Case Report

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The Use of MRI in Median Nerve Entrapment after Posterior Elbow Dislocation and Medial Epicondyle Fracture

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Abstract

Intraosseous median nerve entrapment is an uncommon complication of a closed reduction of a posterior elbow dislocation, that can have devastating consequences for patients. The diagnosis is usually delayed, due to the subtle nature of symptoms. Early identification can have a significant impact on the success of recovery. Here we look at the case of 10-year-old girl in the sub-acute setting, who had median nerve entrapment visualised early on Magnetic Resonance Imaging (MRI) following a pre-hospital closed reduction of a posterior elbow dislocation and medial epicondyle fracture. The patient had surgery within three weeks of her injury, undergoing an exploration of elbow, neurolysis of the median and ulnar nerve and repair of the medial epicondyle fracture. She had full recovery from her symptoms.

Keyword: Median nerve; Entrapment; Intraosseous nerve entrapment; MRI; Elbow dislocation; Paediatric

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Introduction

Intraosseous median nerve entrapment is a severe complication of elbow dislocation, though rare. It is more common in children but still only occurs in 3-12% of all posterior elbow dislocations [1-3]. There is often a delay in diagnosis, which can have a significant impact on prognosis [1-5]. Most reported cases discuss findings and management months, sometimes years, post-injury [1,3,6]. This is a case of a symptomatic median nerve entrapment in a 10-year-old girl. This was clearly demonstrated on MRI in the sub-acute setting, which facilitated early and appropriate surgical management. The patient had a full recovery.

Case Report

A 10-year-old girl sustained a posterior elbow dislocation and fracture of her medial epicondyle, after falling off a trampoline onto her dominant, right hand. Her elbow was reduced at the site of the accident, by an off-duty nurse, and then she presented to the emergency department of a regional hospital. On presentation, she had altered median nerve sensation, but there was no documented motor deficit. She had x-rays of her elbow, confirming enlocation of the elbow joint and fracture of the medial epicondyle, which was minimally displaced. She was placed in an above-elbow plaster cast and was referred on to an upper limb paediatric specialist for follow-up. The working diagnosis at the time was a transient neuropraxia, either from the initial injury or from the reduction.

Over the next few days, she presented multiple times to the same hospital with intractable pain. She was seen four days post-injury, and found to have a complete median nerve palsy with:

- Inability to flex thumb, index and part of middle finger at distal and proximal interphalangeal joint.
- Ongoing altered sensation median nerve distribution.
- Vasomotor changes, including pallor and decreased temperature compared to other hand. However, capillary refill time was normal.

Neuropathic pain and allodynia, and she was very reluctant to let anyone touch her arm. Her ulnar and radial nerves were clinically intact. She was referred for an MRI.

The MRI (Philips Ingenia 1.5 T, 2015) showed a recent medial epicondyle avulsion (near anatomic position) with mild associated

oedema. There is entrapment of the median nerve at this site, with the nerve thickened and oedematous **(Figures 1-5).**

Three weeks after this patient's initial injury, she underwent surgical exploration of her elbow, neurolysis of the ulnar and median nerves and repair of medial epicondyle fracture **(Figures 6-8).**

The operation findings were:

- Incarcerated median nerve within the medial epicondyle fragment.
- Intact ulnar nerve.
- Healing medial epicondyle fracture.

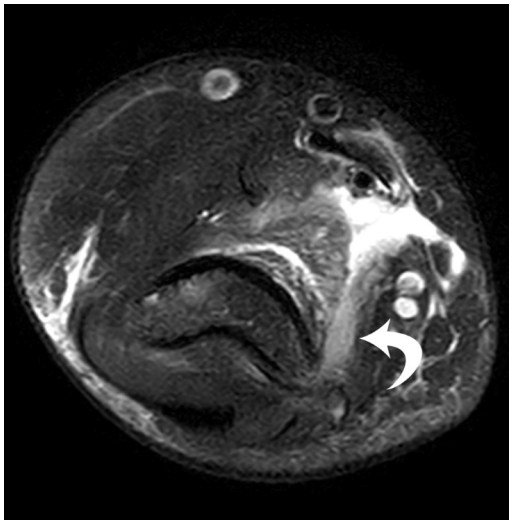

Figure 1 MR axial T2 SPAIR image just proximal to the entrapped segment of the median nerve (curved arrow)

