the collateral ligaments were intact.

Ms X was advised to discard the splint, flex the finger frequently and gently manipulate the finger's proximal interphalangeal joint into flexion and, despite the pain, she did so. She was warned that discomfort would persist for several weeks or months, especially in the cold, and that swelling of the joint would subside slowly but, probably, never quite completely. She agreed not to resume beach volleyball until the next summer.

Comment

Fortunately, the finger was splinted straight for only three weeks and Ms X could then tolerate the pain caused by flexion exercises. Had the period of immobilisation been longer and/or the patient's pain threshold lower, a hand therapist

Ms X first sought medical advice six weeks after injuring a finger playing beach volleyball.



would have experienced considerable difficulty restoring flexion of the finger.

The splint was never needed; buddy taping of the middle finger to the ring finger was all that was required. The finger should never have been allowed to become stiff.

Predict the likelihood of hyperaesthesia and act accordingly

MRS Y, a 40-year-old kindergarten teacher, was unduly concerned about a small lipoma of the palmar aspect of her dominant right thumb. Removal of the lipoma by a local doctor was uneventful, a sling was provided and the sutures were removed two weeks later, at which time she was given a certificate for one further month off work.

One week later, Mrs Y returned complaining of pain. An analgesic was prescribed but a further three weeks later she was still complaining of pain and said that she could not tolerate any touching of the thumb.

Nerve conduction studies were normal. She was sent to an orthotist who fabricated a protective splint, which she wore constantly.

An ultrasound examination was normal. Further medication was prescribed to relieve pain and anxiety. A neurosurgeon was unable to help. It was suggested that she might see an anaesthetist for pain management.

A neurologist concluded that she was suffering from mild complex regional pain syndrome and noted that her right thumb was stiff as

well as painful. The neurologist referred her to a hand therapist.

Mrs Y presented to the hand therapist still wearing the splint and cradling her right arm. She was tearful and anxious and said that she could not work. When the splint was removed, she held her right thumb straight and withdrew it when any attempt was made to touch it.

She was reassured and the nature of hyperaesthesia was explained. By the end of the first session, Mrs Y could tolerate light touching of her right thumb and she agreed to discard the splint and leave the thumb uncovered. She was given a detailed home program to desensitise the thumb by stirring a small tub of polystyrene balls and by rubbing rough surfaces. She was encouraged to exercise and use the thumb.

Later, Mrs Y spoke about a difficult marital situation and about problems at work. After several twice-weekly hand therapy sessions, she returned to work. Weekly hand therapy sessions continued until her confidence had been restored.

Comment

Because of Mrs Y's initial concerns and the site of the operation, post-operative hyperaesthesia might have been predicted and desensitising the scar could have been discussed before the minor operation was performed. Also, Mrs Y was not assisted by the certificate for one further month off work. Earlier referral to a hand therapist may have lessened her subsequent problems.

Reference

1. Therapeutic Guidelines Antibiotic Writing Group. *Therapeutic Guidelines: Antibiotic*. 3rd edition. Melbourne, 2003.

Useful web sites

For doctors

www.emedicine.com/emerg/topic225.htm (relates to soft tissue injuries to the hand)

Therapeutic Guidelines online:

www.etg.hcn.net.au/ (password obtained from the Federal Health Department).

For doctors and patients

www.ahta.com.au (a hand therapy web site)

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GP's contribution



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KARL, 63, an avid fencer with a 20-year history of ankylosing spondylitis, presented with triggering in the fourth finger on his right hand. On further questioning, Karl's ring finger had been triggering since childhood, but recently it had been increasingly painful and interfering with his fencing.

On examination the flexor tendon had a well-established tender nodule. There were no other systemic signs secondary to ankylosing spondylitis. Karl was advised initially to try gentle massage and anti-inflammatory medication.

He returned three weeks later continuing to complain of pain and disability. After discussion regarding the risk and benefits of corticosteroid injection, Karl's finger was injected with Kenacort A10 and lignocaine. Six months later Karl returned for a 'fit and well' certificate for fencing and for a repeat injection. Relief from the second

injection was short-lived and Karl returned in a further three months complaining of pain. The finger was once again injected and Karl was also referred for an ultrasound. The ultrasound demonstrated evidence of tenosynovitis of the flexor tendons of the right ring finger, with associated small synovial outpouching accounting for the palpable abnormality.

At Karl's next visit two months later, he was referred to a hand surgeon, who suggested he would benefit from surgical release. Karl's surgery has been scheduled after the upcoming national fencing competition.

Questions for the author

Could you comment on the appropriateness of management in this case?

Despite their effectiveness under other circumstances, massage and exercise have no appreciable useful effect on a trigger finger, and anti-inflam-

matory medication seldom has much effect. Performing some work tasks differently might have helped. The steroid injections were appropriate and the responses were as expected. Surgery was then indicated but was not urgent.

Should Karl's underlying seronegative arthropathy have influenced his management?

I do not believe so, but a rheumatologist might have a different view.

Should specialist opinion have been sought earlier?

Not necessarily.

Was any imaging required in this case?

I do not believe so because I cannot think of any difference in the planned management that could have resulted from an imaging study.

General questions for the author

What are the most common

mistakes GPs make in managing hand injuries?

- Underestimating the severity of an injury, including missing divided deep structures, fractures, joint injuries and foreign bodies, and not appreciating the seriousness of bite injuries;
- Not adequately debriding wounds;
- Late referral;
- Not immediately immobilising the hand in a position of function;
- Not advising use of a sling;
- Immobilising too long or in a poor position and then not encouraging frequent massage, exercise and use of the hand;
- Not advising a patient wearing a sling to put the shoulder and wrist through a full range of movement several times each day.

Is there an optimal time period for splinting finger sprains?

No. The required time

varies from a few days to several weeks and depends upon the nature of the injury and the manner of splinting. Intermittent splinting and special splints may be used for weeks or months.

Would most patients suffering moderate-to-severe hand injuries benefit from early referral to a hand therapist?

Probably yes, but some patients can attend to their own simple hand therapy if appropriately advised and followed up.

How long after closed tendon injuries, eg, mallet finger, can splinting be attempted to successfully correct the abnormality?

For as long as the site of the tendon avulsion is red-dened, uncomfortable and slightly swollen. Immediate splinting is best, but starting 2-3 months later may still be moderately successful.

HOW TO TREAT

Editor: Dr Lynn Buglar
Co-ordinator: Julian McAllan

NEXT WEEK

The next How to Treat explores ethical dilemmas in general practice. The authors: Dr Stephen Cohen is Associate Professor in the school of philosophy at the University of NSW, and director of the university's graduate programs in professional ethics. Dr Catherine Hickie is a practising psychiatrist in Sydney, NSW.