INJURIES TO THE LATERAL CONDYLE EPIPHYSIS OF THE HUMERUS IN CHILDREN

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This article deals with the mechanism of production and the method of reduction of injuries of the lateral condylar epiphysis of the humerus. These injuries are usually described as affecting the capitulum, but, as noted by Roberts (1936) and Watson-Jones (1943), the detached fragment consists of the capitular epiphysis and the lateral third of the trochlea with a fragment (common to all epiphysial injuries) of the humeral metaphysis. The line of fracture is remarkably constant.

MECHANISM OF PRODUCTION

The usual view is that the extensor muscles avulse the fragment from its bed, causing displacement which varies from a downward and lateral displacement (usually also backwards) to rotation of the fragment. It is difficult to believe that muscular effort alone would cause this. Moreover, when the medial epicondyle is avulsed, without dislocation of the elbow, the displacement is never marked. Our belief is that the elbow is dislocated postero-laterally and carries the fragment with it. If the dislocation is incomplete the fragment moves downwards, laterally and backwards. If the dislocation is more marked the fragment is pulled backwards. Dislocation associated with fracture renders the joint unstable in all directions. The dislocated joint surfaces can fall forwards approximately into their normal position and the fragment lies anterior to the humerus. Clinically no dislocation appears to be present (Fig. 1). This hypothesis of causation gives the clue to successful closed reduction.

FIG. 1
Displacement of lateral condyle epiphysis with rotation of the fragment. Although clinically there may be no apparent dislocation at the time of examination, it is believed that the mechanism of the injury is a dislocation of the elbow with spontaneous (but usually incomplete) reduction.

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TECHNIQUE OF CLOSED REDUCTION

The method of reduction consists in redislocating the elbow postero-laterally, then reducing it, when the fragment settles in its bed accurately. The fragment itself does not require to be pressed into position but care must be taken to move the radius and ulna medially to get accurate apposition. In one case manipulation seemed to be unsuccessful until it was realised that full reduction was possible only by pressing medially on the forearm, when the fracture became stable. Figure 2 shows an obvious fracture-dislocation of the elbow which appears to be a medial dislocation, but reduction could only be made by first

FIG. 2
Case 2—Before reduction

FIG. 3
Case 2—After manipulative correction by redislocating the joint and then reducing it without applying local pressure to the displaced fragment.

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pushing the elbow laterally, and then bringing it medially into position again. This gave accurate reduction (Fig. 3). Another case is illustrated in Figures 4 and 5. Figure 4 shows non-articulation of the ulna with the humerus and the fragment lies anteriorly. Figure 5 shows accurate reduction by redislocating the elbow, then reducing it. Figures 6 and 7 show a further case. In Figure 6 the fragment is trapped between the surfaces and the ulna does not articulate accurately with humerus. Reduction by the manipulation described was again successful (Fig. 7).

The bad results of missed injury seem to depend upon the ulna being in poor apposition.
with the trochlea rather than upon bad positioning of the condylar epiphysis. In the radiographs illustrated the ulna is not in proper alignment with the humerus in any of the cases before manipulation. In one late case in which the displacement was overlooked operation was undertaken to replace the fragment. The condylar epiphysis was dissected away from the humerus and, on exploring the rest of the joint, it was discovered that the remaining trochlear cartilage was non-existent and the lower end of the humerus covered with fibrous tissue to fill the gap between the non-articulating bones. In cases in which the condyle is displaced slightly downwards and laterally the head of the radius still articulates
with the fragment and it seems probable that movement is impaired because the ulna does not articulate properly with the trochlea.

We suggest that elbow injuries in children might be classified as follows: 1) dislocation of the elbow; 2) dislocation of the elbow with fracture of the medial epicondylic; 3) dislocation of the elbow with fracture of the lateral condyle epiphysis.

**CASE REPORTS**

Since 1944 nine injuries of this type have been treated successfully by closed reduction. Eight cases have been followed up and their main features are summarised on page 89.
Case 1—This was the first case reduced by manipulation in 1944. Eight years later function was perfect. Radiographs showed a normal joint.

Case 2—Patient not traced for follow-up (Figs. 2 and 3).

Case 3—Function was normal three and a half years after reduction. Radiographs showed sound union of the fragment to the humerus.

Case 4—One year and three months after reduction flexion of the elbow was full; extension was to 150 degrees. There was obvious thickening over the fragment. Radiographs showed slight lateral displacement of the fragment, but good union to the humerus.

Case 5—Full function was present one and a half years after reduction.

Case 6—When examined three months after reduction flexion of the elbow was full; extension was to 160 degrees.

Case 7—Three months after reduction flexion of the elbow was full. Extension was to 160 degrees. There was palpable thickening over the fragment (Figs. 4 and 5).

Case 8—Three months after reduction flexion was full; extension was to 150 degrees. Slight thickening over the fragment.

Case 9—On examination eight months after reduction the function of the elbow was normal (Figs. 6 and 7).

SUMMARY

1. The mechanism of production of injury to the lateral condyle epiphysis is discussed.
2. A technique of closed reduction of rotational displacements of the epiphysis is described. Nine cases in which the method was successful are noted.
3. It is suggested that the injury should be classified with dislocation of the elbow.

Addendum—Since this article was submitted two more cases have been treated. The first case is interesting in that pressure on the fragment was used in an attempt to facilitate reduction. Far from helping reduction, it caused the fragment to rotate upside down and to become locked inside the joint; operation was necessary to reduce it. In the second case reduction of the large fragment was achieved easily by simply dislocating the elbow, then reducing it, when the fragment settled in its bed (Figs. 8 and 9).

REFERENCES
