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# External fixation of Smith's fracture

## 16 patients followed for 2 years

Jos J. A. M. van Raay and Christiaan van der Werken

External fixation of 16 Smith's fractures was evaluated after 22 (6–42) months. In 15 patients, the radiographic results were satisfactory. There was a definite correlation between the radiographic and clinical end results. However, 6 patients had residual signs of an upper limb dystrophy. Although external fixation of Smith's fractures results in good function, this method should be used with caution because it cannot prevent reflex dystrophy; indeed, it may even initiate it.

Department of Surgery, St. Elisabeth Hospital, P.O. Box 90151, NL-5000 LC Tilburg, The Netherlands
Correspondence: Jos J. A. M. van Raay, Department of Orthopedics, Leiden University Hospital, Rijnsburgerweg 60, P.O. Box 9600, NL-2300 RC Leiden, The Netherlands. Tel + 31–071 263606. Submitted 1990-06-12. Accepted 1990-12-27

Smith's fracture can be classified into three distinct types (Thomas 1957; Figure 1). The Type 1 fracture is extraarticular, extending across the lower cancellous end of the radius. The Type 2 Smith-Barton fracture is an anterior marginal intraarticular fracture with forward and proximal dislocation of the entire carpus. The Type 3 fracture is transverse in the anteroposterior radiograph, but oblique with intraarticular extension in the lateral view. Usually, the Type 1 fracture is treated conservatively, with good results (Mills 1957). Types 2 and 3 fractures are usually unstable, with disappointing results of conservative treatment, due to malunion and incongruity of the joint (Woodyard 1969).

Traditionally, our treatment of Types 2 and 3 fractures has been open reduction and fixation with a volar plate. However, extended comminution might signify great difficulties in effecting satisfactory internal fixation (Heim 1979, Erdweg et al. 1982, Buck-Gramcko 1987, Letsch et al. 1987).

We report our experiences with external fixation in the treatment of 16 unstable Smith's fractures.

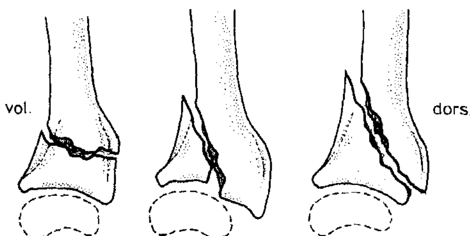



Figure 1. Thomas' classification of Smith's fractures.

## Patients and methods

External fixation of Smith's fractures was performed in the following situations:

1. Severe comminution with or without intraarticular involvement and metaphyseal extension (in 5 patients; Figure 2).

2. Redislocation after (repeated) closed reduction and immobilization in a plaster cast (in 6 patients).

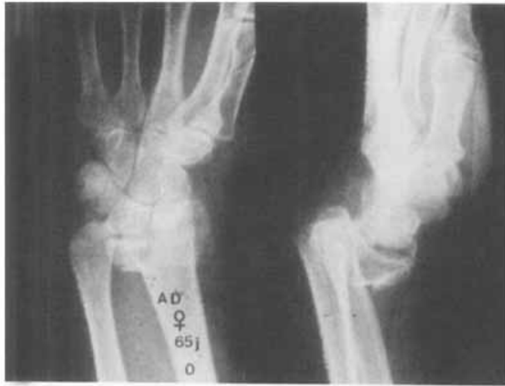
3. An accompanying soft tissue injury (in 2 patients).

4. Severe swelling and pain as signs of upper limb dystrophy or compression of the median nerve that necessitated cast removal (in 3 patients).

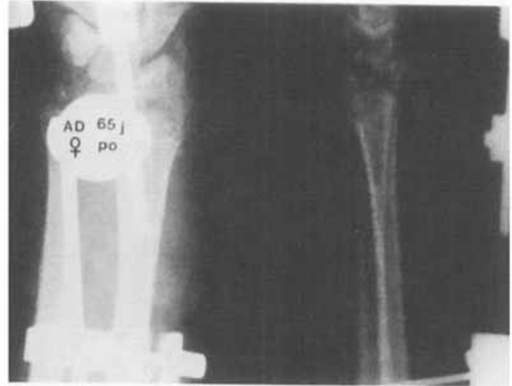
We used the the small design of the Hoffmann-Vidal device. Under appropriate anesthesia, pins were inserted through skin incisions into the distal third of the radius proximal to the fracture and into the second metacarpal bone distally. Under fluoroscopy, the fracture was reduced by gentle distraction, and the hand was fixed in the so-called writing position. After 3 weeks, the external fixator was relaxed to prevent overstretching of the ligaments and the joint capsule. The fixator was removed after 5 to 6 weeks.

