TREATMENT OF THE MISSED MONTEGGIA FRACTURE IN THE CHILD

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Eight children with missed Monteggia fracture-dislocations are described. Seven had reconstructive surgery which included resection of scar tissue from the radiohumeral joint, proximal ulnar osteotomy, reduction of the radial head and reconstruction of the annular ligament. One had excision of the radial head. Excellent results were obtained in patients under ten years of age, up to four years after the initial injury.

Since the original description in 1814 by Giovanni Monteggia of a fracture of the ulna associated with dislocation of the radial head, attention has been focused on the immediate recognition and treatment of this injury. The appropriate management in children, reduction of the fractured ulna and the dislocated head, can usually be achieved by closed methods. The dislocation is not infrequently missed, however, at the time of initial presentation (Fowles, Sliman and Kassab 1983; Dormans and Rang 1990).

The late treatment of unrecognised Monteggia fracture-dislocation remains controversial. The radial head may be left in its dislocated position (Stelling and Cote 1956; Pollen 1973) or excised at maturity if pain or restriction of motion are present (Blount 1954; Watson-Jones 1955). Late reconstruction aims to reduce the dislocated head and reconstruct the annular ligament (Bell Tawse 1965; Lloyd-Roberts and Bucknill 1977). Reconstruction may be accompanied by an osteotomy to shorten the radius (Lloyd-Roberts and Bucknill 1977), a corrective ulnar osteotomy (Wiener et al 1981; Kalamchi 1986), at the site of the original fracture (Scheier, Wiener and Munzinger 1981) or proximally (Bouyala, Chrestian and Ramaherison 1978), or radial and ulnar osteotomies (Freedman, Luk and Leong 1988).

We have examined the results in eight patients who had been treated for late, unrecognised Monteggia lesions to determine if late reconstruction is the appropriate treatment.

PATIENTS AND METHODS

Boyd and Boals (1969) defined a late missed Monteggia lesion as the classical fracture-dislocation presenting at least four weeks after injury (Fig. 1). All eight such patients referred to the Adelaide Children’s Hospital from 1980 to 1990 were reviewed by one of the authors (TMS). They answered a questionnaire about symptoms such as pain, lack of motion and instability and underwent physical examination of both elbows with estimation of the carrying angle and range of motion by goniometry. Pre-operative radiographs were available in all but one case and corresponding anteroposterior and lateral radiographs were taken at follow-up.

Presenting symptoms and signs. At first presentation only one patient complained of pain (case 2). Five had a visible deformity of the limb and seven had some restriction of movement. Flexion was severely restricted.
in one, moderately in two and mildly in three patients. Extension was moderately restricted in one and mildly in two. One patient had complete loss of pronation and two had a mild restriction. Supination was absent in one, moderately restricted in one and mildly restricted in four.

The radiographs showed that the radial head was dislocated anteriorly (Bado type I) in six patients and posteriorly (Bado type II) in one. All had signs of bending or a healed fracture of the ulna (Bado 1967, Fig. 1). The radial head looked significantly deformed in cases 2 and 4 (Fig. 2).

**Surgical technique and intra-operative findings.** The mean interval between injury and operation was three years four months and the mean age at operation eight years six months. The various surgical procedures performed are outlined in Table I.

<table>
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<th>Table I. Details of eight cases of late-treated Monteggia fracture-dislocation</th>
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<td>Age (year/month)</td>
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* 0 represents the neutral position
† with Kirschner wire fixation

One patient (case 1) had successful closed reduction of the radial head four weeks after injury. Six required open reduction of the radial head, using a posterolateral approach to the elbow (Boyd 1940). The first step was to find the radial head which was covered with dense fibrous scar tissue; this was incised longitudinally without excision of any calcified areas. If dense fibrous tissue in the radiohumeral joint blocked reduction it was excised.

In one patient (case 3) the radial head was easily reduced without osteotomy and stabilised by reconstruction of the annular ligament using the technique described by Lloyd-Roberts and Bucknill (1977).

In four patients (cases 5 to 8) the ulnar angulation was reversed and the radial head relocated by a proximal ulnar osteotomy held by a small plate bent to the desired shape (Figs 3 and 4). Once the ulna had been stabilised, the annular ligament was reconstructed. The stability of the reduction was enhanced in two patients by a Kirschner wire across the radiohumeral joint (Fig. 5). One radial head, not so fixed, dislocated in the early postoperative period and was secondarily transfixed with a Kirschner wire after reduction and reconstruction of the annular ligament.

