ENTRAPMENT OF THE MEDIAN NERVE AFTER DISLOCATION OF THE ELBOW

A CASE REPORT

JEFFREY HALLETT

From the Royal National Orthopaedic Hospital and University College Hospital, London

A case of posterior dislocation of the elbow complicated by entrapment of the median nerve is reported. The 13 cases previously reported in the literature are reviewed and the mechanism of the injury discussed. Early exploration of the nerve is advised if entrapment is suspected or if motor recovery in the forearm muscles is retarded.

Entrapment of the median nerve in the elbow is a rare complication that may occur after reduction of a closed dislocation of the elbow (Seddon 1975). Although the condition is infrequent, failure to diagnose it early has serious functional effects and therefore special attention should be paid to assessment of the nerve both before and after reduction.

Incidence. There have been 13 previous cases reported in the literature. In a series of 5000 fractures and dislocations seen in Liverpool over a period of two years there were 97 dislocations of the elbow (Watson-Jones 1930). Although there were 12 lesions of the ulnar nerve the median nerve was damaged only once and this was a partial traction lesion that recovered rapidly. Entrapment was not seen. The median nerve seems to escape injury in elbow dislocations more often than even the arteries. In 1937 Eliason and Brown reported an intact median nerve in a closed posterior dislocation of the elbow where both the radial and ulnar arteries were ruptured. Fourteen further cases of arterial damage were reviewed amongst which three ruptures of the median nerve were reported, but only one of these ruptures was confirmed at operation (Holl 1880). In another case where the brachial artery was trapped

Fig. 1

Figure 1—The two incisions used to expose the entrapped median nerve. Figures 2 and 3—The median nerve emerging from the elbow.
within the elbow after posterior dislocation, the median nerve was stretched causing paraesthesia and a weakness of flexion in the index finger (Mains and Freeark 1975). In their report in 1977 Fourrier, Leval and Collin estimated that for every 500 dislocations of the elbow there would be 100 nerve injuries of various types. However, there would be entrapment of the median nerve in only two or three of these 100 cases. In 1973 Pritchard, Linscheid and Svien stated that partial lesions of the nerve occurred in only seven out of 107 dislocations of the elbow and that none of these were due to entrapment.

CASE REPORT

In 1975 a boy of nine and a half years fell from a fence landing on his right arm. On admission to hospital he was found to have sustained a closed dislocation of the right elbow. No record was made of any sensory disturbance. The dislocation was reduced under general anaesthesia and a backslab applied. Two days after discharge he was admitted for observation as the arm had become swollen and the ring and middle fingers were found to have reduced sensibility. After three weeks the plaster was removed and the elbow mobilised with the aid of physiotherapy. The sensory loss persisted and he was unable to flex his fingers normally. Spontaneous recovery of his presumed axonotmesis was anticipated but when no recovery had occurred after two and a half years he was referred to another hospital.

When the boy was seen in 1977 at the age of 12 years he was found to have full flexion of the elbow but lacked 15 degrees of extension. Sensibility to light touch was absent in the area supplied by the median nerve, and the median innervated muscles in the forearm and hand were paralysed. Tinel's sign was positive at the elbow. A radiograph showed a bony boss at the medial epicondyle suggesting that there had been a fracture at the time of dislocation. Exploration of the median nerve at the elbow was advised in the hope that recovery of sensibility and possibly some motor function could be restored in the forearm and hand.

At operation two incisions were made (Fig. 1) and the proximal end of the nerve was seen to disappear into a hole in the medial epicondyle and then into the elbow emerging at the coronoid process of the ulna (Figs 2 and 3). Subluxation of the joint after division of the medial ligament enabled the flattened nerve lying between the ulna and humerus to be seen (Figs 4 and 5). The encircling bone was nibbled away at the epicondyle. The nerve was then freed from adhesions and retrieved from the elbow. When the nerve was laid in its normal position it was seen to be grossly elongated (Figs 6 and 7). There was a neuroma proximal to the site of entrapment in the bone but no loss of continuity. The tissues were then closed with the nerve in its normal anatomical position.

Fig. 4

Figures 4 and 5—The median nerve in a bony tunnel and entering the elbow.

