Plastic and Reconstructive Surgery

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THE HAND—II

Infections

The ultimate aim in managing injuries and infections of the hand is to produce a pain free, stable, and mobile hand.

Paronychia (whitlow) is an acute or chronic infection around the nail. Pus initially accumulates between the cuticle and the nail matrix. Treatment includes draining the abscess and splinting and raising the hand. The usual organism is a staphylococcus. Chronic paronychia is usually caused by a combination of low grade staphylococcal and candidal infection. If the lesion is not cured by appropriate chemotherapy then excision of the adjacent nail may help.

Infection of the pulp space (felon) is often extremely painful because the fibrous septa limits the spread of any pus. The increase in pressure can cause thrombosis of the small distal digital vessels and in a chronic case can lead to avascular necrosis of the distal phalanx, beyond the epiphyseal plate.

Webb space infection—The palmar space, the thenar space, and the flexor tendon sheaths may become infected. Again treatment depends on drainage and antistaphylococcal antibiotics. In suppurative tenosynovitis the finger becomes swollen and sausage like and is held in the flexed position; movement causes extreme pain. The tendon sheath may have to be irrigated with solution of benzylpenicillin.

Human bites are usually sustained in fights when a blow to the opponent's teeth causes a laceration over the dorsum of the metocarpopharyngeal joint. The injury is usually compound, affecting the skin, the underlying extensor tendon, and the joint cavity. The wound may be contaminated by foreign bodies, especially fragments of broken teeth. These injuries are renowned for their initial trivial appearance belying their severity. This may become manifest only when the wound has failed to heal after many weeks and with the development of a septic arthritis. The wound should be explored and wound swabs taken for aerobic and anaerobic culture. The wound should then be carefully debrided and the hand must be raised and splinted. Delayed repair of structures is best, together with the use of both antistaphylococcal and antianaerobic chemotherapy (metronidazole).

Foreign bodies

Foreign bodies are common in injuries to the hand. These may present acutely or through chronic infection. In the case of non-irritant foreign bodies such as broken ends of needles, flakes of steel from grinding machines, and small fragments of glass, a "wait and observe" policy can be advocated, especially if the fragments lie deep in the hand. Provided the foreign body is small it causes little problem and becomes sealed off by a fibrous capsule. This makes it easier to locate if it does go on to cause trouble. Irritant foreign bodies, in particular wooden splinters, rose thorns, cacti, and sea urchins' spines, are best explored at the time of presentation, before frank abscesses develop. Radiographs taken in two planes with a marker attached to the skin may help to locate radio-opaque foreign bodies.

Needle inserted through dorsal aspect and advanced until it is felt under the skin on the palmar aspect. Plain lignocaine is then injected as the needle is withdrawn along its whole course.

A tourniquet can be fashioned using the amputated finger of a sterile glove.

Exploration should be undertaken under the very best of surgical conditions with good lighting, a bloodless field provided by a tourniquet, and good anaesthesia by either local digital nerve block, regional block, or general anaesthesia.

Nail injuries

The nail is a keratinised, epidermal skin appendage. It supports the terminal pulp of the finger and is therefore important in helping sensation and grip. It also has an aesthetic property and may occasionally have a combative function. Nails grow at about 1 mm a week, more rapidly in the hand than in the foot, in the young, in the middle finger, and in the dominant hand.

A blunt crush injury to the tip of the finger can produce a closed injury and subungual haematoma. The haematoma is under high pressure and is therefore very painful. Initial treatment by elevation and cold compresses can help, but trephining the nail with the end of a heated paper clip produces instantaneous relief.

A more severe injury may avulse the nail either partially or completely. Any part of the nail can become dislocated but usually the proximal nail becomes sprung from underneath the nail bed fold. In more severe injuries the nail can be completely detached with or without damage to the underlying matrix or nail bed, and there may be an accompanying phalangeal fracture. If the nail bed is undamaged the nail will regenerate, and so long as no adhesions occur between the lunula and the nail bed there will be no surface irregularities in this new nail. Adhesions are best prevented by replacing the avulsed nail in its exact position, using it both as a splint to the nail matrix and as a dressing to the nail bed. Injuries to the nail bed are important, since any surface irregularity will lead to a new nail being deformed. Lacerations should be accurately repaired using magnification. Any tissue loss should be replaced with a partial thickness skin graft.

