ANTERIOR DISLOCATION OF THE RADIAL HEAD IN CHILDREN

AETIOLOGY, NATURAL HISTORY AND MANAGEMENT

G. C. LLOYD-ROBERTS and T. M. BUCKNILL, LONDON, ENGLAND

From the Hospital for Sick Children, Great Ormond Street, London

The results of operation for traumatic anterior dislocation of the head of the radius in eight children have been reviewed. We are satisfied on the basis of the results obtained and the outcome in one untreated patient that operative reduction is fully justified, provided that the annular ligament is reconstructed and internal fixation employed. We have not seen unilateral congenital dislocation and doubt its existence. Secondary subluxation of the distal radio-ulnar joint has been noted in an untreated patient.

There are two important aspects of anterior dislocation of the radial head in children. First, although it has been generally accepted that there is a congenital variety of unilateral anterior dislocation with specific diagnostic signs, it is considered that this assumption should be questioned. Second, there is debate about whether early surgical reduction is indicated or if an expectant attitude should be adopted with possible excision of the radial head in the future. Uncertainty about the aetiology contributes to this dilemma.

THE NATURE OF THE DISLOCATION

The existence of congenital anterior unilateral dislocation as a separate entity is doubtful and we agree with Caravias (1957), who was only prepared to accept the congenital variety as a rarity. Congenital dislocation is characteristically bilateral and more commonly posterior, being sometimes seen in Ehlers–Danlos, nail–patella and Silver’s syndromes (Almquist, Gordon and Blue 1969).

McFarland (1936) described the radiological signs which he believed distinguished the congenital from the traumatic in unilateral dislocations, but we submit that all of these could be as readily attributed to the late manifestations of anterior Monteggia fractures. Figure 1 illustrates the elbow of a man of fifty-nine who sustained an anterior Monteggia fracture-dislocation at the age of nine. The convex radial head, flattening of the capitulum and anterior angulation of the ulna which are regarded as characteristic of congenital dislocation are clearly seen as a result of the injury. McFarland also described sesamoid bones in the area, but we suspect that he was misled by ectopic calcification or localised myositis ossificans, as may be seen in Figures 2 and 3, where the normal posterior curve of the ulna is also reversed.

McFarland’s suspicions of the congenital nature of the deformity were raised by the lack of a history of injury in some patients. However, relatively little force may be necessary to cause a greenstick fracture of the ulna in a very young child and the transitory symptoms may be ignored by the parents, especially if the injury is the result of assault. Furthermore, even if the dislocation is recognised, the associated fracture may be easily overlooked, as it was in the patients illustrated in Figures 3 and 10.

We believe, therefore, that the congenital nature of some unilateral anterior dislocations remains unproven. If its existence is denied our attitude to management may be greatly simplified, because we may then assume that we are dealing with a disorder of an elbow which has been normal at one time. Such elbows are more likely to be reparable than those in whom the dislocation occurred during intra-uterine life.
Fig. 2
Lateral radiograph of an elbow showing calcific opacity surrounding the radial neck three years after injury. The normal posterior curve of the ulna is reversed.

MANAGEMENT
Rational management depends upon a comparison between the outcome in untreated deformity and the results that we may reasonably expect to achieve by surgical correction.

Natural history of an untreated dislocation—Figure 1 illustrates the elbow of a man of fifty-nine which had been injured at the age of nine. Although the elbow had been painful for no more than five years, there was fixed flexion deformity of 80 degrees and an unstable valgus deformity of 30 degrees. Flexion was limited to 110 degrees and forearm rotation was restricted. Power and dexterity were reduced because of limitation of movement, instability and, latterly, pain. The outcome may therefore be regarded as unsatisfactory and a reliable method of early correction is needed.

