MINOR HAND INJURIES
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Little originality is claimed for this paper, which reports some of the cases treated at the London Hospital during the last year. There are nearly 24,000 attendances in the Orthopaedic and Accident Department each year, of which about 6,000 are accident cases. Since no beds can be reserved for these patients the vast majority have to be treated as out-patients and operated on under local anaesthesia.

Apart from domestic accidents, most of the injured hand cases come from the surrounding tailoring and wood-working industries. The title of this paper was deliberately chosen to exclude the more dramatic major mutilations. So-called "minor" injuries of the hand are responsible for an enormous loss of working time, and by laying down standard methods of treatment we have found that we are returning patients to work earlier than in previous years.

With the publication of Rank and Wakefield's book (1953) stressing the principles of repair in the treatment of hand injuries, a reasonable classification and outline of treatment have become readily available. Most of the cases reported here fit into that classification, and in general the treatment has been found to follow the recommendations of Rank and Wakefield.

Classification—The cases described are classed under the headings: extensor tendon injuries, finger tip injuries, and skin flap injuries.

ILLUSTRATIVE CASES

EXTENSOR TENDON INJURIES

Rank and Wakefield rightly stressed the difficulties frequently met in trying to obtain a result which is of a high standard both from the surgical and practical viewpoints.

The cases to be described in this group illustrate injuries to the tendons at the four common sites: the dorsum of the wrist, over the metacarpophalangeal joint, over the proximal interphalangeal joint, and at the distal insertion of the tendon.

The dorsum of the wrist—Figure 1 shows the left hand of a youth of seventeen who fell through a window, cutting the extensor tendons to the index, middle and ring fingers.
Fortunately, the flap which had been raised was based proximally and gave a good exposure of the tendons, which were repaired with fine wire. Figure 2 shows the lag in extension of the index finger six weeks after injury; with active exercises the slack was taken up within two months and the final result is shown in Figure 3.
The metacarpo-phalangeal joint—Figure 4 (top) shows the right hand of a man in which there was actual loss of skin and extensor tendon caused by a circular saw injury. The joint was not damaged. The severed tendon was sutured by fine wire and a rotation-advancement flap was moved to replace the skin loss. The bottom picture shows the result obtained five weeks after injury and Figure 5 indicates the range of movement.

The proximal interphalangeal joint—Figure 6 shows a cog wheel injury to the left middle finger of a printer. The extensor tendon was virtually severed over the proximal interphalangeal joint, the capsule of which was also penetrated. Both wounds of the tendon were sutured with fine wire and the skin wounds closed with nylon sutures. Figure 7 shows the result six months after injury. The range of movement is: proximal interphalangeal joint—active 165–115 degrees, passive 170–100 degrees; distal interphalangeal joint—active 145–100 degrees, passive 180–100 degrees. This finger illustrates the type of case that can be considered a bad surgical result but an acceptable practical one in that the deformed finger is no hindrance to its owner.

The distal interphalangeal joint—Figure 8 shows the result of a crush injury to a woman's left ring finger. The bony fragment was removed and Figure 9 shows the very indifferent result obtained. The patient is, however, quite satisfied with the finger. The range at the joint is: active 180–160 degrees; passive 180–150 degrees.

That mallet fingers are notoriously difficult to treat satisfactorily is shown by the great variety of treatments suggested. When there is an open wound with bony damage, suture must always be tried, but we have found accurate reposition of the bony fragment often extremely difficult.

FINGER TIP INJURIES

These are by far the most common injuries treated and, after cut/crush ratio (Barron 1947) has been determined, are classified for treatment as small "tidy" areas, nail injuries, partial
and complete amputations, and pulp loss. Small areas of "tidy" epithelial loss are replaced by a thick split-skin graft and need no comment.

Nail injuries—Slicing wounds frequently involve both the nail and finger tip. These wounds should be treated by an immediate split-skin graft. Ideally, the graft should be cut thinner at one end. The thin part should be placed over the nail area and the thicker part over the finger-tip wound. Figure 10 shows the finger of a butcher which was treated in this manner. As the nail grew it covered the thin part which became incorporated in the nail bed (Fig. 11).

Partial amputation—Injuries such as that shown in Figure 12 are common in the tailoring industry, being caused by a power-driven cutting machine. Provided that one of the vascular bundles is intact, the flap, even if it includes the bone, should be sutured back into place.
the hand kept elevated and the minimum of dressings applied. The results are almost invariably good (Fig. 13).

Complete amputation—Rank and Wakefield stressed that considerations of ideal amputation sites do not apply in the immediate treatment of traumatic amputation of digits. All available skin should be used to give the greatest length possible. Figure 14 shows a crush injury to the right little finger of a stonemason. The radiograph (Fig. 15) shows that there was extensive exposure of the distal phalanx. The phalanx was, therefore, filleted out and the remaining soft tissues were used to cover the defect. Figure 16 shows the final result.

![Fig. 14](image1)
![Fig. 15](image2)
![Fig. 16](image3)

**FIG. 14** Complete amputation. **FIG. 15**—Initial state. **FIG. 15**—Radiograph showing exposure of phalanx. **FIG. 16**—Result after filleting the phalanx and closure of soft tissues.