In one patient (case 2) we performed shortening of the radius and ulnar osteotomy to relocate the radial head. Despite annular ligament reconstruction the radial head redislocated and was excised four years later.

Postoperatively, all the patients who had had reduction of the radial head were immobilised in a plaster cast for four to six weeks, when the plaster cast and any Kirschner wires were removed. The children then mobilised their elbows without formal physiotherapy.
Case 7: a) the intra-operative photograph shows the radial head in good position, and the corrective ulnar osteotomy which allowed the relocation; b) after six months the head remains reduced and the osteotomy site has healed.

Fig. 3a

Fig. 3b

One patient (case 4) had primary resection of the radial head at skeletal maturity nine and a half years after the original injury.

RESULTS

All the patients were reviewed six months to eight years five months after surgery (mean three years three months). The results are given in Table I.

Only one (case 2) complained of pain; this was after unsuccessful reconstruction and later excision of the radial head.

Cubitus valgus deformity was present in the one patient who had had closed reduction and in the patient in whom the radial head was later excised. There was slight valgus in one of the osteotomised arms (case 5). The range of motion of the elbow and forearm was found to be restricted to some degree in all the cases but only case 4 showed severe restriction. Gross elbow instability was found in one patient after excision of the head of the radius (case 4).

There were no local or systemic complications due to the operation and no neurovascular structures were damaged. Radiographs at follow-up showed that the radial head was correctly located in seven of the eight elbows and there were no degenerative changes.

DISCUSSION

There have been two main subjects of controversy in previous reports of the surgical treatment of missed Monteggia fracture-dislocation in childhood.

The first concerns the interval between injury and treatment and how much disturbance of growth and joint incongruity is consistent with a good result from surgical treatment. The time interval has varied in the literature from three months (Blount 1954) and six months (Salter 1970) to three years (Bell Tawse 1965; Lloyd-Roberts and Bucknill 1977). Scheier et al (1981) reported one successful

Fig. 5

Case 8: a postoperative radiograph showing the corrective osteotomy and Kirschner wire fixation to stabilise the radial head.
case operated on after four years and Wieser et al (1981) described a patient operated on after five years. Freedman et al (1988) reported a good result six years after the injury. In our series the longest interval with a good result was four years one month and the one case in which a reconstruction was attempted more than eight years after the injury failed.

The other important subject of controversy is the age at which there is still sufficient adaptability of the many structures of the forearm and elbow to enable surgical correction to be functionally successful. There are three reports of children older than ten years at the time of surgery, the oldest being 12 (Wieser et al 1981; Hurst and Dubrow 1983; Freedman et al 1988).

In our series the oldest child with a successful outcome was aged nine years and five months and the operation was performed three years ten months after injury.

In all the six patients in whom a stable reduction of the radial head had been achieved neither the interval between injury and surgery nor the age at operation prejudiced the result at follow-up. Individual assessment of the shape of the head and the extent of its proximal shift is essential (Figs 2 and 6).

Bell Tawse (1965) and Lloyd-Roberts and Bucknill (1977) believed that an open reduction of the radial head was sufficient without an ulnar osteotomy. Fowles et al (1983) reported five cases only two of which required an osteotomy. This experience contrasts strongly with our series in which five of the six cases that needed open

Case 6: a pre-operative MRI shows the normal shape of the cartilage of the dislocated radial head. Reduction was successful.
reduction also required corrective ulnar osteotomy. The main difficulties in achieving relocation were compression of the proximally shifted radial head on the capitellum and deviation of the radial head. The need for ulnar osteotomy was stressed by Scheier et al (1981) and Wieser et al (1981). It is doubtful if a simple ulnar osteotomy without internal fixation (Kalamchi 1986) is appropriate since it is also necessary to lengthen the ulna.

In all our patients some degree of restriction of pronation and supination persisted. Only one patient, however, had a functionally disabling limitation of range of movement after excision of the radial head (case 4). The best range of movement was achieved after an open reduction and ulnar osteotomy (case 7, Fig. 7).

**Conclusion.** Reconstruction of late Monteggia lesions can be successfully achieved by open reduction of the radial head and ulnar osteotomy in children up to ten years of age and at least four years after the initial injury. Additional stability of the reduction can be obtained by a transfixing Kirschner wire and by reconstruction of the annular ligament. Excision of the radial head is a salvage operation which should only be performed if reconstructive surgery is not possible and when skeletal growth has ceased.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

**REFERENCES**


