

Elbow dislocation in children and adults

A long-term follow-up of conservatively treated patients

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Sixty-three elbow dislocations in 28 children and 34 adults were followed for a median time of 7 years. Fifty-seven dislocations were posterior or posterolateral. All the cases were treated with closed reduction and immobilization. Although function became satisfactory in both age groups, it was better in children than in adults.

Dislocation of the elbow is always accompanied by damage to the capsule and ligaments, well demonstrated radiographically by Johansson (1962). Dislocation may be associated with extra-articular or intraarticular fractures. Extraarticular fractures are mainly avulsions pulled off by capsular attachments. When intraarticular fractures are present, the damage to the joint surfaces is known to impair the prognosis, especially in adults (Linscheid & Wheeler 1965, Roberts 1969). We have studied the long-term sequelae of elbow dislocations, treated closed, in children and adults.

Patients and Methods

Totally, 129 patients with radiographically verified dislocations of the elbow were treated from 1965–1983 inclusive. Among them, 25 patients, mainly adults, were excluded from the study because their dislocations were associated with intraarticular fractures, 18 of the radial neck and head, four of the olecranon, and three of the humeral condyles. Thirteen patients treated operatively were also excluded: 6 of them had open reduction (including suture of the medial collateral ligament in 4 cases), 6 had osteosynthesis of the medial epicondyle, and 1 of the lateral epicondyle. Of the remaining 91 patients, 7 patients could not be traced, 22 patients who had moved

from the district answered a questionnaire in order to determine the functional status of the elbow, and 62 patients were seen at follow-up examinations. At the time of injury, 43 patients were children, 30 boys and 13 girls, with a median age of 10 (5–15) years, and 41 were adults, 26 men and 15 women, with a median age of 35 (16–67) years. The 62 patients seen at follow-up examination had suffered 63 dislocations, since 1 woman had sustained dislocation of both elbows at an interval of 5 years. Thirty-one dislocations were on the right side, and 32 on the left side. Thirty-two dislocations were posterior, 25 posterolateral, 5 posteromedial, and one lateral. The four types were equally distributed in the children and adults. Fourteen of the 28 dislocations in the children and 10 of the 35 in adults had concurrent avulsion fractures (not significant difference). Seventeen of these fractures were minor avulsions from the medial or the lateral epicondyles or coronoid process, pulled off by capsular attachments. A 9-year-old girl had a partial avulsion of the olecranon ossification center. Six children had an avulsion fracture of the medial epicondylar epiphysis. Additional fractures involving other parts of the upper extremity were seen in 4 patients: 2 children had fractures of the forearm, 1 child had a fracture of the distal humerus, and 2 adults had a Colles' fracture.

All the closed reductions were made within the first 24 hours, followed by immobilization in a splint in 90° of flexion. Median immobilization time for both children and adults was 22 (10–42) days. Upon removal of the bandage, most of the patients started mobilizing exercises on their own, and only a few attended physiotherapy. Redislo-

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cations or recurrent dislocations were not observed.

At follow-up, median time 7 years, the patients were interviewed, and all the symptoms related to the joint were noted. Both elbows were tested for mobility and any difference was recorded. In 1 case of bilateral dislocation, the normal range of mobility (American Academy of Orthopaedic Surgeons 1966) was used as a basis. Stability was tested with the patient's forearm in full supination and the elbow extended and passively flexed 15 to 20 degrees by the examiner (Woods and Tullos 1977), who at the same time applied a valgus or varus stress to the joint. Instability was not graded, but it was recorded if the injured joint was found to be less stable than the intact one. Nerve function was examined, and the results were graded according to Roberts (1969). A radiographic reexamination of the injured joint with standard projections was also carried out.

For evaluation of the results, the chi-square test was used in a fourfold table.

Results

Children. The median time from injury to the follow-up examination was 7 (2-16) years. Subjective symptoms were few. Two patients complained of pain after certain strenuous activities, which they had learned to avoid; but they had no substantial disability, and their symptoms were moderate. None of the patients complained of instability of the joint. The majority had paid no attention to the elbow injury in their later choice of occupation. Thirteen did manual work in the building industry and agriculture without any symptoms. Six patients had limitation of extension, which was 10° or less in 3 patients, between 11 and 30° in 2, and 45° in 1 patient. All the patients had a full range of flexion, pronation, and supination. Instability was found in 11 joints. Eight of these were loose in valgus, two in varus, and one in both valgus and varus. Although 2 patients had had initial symptoms of nerve injury, none had symptoms or signs of nerve involvement at the follow-up examination. Radiographically, 17 joints were normal. In four joints more than one abnormality was found. The most common finding, seen in eight joints, was the presence of calcifications, presumably the result of healing of the original soft-tissue damage. In three joints calcifications were present at the site of the medial

collateral ligament, in another three at the site of the lateral collateral ligament. Calcifications in a seventh joint were present at the site of the medial and lateral collateral ligaments. In the eighth joint, calcifications were seen posteriorly, presumably in the capsule. All the ligament calcifications were situated near the humeral insertions. The calcifications became visible approximately 1 month after the injury. In three joints, minimal osseous irregularities caused by fractures were seen, but in four joints with fracture of the medial epicondylar epiphysis, fibrous union had occurred.