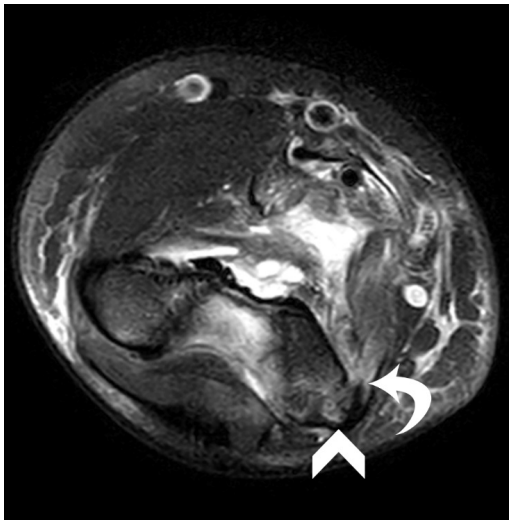

Figure 2 MR axial T2 SPAIR image at the level of the entrapped segment of the median nerve (curved arrow). There is hyperintense nerve thickening and the entrapped nerve is poorly defined at the level of maximal compression. The minimally displaced medial epicondylar apophysis (arrowhead) is demonstrated with mild marrow oedema. There is an associated brachialis muscle tear

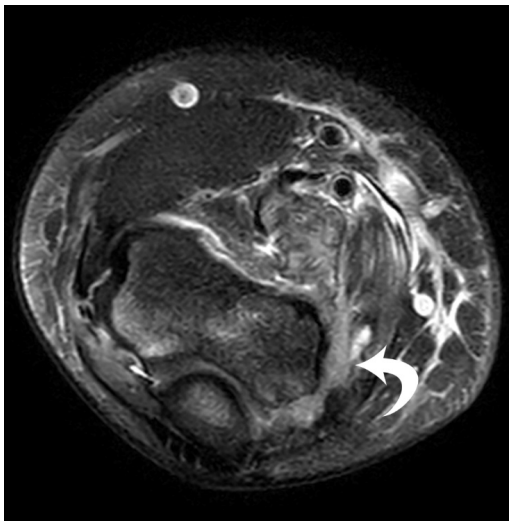

Figure 3 MR axial T2 SPAIR image at the distal margin of the entrapped segment of the median nerve (curved arrow).

Figure 4 MR sagittal PD image showing the thickened median nerve (arrows) coursing abnormally posteriorly towards the medial epicondyle.

Figure 5 MR coronal T2 SPAIR image showing the entrapped median nerve (curved arrow), with hyperintense nerve thickening.

Her post-operative management included plaster for two weeks, then a hinged elbow brace for a further four weeks. At her six-week review, she had resolving neuropathic pain and vasomotor changes. However, she was experiencing ongoing allodynia and a persistent flexor digitorum profundus deficiency. Her flexor pollucis longus, thenar eminence muscles, flexor digitorum superficialis and palmaris longus had begun return to function. She had regular follow-up appointments and at the two-year mark, demonstrated complete resolution of all of her symptoms.

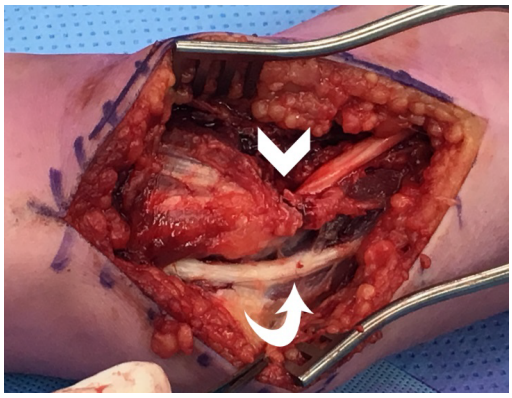

Figure 6 Operative photograph showing the median nerve (arrowhead) entrapped in the medial epicondyle fracture. The ulnar nerve (curved arrow) is seen more posteriorly in this figure.

