

Surgery for nonunion of the lateral humeral condyle in children

6 cases followed for 1–9 years

Hugo De Boeck

Nonunion of the lateral humeral condyle in 6 children was treated by open reduction, internal fixation and

bone grafting. All cases united. All patients had relief of pain. There were no complications.

Department of Pediatric Orthopedic, Academisch Ziekenhuis V.U.B., Laarbeeklaan 101, B-1090 Brussels, Belgium
Tel +32 2-477 6547. Fax -477 6505
Submitted 95-04-22. Accepted 95-06-20

Fracture of the lateral condyle is the second commonest injury in children's elbows. Impaired function or pain is rare after correct treatment (Flynn and Richards 1971, Hardacre et al. 1971, Flynn et al. 1975, Foster et al. 1985, Wilkins 1990). However, these fractures are sometimes underestimated or undiagnosed, which may lead to painful nonunion.

Patients and methods

Between 1984 and 1993, 6 children with a posttraumatic established nonunion of the lateral humeral condyle were treated. The nonunion was diagnosed clinically—the fragment was palpable and mobile—and was demonstrated radiographically. In no case was the separation of the fragment larger than 1 cm. There were 1 girl and 5 boys and their mean age was 7 (5–10) years. All patients complained of pain. The patients were operated on 10 (6–18) months after the injury.

The nonunion was exposed through a lateral approach. An incision was made along the lateral border of the distal humerus to below the lateral condyle along the posterior lateral surface of the forearm. The brachioradialis muscle and the extensor carpi radialis longus were separated anteriorly from the triceps posteriorly. The adjacent surfaces of the humerus and of the fragment were cleared of fibrous tissue, taking care not to damage the epiphyseal plate.

The condylar fragment was replaced in its original location and fixed with 2 small screws providing compression across the fracture site. The screws were placed, under radiographic control, from the metaphysis to the metaphysis. Autologous bone grafts from the iliac crest or proximal ulna were placed on the surface of the pseudarthrosis. A plaster cast, with

the elbow at a right angle and the forearm in neutral position or slight supination, was applied for 8 weeks. The screws were removed between 6 and 10 months after operation.

The mean follow-up period was 4 (1–9) years. At follow-up, all patients had a personal interview and examination. Motion was compared with the normal contralateral elbow. Radiographs, taken a minimum of 6 months after removal of the screws, were available for all patients.

Results

All nonunions united. There were no cases of avascular necrosis. A lateral condylar spur formation was radiographically visible in 3 cases but had no cosmetic or functional significance. All patients were pain-free. The range of motion was unchanged or improved in all cases. 3 patients had a normal range of motion. All patients had normal daily activities including sports activities, even though 2 had 5–15 degrees' restriction of extension. 3 patients had slight restriction of supination and pronation. 2 children had 5 degrees' and 10 degrees' loss in the carrying angle, but no restriction of function.

Discussion

There is still some controversy about the treatment of nonunion of the lateral humeral condyle in children. Surgery may be complicated by avascular necrosis (Hardacre et al. 1971, Jakob et al. 1975, Dhillon et al. 1988), but other authors have reported good results with open reduction and internal fixation (Flynn et al. 1975, Foster et al. 1985, Flynn 1989, Wilkins 1990).



Nonunion of the lateral condyle in a 5-year-old girl 8 months after injury.



6 weeks after surgery. Note bone grafts on the surface of the nonunion.



5 months after surgery. Healing of the nonunion. Note spur formation on the lateral side.



2.5 years after surgery. Normal alignment and no signs of avascular necrosis.

The question is whether elbow function can be improved by surgery. Most children with nonunion complain of pain during strenuous activity but function quite well as long as there is no substantial displacement of the fragment (Wilkins 1990). Nonunion, however, is characterized by progressive displacement; the fragment tends to migrate proximally with increasing valgus deformity which may cause ulnar nerve palsy (Flynn and Richards 1971, Hardacre et al. 1971, Smith 1973, Dhillon et al. 1988, Flynn 1989, Wilkins 1990).

In my study, all patients had pain relief after open reduction and internal fixation. 3 patients stated that they had improved function. No patient was in worse condition after surgery.

In disagreement with those who consider established nonunion in good position to be an acceptable result (Hardacre et al. 1971, Dhillon et al. 1988), I believe that it should be treated operatively. Special attention to details in technique is required. One of the drawbacks of operative treatment is the risk of avascular necrosis of the fragment. The way to prevent this complication is to have knowledge of the course of the blood supply to the lateral condyle (Wilkins 1990). The lateral condyle receives its blood

supply posteriorly through an anastomosis between a collateral branch of the arteria profunda brachii and the recurrent interosseous arteria. When dissecting, the posterior aspect of the lateral condyle must be avoided. Care should be taken to strip the soft tissue as little as possible. The common origin of the extensor muscles should not be dissected anymore than necessary. The degree of displacement seems to be important; the greater the displacement the more probable that surgery will lead to avascular necrosis. Flynn (1989) accepts up to 1 cm separation of the fragment as a preoperative criterion for successful treatment.

Replacement of a more displaced and rotated fragment requires thorough dissection, with risks of avascular necrosis followed by arthrosis and is therefore, for good reasons, not recommended. Therefore, nonunion, even with the fragment in good position, should be treated to prevent displacement and to relieve pain.

References

- Dhillon K S, Sengupta S, Singh B J. Delayed management of fracture of the lateral humeral condyle in children. *Acta Orthop Scand* 1988; 59 (4): 419-24.
- Flynn J C. Nonunion of slightly displaced fractures of the lateral humeral condyle in children. An update. *J Pediatr Orthop* 1989; 9 (6): 691-6.
- Flynn J C, Richards J F. Non-union of minimally displaced fractures of the lateral condyle of the humerus in children. *J Bone Joint Surg (Am)* 1971; 53 (6): 1096-101.
- Flynn J C, Richards J F, Saltzman R I. Prevention and treatment of non-union of slightly displaced fractures of the lateral humeral condyle in children. *J Bone Joint Surg (Am)* 1975; 57 (8): 1087-92.
- Foster D E, Sullivan J A, Gross R H. Lateral humeral condylar fractures in children. *J Pediatr Orthop* 1985; 5 (1): 16-22.
- Hardacre J A, Nahigian S H, Froimson A I, Brown J E. Fractures of the lateral condyle of the humerus in children. *J Bone Joint Surg (Am)* 1971; 53 (6): 1083-95.
- Jakob R, Fowles J V, Rang M, Kassab M T. Observations concerning fractures of the lateral humeral condyle in children. *J Bone Joint Surg (Br)* 1975; 57 (4): 430-6.
- Smith F M. An eighty-four-year follow-up on a patient with ununited fracture of the lateral condyle of the humerus. A case report. *J Bone Joint Surg (Am)* 1973; 55 (2): 378-80.
- Wilkins K E. Residuals of elbow trauma in children. *Orthop Clin North Am* 1990; 21 (2): 291-314.