Fig. 7

Figures 6 and 7—The elongated and flattened median nerve is returned to its original anatomical position at the end of the operation.
Recovery after this operation was uncomplicated and after 12 weeks Tinel's sign was present 10 centimetres below the medial epicondyle. At 24 weeks this had increased to 19 centimetres and at 15 months the sign was present at the wrist. By then there was recovery of sensibility to light touch in the palm, but not in the thumb or index finger. As there was no functional motor recovery tendon transfers were carried out one and a half years after the exploration and four years after the accident.

**DISCUSSION**

**Mechanism of entrapment.** There are probably three different ways in which the median nerve can be trapped after dislocation of the elbow (Fourrier, Levai and Collin 1977). *Type 1*—the nerve is caught in the joint between the humerus and ulna. *Type 2*—the nerve runs through a healed fracture of the medial epicondyle. *Type 3*—the nerve is looped into the humero-ulnar joint (Fig. 8).

In the first type there is a rupture of the medial collateral ligaments as the elbow dislocates and so at injury or during reduction the nerve slips into the joint. The ligament subsequently repairs by fibrosis and the nerve is permanently trapped. In the second type the medial epicondyle is fractured, as Watson-Jones describes happening in 25 per cent of the dislocations of the elbow. (In children the epiphysis of the epicondyle is torn off by the common flexor origin). The nerve slips into the fracture site and stays there when the dislocation and fracture are reduced together. When the fracture heals the nerve is trapped in a tunnel in the epicondyle. In the third type the nerve is tightly stretched over the front of the humerus in the dislocated position. If the nerve is held there during reduction it becomes looped in the front of the joint. The case reported in this paper appears to have resulted from a combination of the first and second mechanisms.

**Anatomical studies of entrapment.** Previous authors have studied the mechanism of entrapment in cadavers.

![Diagram](image)

**Fig. 8**

The three main ways in which the median nerve can be trapped after posterior dislocation of the elbow. *Type 1*—median nerve passes through trochleoulnar joint. *Type 2*—median nerve passes through a bony tunnel at the site of the healed fracture. *Type 3*—median nerve looped into the front of the elbow.

![Diagram](image)

**Fig. 10**

Figures 9 and 10—Dissection of a cadaver to show how the median nerve is pulled into a fracture of the epicondyle when an elbow that has dislocated posteriorly is extended and pronated.
Bonvallet (1977) found that in extension the nerve only rested on the articular surface of the dislocated humerus after artificially fracturing the epicondyle or dividing the attached soft tissues. In order to trap the nerve behind the epicondyle it was necessary to pronate the extended forearm in the dislocated position. The vascular bundle is more difficult to trap in the joint. Pritchard et al. (1973) used a cadaver to reproduce the way in which the nerve was dragged into the dislocated trochleo-ulnar joint in extension and valgus. It was held there by the flare of the epicondyle during reduction. However, I found that in adult cadaver specimens the nerve could only be trapped in the dislocated elbow after fracturing the medial epicondyle, or dividing the muscle and ligament attachments. It was then demonstrated how the nerve was pulled back onto the articular surface and into the fracture site when the elbow was hyperextended and the forearm pronated (Figs 9 and 10).

Analysis of reported cases. Table I shows that this complication which occurs in children is often not diagnosed until several months have passed. It may be successfully treated by surgical exploration with neurolysis, or by resection and repair.

Reduction of posterior dislocations of the elbow. Most authors (Mannerfelt 1968; Steiger, Larrick and Meyer 1969) agree with Watson-Jones that the dislocation should be reduced by gentle traction in flexion along the long axis of the forearm. Once the dislocation is reduced the joint may be flexed further. However, hyperextension before reduction is hazardous. Any lateral displacement is reduced by appropriate pressure.

Diagnosis and management of median nerve entrapment. The possibility of this complication should be remembered whenever an elbow is dislocated. Initial findings on examination should be carefully recorded for comparison with those after manipulation and the reduction manoeuvres should avoid excessive force or hyperextension. Since pain is not a characteristic sign of entrapment (Matev 1976) the diagnosis depends on finding sensory loss in the areas of the hand innervated by the median nerve, and weakness in the long flexors of the thumb and index finger. The abductor pollicis brevis will probably be paralysed and Tinel’s sign may be