TABLE 1
Details of Injury, Operation and Results

<table>
<thead>
<tr>
<th>Case number</th>
<th>Age (years)</th>
<th>Injury</th>
<th>Interval injury to operation</th>
<th>Operation</th>
<th>Duration of follow-up</th>
<th>Function</th>
<th>Extension/flexion (degrees)</th>
<th>Pronation/supination (degrees)</th>
<th>Carrying angle</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>Isolated radial head dislocation</td>
<td>3 years</td>
<td>Palmaris tendon loop and Kirschner wire</td>
<td>6 months</td>
<td>Good</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Anterior Monteggia</td>
<td>9 months</td>
<td>Palmaris tendon loop and Kirschner wire</td>
<td>18 years</td>
<td>Good</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>Posterior Monteggia</td>
<td>14 months</td>
<td>Triceps sling Kirschner wire Ulnar osteotomy</td>
<td>18 months</td>
<td>Good</td>
<td>-20</td>
<td>Full</td>
<td>75</td>
<td>Full</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>Anterior Monteggia</td>
<td>3 years</td>
<td>Triceps sling Kirschner wire</td>
<td>2½ years</td>
<td>Good</td>
<td>-10</td>
<td>45</td>
<td>45</td>
<td>15 degrees varus</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Isolated radial head dislocation</td>
<td>19 months</td>
<td>Triceps sling Kirschner wire</td>
<td>20 months</td>
<td>Fair</td>
<td>-5</td>
<td>100</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>Anterior Monteggia</td>
<td>4 months</td>
<td>Triceps sling Kirschner wire</td>
<td>5 years</td>
<td>Good</td>
<td>Full</td>
<td>75</td>
<td>75</td>
<td>Full</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Anterior Monteggia</td>
<td>18 months</td>
<td>Triceps sling No Kirschner wire</td>
<td>7 years</td>
<td>Good</td>
<td>-5</td>
<td>100</td>
<td>45</td>
<td>Full</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>Anterior Monteggia</td>
<td>6 months</td>
<td>Triceps sling Kirschner wire</td>
<td>7 years</td>
<td>Good</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
</tr>
</tbody>
</table>
Surgical treatment — We have operated upon eight patients. Some clinical details together with results are summarised in Table 1. It is evident that the functional and radiological results are satisfactory over relatively short periods. Reduction was complete in all but two patients in whom some subluxation persisted (Figs. 6 to 9). Although one patient (Case 1 in Table 1) was not seen after six months, the overall average follow-up period was more than five years. One patient who is now twenty-two and was operated upon eighteen years ago remains entirely satisfactory (Figs. 10 and 11). The longest interval between injury and operation was three years, and the shortest four months.

Myositis ossificans has not developed after operation in any elbow, though it was a complication that we feared. The annular ligament was repaired in all patients. We used a free graft of palmaris longus in two (Cases 1 and 2) (Watson-Jones 1955) and in six a part of the triceps tendon, retaining its attachment to the ulna. In seven patients reduction was secured by a Kirschner wire. This was omitted in one patient in whom we failed to maintain complete reduction (Case 7).

Although satisfactory results were obtained with both methods we prefer reconstruction with the triceps tendon, for it confines the operation to one surgical field, and the preservation of the normal ulnar attachment inspires confidence in the viability of the refashioned ligament. Kirschner wire fixation seems essential in both methods.

TECHNIQUE OF OPERATION
We have introduced two modifications to the technique described by Bell Tawse (1965). We have used the lateral rather than the central portion of the triceps tendon because, having a rolled edge, it is more substantial than the less compact central slip; and we have inserted a Kirschner wire to stabilise our reduction as suggested by Lambrinudi (1939). The patient lies prone with the elbow flexed and forearm hanging free (Boyd 1940), the ulnar nerve is identified and the lateral margin of the triceps tendon cleared of surrounding connective tissue. The joint capsule is abnormal, being infolded laterally and apparently in two layers due to partial tearing of the anterior layer. This may temporarily disorientate the surgeon, but if the radial head is pushed backwards by a finger around the front of the elbow it may be more easily felt within the capsular recess. It is now easy to cut down upon it and to clear the remaining capsule from head and neck. Reduction is now possible without tension.

