OPERATION FOR CHRONIC DISLOCATION OF THE RADIAL HEAD IN CHILDREN

REDUCTION BY OSTEOTOMY OF THE ULNA

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Nine children with chronic post-traumatic dislocation of the head of the radius were treated by an osteotomy of the ulna with over-correction of the angular deformity and with elongation of the bone. Satisfactory results were obtained in eight cases, the only poor outcome following a three-year delay between the initial injury and the reposition. The interosseous membrane of the forearm appeared to be the most important structure in maintaining the corrected position of the radial head.

Opinions vary as to the need for operative correction of chronic asymptomatic dislocation of the head of the radius. However, in children with elbow deformities, or with decreased range of movement, or chronic pain, reposition of the radial head is desirable. Techniques which have been advocated include: reconstruction of the annular ligament (Campbell 1929; Bell Tawse 1965; Boyd and Boals 1969; Wilson 1976), osteotomy of the ulna (Judet, Lord and Roy-Camille 1962; Nishio et al. 1965; Bouyala, Chrestian and Ramaherison 1978) or of the radius (Yamamoto et al. 1976) and a combination of ligament reconstruction and osteotomy (Lloyd-Roberts and Bucknill 1977; Fowles, Sliman and Kassab 1983).

Reconstruction of the annular ligament is often inadequate to maintain the position of the radial head and may be followed by re-dislocation. In addition, narrowing and restriction of rotation of the radial neck may be caused by excessive tension in the reconstructed ligament (Campbell 1929; Boyd and Boals 1969; Bunnell 1970; Lloyd-Roberts and Bucknill 1977; Fowles et al. 1983). In children, inhibition of growth of the radial head by the reconstructed ligament must also be considered.

Judet et al. (1962), Nishio et al. (1965) and Bouyala et al. (1978) have reported the use of ulnar osteotomy for repositioning the radial head, but there are no large-scale studies of patients followed over a long period of time.

An osteotomy of the ulna with over-correction and elongation aims to maintain the reduced position of the radial head through the stabilising action of the interosseous membrane. The technique requires removal of the scar tissue interposed in the radiohumeral joint, and its success depends on the absence of deformity of that joint and the avoidance of excessive pressure on the radial head after the operation.

PATIENTS AND METHODS

We have treated nine cases of post-traumatic symptomatic chronic dislocation of the radial head in the last seven years. The age at operation ranged from 2 to 12 years but was under 10 years in eight cases. There were five boys and four girls; the right side was affected in three cases, and the left in six. The interval between injury and surgical repair ranged from two months to three years, but in seven cases repositioning was performed within six months. The radial head was dislocated anteriorly in five cases, anterolaterally in two and laterally in two; four of the cases with anterior dislocation were complicated by paralysis due to involvement of the deep branch of the radial nerve.

There was elbow deformity in seven patients, with protrusion of the radius at the elbow in five and cubitus valgus in two. Restricted range of movement of the elbow was found in six cases, with pain on movement in four. In two of the four cases complicated by radial nerve palsy, the nerve had become trapped; this interfered with the repositioning of the dislocation. In one patient nerve resection and repair was required for neural disruption.

Technique of operation. A pneumatic tourniquet is used on the upper arm and a posterolateral skin incision (Boyd

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Fig. 1

Over-correction with posterior convexity and elongation of the ulna for anterior dislocation of the radial head.

1940) extends from above the elbow to expose the joint and the proximal third of the ulna. Then the meniscus-shaped scar tissue around the radiohumeral and proximal radio-ulnar joints is excised to facilitate the repositioning of the radial head by direct digital pressure, though at this stage the position is difficult to maintain.

A subperiosteal osteotomy of the ulna is then performed 5 cm below the olecranon. This osteotomy is distracted by about 1.0 cm to elongate the ulna, and angulated to produce over-correction of the deformity; anterior displacement of the radial head is corrected by posterior angulation of the ulna (Fig. 1), and lateral dislocation by medial angulation (Fig. 2). The osteotomy is held by a metal plate bent to an angle of about 15°. It is important to ensure that the repositioned radial head lies in the radial notch of the ulna; this ensures proper spacing in the radiohumeral joint and prevents excessive pressure on the radial head. In later cases, because of two instances of fatigue failure, a heavier plate was used. Before wound closure the stability of the repositioned radial head is tested by flexion, extension, pronation and supination. The anconeus muscle is re-approximated to help maintain the position, but no attempt is made to repair the annular ligament.

Postoperatively, the elbow is immobilised in 90° flexion and full supination in a plaster splint. Active movements are begun after four weeks. The key to the success of the procedure is adequate elongation of the ulna to produce proper spacing at the radiohumeral joint.

