Salvage of the radial head in chronic adult Monteggia fractures

REPORT OF FOUR CASES

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Four men who presented with chronic dislocation of the radial head and nonunion or malunion of the ulna were reviewed after open reduction of the radial head and internal fixation of the ulna in attempted overcorrection. Their mean age was 37 years (28 to 46) and the mean interval between injury and reconstruction was nine months (4 to 18).

The mean follow-up was 24 months (15 to 36). One patient who had undergone secondary excision of the radial head was also followed up for comparison.

The three patients who had followed the treatment protocol had nearly normal flexion, extension and supination and only very occasional pain. All had considerable loss of pronation which did not affect patient satisfaction.

Preservation of the radial head in chronic adult Monteggia fractures appears to be a promising mode of treatment.

Relocation of the radial head in chronic Monteggia fractures by various means is well documented.1-4 In particular, ulnar osteotomy has been described.5-7 All these reports relate to children because, in adults, the traditional treatment has been excision of the radial head for long-standing lesions.8-10

Because of the author’s experience of the poor outcome of excision of the radial head regarding instability, weakness and pain, it was decided to reconstruct the elbow by relocation of the radial head and ulnar osteotomy.

Patients and Methods

Between May 2002 and July 2003 four men, all right-hand dominant, presented with chronic dislocation of the radial head and nonunion or malunion of the proximal ulna. One patient, aged 46 years (case 1), was seen 18 months after injury. He had sustained a segmental fracture of the ulna treated by an unlocked nail.

There was nonunion of the proximal ulna, with a broken nail in situ (Fig. 1).

Another, aged 41 years (case 2), had been assaulted with a sickle and had sustained bilateral injuries to the forearm. Initial treatment had consisted of suturing the lacerations and splintage. He presented 11 months later with dislocation of the radial head, nonunion of the proximal ulna and malunited segmental fractures of the distal ulna. He also had multiple injuries of the tendons of the forearms, with resulting deformities of the hands.

The other two patients aged 28 and 34 years, respectively (cases 3 and 4) presented four months after injury with dislocation of the radial head and malunited fractures of the proximal ulna.

All the patients had a flexion deformity, limited further flexion and pain. Two (cases 3 and 4) had only a ‘jog’ of painful movement at the elbow, marked deformity and shortening of the forearm. One (case 2) had a lateral dislocation of the radial head with a mild anterior component. The others had considerable lateral and anterior components.

Pre-operatively, the patients were informed of the probable need for excision of the radial head at three months if they were not satisfied. The objectives of surgery were primarily, to relocate the radial head and secondly, to obtain the correct relative lengths of the radius and ulna.

The surgical technique was as described by Hirayama et al7 using Boyd’s approach.11 All the radial heads were lustreless but not deformed. Dense scar tissue in the radiocapitellar and the proximal radio-ulnar joints was excised carefully. The nonunions were freshened and osteoclasis performed for the malunited fractures. After mobilisation of the fracture, a trial reduction of the radial head was done. In all patients, the pre-operative plan was to overcorrect the fracture, leaving mild dorsomedial angulation. Fixation was by reconstruction plates and 3.5 mm AO screws.
After radial head excision, a stable reduction of the radial head was achieved. The proximal screws were placed first through the precontoured plate, and the first distal screw was applied in distraction mode to lengthen the ulna. Local callus was placed around the site of the fracture.

Post-operatively, the patients were immobilised in semisupination for six weeks, after which active move-
ments of the elbow, forearm and wrist were encouraged. The patient with tendon injuries (case 2) had multiple reconstructive procedures after the forearm was considered to be stable.

At final follow-up, the range of movement was compared with that of the normal elbow. Function was assessed using the Liverpool elbow score which uses a scale of 0 (worst) to 10 (best).

Results
The outcome in all four patients is shown in Table I. The mean follow-up was 24 months (15 to 36). All the fractures united within four months. There were no cases of redislocation but one patient (case 3) had minimal asymptomatic lateral subluxation (Fig. 2).

In two patients (cases 3 and 4), there were per-operative problems. One patient (case 3) had a radial angulation of 47° of the ulna, with severe shortening of the forearm. This could only be corrected partially because of the severe pull of the interosseous membrane, which bent the precontoured plate in the opposite direction. The residual angulation was 13°. However, the radial head was stable and the position was accepted.

The other patient (case 4) had a similar problem. The ulna started to splinter when reduced. A mild overcorrection was achieved at the expense of shortening. The radial head was stable.

The primary objective was achieved in all patients. The secondary objective was fully achieved in two patients (cases 1 and 2), partially in another (case 3) and not in the fourth (case 4).

Three patients (cases 1 to 3) were very satisfied. All three felt occasional clicks on extremes of pronation, but this was painless.

Case 3. Figures 2a and 2b – a) Pre- and b) post-operative radiographs of the left forearm showing residual radial angulation and minimal subluxation of the radial head. Figures 2c and 2d – Photographs showing c) full supination and d) restricted pronation.
The fourth patient (case 4) had obvious relative lengthening of the radius. At three months he had a supination deformity of 30° with further supination of 50°. Radial shortening osteotomy was advised.\textsuperscript{13,14} He presented 12 months later having had excision of the radial head elsewhere. Although rotary movement was improved significantly and extension marginally, pain, instability and weakness had increased. He scored well in the clinical assessment part of the Liverpool elbow score, except for strength, but poorly in the patient-answered part. Although overall movement was almost normal, his score was the lowest and he was the only patient who did not return to his original occupation.

One patient (case 3) was offered correction of residual angulation, but refused since he had no disability.

Discussion

The study shows a favourable outcome for preservation of the radial head in chronic Monteggia injuries in adults.\textsuperscript{7} Reports of which have previously been sparse.

Horii et al\textsuperscript{15} described relocation in patients up to 20 years of age but the results for older patients (those who had reached skeletal maturity) were not clearly described. Tajima and Yoshizui\textsuperscript{14} advocated salvage of the radial head even in adults, but their data were unclear as to age of patients, the method of treatment and the outcome. Richards\textsuperscript{16} advised ulnar osteotomy and repair of the annular ligament in chronic malunited Monteggia fractures, but the outcome was not described.

The results of excision of the radial head vary, with reports of proximal migration of the radius and the subsequent problems this can create.\textsuperscript{17-19} The range of movement alone does not guarantee good function. In this study, stability and strength compensated for loss of pronation.

The best results were in the patients for whom the problem of relative length of the radius and ulna had been addressed in full. McGinley and Kozin\textsuperscript{20} described the importance of the interosseous membrane in longitudinal forearm stability and load transfer. Hirayama et al\textsuperscript{7} described the other role of this membrane in keeping the radial head located. The integrity of the interosseous membrane could be restored in a chronic lesion by restoring the relative lengths of the radius and ulna. This was attempted in all patients. It was not achieved in one patient (case 4) and the results in two cases (cases 3 and 4) may have been better had an additional radial shortening osteotomy been carried out to restore relative length.

A possible alternative is the use of external fixation to lengthen and angulate the ulna gradually, as described by Tetsworth, Krome and Paley\textsuperscript{21} and Exner.\textsuperscript{22} These studies were, however, in children.

The Liverpool elbow score was easy to use and was not time-consuming. The patients were able to comprehend the questions fully. It also correlated well with patient satisfaction.

Neglected Monteggia fractures are rare in adults because the severe deformity and disability mean that treatment is sought early. Long-term follow-up is required in order to study the pressure effects on the radiocapitellar joint of such patients. In the short-term the results of this study suggest that the procedure is worthwhile.

References