A strip of triceps tendon about 1 centimetre broad and 6 centimetres long is detached from the lateral side, with care to preserve its attachment to the olecranon. The dissection is continued distally, lifting the periosteum of the ulna in continuity with and at the same width as the tendinous strip down to a point opposite the radial neck. The strip is now passed around the neck and passed through a large drill hole in the ulna and stitched both to itself and to the ulnar periosteum (Fig. 4), thus reconstructing the annular ligament.

A Kirschner wire is now passed through the capitulum to enter the proximal radius with the elbow flexed (Fig. 5), and a plaster is applied. The plaster is retained for six weeks, after which the wire is removed and mobilisation begins.

It has only once been necessary to correct the deformity of the ulna (Case 3: Figs 6 to 9) when bowing prevented satisfactory reduction. There was also some deformity of the neck of the radius which has prevented full correction.
ILLUSTRATIVE CASES

Case 2 — At the age of four this girl fell from a sofa and injured her left elbow. A radiograph was regarded as normal, pain and swelling gradually disappeared, and function improved to the extent that there was no disability. She was seen at the Hospital for Sick Children four months later because her mother had noticed that the elbow was misshapen. The radial head was palpable anterior to its normal position, and movements were full with the exception of flexion, which lacked 20 degrees (Fig. 10). Five months later (nine months after the injury) open reduction and annular ligament reconstruction using the tendon of palmaris longus with Kirschner wire fixation were undertaken.

Eighteen years later at the age of twenty-two she was free of symptoms and the elbow was stable with a full range of movement (Fig. 11). She could recall no disability except that when at school she had some difficulty in maintaining a handstand.

Case 3. Figures 6 and 7 — Radiographs of the forearm of a six-year-old boy fourteen months after an anterior Monteggia fracture, showing the deformity of the ulna and of the neck of the radius which is dislocated. Figures 8 and 9 — The same forearm after reduction of the radial head and ulnar osteotomy. Some subluxation persists in part caused by the deformity of the neck of the radius.
Case 8. Figures 12 and 13—Anterior and lateral radiographs of the elbow showing the dislocated radial head. There is some anterior bowing of the ulna.

Fig. 14

Fig. 15

Figures 14 and 15—The radiographs seven years after operation.

Case 8—The history was similar in many respects. At the age of five the patient fell from a chair and a radiograph at the time was regarded as normal. Six months later, however, the radial head was clearly displaced on clinical examination but this was less evident in the lateral radiograph although obvious in the antero-posterior projection (Figs. 12 and 13). Open reduction was stabilised by a triceps sling and Kirschner wire.

Seven years later she is living abroad and we are grateful to Dr H. I. Blaylock of Birmingham, Alabama, for details of her present state (Figs. 14 and 15). She has no symptoms and movement is full. Reduction is maintained.

DISCUSSION

We believe on the basis of our results that surgical correction is fully justified in irreducible anterior dislocation of the radial head in children. We do not subscribe to the expectant attitude advocated by some authors (McFarland 1936; Salter 1970; Pollen 1973) because of the unsatisfactory outcome which we have described. Nor do we agree with Blount (1954) that...
operation should be withheld if the dislocation is more than three months old.

We have only once denied operation. The dislocation had been present for five years, movement and function were good, and proximal displacement of the radial head was such that it could not be disengaged from the front of the humerus. We believed that shortening of the radius would have been necessary to achieve reduction which seemed unjustifiable in the circumstances.

We are cautioned against excision of the radial head in growing children because of the risk of secondary subluxation of the distal radio-ulnar joint due to proximal migration of the radius (Watson-Jones 1955). This is an illogical argument in this context, for radio-humeral stability has been lost by the dislocation, and if this remains uncorrected the cause of this complication is already present (Fig. 16). Early excision is nevertheless undesirable in anterior dislocation because instability of the proximal radio-ulnar joint permits the radius to displace further forwards and to migrate more proximally, thus producing increasing valgus deformity and instability. Late excision may, however, alleviate the problem in some neglected patients by improving the range of flexion and rotation.

REFERENCES