Late deformities of the nail are extremely difficult to treat both cosmetically and functionally. Many patients may best be served cosmetically by having their nail removed and using an artificial nail. More modern microvascular techniques allow nails and nail beds to be transferred from the toes to the hand using the dorsalis pedis artery and vein. This is, of course, a surgical tour de force.

Pulp tip injuries

Injuries to the finger tip can be either simple lacerations, guillotine amputations, or crush injuries producing a more extensive ragged bursting type of injury. On initial examination the clinician should try to assess the amount of skin loss, whether there is exposed bone, and the viability of the remaining skin. In young children most injuries can be treated conservatively even when there is extensive skin loss and exposed bone, as the finger tips in this age group have remarkable abilities to heal, and even possibly regenerate. Skin that is present and viable should be replaced in the correct position; pieces of skin can be retained with Steristrips, but these must not be placed circumferentially around the finger. The best splintage and dressing is provided by the corner of the aluminium foil packet which is used to package vaseline gauze dressings.

In an adult the type of repair should depend on the type of injury, the finger affected, the age and occupation of the patient, and the manual dexterity that he requires. Where there is pure skin loss a partial thickness skin graft is the simplest method of coverage; this will eventually contract leaving a scarred tip to the finger. If this provides unsuitable cover a later reconstruction with local flaps can be performed. For some patients, particularly those for whom cosmesis is important, the finger length can be maintained by the use of local flaps. These are best used where there are straight or dorsally angled amputations. In other cases cross finger or thenar flaps may be used but the disadvantages of these types of repair are the scars produced on other fingers and the three weeks' immobilisation, which may produce stiffness in both the injured finger and other joints of the hand. In a manual worker with thick fingers who does not require fine manual dexterity and where there is exposed bone the simplest procedure may be to nibble back the exposed bone and perform a distal amputation. This usually provides the quickest form of healing and thus gets the patient back to work in the shortest possible time.

Joint injury

Joint injuries are common, often sustained during fights or sporting activities. The patient presents with a swollen tender finger joint. If there is a nearly complete full range of active movement with no instability then there is probably no serious injury. Such a "sprain" may extend as far as a partial tear of the collateral ligament. Such minor injuries often remain painful for six months, swollen for two years, and cause considerable inconvenience, but they usually settle without any specific treatment. The major point of management is early mobilisation to avoid joint stiffness. When there is limited or abnormal movement the lesion is more sinister, and anteroposterior and true lateral radiographs should be taken of the joint. Any subluxation or dislocation should be reduced. If it is not easily reduced by manipulation then an open reduction should be performed as this usually indicates soft tissue interference with the reduction. When there has been a complete tear of the collateral ligament or volar plate, as often indicated by a flake fracture on the x ray film, open reduction and fixation are required.

Mallet finger injuries

Mallet injuries are a disruption of the distal part of the extensor mechanism of the finger, distal to the interphalangeal joint. Only the tendon may have been ruptured, but many of these injuries also include avulsion of a small fragment of bone at the insertion. When there is no associated fracture splintage of the extended finger for six weeks is sufficient. If there is a large fragment of bone attached to the ruptured tendon, and especially if more than a third of the joint surface is affected, open reduction and fixation should be performed. It is important that the patient retains good flexion at the interphalangeal joint, and this should not be compromised by trying to gain a complete range of extension.

Management of lacerations

The dangerous laceration with a glass spicule.

Nowhere is it more important that an accurate history and careful and thorough examination should be undertaken than with lacerations, for primary repair offers the best results to most such injuries. Inappropriate treatment or missed injuries to deeper structures lying beneath a trivial skin wound can lead to some patients requiring extensive secondary surgery. In some cases the end result is a useless, painful, stiff finger, hand, or arm—with crippling consequences. Examination of such an injury should follow the time honoured orthopaedic system of taking a history and then looking, feeling, and moving.

