THE MONTEGGIA FRACTURE WITH POSTERIOR DISLOCATION OF THE RADIAL HEAD

J. H. Penrose, Coventry, England

Formerly of the Bristol Royal Infirmary

There are two varieties of the fracture-dislocation originally described by Monteggia (1814), according to whether the head of the radius is dislocated anteriorly or posteriorly. The anterior variety, which is the more common, has received a prominent place in all text-books on fractures, chiefly on account of the frequency with which the dislocation is overlooked (Speed and Boyd 1940, Watson-Jones 1943). The posterior variety, however, has received much less attention and there are few references to it in the literature. Most authorities put the incidence of the posterior variety at 10 to 15 per cent but in a series of ten Monteggia fractures treated during the last year at the Bristol Royal Infirmary no fewer than seven had posterior dislocations of the radial head.

![Image of a Monteggia fracture]

**Fig. 1**
The typical injury. Note the fracture of the ulna with anterior comminution and posterior angulation, the posterior and lateral displacement of the upper end of the radius, and the fracture of the head of the radius.

**Age and sex incidence**—There were five women and two men in the group. In all five women the radiographic appearances were almost identical, but the two men did not follow the pattern so closely. The average age was forty-eight years. Unlike the anterior Monteggia fracture, which occurs frequently in children, this is essentially an injury of middle age, and women seem particularly susceptible.

**PATHOLOGY**

*The fracture of the ulna*—There is a fracture of the ulna about one inch distal to the coronoid process, with a separate triangular or quadrilateral fragment displaced anteriorly (Fig. 1). Several smaller fragments also are usually present on the subcutaneous aspect, but are seldom well seen in the radiograph. There is posterior angulation at the site of fracture, and the distal fragment is displaced towards the radius. (In the more usual anterior type of Monteggia fracture it is the proximal fragment that is displaced towards the radius.) In the five female
Radiograph (Fig. 2) and photograph (Fig. 3) of a specimen showing the usual injury to the radial head in the posterior Monteggia fracture.

Tracings of the ulnar fracture in seven cases of posterior Monteggia fracture. (The main fragments only are shown.)

Tracings showing the pattern of the fracture as seen in the antero-posterior radiographs of six patients with posterior Monteggia fracture. Note the constant position of the detached fragment of the radial head, the lateral displacement of the shaft of the ulna (except in Case 7) and the lateral subluxation of the head of the radius.
patients the fracture of the ulna followed this pattern closely (Fig. 4). In one of the men there was a slight variation in that the anterior triangular fragment was larger than usual and included the major part of the articular surface of the trochlear notch [greater sigmoid cavity]. The other man had a simple fracture of the midshaft of the ulna, such as is often seen in the anterior Monteggia fracture. In this case the mechanism of the injury was different from that in the other six.

*The injury to the radius*—The radial head is dislocated posteriorly and the annular [orbicular] ligament is ruptured, or avulsed with its bony attachment. In four of the seven cases there was a lateral subluxation as well and in every case there was a fracture of the radial head (Figs. 2 and 3). In four cases out of seven this was a fracture of the anterior margin, which had clearly been sheared off by the capitulum [capitellum] as the dislocation occurred. The detached fragment of the radial head lay anteriorly and could be seen between the radius and ulna (Fig. 5). In the other three cases there was a fracture through the neck of the radius in addition to the anterior marginal fracture, so that the broken radial head lay free in the joint in two pieces.

*The injury to the humerus*—In two cases obvious damage to the articular surface of the capitulum was noticed at operation.

**MECHANISM OF THE INJURY**

Patients’ statements regarding the position of the limb at the time of injury notoriously lack detail and the patients in this series could say no more than that they “just fell on the arm,” one from a height of twelve feet, one from the top of a gate, one from a chair and the others from ground level. One man—with the atypical fracture already referred to—had caught his arm in a hydraulic jack. Very little help as to the mechanism of the injury was gained from the patients’ statements.

Evans (1949) has drawn attention to the role of excessive pronation in the production of the anterior Monteggia fracture, and if the posterior variety is to be considered as the counterpart of this injury it is tempting to suggest that forcible supination might play a part in its production. In fact, however, excessive rotation in either direction does not enter into the mechanism at all.