All the patients were reexamined after a mean follow-up period of 22 (6–42) months. The evaluation criteria of Scheck (1962) were applied. This point-scoring system combines subjective and objective function with radiographic assessment (Table 1).

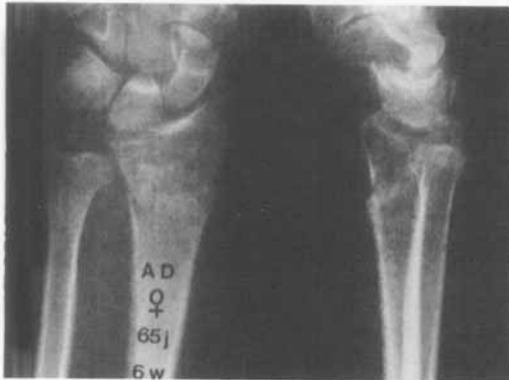
There were 16 patients (11 women and 5 men with a mean age of 56 [31–79] years [Table 2]). The decision for external fixation was made in 7 patients primarily without attempts to perform closed reduction because of obvious comminution and intraarticular involvement.



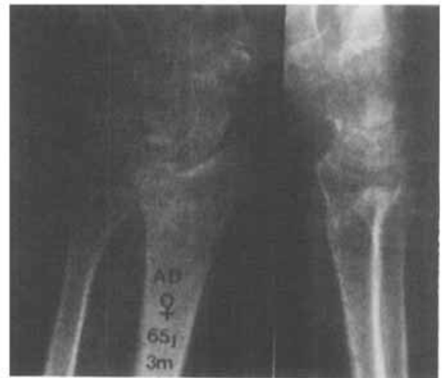
Before treatment



After external fixation.

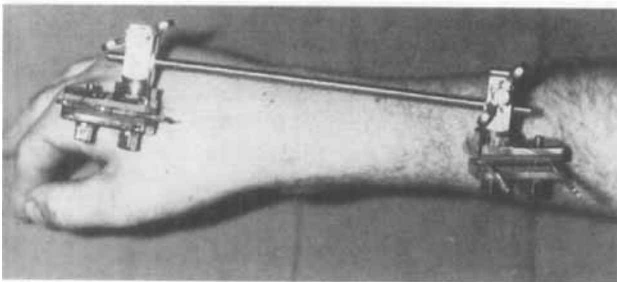


Result after 6 weeks.



Result after 3 months.

Figure 2. Smith's fracture with extensive comminution and intraarticular involvement in a 65-year-old woman (Case 4).


Position of the hand in the so-called writing position.

In 2 of these 7 patients (Cases 3 and 4), external fixation, combined with a fasciotomy by a volar approach, was performed because of a severe soft-tissue injury or signs of median nerve compression. In 6 patients with comminuted and Type 3 fractures, the decision for external fixation was made secondarily because of failure to maintain adequate reduction in a plaster cast. In 3 patients with a Type 1 fracture (Cases 9, 10, and 14), external fixation was performed secondarily for an incipient reflex dystrophy with pain and swelling necessitating cast removal. Delayed external fixation was performed after a mean period of 8 days.

## Results

There were no deep infections or pin loosenings; one pin-tract infection resolved after removal of the pin, and another pin was removed prematurely because of pain. Injury to the superficial radial nerve was not encountered. Without considering 3 patients in which reflex dystrophy was the main reason for external fixation, 4 other patients developed an upper limb dystrophy that had abated at the time of the follow-up examination. These were patients with severely comminuted intraarticular fractures with considerable soft tissue injury. In spite of intensive

**Table 1. Points system as described by Scheck**

| Description | | Points |
|---|---|---|
| 1. Subjective evaluation | | |
| Excellent | No pain, weakness, or loss of motion; no restriction in activity | 0 |
| Good | Occasional discomfort after exertion, slight loss of motion, slight restriction during activity | 1 |
| Poor | Deformity, pain, weakness, and loss of motion; patient has not continued with former occupation and recreational activities | 2 |
| 2. Appearance of the wrist | | |
| Excellent | Normal appearance | 0 |
| Good | Just noticeable deformity because of some broadening of the wrist and slight predominance of the ulnar styloid process | 1 |
| Poor | Obvious deformity | 2 |
| 3. Wrist and finger motion: pronation and supination | | |
| Excellent | 0°–15° loss of movements | 0 |
| Good | 16°–30° loss of movements | 1 |
| Poor | Over 30° loss of movements | 2 |
| 4. Grip (as percentage of strength of the injured hand) | | |
| Excellent | 100 percent | 0 |
| Good | 85–89 percent | 1 |
| Poor | Less than 85 percent | 2 |
| *Radiographic anatomic result* | | |
| 1. Radial angle | | |
| Excellent | 18°–22° | 0 |
| Good | 10°–17° | 1 |
| Poor | Less than 10° | 2 |
| 2. Volar angle | | |
| Excellent | 6°–11° | 0 |
| Good | 0°–6° | 1 |
| Poor | Negative volar angle | 2 |
| 3. Radial length | | |
| Excellent | 10–13 mm | 0 |
| Good | 5–9 mm | 1 |
| Poor | Less than 5 mm | 2 |

A functional or radiographic follow-up score—derived from all the factors mentioned in Tables 1 and 2—of 0 or 1 point is an excellent result, 2 or 3 points is a good result, and over 3 points is a poor result. The combined functional and radiographic result is excellent in case of 0–3 points, good in case of 4–8 points and poor in case of over 8 points.

