REDUCTION OF SMITH'S FRACTURE

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The Smith's or reversed Colles's fracture is a comparatively uncommon injury. The fracture and its treatment are described in the standard fracture text-books, but there appear to be no other references to it in the literature since Smith published his original paper describing the injury in 1847.

The fracture is easily recognised clinically (Fig. 1). The normal anterior curve of the lower end of the radius is exaggerated and the lower end of the ulna is abnormally prominent on the dorsum of the wrist.

FRACUTURE OF THE LOWER EXTREMITY OF THE RADIUS, WITH DISPLACEMENT OF THE LOWER FRAGMENT FORWARDS.

This is an injury of exceedingly rare occurrence, and one which presents characters closely resembling those of dislocation of the carpus forwards. It generally occurs in consequence of a fall upon the back of the hand, and the situation of the fracture is from half an inch to an inch above the articulation; it is accompanied by great deformity, the principal features of which are a dorsal and a palmar tumour, and a striking projection of the head of the ulna at the posterior and inner part of the forearm; the dorsal tumour occupies the entire breadth of the forearm, but is most conspicuous internally, where it is constituted by the lower extremity of the ulna displaced backwards; from this point, the inferior outline of the tumour passes obliquely upwards and outwards, corresponding in the latter direction to the lower end of the superior fragment of the radius. Immediately below the dorsal swelling there is a well-marked sulcus, deepest internally below the head of the ulna, directed nearly transversely, but ascending a little as it approaches the radial border of the forearm.

![Fig. 1](image)

Extract from Smith's original report of the fracture that bears his name.

No attempt appears to have been made to classify the different varieties of Smith's fracture. I have found it helpful to separate such fractures in adults into three distinct types which can be recognised radiologically.

Type 1—In the older patient, and particularly in women, the fracture extends across the lower cancellous end of the radius. The small lower fragment is bent forwards, and sometimes completely transposed anteriorly. It is often comminuted, and the ulnar styloid process is usually seen to be avulsed (Figs. 2 to 7).
Case 1—Smith's fracture of Type 1. Before reduction.

Case 1—After reduction.

Case 1—After consolidation.
Fig. 5
Case 2—Smith's fracture of Type 1. Before reduction.

Fig. 6
Case 2—After first attempt at reduction, with the forearm in neutral rotation.

Fig. 7
Case 2—After further reduction with full supination.
Case 3—Smith's fracture of Type 2. Before reduction.

Case 3—After reduction.

Case 3—After consolidation.
Case 4—Smith's fracture of Type 3. Before reduction. Note the associated fracture of the second metacarpal.

CASE 4—After reduction.

Case 4—After consolidation.
Type 2—In younger patients with harder bone, and particularly in men, the fracture takes a different form. There is an anterior marginal fracture of the lower articular end of the radius, with forward and proximal dislocation of the entire carpus (Figs. 8 to 10).

Type 3—The third type of Smith's fracture occurs almost exclusively in motor cyclists involved in accidents, and appears to be caused by a forcible blow on the knuckles of the hand as it grips the handlebar. The lower end of the radius shears within one inch of the wrist joint. The fracture line is seen to be roughly transverse in the antero-posterior radiograph. In the lateral view the fracture line is slightly oblique (Figs. 11 to 13). The lower end of the radius is displaced and tilted anteriorly. This type of fracture is frequently associated with fractures of the metacarpals.

In children the injury is seen as a forward fracture-separation of the lower radial epiphysis, or as a greenstick fracture of the radius within two inches of its lower end.

**MECHANISM OF INJURY**

Smith stated: "It (the fracture) generally occurs in consequence of a fall upon the back of the hand." His reference to the drawing (Fig. 1) accompanying his article has a strangely modern ring: "The patient, in endeavouring to save himself from being run over by a car, fell with great violence upon the back of the hand."

