INTRA-ARTICULAR AND PERI-ARTICULAR FRACTURES OF THE PHALANGES


From the Accident Service, Radcliffe Infirmary, Oxford

It is generally accepted that joint injuries accelerate the onset of degenerative changes, with increasing pain and stiffness of the affected joint. The incapacity produced by a stiff and painful finger can be considerable, and may lead to serious disability, with a consequent loss of earning power. A review has therefore been carried out to investigate the disabilities that may be expected after the various types of intra-articular and peri-articular fractures of the phalanges of the hand.

MATERIAL

Between July 1953 and December 1957, 1,225 patients attended the Accident Service of the Radcliffe Infirmary with fractures of the phalanges; 223 (19 per cent) of these fractures were of the type under review. The records of these patients have all been examined and as many patients as possible have been traced, examined and radiographed. The average age at the time of injury was thirty-one years.

Of the 117 patients that could be traced ninety-two (79 per cent) were male and twenty-five (21 per cent) female. Eighty-four male patients and twenty-two female patients could not be traced.

The incidence of the various types of injury is shown in Table I. There was no common pattern of injury among the open or miscellaneous types of injury, and these have therefore been excluded from the review.

TABLE I
THE NUMBERS OF PATIENTS AND THE VARIOUS TYPES OF FRACTURE IN THIS SERIES

<table>
<thead>
<tr>
<th>Type of Fracture</th>
<th>Number Traced</th>
<th>Per cent</th>
<th>Patients Reviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallet fractures</td>
<td>38</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Hyperextension sprain fractures</td>
<td>42</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>Proximal phalangeal corner fractures</td>
<td>34</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Phalangeal head fractures</td>
<td>20</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Fracture-dislocation</td>
<td>18</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Compound fractures</td>
<td>23</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>48</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>223</strong></td>
<td><strong>100</strong></td>
<td><strong>117</strong></td>
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</tbody>
</table>

RESULTS

Mallet fractures—Twenty-two patients with this injury were traced—fourteen with slight separation of the bony fragment, and eight with wide separation (Figs. 1 to 6).

Fifteen were treated in a metal splint (Fig. 7) for an average of thirty-eight days, five in a mallet plaster-of-Paris cast for an average of twenty-three days, and two had no treatment
as they attended more than one month after the injury. Only eleven patients attended within forty-eight hours of the injury.

The interval between injury and review varied from eight months to six years, the average being four years. Pain was not a feature except for the one patient seen only eight months after the injury (this finger was reviewed at this time because the patient attended with a much older injury of another finger). Only four other patients, with varying severity of injury, complained of slight pain which was felt only in cold weather or when the joint was knocked or strained. Thirteen fingers had restriction of movement at the distal joint, and nine of

these had a fixed flexion deformity of the terminal joint of between 10 and 30 degrees. In the fingers with a fixed flexion deformity the amount of separation of the fracture varied; seven of the nine patients attended many days after the injury. The two patients who attended soon after the injury showed radiographic evidence of degenerative changes in the joint at the time of injury.

Wide separation of the avulsed bony fragment was present in eight fingers, but only two of these had any fixed flexion deformity. Most of these patients had, however, attended for treatment soon after the injury.

Radiographs taken at the time of review showed a varying amount of bone extending from the dorsum of the base of the distal phalanx and related to the amount of separation
of the fragment originally (Figs. 2 and 4). In no patient did the fragment fail to unite by bone however widely it was separated at the time of injury. The joint space usually showed some irregularity, though not often was it narrowed. One patient, who was untreated and who did not attend until one month after the injury, developed a spontaneous bony ankylosis (Fig. 6). **Hyperextension sprain fractures**—Twenty-two patients with this injury of the proximal interphalangeal joint were traced, three with a distal joint injury. The radiographic picture was typical (Fig. 8). In no case was there any subluxation of the joint. The injured finger was immobilised in plaster-of-Paris in semi-flexion for an average of fifteen days. Only one patient failed to attend hospital within two days of the injury.

The interval between injury and review varied from two to seven years, the average being four years. Only five patients complained of any symptoms, which consisted of slight aching in cold weather, or on a heavy strain of the injured joint. Only one patient had any restriction of movement—a loss of 20 degrees of flexion at an injured proximal interphalangeal joint, for which there was no apparent reason. Radiographs at the time of review invariably showed slight spiking anteriorly on the base of the affected phalanx (Fig. 9) but an otherwise normal joint.