**Table 2. Sixteen Smith's fractures treated by external fixation**

| Case | Sex | Age | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M | 34 | 4 | p | – | – | 30 | 0 | 1 | 1 |
| 2 | M | 33 | 3 | p | – | – | 31 | 0 | 0 | 0 |
| 3 | M | 50 | 3 | p | + | + | 18 | 3 | 1 | 4 |
| 4 | F | 65 | 4 | p | + | + | 42 | 1 | 1 | 2 |
| 5 | M | 31 | 4 | p | – | – | 29 | 0 | 0 | 0 |
| 6 | F | 78 | 3 | d | + | – | 26 | 1 | 0 | 1 |
| 7 | M | 44 | 4 | d | – | – | 18 | 0 | 1 | 1 |
| 8 | F | 79 | 3 | d | + | – | 9 | 1 | 1 | 2 |
| 9 | F | 44 | 1 | d | – | – | 6 | 1 | 1 | 2 |
| 10 | F | 40 | 1 | d | – | + | 21 | 3 | 5 | 8 |
| 11 | F | 55 | 3 | d | – | – | 11 | 0 | 2 | 3 |
| 12 | F | 52 | 4 | p | – | + | 36 | 1 | 2 | 3 |
| 13 | F | 75 | 3 | p | – | + | 9 | 2 | 2 | 4 |
| 14 | F | 65 | 1 | d | – | + | 21 | 0 | 2 | 2 |
| 15 | F | 73 | 4 | d | – | – | 13 | 3 | 2 | 5 |
| 16 | F | 50 | 4 | d | – | – | 28 | 1 | 1 | 2 |

A Fracture Types 1–3 (Thomas 1957), 4 comminuted fracture
B Primary (p) or delayed (d) operation
C Decompression: – no, + yes
D Dystrophy: – no, + yes
E Follow-up time (months)
F Functional result
G Radiographic result
H Combined (overall) result derived from sum of all the factors

treatment with analgesics, oxygen radical scavengers, elevation of the arm, and cautious mobilization of the joints, 2 patients developed an accompanying severe shoulder-hand syndrome that required many months of outpatient treatment and physiotherapy.

At the follow-up examination, function was excellent in 12 patients and good in 4 patients (Table 2). No patient had substantially decreased function, and all the patients who had been working returned to their usual employment. The radiographic results were excellent in 10 patients, good in 5 patients, and poor in 1 patient; this last patient, however, had good function. There was a definite correlation between clinical and radiographic outcome, although an optimal anatomic result does not necessarily guarantee optimal function.

Ten excellent radiographic results gave nine excellent functional results, five radiographically good results resulted in excellent function in 3 patients, while one poor reduction ended in good function (Table 2).

## Discussion

Smith's fracture in which all or part of the articular surface is displaced proximally and volarly, and in which the proximal carpal row is subluxated, is extremely unstable. The literature on external fixation of this type of injury is scarce, whereas several authors have reported favorable results of treating unstable Colles' fractures by external fixation (Cooney 1983, Vaughan et al. 1985, Kongsholm and Olerud 1987). We found that the external fixator effectively maintains the reduction

of unstable Smith's fractures. However, in spite of the lessening of the ligamentotaxis after relaxing the fixator after 3 weeks in all the patients, severe reflex dystrophy developed in 4 patients with comminuted intraarticular fractures and fractures with accompanying soft-tissue injury. Two of 3 patients with a Type 1 fracture in which external fixation was performed because of a threatening reflex dystrophy still had signs from this severe complication at the follow-up examination. This high incidence can be explained on the basis of the negative selection of a number of severely comminuted fractures that we treated and of our familiarity with early clinical signs and symptoms (van Raay et al. 1990).

External fixation obviously cannot prevent reflex dystrophy; and the question is whether or not tension on soft tissues, capsules, and ligaments by ligamentotaxis might induce (which seems likely) reflex dystrophy. Because of the severity and persistence of this complication, in our opinion, external fixation of unstable Smith's fractures must be used restrictively despite the good anatomic results that can be achieved.

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