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Delay before diagnosis (months)</th>
<th>Type of entrapment</th>
<th>Management</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gurdjian and Smathers</td>
<td>1945</td>
<td>F</td>
<td>7</td>
<td>5½</td>
<td>1</td>
<td>Neurolysis</td>
<td>Improved</td>
</tr>
<tr>
<td>Mannerfelt</td>
<td>1968</td>
<td>M</td>
<td>9</td>
<td>7 days</td>
<td>1</td>
<td>Neurolysis</td>
<td>Sensory and motor good</td>
</tr>
<tr>
<td>Steiger, Larrick and Meyer</td>
<td>1969</td>
<td>M</td>
<td>11</td>
<td>3</td>
<td>2</td>
<td>Neurolysis</td>
<td>Sensory and motor good</td>
</tr>
<tr>
<td>Steiger et al.</td>
<td>1969</td>
<td>F</td>
<td>8</td>
<td>10</td>
<td>1+2</td>
<td>Neurolysis</td>
<td>Sensory good, motor improved</td>
</tr>
<tr>
<td>Seddon</td>
<td>1975</td>
<td>M</td>
<td>5</td>
<td>3 weeks</td>
<td>1</td>
<td>Neurolysis</td>
<td>Full recovery</td>
</tr>
<tr>
<td>Pritchard et al.</td>
<td>1973</td>
<td>M</td>
<td>12</td>
<td>8</td>
<td>3</td>
<td>Resection and repair</td>
<td>Sensory good, motor improved</td>
</tr>
<tr>
<td>Rana et al.</td>
<td>1974</td>
<td>M</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>Resection and repair</td>
<td>Sensory and motor good</td>
</tr>
<tr>
<td>Matev</td>
<td>1976</td>
<td>M</td>
<td>9</td>
<td>12</td>
<td>1+2</td>
<td>Resection and repair</td>
<td>Sensory and motor good</td>
</tr>
<tr>
<td>Matev</td>
<td>1976</td>
<td>M</td>
<td>11</td>
<td>22</td>
<td>3</td>
<td>Neurolysis</td>
<td>Sensory good, motor improved</td>
</tr>
<tr>
<td>Roulet, Levai and Collin</td>
<td>1977</td>
<td>M</td>
<td>13</td>
<td>18</td>
<td>?</td>
<td>Resection and repair</td>
<td>?</td>
</tr>
<tr>
<td>Roulet</td>
<td>1977</td>
<td>F</td>
<td>12</td>
<td>36</td>
<td>?</td>
<td>Neurolysis</td>
<td>?</td>
</tr>
<tr>
<td>Bonvallet</td>
<td>1977</td>
<td>M</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>Exploration</td>
<td>?</td>
</tr>
<tr>
<td>Present case</td>
<td>1980</td>
<td>M</td>
<td>12</td>
<td>30</td>
<td>1+2</td>
<td>Neurolysis</td>
<td>Sensory improved</td>
</tr>
</tbody>
</table>

Figures 11 and 12—Radiograph and diagram of the elbow described in this case report. The sclerotic lines are the margins of the bony tunnel through which the median nerve passes. This is called Matev’s sign.
positive at the elbow. However, the elbow may well have a normal range of movement. After several weeks radiographs may show Matev's sign (Matev 1976) of a well-defined oblique stripe with sclerosed margins across the medial epicondyle (Figs 11 and 12). The sign is caused by healing around the nerve which passes through a bony tunnel formed by a fracture of the epicondyle. Nerve conduction studies and electromyograms confirm the diagnosis but as the nerve passes along an abnormal course they may give false results (Steiger et al. 1969).

In conclusion, if entrapment is diagnosed the nerve should be explored surgically and freed from the bone or joint. Only Bonvallet (1977) felt that the dissection needed to free the nerve from the joint was unjustified. He felt that the elbow would be damaged and he left the nerve where it was. Others have freed the nerve and carried out either neurolysis with the nerve in continuity, or resection and direct suture. Appreciable sensory recovery may occur even after entrapment for two and a half years, but motor recovery is less likely after one year.

I would like to thank Mr Donal Brooks for permission to report his case and for his help in preparation of this paper. I am also indebted to Mr Rodney Sweetnam for the previously unpublished details of the patient upon whom he operated and whose case was reported by Seddon (1975). I am grateful to Mr John Collins of the Royal National Orthopaedic Hospital, and Mr Derrick Ellis of University College Hospital for the photography.

REFERENCES