**Corner avulsion fractures**—To the seventeen patients with this injury traced at the Radcliffe Infirmary, ten other patients have been added, who were treated and reviewed at the Cardiff Royal Infirmary. In fourteen patients there was a chip, or small fragment, of bone separated without rotation (Fig. 10). In thirteen patients the fragment was displaced and rotated (Fig. 12). In no patient was there any evidence of subluxation of the metacarpophalangeal joint at the time of first attendance.

The interval between injury and review varied from two to ten years, the average being four and a half years. Fifteen patients were treated by immobilisation in a plaster cast for an average of seventeen days; eight were treated with strapping alone, but none of these had rotation of the bony fragment; one patient had no treatment; two patients had operations, one having a rotated medial corner fragment replaced and held with a catgut suture two weeks after the injury (Figs. 14 to 16), and the other having a rotated lateral corner fragment excised five weeks after the injury (Figs. 17 and 18).

The patient who had no treatment was a man aged fifty who attended two weeks after an injury to the thumb, complaining of pain and abnormal mobility at the metacarpophalangeal
joint. The radiograph showed a fracture of the lateral margin of the base of the proximal phalanx with rotation and an unusually wide separation of the bony fragment (Fig. 19). No treatment was given. Ten years later he complained only of pain in cold weather and on heavy use of the thumb. There was severe medial instability of the joint, with pain on straining. The radiograph at the time of review showed separation of the fragment with medial subluxation of the proximal phalanx (Fig. 20).

Only five patients attended hospital more than two days after the injury. Seven patients complained of some discomfort when the injured joint was strained. In three of these the fragment had been rotated and in three it had been slightly displaced without rotation. The other patient was the one with marked subluxation of the metacarpo-phalangeal joint of the thumb. Only two patients had slight loss of flexion of the affected joint; both had suffered fractures with rotation of the fragment. In all but two patients the radiographs at review showed that the fragment had united by bone in the original displaced position (Figs. 11 and 13). In one patient the fragment obtained a stable painless fibrous union (Fig. 21); the other exception was the subluxation already described. There were no degenerative changes.

Fractures of the head of the phalanges—Eleven patients with this injury were traced, of whom six had condylar fractures of various types of the heads of the proximal and middle phalanges, and five had avulsed chips at the attachments of the collateral ligament (Fig. 22). Condylar fractures have been excluded from this review. The injured finger was immobilised in plaster-of-Paris in partial flexion for an average of eighteen days. Five patients attended later than one day after the injury.

The interval between injury and review varied from four to seven years, the average being five years. The numbers are unsatisfactorily few, but two of the five patients with avulsion chip fractures suffered pain in the affected joint and four had a flexion deformity of 20 to 30 degrees with slight limitation of flexion.
Fracture-dislocation—Seven of the eight patients who could be traced had suffered dorsal dislocation (Figs. 23 and 24), and the eighth had a palmar dislocation of the proximal interphalangeal joint of the left ring finger. All were associated with one or more small avulsed fragments of bone around the affected joint. One joint remained subluxated after dislocation (Figs. 26 and 27), but this patient attended for treatment for the first time ten days after the injury. The other patients all attended shortly after the injury. Treatment by reduction and immobilisation in flexion in a plaster cast was used on the average for eighteen days.

The interval between injury and review varied from four to nine years, the average being six years. Four patients felt some discomfort in cold weather and when they strained the joint. The patient with the persistent dorsal subluxation had a painless joint but had only 25 degrees range of movement from the extended position. Only three patients had a full range of movement, of whom two had discomfort in cold weather. There was no radiological difference between the patients with full or limited movement of the injured joint, and the radiographs showed either no sign of any joint damage or ossification anterior to the base of the middle phalanx (Fig. 25), which was more extensive than that which followed the hyperextension sprain fractures (Fig. 9).

**DISCUSSION**

That the injuries under review are uncommon is indicated by the relatively small number in this series despite a search through the records of a large number of patients; also no large series has been found in the literature, with the exception of mallet finger injuries. This suggests that treatment is largely determined by hearsay, or by following textbook recommendations. Moberg and Stener (1953) published experimental work on ligament injuries of the fingers and reviewed thirty-one patients with various ligament injuries.