Adults. The median time from injury to the follow-up examination was 8 (2-19) years. Fifteen patients complained of pain, mild in 7 and moderate in 8. One complained of painful swelling following use, necessitating analgetic medication. Three complained of ulnar paresthesias, developing gradually in 2, but present from the time of injury in the third patient. All 34 patients had resumed their former occupation shortly after rehabilitation without decreased working ability. The neurologic examinations were normal. Extension was limited by 10° or less in 6 patients, by 11 to 30° in 3, and by more than 30° in 1. In 2 patients who had limitation of extension of 25°, flexion was also limited by 10° degrees. One of these, in whom the dislocation was compound and who had also sustained a Colles' fracture of the same arm, had concurrent limitation of pronation of 20°. Another patient had limitation of flexion of 20°, but otherwise had full elbow movements. Eight elbows were unstable, seven in valgus and one in varus. Only eight joints were radiographically normal. Calcifications, similar in appearance and location to those observed in the children, were seen in 23 joints. In 11 joints they were located at the site of the lateral collateral ligament, in six at the site of the medial collateral ligament, and in another six they were bilateral. In one joint an avulsion fracture of the lateral epicondyle had resulted in fibrous union. Fibrous union of the medial epicondyle was seen in a 64-year-old man. He had sustained a pure posterior dislocation of the elbow at the age of 50, but his history included an injury to the same joint when he was 12 years old, and the fibrous union was present on the primary radiographs. Thus, he might have suffered a fracture of the medial epicondylar epiphysis in childhood. In the woman with bilateral

Table 1. Results after closed treatment of elbow dislocation. Grading according to Roberts (1969)

	Children ^a	Adults	Total
Excellent	21	13	34
Good	3	10	13
Fair	3	11	14
Poor	1	1	2
Total	28	35	63

^a Different from adults ($P < 0.01$, χ^2 -test)

dislocation, heterotopic ossification had developed in the more recently injured joint, which dislocated 8 years prior to follow-up. Arthrosis was observed in the humeroradial joint of a 40-year-old man 17 years after the injury.

There was no association in children or adults between the range of mobility and the radiographic presence of calcifications. Although calcifications were present in 31 joints, only 13 (in 2 children and 11 adults) had limitation of motion. In the remaining 18 joints, all movements were full. Forty-seven elbows (in 24 children and 23 adults) were graded as excellent or good (Table 1). Thus, more than two thirds of the children and nearly as many of the adults had a satisfactory outcome.

Of the 22 patients who answered the questionnaire, 12 children and 5 adults were asymptomatic; the remaining 3 children and 2 adults were complaining of occasional aching, but had no limitation of activities. All the patients were satisfied with the functional status of the elbow. The median time from injury to follow-up was 14 (4-19) years.

Discussion

Reduced motion, mostly an extension defect, is the most important sequela of elbow dislocation.

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Less than one third of our patients had limitations, slight in most cases. In a previous series, increasing stiffness was directly related to the length of immobilization (Protzman 1978). In uncomplicated cases, immobilization for 10-14 days is usually sufficient. The median time of immobilization in our study was 3 weeks, partly because of prolonged immobilization of the fracture cases. Our findings of collateral ligament calcifications in approximately half of the joints are comparable to the report of Josefsson et al. (1984) with calcifications in 38 of 52 joints. Both studies show that calcification was the most common radiographic abnormality following elbow dislocation, but in our study there was no association between calcification and limited motion.

Our finding of instability in 19 out of 63 joints may indicate that it is more common than previously thought. Roberts (1969) found no instability in 60 joints, whereas Josefsson et al. (1984) found seven with slight and one with obvious instability in their series of 52 elbows. When instability was present in our patients, the joint functions were uninfluenced and all the patients were asymptomatic. Although the functional outcome was favorable in both groups, the final results in children were even better than in adults.

Much of the stability of the elbow depends on the coronoid process and the olecranon. These structures are poorly developed in children, and thus the joint dislocates more readily in early life. As a corollary, joint dislocation occurs with relatively smaller tears of capsule and ligaments. Most of the children in our study had normal radiographs, and calcifications, probably resulting from healing of the torn capsule and ligaments, had developed in only eight joints. This allowed full preservation of the joint function in most of the patients injured in childhood.

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