Closed rereduction of axial compression in Colles' fracture is hardly possible

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Totally, 146 Colles' fractures that were displaced after the primary reduction were treated by closed rereduction and plaster immobilization. A permanently acceptable position was achieved in 11 of 27 cases, where dorsal angulation was the only malalignment. In fractures with both axial compression and dorsal angulation, both displacements improved to a permanently acceptable position in only 7 of 105 cases, and only the dorsal angle improved to an acceptable position in 26 cases. The axial compression was most difficult to correct.

The chances of achieving a permanently acceptable position by rereduction are rather small in Colles' fracture with axial compression alone or combined with deviation of the dorsal angle. High age and the presence of dorsal comminution are further factors likely to worsen the prognosis.

The frequency of redisplacement after Colles' fracture has been reported to be as high as 59 percent (Madsen 1949). However, the value of rereduction in elderly patients was recently questioned by McQueen et al. (1986). I report the results of rereduction in a consecutive series of displaced Colles' fracture.

Patients and methods

The investigation was prospective and was based on all the cases of Colles' fracture in patients over 15 years of age treated at Södersjukhuset (Southern Hospital) during 1981 and 1982. During this period, 1,495 Colles' fractures occurred in 1,491 patients: 718 fractures were reduced primarily (no primary rereductions were done), and 146 (20 percent) fractures were found redisplaced at the 1–2-week radiographic examination. In this group there were 135 female patients and 11 male patients. Their median age was 67 (23–87) years.

The rereduction was performed under general anesthesia in 135 cases and with regional intravenous anesthesia in 11 cases. The fracture was immobilized in a low circular plaster cast with no dorsal or volar flexion of the wrist, with slight ulnar deviation, and with the forearm in slight pronation. Rereduction was carried out 12 (7–21) days after the first reduction. Radiographs were taken immediately and again 1 and 2 weeks later.

The limits for an acceptable position of the fracture were 3-mm axial shortening of the radius and 25° of dorsal angulation. If one of these limits was exceeded, the fracture was reduced. The same limits were used for primary and later reduction, with few exceptions. The fractures were classified as described by Frykman (1967), and characterized with regard to dorsal angulation, axial shortening, and the presence of a dorsal cortical fragment (Figure 1). Fifty-seven rereduced fractures (39 percent) belonged to Frykman's category 2, (extraarticular fracture including the distal ulna), whereas in the whole series the category 1 fractures (extraarticular fracture only) predominated ($P < 0.001$). There were more women among the rereduced (93 percent) than in the total series (84 percent).

The chi-square test was used in the statistical analysis.

Results

No difference in results was found between re-reductions done early (7days) or late (21 days) following the primary reduction (Table 1).

Angulation of the radius. Of the 146 rereduced fractures, 27 showed dorsal angulation exceeding 25° as the only malalignment. After rereduction an acceptable and lasting position was achieved in 11 cases (median age 62 years), whereas 11 fractures remained un-

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Figure 1. Colles' fracture with a dorsal cortical fragment.

Table 1. Displacement of fracture related to the result of rereduction. Early and late rereduced fractures compared. N 143. Three cases with volar angulation were excluded. DA dorsal angulation, AC axial compression

	DA	AC	DA + AC	DA + AC, one of them acceptable
Day 7–13				
Acceptable	6		3	2
Unacceptable	9		55	4
Day 14–21				
Acceptable	5		4	2
Unacceptable	7	1	43	2
Total	27	1	105	10

Table 2. Dorsal cortical fragment related to alignment

	Dorsal fragment	
	Present	Absent
Acceptable	9	13
Unacceptable	86	35
Total	95	48

changed or even deteriorated, and slight but insufficient improvement was obtained in 5 cases. Altogether, 16 fractures (median age 71 years) thus remained in an unacceptable position (Table 1). Before the re-reduction 3 fractures had a volar angle that all improved to a permanent, acceptable position.

Axial compression. In 1 case there was solely axial shortening exceeding 3 mm, which did not improve to an acceptable position after rereduction.

Dorsal angulation combined with axial compression. In 105 fractures there was axial compression exceeding 3 mm and a dorsal angle exceeding 25°. After rereduction, both malalignments improved in 7 cases (median age 58 years). In 31 cases (median age 65 years), one of the displacements improved to an acceptable and lasting position (Table 1), and in 26 cases only the dorsal angle improved. Sixty-seven fractures (median patient age 68 years) remained unchanged or deteriorated.

Dorsal angulation and axial compression, one of them acceptable. Ten of the fractures showed both dorsal angulation and axial compression, one of which was unacceptable. After rereduction the unacceptable feature remained unchanged or deteriorated in 6 (axial compression in all cases) and improved in 4 (3 dorsal angle, 1 axial compression).

Dorsal cortical fragment. In 95 fractures the radiographs showed a dorsal split-away cortical fragment (Figure 1). This was more common ($P < 0.01$) in the groups where an acceptable position was not achieved by rereduction (Table 2). Among fractures with dorsal angulation only, the fragment was present in 9 of 16 fractures that could not be rereduced acceptably and in 4 of 11 that acquired a permanently acceptable position. In the group with both dorsal angulation and axial compression, a fragment was present in 72 of 98 fractures not acceptably rereduced. The numbers of the malalignment components, compression and angulation, did not differ between the comminuted and non-comminuted categories.

Discussion

The types of rereduced fractures differed from the distribution of types in the entire primary series. The over-representation of fractures with fractured ulnar styloid (Frykman category 2) can be explained by the increased instability in the radioulnar joint due to the detachment of the triangular fibrocartilage complex.

Collert and Isaksson (1978) obtained more successful rereductions when the procedure was carried out in the second week after the primary reduction than when it was performed earlier. In this series there was no such difference.

The influence of the alignment of the reduced fracture on the final function has been discussed by Bacron and Kurtzke (1953), Lidström (1958), and Frykman (1967): Fractures that heal with severe displacement give more severe malfunction. Lidström (1959) set a limit of 20° for the dorsal angulation, but found axial compression to be the most important factor. Bacron and Kurtzke (1953) and Solgaard (1985) used similar limits. Lidström (1959) considered compressions of more than 4 mm as major compressions, and the same figure was given by de Palma (1952). No other limits of acceptable and unacceptable displacement based on clinical or biomechanical data have been reported. The limit of 3 mm has long been used at Södersjukhuset.

My investigation shows that dorsal angulation only was the displacement most readily influenced, with 11 of 27 fractures improved to a permanent acceptable condition. Axial compression was less easily corrected; only 12 of 105 improved to a permanently acceptable position. Collert and Isaksson (1978), McQueen et al. (1986), and Solgaard (1986) reported similar figures. The proportion of women was higher in the present than in the total series, and the median age was lower in the groups that improved than in those in whom an acceptable position was not achieved. Brittleness of bone increases with age, especially in postmenopausal women, and is likely to contributed to redisplacement. In Colles' fracture, which is often compressed, the compression of the spongiosa in the distal radius persists after the repositioning. The dorsal cortical bone is often fragmented, which also contributes to the redislocation. There was a high frequency of dorsal cortical fragments in the group that did not improve after rereduction.

This study shows that the changes of achieving a lasting acceptable position by closed rereduction of axial compression in Colles fracture is hardly possible. If rereduction is necessary a more secure fixation than a plaster cast should be preferred.

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