The number of patients who suffered fracture-dislocations and phalangeal head injuries are unfortunately too few to allow any satisfactory conclusions, although it is interesting that four of these eight patients with fracture-dislocations felt pain in cold weather or with strain, and five had a restricted range of movement. Among the phalangeal head injuries it is
particularly striking that the collateral avulsion chip fractures caused a high incidence of discomfort (two out of five patients) and loss of function (four out of five patients).

It was possible to trace and review a more satisfactory number of patients with the remaining types of injuries.

**Corner avulsion fractures of proximal phalanges**—In the management of these injuries there is some difference of opinion. Perkins (1958) recommended ordinary movement provided that lateral hinging is prevented; removal of the fragment was advised if it was rotated. Flatt (1959) considered that these injuries were serious and agreed that the rotated fragment should be removed, but advised immobilisation in plaster-of-Paris for three weeks. Robins (1961) pointed out that permanent disability would occur unless adequate treatment was given, and recommended six weeks' immobilisation, but gave no indications for surgery.

In this series only two patients had operations, one because of pain within five weeks of the injury and the other because of rotation of the fragment. When reviewed neither of these two patients had any residual restriction of movement, but the patient who had the fragment removed had a tender scar. However, of the other ten patients presenting with the bony fragment rotated, and excluding the patient with the untreated subluxated joint, only three complained of any discomfort on strains, and only two had slight loss of flexion of the joint, one of whom being the only patient whose fragment had failed to unite by bone, though obtaining a sufficiently strong fibrous union to prevent subluxation of the joint. The only review radiograph that showed no deformity was that of the patient who had the fragment excised. It is, therefore, possible to obtain a good symptomatic and functional result with bony union by conservative treatment despite rotation of the fragment, provided that there is no delay in starting treatment.

**Hyperextension sprain fractures**—Although Perkins (1958) and Furlong (1957) both recommended mobilisation, it seems more reasonable to rest a joint of which the capsular attachment has been partially, or perhaps completely, ruptured. All the fingers in this series were immobilised for an average period of fifteen days, and only one patient suffered any loss of movement; this was an average lesion that received average treatment, and no reason could be found for the different end result. Hyperextension fractures of this type are often thought to be caused by subluxation of the joint, or occasionally by a spontaneously reduced dislocation. The contrast in the recovery of the range of movement after this injury is striking when compared with the results of avulsion fractures associated with dislocation in which five out of eight patients had persistent loss of function. It seems likely that in dislocations the capsular lesion, and consequent new bone formation, is more extensive (Fig. 25), leading to more severe restriction of movement, and that the minor bony changes found after hyperextension injuries (Fig. 9) are an indication that traumatic subluxation or dislocation has not occurred. The unexpectedly high incidence of stiffness (four out of five patients) following collateral ligament avulsion injuries of the phalangeal heads supports this supposition, as severe collateral ligament damage must accompany complete dislocations, but must be relatively trivial in simple hyperextension injuries.

**Mallet fractures**—The recommended treatment for mallet fingers varies from internal wire splinting (Pratt 1932, Casscells and Strange 1957) to a plaster cast (Watson-Jones 1955) or simple fixation on a spatula (Robb 1959). The incidence of deformity, restriction of movement and of discomfort is similar to that found by Robb in his review of mallet fingers including those due to simple tendon ruptures; so is the finding that the type and duration of treatment do not affect the functional result, though delay in receiving treatment does definitely lead to a less satisfactory cosmetic result, whether there is small or wide separation of the fragment. It has been taught in the past that mallet fractures unite by fibrous tissue only; however, it is shown here that sound union by bone may be expected and that with correct and early treatment a good result can be obtained.
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SUMMARY
1. A review of intra-articular and peri-articular fractures of the phalanges has been carried out, and the late results of such injuries have been examined.
2. These fractures usually unite by bone.
3. The results of conservative treatment by immobilisation are satisfactory in the case of mallet fractures, hyperextension sprain fractures and collateral avulsion fractures of the proximal phalanges.
4. The less satisfactory results after collateral avulsion fractures of the interphalangeal joints and avulsion fractures complicating dislocations are discussed.

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REFERENCES