Two consecutive cases of chronic dislocation of the head of the radius after missed Bado type-I Monteggia lesions are presented. Reduction was successfully achieved in both patients after ulnar corticotomy, gradual lengthening and angulation of the ulna using an external fixator. Open reduction or reconstruction of the radio-ulnar capitellar joint was not undertaken. The age at injury was seven years in the older and two years in the younger patient. The time from injury to treatment was five years in the older and three months in the younger child. At follow-up, nine years after completion of treatment in the older and eight months in the younger patient, both show satisfactory movement, function of the forearm and reduction of the head of the radius.

This technique may be considered in missed Monteggia lesions before open procedures on the radio-ulnar capitellar joint are undertaken.

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A Monteggia lesion is a dislocation of the head of the radius in association with a fracture of the ulna. They are rare in children and dislocation of the head is often missed at the time of injury. Bado described a classification system for Monteggia lesions based on the mechanism of the injury and the direction of the dislocation.

Recently, Rodgers, Waters and Hall stated that many operations for chronic Monteggia lesions are unsatisfactory salvage procedures. In a series of seven patients they found that the results of open reduction of the head of the radius and reconstruction of the annular ligament, combined with ulnar osteotomy in five, to be unpredictable.

Inoue and Shionoya described the combination of open reduction of the head and reconstruction of the annular ligament with osteotomy of the ulna for malunited anterior Monteggia lesions in 12 children and related improved results to overcorrection of the osteotomy. Seel and Petersen found in seven patients that the results of operative treatment for chronic Monteggia lesions could be improved by a new technique for reconstruction of the annular ligament. They also gave an overview of the literature on the treatment which included the early reports by Bell Tawse and Lloyd-Roberts and Bucknill. These two studies reported good results in six cases of malunited Monteggia lesions which had been treated by open reduction of the head of the radius and reconstruction of the annular ligament with a slip of the tendon of triceps.

To our knowledge the first description of ulnar osteotomy combined with open reduction of the head of the radius was by Judet, Lord and Roy-Camille in the French literature. Kalamchi described two patients with missed Monteggia lesions, in whom he successfully carried out open reduction of the head of the radius after osteotomy of the ulna. The principle of angular osteotomy of the ulna to treat chronic post-traumatic dislocation of the head has been well illustrated by Hirayama et al.

We now describe the technique of gradual lengthening and angulation of the ulna using callotasis without opening the radiocapitellar joint in two consecutive cases of chronic Bado type-I anterior dislocation of the head of the radius with anterior angulation of the fracture of the ulna.

Case reports

Case 1. A boy suffered a Monteggia lesion of the left arm at the age of seven years; the dislocation of the radial head was missed. He was treated in a plaster cast for five weeks. The dislocation was first diagnosed at the age of 12 years (Fig. 1a) when he presented with increasing pain in his left elbow.

Clinically, there was slight cubitus valgus. Flexion and extension of the elbow were full, but supination was reduced by about 5°. A unilateral lengthening apparatus (Monotube; Howmedica) was applied and a corticotomy of the ulna undertaken. After a delay of seven days the ulna was gradually lengthened by 7 mm over seven days. The first angulation was then carried out under analgesia (Fig. 1b). As the head of the radius failed to reduce a further
lengthening of 5 mm was undertaken followed by a second angulation of about 30° flexion and 10° abduction which reduced the head (Fig. 1c). The fixator was removed when the callotasis had healed four months after the corticotomy.

When seen at 20 years of age, there was a full range of movement of the elbow and forearm (flexion/extension bilaterally 140° to 0° to 10°, pronation and supination bilaterally 80° to 0° to 90°). He was free from pain and the alignment of the wrist was normal. The radiological appearance of the elbow is shown in Figure 1d.

**Case 2.** A girl sustained a Monteggia lesion of the left arm at the age of 2.5 years. The dislocation of the head of the radius was not recognised and she was treated in a plaster cast. Three months later the prominent head was recognised by her parents and the diagnosis was made after radiological examination (Fig. 2a).

Corticotomy of the ulna and application of an external fixator (Hofmann; Howmedica) were undertaken. The proximal ulna was acutely lengthened by 3 mm and angulated with 10° of flexion and 5° of ulnar abduction, the amount being determined by manual manipulation of the Schanz screws without the use of lever arms. After a delay of seven days the position of the head was not considered to be satisfactory (Fig. 2b). Further lengthening of the ulna was therefore undertaken. When 4 mm had been obtained over eight days, flexion was increased to 15° under general anaesthesia and the radial head was satisfactorily reduced on the capitellum (Fig. 2c). Two months after the corticotomy the ulna had healed and the fixator was removed. The radiograph taken four months after removal of the fixator showed a satisfactory position (Fig. 2d), and eight months after removal of the fixator she was free from pain. Flexion and extension of the elbow were 140° to 0° to 10° on the right and 145° to 0° to 5° on the left, and pronation and supination were equal, 80° to 0° to 90°.

**Discussion**

The treatment of the dislocation of the head of the radius in both of these patients was based on the hypothesis that the main problem was the malunion of the ulna. The radius appeared to have moved proximally compared with the ulna. It may have overgrown in the older patient, because of the loss of pressure between the capitellum and the head. Therefore, in the first case initial lengthening of the ulna was undertaken using callotasis to restore the head of the radius to a position distal to the capitellum. When this had
been achieved it was possible to reduce the head by angulation of the ulna through the distraction callus. The principle of ulnar lengthening and angulation described by Lammens et al\cite{10} had been used earlier in several cases of dislocation of the head of the radius from other causes. In the second patient, because of her age and the shorter duration of the dislocation of the head of the radius, angulation and lengthening of the ulna were carried out acutely at the time of corticotomy. Further lengthening and angulation were needed, however, to centre the head correctly.

In spite of the persistence of considerable ulnar bowing in both patients no loss of extension of the elbow or disturbance of carpal alignment was observed at follow-up. The experience of these two cases suggests that gradual lengthening and angulation of the malunited ulna can satisfactorily reduce chronic dislocation of the head of the radius after Monteggia lesions without open reduction of the radiocapitellar joint.

The procedure may therefore be used as the primary operation to reduce the head in missed Monteggia lesions. If the radio-ulnar capitellar joint reduces satisfactorily further open measures are unnecessary. If satisfactory reduction is not achieved by closed means, open reduction and reconstruction may be easier to achieve after the normal anatomy of the ulna has been restored.

Based on these observations closed reduction and control of the ulnar fracture by an external fixator may be considered in the acute Monteggia lesion, when closed manipulation fails to achieve stable reduction of the radial head.

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Case 2. Radiographs showing a) the position three months after injury with healing of the ulnar fracture after closed reduction and casting but persistence of the anterior dislocation of the head of the radius, b) at ten days after corticotomy acute angulation and distraction by a few millimetres, incomplete reduction of the radial head which required further angulation and lengthening of the ulna, c) eight weeks after corticotomy healing of the ulna and reduction of the radial head and d) four months after removal of the fixator with correct alignment of the elbow.
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


