Osteosynthesis for longstanding nonunion of the lateral humeral condyle

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Summary. Six patients with symptomatic longstanding nonunion of the lateral humeral condyle were treated by internal fixation with iliac bone graft. The indication for surgery was pain and weakness in the elbow. Follow-up ranged from 18 months to 4 years, with an average of 28 months. Bony union was achieved in all cases. Stability and strength of the elbow were restored in all cases, but postoperative elbow motion was decreased in three patients, with an average loss of 6.7° of the motion present before surgery. All patients were painfree in the elbow upon strenuous activities and satisfied with the outcome of the procedure.

Nonunion of the lateral condyle of the humerus may arise from unrecognized undisplaced or minimally displaced fractures, or from inadequate reduction or immobilization of such fractures when recognized. There is controversy as to whether nonunion of this fracture should be treated surgically or be left alone. Some authors [1, 4, 6] recommend surgical intervention in established nonunion in children to prevent subsequent valgus deformity and frequent degeneration of the elbow joint. Others [2, 3, 5] consider that surgery is contraindicated for fear of epiphyseal arrest of the condylar fragment and/or loss of elbow motion.

We describe our surgical experience in six patients with longstanding nonunion of the lateral condyle of the humerus.

Patients and methods

Patients

Fifteen patients with nonunion of the lateral humeral condyle were seen between 1984 and 1990. Six patients, in whom the main problem was not the elbow itself but tardy ulnar nerve palsy, were treated with an anterior transposition of the nerve. One nonunion of 4 months' duration was treated conservatively. The remaining 8 patients had symptoms in the elbow and were treated by insertion of a bone graft with internal fixation. In two of these cases nonunion had lasted for less than 1 year, and these cases were excluded from the study.

There were one female and five male patients, with an average age of 17 years (range 7–26 years). Three injuries involved the left elbow and three the right. The time from the original fracture to nonunion ranged from 5 to 22 years, averaging 12.8 years. All fractures were initially treated with conservative methods at other institutions. The main complaint at presentation was pain and weakness in the elbow upon strenuous activity. Two patients also complained of significant instability of the elbow, one complained of cubitus valgus deformity. Four patients presented symptoms of tardy ulnar nerve palsy.

Operative procedure

Through the lateral epicondylar incision, the pseudoarthrosis was exposed with the minimum of dissection, care being taken not to disturb the extensor muscle attachment from the fragment that maintains its vascular supply. Within the limits of the proximal one-half to two-thirds of the pseudoarthrosis, the fractured surfaces were cleared of all fibrous tissue without invasion of the fibrous union at the distal part. The gap was packed with a rectangular iliac bone graft and fixed with a compression screw, Kirschner wires, or both (Fig. 1). Generally, the attempt should be made not to replace the fragment anatomically, but to fix it in situ, because aggressive reduction of the fragment may disturb a well-adapted relationship at the radiohumeral and ulnohumeral articulation and lead to stiffness to the elbow. In cases where the elbow joint was grossly unstable with lateral shift of the condylar fragment, the condylar fragment was backed to its original linear alignment applying a mild varus force to the elbow and fixed in its position (Fig. 2).

The bone graft should be placed in the proximal two-thirds of the pseudoarthrosis, because too large a bone graft may produce a bone block at the distal humeral fossa. In children, a pin or screw was inserted avoiding transfixing the epiphyseal plate. Four patients underwent anterior transposition of the ulnar nerve for ulnar neuropathy. Postoperatively, the elbow was immobilized in a plaster cast for 4 weeks. One patient required immobilization for 6 weeks due to simultaneous supracondylar osteotomy for correcting the valgus deformity.

Results

Follow-up ranged from 18 months to 4 years, with an average of 28 months. Radiologically, all of the patients...
achieved solid union at the fracture site. None had avascular necrosis of the lateral condyle. Two patients with an open epiphyseal plate had normal growth of the condylar fragment.

The range of motion of the elbow joint improved or remained unchanged in the three younger patients and decreased in the three older patients. The average loss of motion was 6.7° compared with the motion before surgery (8.3° loss in extension and 1.6° gain in flexion). The valgus deformity of the elbow remained unchanged in three patients and improved in three. All of the patients were free of pain in the elbow upon strenuous activities and satisfied with the outcome of the procedure (Table 1).

**Table 1. Patients’ clinical data and results**

<table>
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<tr>
<th>Case no.</th>
<th>Age</th>
<th>Elbow</th>
<th>Interval from injury to operation (years)</th>
<th>Ulnar nerve palsy</th>
<th>Elbow motion extension/flexion (°)</th>
<th>Cubitus valgus (°)</th>
<th>Postoperative elbow pain</th>
<th>Follow-up (months)</th>
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</table>

* Corrective osteotomy for the valgus deformity was performed simultaneously.

**Fig. 1 a–c.** Case 6. **a** Preoperative radiograph showing nonunion 22 years after injury. **b** Radiograph taken after iliac bone grafting with internal fixation. A bone graft was inserted in the proximal two-thirds of the pseudoarthrosis. **c** One year after surgery the bone showed solid union. Stability and strength of the elbow were restored.

**Fig. 2 a–c.** Case 1. **a** Preoperative radiograph of a 7-year-old boy with nonunion of the lateral humeral condyle 5 years after injury. The lateral condyle translocated both laterally and proximally. **b** Radiograph after iliac bone graft with internal fixation. The screw and Kirschner wires avoided the epiphyseal plate. **c** Radiograph 4 years after surgery showing solid union and normal growth of the condylar fragment.

**Discussion**

We would not agree with those who consider established nonunion in a good position to be an acceptable result. Although many patients with bony nonunion have relatively few symptoms, they do not have stable elbows and the elbows often tire easily upon strenuous activities. Some have weakness or pain in the elbow, particularly younger, active persons. We also disagree with those who state that surgical treatment in childhood for nonunion leads to worse deformity with loss of motion. Flynn et al. [1], Tajima et al. [6], and our cases have shown that the fragment unites and continues to grow, producing satisfactory results with minimal loss of motion. Although