Pulp loss—When there has been considerable pulp loss of the "tidy" type, it is our practice to use a palmar flap. Figure 17 shows the right ring finger of a man's hand that had the pulp removed by being crushed in a car door. A palmar flap was attached for two weeks (Fig. 18); the final result is shown in Figure 19. Figure 20 shows a man's right hand injured in a machine cutter. The thumb was intact; the index finger had minor lacerations; the middle finger had considerable pulp loss; the distal phalanx and nail of the ring finger had been avulsed and a ragged flap had been raised on the palmar surface of the little finger. The middle finger was treated by a palmar flap, the ring finger by removing the phalanx and completing the amputation, and the flap on the little finger was loosely sutured into place. Figure 21 shows the final result.

We have no hesitation in recommending the use of the palmar flap for reconstituting these finger tips. Rank and Wakefield did not recommend the practice and Robins (1954) has recently described his use of the post-auricular graft in these cases. It seems probable that skin from a distance must be an inferior substitute for a full-thickness skin flap with associated fat. The palmar flap skin comes from an area which is accustomed to trauma and contains in far greater abundance than skin from any other area the appropriate nerve endings into which regeneration can take place. The operation is frequently condemned on the grounds that a second defect is created in the hand. If a thick split-skin graft is sewn into the donor site the resultant area is perfectly serviceable and the photographs show that it soon takes up the normal palmar creases.

**SKIN FLAP INJURIES**

The two cases to be described in this section illustrate a problem that is sometimes presented by flaps raised by injury.
Figure 22 shows a small flap raised by the patient while chopping wood. The photograph was taken twelve days after the injury and shows a swollen tense flap with necrosis of its edge. Figure 23 shows the healed state one month later; the flap is still tense and oedematous.

Figure 24 shows a large multiple palmar flap raised by trauma. The flap was sufficiently thick to expose the palmar muscles. The photograph was taken six days after the injury and seems to show good primary healing, but the tip of the flap is discoloured. Figure 25 shows the state one month later; the tips of the flap have sloughed away and the distal portions are swollen and oedematous. Figure 26 shows the final state fifteen weeks after the original injury.

The common factor in these two cases is that the flap is based distally. In the hand,
FIG. 20

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FIG. 21
Pulp loss from middle finger; avulsion of distal phalanx of ring finger. Figure 20—Initial state. Figure 21—Result.

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a flap which is based proximally has both an adequate arterial supply and a good venous return. A flap based distally, though it has an adequate arterial supply, has its normal venous return system completely severed. The flap bleeds freely from its tip but because of

the lack of venous return the blood stagnates, the flap swells and distal portions often slough. The narrower the base of the flap and the more acute the angle of its tip, the more the flap is likely to be lost.
Unfortunately, an accurate prognosis for a flap cannot be given unless it is of the narrow peninsular type, when it is almost certain to die. Some guidance can be obtained from the fact that a Z-plasty flap is usually designed with an angle of not less than 60 degrees. A flap that seems certain to die should be flayed and replaced as a full thickness skin graft. Probably the best treatment for the doubtful flaps is to excise the area of loss when it is defined and apply a split-skin graft to the defect if the area warrants it.

COMMENT

The cases described here have been chosen to illustrate a cross-section of the types of injury treated in this department as out-patients. Average results have been shown rather than the occasional good result obtained in the more difficult cases.

All the operations were done under local anaesthesia, most being under digital block, but three patients were operated on under brachial block anaesthesia and were admitted overnight as beds happened to be available. With the exception of the more extensive tendon injuries, all the patients were treated by the senior house surgeon to the department or by the surgical dressers under his direction.

A major problem has been the frequent change of house surgeons, necessitating the repeated training of new ones. By insisting on the strict immediate classification of all wounds and on their treatment by a standard plan, we have found that a satisfactorily high standard of treatment can be maintained. This training has been greatly helped by copying Clarkson's (1951) system of wall cards to illustrate principles of treatment.

Before reorganising the treatment of these minor hand injuries, we found that most of the unsatisfactory long-term results were in cases of nail injuries and pulp loss. This was because frequently the former had been left to heal by granulation and the latter had been grafted with thin split-skin grafts which would not withstand the trauma to which they were subjected.

By immediate grafting of all nail injuries we are now getting good results, and in the use of the palmar flap we have yet to have an ungrateful patient. The only disability which appears to result is a somewhat distinctive set of finger prints.

By the use of "Tubegauz" dressings, protected when necessary by leather finger stalls, most patients with lacerations and free grafts have been kept at work and the remainder have returned to useful employment earlier than we have previously managed.

Accurate figures are impossible to obtain, particularly as some patients, having been issued with their Final Certificate, have been known to destroy it and to persuade the private practitioner to continue the issue of Intermediate Certificates. A further factor which often hinders an early return to work is protracted litigation, cases sometimes being brought for what are truly trivial injuries.

My thanks are due to Sir Reginald Watson-Jones for his interest in this work and to the house surgeons to the Department who treated the cases. I would also like to thank Mr R. F. Ruddick for his willing co-operation in securing the photographic records.

REFERENCES