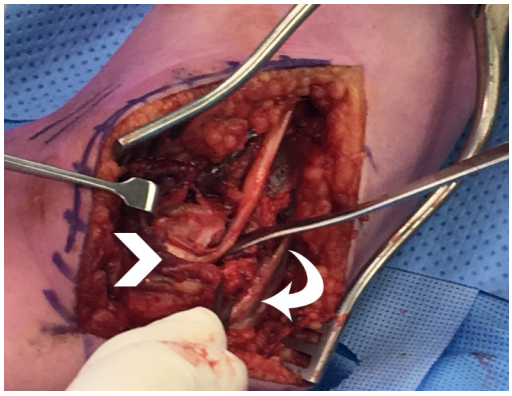

Figure 7 Operative photograph showing the median nerve (arrowhead) being levered out of the fracture. The ulnar nerve (curved arrow) is again visualised posteriorly.

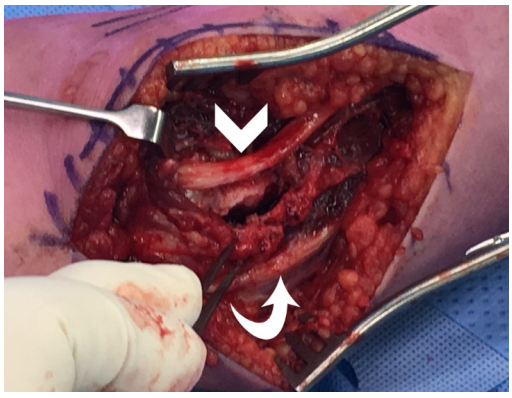

Figure 8 Operative photograph showing the median nerve (arrowhead) post release. The ulnar nerve is indicated by the curved arrow.

Discussion

Median nerve entrapment can lead to severe neurological and muscular consequences. Diagnosis of this injury can be delayed and attributed to transient neuropraxia caused by contusions or stretching of the nerve [3]. This is a case that utilised the use of MRI in the acute stage of a symptomatic patient, prior to any electromyogram studies. Practitioners should have a high index of suspicion for an entrapped nerve in the paediatric population, especially when there are progressive neurological changes, such as in this case.

Urgent MRI can provide an answer as to whether or not surgical exploration is required, and in the setting of an entrapped nerve, early release provides the best outcomes. MRI can demonstrate later signs such as muscle oedema and atrophy, as well as morphologic and signal alterations of the nerves [7]. MRI can clearly demonstrate the course of the median nerve and allow for accurate pre-surgical planning [1,2,5,7]. MRI therefore has a valid role in the acute setting and management of these patients. This may be particularly helpful in the management of the paediatric patient, when there are minimal objective signs in the early stages and the child may be unable to accurately describe symptoms.

The MRI in this case clearly demonstrates the course of the median nerve. Later signs such as muscle atrophy, may be seen in the presence of chronic denervation [2]. It has been suggested that there should be increased suspicion in paediatric patients where there is difficulty in reducing the dislocation, a fracture of the medial epicondyle or an increased joint space 10 days after reduction [1,6,8].

Median nerve entrapment can be classified into four types, depending on location and concomitant features. Three types of median nerve entrapment were initially described by Fourrier, and then a fourth was described later by Danielsson et al. [6], who classified it as a modified Type 1 [4-6]. It was Al-Qattan et al. [4] who recommended this to be formally recognised as a separate, fourth type of entrapment [4].

In type 1, the medial collateral ligament is torn and the median nerve is caught posteriorly between the ulna and humerus after slipping behind the torn ligament. Type 2 describes the median nerve being trapped in the healing medial epicondyle fracture. In type 3, the median nerve is locked into the humero-ulnar joint without any fracture, entering and leaving anteriorly. Type 4 is a combination of Types 1 and 2. This is a case of type two median nerve entrapment.

Conclusion

The types help with anatomical descriptions, but it is unclear if they have differing effect on prognosis. From the data reviewed, it is unclear if the age of the patient had an impact on recovery. The large majority of cases are paediatric, and the data reflects

this. Early diagnosis and surgical exploration of the fracture site and neurolysis are the key contributing factors in the prognosis of these patients. The early use of MRI facilitated an early diagnosis, guided management and provided a clear surgical plan, which eventuated in a successful outcome for this patient.

Conflict of Interest

The authors declare that they have no conflict of interest.

Acknowledgement

The case study participant, or their legal guardian, provided informed consent prior to submission of the case report.

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