The position of the fractured segment of the radial head affords evidence of the position of the forearm at the moment of impact. Clearly this segment is sheared off by the capitulum as the posterior dislocation occurs (Fig. 6). The position at the time of injury can therefore be determined by placing the forearm in that degree of rotation in which the missing segment faces directly forwards. This can most easily be observed at the time of operation if the radial head or its displaced segment is being removed, but it can be determined also from lateral radiographs taken in varying positions of rotation until the position is found where the fractured segment faces directly forwards. Figure 6 shows a lateral radiograph of an elbow in the dislocated position. The fractured segment of the radial head is facing forwards, and is in contact with the capitulum which sheared it off. The forearm was, therefore, in this position of rotation at the moment of impact; it was neither fully pronated nor fully supinated, but approximately in the mid-position. This was confirmed at operation, which showed that the position was in fact about 30 degrees of pronation. This degree of pronation corresponds to that observed when the hand is placed on the floor with the elbow slightly
flexed, and held well away from the side as in a fall on the hand. In all four cases in which simple marginal fractures occurred there were similar findings and in no case was the arm fully pronated or fully supinated. In the remaining three cases the radial head was completely detached and gave no clue as to its position at the time of injury. The displacement of the radial head posteriorly or postero-laterally invites comparison with the displacement in a dislocated elbow, and it appears likely that the posterior Monteggia fracture is simply a variation of the dislocated elbow, in which the ligamentous attachments of the elbow prove stronger than the shaft of the ulna, and the shaft therefore fractures. In the dislocated elbow the reverse is the case. This hypothesis was tested experimentally by placing a dissecting-room specimen on a rigid support with the elbow at 120 degrees and the forearm in moderate pronation (Fig. 7). The hand was amputated through the wrist and a violent blow was delivered on the distal end of the radius and ulna. As had been expected, the result was a posterior dislocation of the elbow (Fig. 8). But when the upper end of the ulna was deliberately weakened by notching its anterior cortex a similar force reproduced nearly all the typical features of the injury under discussion—namely, a fracture of the ulna with comminution anteriorly and posterior angulation; posterior dislocation of the radial head; and marginal fracture of the radial head (Fig. 9). Under the conditions of the experiment the fracture of the ulna was to be expected and is of no particular significance, but the fracture and dislocation of the radial head, so exactly resembling the clinical condition, does indicate that the mechanism described can produce this injury. The effects of excessive supination and of forcible abduction were also tried, but did not reproduce this pattern of injury.
FIG. 10
Case 2—Radiographs of the elbow before reduction. The head of the radius lies free in the joint in two pieces.

FIG. 11
Case 2. Figure 11—After excision of the head of the radius and internal fixation of the ulna.

FIG. 12
Figure 12—Three months later, after removal of the intramedullary wire.
Case 3—Radiographs before reduction.

Case 3—After excision of the detached fragment of the head of the radius and internal fixation of the ulna.

Case 3—After removal of the intramedullary wire. Despite imperfect reduction of the ulna good function and mobility were regained.
FIG. 16
Case 5—Before reduction. The pattern of the fracture is not quite typical. The triangular anterior fragment is larger than usual and involves most of the greater sigmoid notch.

FIG. 17
Case 5—After excision of the displaced fragment of the radial head and intramedullary nailing.

FIG. 18
Case 5—After removal of the nail. Union is sound.
TREATMENT

Immobilisation in plaster with the elbow extended and the forearm supinated has been recommended for the treatment of this injury. In the cases in which we used this method, it did not produce a good reduction; it tended to increase the forward displacement of the triangular fragment of the ulna to which the brachialis is attached, and it did not prevent the displacement of the distal fragment towards the radius. Moreover, all these injuries occurred in middle-aged people in whom immobilisation of a severely injured elbow in extension for perhaps three months might seriously prejudice the chances of regaining a good range of flexion. These hazards can be obviated by internal fixation of the ulna, especially as operation is necessary in most cases for the fractured head of the radius.

**Technique of operation**—The joint is exposed through a postero-lateral incision. According to the degree of damage to the head of the radius and the capitulum, either the whole radial head or the displaced fragment is excised and the dislocation is reduced. Only if the displaced segment is small and the rest of the joint normal should the segment alone be removed. The joint is closed and the ulnar fracture is exposed by extending the skin incision along the subcutaneous border of the ulna. In most cases the upper fragment is not large enough to permit plating, and consequently intramedullary wire or nail fixation has usually been relied upon. In addition one or two loops of stainless steel wire have been used to maintain the reduction of the comminuted fragments. If fixation is rigid, plaster can be dispensed with and active movements may be started as soon as the wound is soundly healed. The intramedullary wire or nail is removed after the fracture has united. The only difficulty in the operation is to reduce the displaced anterior fragment of the ulna; but even if reduction is imperfect the result may be satisfactory.

Illustrative radiographs are shown in Figures 10 to 18.

**TABLE 1**

**Final Range of Elbow Movement**

<table>
<thead>
<tr>
<th>Case</th>
<th>Angle at elbow (degrees)</th>
<th>Range (degrees)</th>
<th>Pronation (in degrees from neutral rotation)</th>
<th>Supination</th>
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<tr>
<td></td>
<td>Flexed</td>
<td>Extended</td>
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<td></td>
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<td>1</td>
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<tr>
<td>Average</td>
<td>64</td>
<td>160</td>
<td>96</td>
<td>78</td>
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**RESULTS**

There has been some residual disability in all cases (Table 1), but it has been relatively slight when the severity of the injury is considered. It is to be expected that the results will be inferior to those following the anterior Monteggia fracture, in which the radial head is seldom, if ever, fractured and which frequently occurs in very young people.
Slight restriction of flexion and extension and some limitation of supination have been usual. Pronation and supination seem slightly better in those cases in which the whole radial head has been excised. This may prove to be the better treatment in all cases.

CONCLUSIONS
1. The posterior Monteggia fracture usually conforms to a typical pattern.
2. Its incidence is greatest among middle-aged women.
3. The mechanism of the injury is probably similar to that of the dislocated elbow. Excessive rotation of the forearm plays no part in its production.
4. Internal fixation of the ulna combined with excision of the whole radial head, or of its detached segment, is suggested as the treatment of choice.
5. The functional results after operation are excellent, but some slight permanent restriction of movement is to be expected.

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REFERENCES