<p>Normal posture in a relaxed hand supported at the wrist</p>	<p><u>History</u></p> <p>Acute - When, where, what and how position of hand or finger</p> <p>Chronic: Pain, stiffness, weakness progress since injury</p> <p>General Dominant hand occupation and hobbies commitments: work and home</p>	<p>Abnormal posture due to laceration at wrist</p>
<p>Lacerated finger: structures that can be damaged</p>	<p><u>Look</u></p> <p>Posture</p> <p>Compare — Injured with uninjured</p> <p>Viability</p> <p>Skin loss</p> <p>Position of laceration NB Anatomical level</p>	<p>Lacerated wrist</p>
<p>Nerve testing 'Pin prick'</p>	<p><u>Feel</u></p> <p>Pulse</p> <p>Temperature</p> <p>Viability</p> <p>Neurological tests</p>	<p>Nerve testing 'Pen test'. Lack of sympathetic innervation produces decreased resistance because of no sweating</p>
<p>Superficialis test: extending other fingers relaxes the profundus</p>	<p><u>Move</u></p> <p>Tendons — Active</p> <p>Joints — Range of movement</p>	<p>Profundus test</p>

Fractures of the hand

As with other fractures, treatment of fractures of the hand depends on reduction, retention, and rehabilitation. Three groups can be identified.

The minimally displaced but stable fracture may be rested for a few days to allow the swelling to settle and the pain to subside. This then allows the adjacent joints to be mobilised within a few days, which is important to prevent stiffness. Swelling, which has been called the cement of the hand, can be reduced by keeping the hand raised in a high sling and elevating it on pillows by the side of the bed at night. Seventy per cent of fractured phalanges can be mobilised early.

Most unstable fractures can be treated by reduction and splintage in the correct position, which is with the metocarpophalangeal joint flexed and the interphalangeal joint in extension. Splintage can be achieved by strapping to the adjacent finger, allowing a dynamic form of support, or by using an external metal Zimmer splint, or plaster of Paris front slab. It is important to check the position of the tips of the fingers for malrotation. Twenty five per cent of fractured phalanges require such treatment.

A minority of unstable fractures or failed closed reductions require internal fixation. This may also be necessary in displaced fractures close to a joint, multiple fractures, or where the finger has been replanted. However, this type of management accounts for only about five per cent of cases.

Flexor tendon injuries

The flexor tendons pass through the carpal tunnel and both a superficial and a profundus tendon supply each finger. For most of the length of the finger the two tendons lie next to each other in a flexor tendon sheath. Injuries to these tendons in the finger have until recently been associated with a very bad prognosis and in the past tendons were not repaired primarily: management was by a delayed tendon graft. Modern methods of tendon repair, in which both tendons are repaired at the time of injury with careful postoperative supervision using dynamic traction, provide far better results than either delayed repair or tendon grafting. Tendon repair is performed under tourniquet and the incisions need to be extended to oppose the two ends of the tendon. The ends of the divided tendon should be handled as atraumatically as possible. The flexor tendon sheath must be repaired at the same time, as must the thickenings in the flexor tendon sheath which act as pulleys and keep the tendon adjacent to the phalanges.

After operation the hand is raised and set in dynamic splintage. This comprises a protective back slab plaster with the wrist and the fingers flexed on a tight elastic band. Active extension allows the finger to be straightened but it is then returned to the flexed position by the pull of the elastic band. This protected movement should be maintained for six weeks, after which the patient should be referred for rehabilitation.

Repair of nerves

The repair of nerves remains a major problem in hand surgery. The most important factor other than the amount of damage at the division is the age of the patient. Young patients obtain good results, but in older patients, no matter how accurate the repair, the results will generally be disappointing. The best results are undoubtedly attained by primary repair of the nerve, the use of magnification, avoidance of any tension, and the provision of a well vascularised bed.

Four weeks' immobilisation is then usually necessary until the two ends are well joined. When major nerves are divided it is important that the patient realises that it will take many months before the nerves regenerate and that the results go on improving up to a year or more and may further be helped by sensory re-education.