Few of the patients in my series were able to give an accurate account of the type of fall that caused the injury. Most of the fractures in men resulted from motor cycle accidents. None of the patients could recall falling upon the back of the hand, and no patient with
Type 1 or Type 2 fractures showed abrasions of the knuckles or dorsum of the hand, such as could have been expected to result from such a fall. Several patients, however, described a backward fall on to the palm of the outstretched hand.

In such a fall the forearm is locked in full supination, and the weight of the falling body pronates the upper limb with the hand relatively fixed to the ground. This twisting is combined with a heavy compressive force and, in theory at any rate, provides the ideal mechanism for the production of a Smith's fracture (Figs. 14 and 15) (Evans 1951).

Type 3 fractures, as mentioned before, are assumed to be caused by a severe blow on the knuckles of the clenched hand, and this assumption is confirmed by the occurrence of metacarpal fractures in this group.

![Diagram](image)

**FIG. 16**

The diagram in Figure 16 shows how the stability of a Smith's fracture of Type 2 is increased when the wrist is slightly flexed. Figure 17 shows how redisplacement of the fracture-dislocation may occur more easily when the wrist is extended.

**TREATMENT**

In all types of Smith's fracture reduction can usually be effected by a manipulation like that used for a Colles's fracture, but with all movements reversed. Maintenance of reduction is extremely uncertain, however, and redisplacement of the fracture almost invariably occurs, resulting in an ugly wrist with impaired function. Most orthopaedic surgeons seem to be aware of the poor results of treatment of this fracture, but none of the descriptions of treatment in the standard text-books of surgery stresses the difficulty of maintaining reduction by ordinary methods of splintage.

If it can be assumed that the Smith's fracture is caused by a pronation force, full supination of the hand would be expected to aid reduction. Maintenance of the fully supinated position should also prevent relapse of the fracture into a position of deformity.

In my series reduction was consistently achieved by forcing the hand into a position of extreme supination. The degree to which the hand should be supinated is determined by noting the greatest degree of supination possible in the opposite, uninjured limb. The fully supinated position was held by a plaster including the elbow, which was flexed at a right angle. Plaster fixation was continued for six weeks, and thereafter mobility was regained by normal active use of the limb.
Originally it was feared that fixation of these fractures in a position of full supination might be followed by some permanent restriction of pronation. With two exceptions, however, all patients in this series regained full pronation within three months.

One of the exceptions was an unusual fracture. The radial fracture was compound and there was a fracture of the shaft of the ulna which angulated while in plaster. The patient, a woman, had a permanent loss of pronation of 40 degrees. The other exception was a Type 2 Smith's fracture in a man who also sustained a severe head injury. This patient was reluctant to make active use of his injured wrist and hand, and he has an 80 degrees' loss of pronation.

The most unstable of all these fractures are those classified as Type 2. When this type of Smith's fracture is immobilised in a supination plaster the wrist should be slightly flexed. This position helps to maintain congruity between the proximal row of the carpus and the intact part of the lower end of the radius. Even a small degree of dorsiflexion encourages the carpus to subluxate forwards (Figs. 16 and 17).

CLINICAL MATERIAL

Smith's fractures are uncommon, and in the past three years I have managed to collect only nineteen cases. It is not intended to make a detailed analysis of the results of treatment; apart from the two patients mentioned above, all regained normal function.

Some of the patients were seen several days after the primary "casualty" reduction. With one exception the fractures had all either become redisplaced after an initially acceptable reduction, or had never been satisfactorily reduced. The first fracture in this series (a Type 2 fracture) was two weeks old when finally reduced by manipulation into full supination. The classification of the nineteen fractures of this series is shown in Table I.

<table>
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<tr>
<th>Type of fracture</th>
<th>Number of cases</th>
<th>Remarks</th>
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<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Type 1</td>
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<td>8</td>
</tr>
<tr>
<td>Type 2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Type 3</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Fractures in children</td>
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SUMMARY

A classification of Smith's fractures into three types is proposed. It is suggested that the majority of these fractures are caused by a pronation injury. The reduction of Smith's fractures by supination is described and the importance of the supinated position during splintage is stressed.

REFERENCES