Fig. 2

Over-correction with medial convexity and elongation of the ulna for lateral dislocation of the radial head.

RESULTS

Follow-up was from 18 months to 7 years, with a mean of three years. Using the criteria of Bruce, Harvey and Wilson (1974), the results were excellent in six cases, good in two and poor in one. The patient with a poor result was operated on at the age of 12 years, some three years after the injury, and restriction of extension and pronation persisted. In three patients, loss of 40° to 80° pronation persisted. Deformity was corrected in all patients and any pre-operative pain on movement was relieved.

Radial nerve palsy recovered in two patients after reposition of the dislocation; in two other patients there was some improvement in neural function, after external neurolysis in one case, and after local resection of scar tissue and epineural repair in the other.

Postoperative radiographs revealed residual subluxation of the radial head in one patient; retrospective evaluation revealed that some displacement had been apparent immediately after operation. In one case, there was marked radiographic enlargement of the radial head three years after operation, but the correction of the protrusion deformity had restored a normal clinical appearance. In no case was there myositis ossificans of the elbow or necrosis of the radial head, and no clinical or radiographic abnormalities were found in the distal radio-ulnar joint. In two patients, fracture of the plate occurred, but this was successfully treated by further fixation. No other complications were noted.

CASE REPORTS

Case 2. A four-year-old girl had sustained an anterior dislocation of the right elbow in a fall. Residual displacement of the radial head had been overlooked and her elbow was splinted in plaster. She was referred six months later with a protrusion deformity of the radial head and cubitus valgus of 20°. The range of movement was from 20° to 120° of elbow flexion and she had mild restriction of pronation (Figs 3a and 3b). Radiographs showed ulnar deformity and anterior dislocation of the radial head (Figs 3c and 3d). Arthrography of the elbow confirmed that there was no deformity of the radiohumeral joint surfaces.

Relocation of the radial head with over-correction and elongation of the ulna was performed, with union of the osteotomy by four months (Figs 4a and 4b). Four years later there was no deformity, and a full pain-free range of movement (Figs 5a to 5d). Radiographically, some posterior convexity persisted at the site of the ulnar osteotomy but the radial head was normally located and the distal radio-ulnar joint appeared to be normal.

Case 8. A two-year-old girl had sustained a lateral dislocation of the left elbow in a fall. The elbow was reduced and held in plaster, but residual dislocation of the radial head was overlooked. She was referred with a protrusion deformity of the radial head, and had marked restriction of movement with flexion of 20° to 120°, pronation of 20° to 80° and no supination. Her radiographs are shown in Figure 6. Two months after the injury, a corrective ulnar osteotomy was performed, with union in four months. On review, 18 months postoperatively, there was no deformity or pain and a full range of movement. Radiographically, the radial head remained in position and there was only slight deformity at the osteotomy site (Fig. 7).

DISCUSSION

Various methods of ligament reconstruction, osteotomy of the radius and/or the ulna, or combinations of both

Case 8. Figure 6 – Two months after injury, the radial head is dislocated laterally and ulnar malunion is seen. There was marked restriction of movement and protrusion of the radial head. Figure 7 – Eighteen months after over-correction and elongation of the ulna, the protrusion of the radial head had disappeared with almost full recovery of range of movement.

have been performed for chronic dislocation of the radial head. It is usually necessary to resect the scar tissue found in the radiohumeral and the proximal radio-ulnar joints.

The radial head can be maintained in position by elongating the ulna. The tension in the interosseous membrane helps to hold the radial head in its normal position and also prevents excessive pressure at the radiohumeral joint. Several postoperative complications

have been described. First, limitation in pronation can occur, but this is probably caused by operative fixation in a position of supination. The interosseous membrane is normally tense in supination and in the intermediate position (Wiley, Pegington and Horwich 1974). In order to avoid restriction in pronation, fixation is now performed with the distal ulna rotated into an intermediate position. A strong plate is used. In addition,

early active movements appear to be helpful.

Secondly, a flexion contracture, persisting after fixation of the osteotomy, is probably due to shortening of the biceps secondary to the chronic dislocation. In some cases it was necessary to lengthen the tendon of the biceps to regain full extension as the final stage of the repositioning procedure.

The operation is recommended for children under 10 years of age, but it is not appropriate if there is deformity of the head of the radius, flattening of the capitellum, or a valgus deformity of the neck of the radius. It is important that the condition of the articular cartilage in the radiohumeral joint is evaluated by pre-operative arthrography.

Conclusion. Post-traumatic dislocation of the head of the radius can be treated by over-correction and elongation osteotomy of the ulna. Repositioning and maintenance are simple and effective, and postoperative complications are few. Strong internal fixation is imperative so that early active movement can be encouraged.

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