Neuroma, causalgia, and reflex sympathetic dystrophy

When a nerve is divided the proximal fibres first degenerate and then regenerate, producing a large sprouting mass from the proximal end of the nerve. If these new nerve fibres fail to grow up the distal myelin sheath they eventually lead to formation of a neuroma. Such damage to a nerve may produce a range of symptoms ranging from a localised neuroma to, at its extreme, a painful, swollen, stiff hand with loss of hair, changes in the nail, and thinning or atrophy of the skin. Alternatively, the hand may be affected by hyperpathia, in which light touch causes severe pain, although there may be little associated sensory or motor loss.

Treatment consists of: (a) rehabilitation; (b) electrical counterstimulation, which decreases the ectopic generator firing; and (c) sympathetic block using guanethidine, which decreases the local noradrenaline concentration. Surgery has little part to play except in an unrepaired divided nerve. Simple resection of the neuroma rarely helps; neither do local blocks using phenol and alcohol.

Causes of nerve pain

- 1 Nerve as an ectopic generator of painful stimuli
- 2 Cross linkage of myelinated and non-myelinated nerve fibres
- 3 Dorsal root ganglion acts as ectopic generator
- 4 Increased sensitivity to noradrenaline or sympathetic stimulation

Rehabilitation

Two major factors determine the outcome of most hand surgery: firstly, the character of the patient, his willingness and enthusiasm to cooperate, withstand local pain and discomfort, and work diligently at rehabilitation; and, secondly, the provision of a properly manned occupational therapy and rehabilitation service. An occupational therapy unit must include a person who can attend the hand clinic regularly to provide assessment of hand function both before and after operation. This evaluation includes work and domestic environments and also assesses the range of movements in individual joints and the strength of various grips, etc. The facilities offered by the unit should include wax baths, an ice machine, ultrasound, and the ability to make customised splints. Once the initial surgery has been undertaken and the wounds have healed the patient should then progress to a home orientated unit; and there should be a workshop with the ability to adapt implements to preserve a patient's independence both at work and at home. After nerve repairs sensory retraining is important. This includes the recognising of shapes and textures of various fabrics and materials.

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Philosophical Medical Ethics

To what do we have moral obligations and why? II

RAANAN GILLON

In my last article I looked at claims that all living human beings have special moral importance including a "right to life" just because they are living human beings. I contrasted these claims with the Benthamite claim that all creatures that can experience suffering and pleasure are morally equal and that all moral issues including that of the right to life depend entirely on calculations of overall pleasure and pain, irrespective of difference in species. I shall now consider arguments about the moral importance of: being human; "viability"; and being a "person."

"Speciesism"

Professor Peter Singer, a contemporary utilitarian, argues against both the simple Benthamite moral equating of humans and other sentient animals and what he dubs the prejudice of "speciesism" (a neologism attributed to Richard Ryder and intended to be a pejorative term analogous to racism and sexism—"specism" would have been better). Thus, so far as pain and suffering go, Singer argues that "pains of the same intensity and duration are equally bad

whether felt by humans or animals."¹ To be prepared to inflict such pain on animals but not on humans, other circumstances being the same, is irredeemably speciesist. On the other hand, argues Singer, human beings tend to have many interests that most other sorts of animals do not and cannot have. It is possession of such differing interests that can ground different moral rights and moral evaluation of human beings who possess these interests. Thus human lives that have a capacity for self awareness, ability to plan for the future, ability to have relationships with others and close family and personal ties, importance to other affected human beings, and other attributes such as the capacity for abstract thought and complex communication may, claims Singer, be legitimately valued more than lives that do not have these qualities.

This, he argues (somewhat contentiously), in no way undermines the principle that in making any moral decision the interests of all sentient beings affected by that decision must be taken equally into account; it is just that those interests are often vastly different. Such differences, however, are not determined simply by membership of a species. For instance, so far as a right to life is concerned "mere membership of our own biological species cannot be a morally relevant criterion. . . . A chimpanzee, dog, or pig, for instance, will have a higher degree of self awareness and a greater capacity for meaningful relations with others than a severely retarded infant or someone in a state of advanced senility. So if we base the right to life on these characteristics we must grant these animals a right to life as good as, or better than, such retarded or senile humans."²

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