Intraosseous Median Nerve Entrapment Following Pediatric Posterior Elbow Dislocation

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Intra-articular entrapment of the median nerve following reduction of a pediatric posterior elbow dislocation is a rare complication but has been reported in the literature. This article describes a case of a 7-year-old girl who sustained a posterior elbow dislocation associated with a medial epicondyle fracture and the subsequent intraosseous entrapment of her median nerve. The entrapment is believed to have resulted from new bone formation over the nerve that went unrecognized for nearly 2 years following injury. Routine imaging studies failed to detect the entrapment prior to exploratory surgery. Intra-articular entrapment of the median nerve must be suspected following pediatric elbow dislocation when concentric reduction fails, postreduction images demonstrate joint widening, or the patient has persistent clinical symptoms. This case demonstrates the potential for delay in diagnosis of the cause for neurological impairment following a relatively common injury in the pediatric population.

Objective intraoperative findings and intraoperative micropathology aided in limiting the amount of nerve resected to nonviable portions. Our case demonstrates the potential use of a cable nerve graft to bridge segmental defects in peripheral nerves.
Intra-articular median nerve entrapment following pediatric posterior elbow dislocation is rare.1-3 Symptoms of median nerve entrapment in the joint include persistent clinical neurologic deficits4; inability to obtain concentric reduction5; various radiographic findings, such as a widened joint space following reduction6 and cortical depression with surrounding sclerotic edges in the distal humeral metaphysis (Matev’s sign);7 and the presence of the nerve in the joint space on magnetic resonance imaging (MRI).8 A 7-year-old girl sustained a posterior elbow dislocation associated with a medial epicondyle fracture and subsequent intraosseous median nerve entrapment.

**Case Report**

An otherwise healthy 7-year-old girl fell approximately 3 feet from a tree and landed on an outstretched arm, sustaining a posterior elbow dislocation associated with a medial epicondyle fracture (Figure 1). The patient reported subjective numbness in her first 3 fingers and underwent what was believed to be a successful closed reduction under conscious sedation, with satisfactory concentric elbow joint and medial epicondyle reduction (Figure 2). However, the patient reported persistent subjective numbness.

The patient presented to the senior author (J.E.P.) at age 9, approximately 2 years after initial injury. She reported numbness over the radial 3 digits, was unable to flex her thumb, and had weakness in flexion of the index finger distal interphalangeal joint and index and middle finger proximal interphalangeal joints. She had strong flexion of the middle, ring, and small fingers at the distal interphalangeal joints and ring and small finger distal interphalangeal joints. She had absent palmar thumb abduction. Radiographs showed an osseous window in the medial supracondylar ridge, which was an advanced form of Matev’s sign (Figure 3). Clinical presentation was consistent with a median nerve injury. Electromyogram and nerve conduction studies (EMG/NCS) were consistent with an axonal injury to the left median nerve, with incomplete reinnervation, which was located just distal to the elbow, with increased dispersion of the waveforms, suggesting scar tissue around the median nerve. Magnetic resonance imaging was initially read as negative, but, in retrospect, demonstrated the appearance of a structure passing posterior to the medial condyle, corresponding with the area of radiographic abnormality, consistent with an advanced Matev’s sign. Due to clinical examination, EMG/NCS studies, radiographs, MRIs, and the patient’s lack of recovery in the 2-year time frame, the patient underwent exploratory surgery.

Intraoperatively, the distal portion of the median nerve was displaced ulnarly, disappearing into a mass of scar tissue anterior to the elbow joint. Neurolysis was performed, and the nerve coursed deep into the ulnotrochlear joint. Proximally, the median nerve was ulnarly displaced compared with its normal course, extending distally to the point at which it disappeared posteriorly along the superior aspect of the medial supracondylar ridge. The proximal portion of the nerve coursed through a bony tunnel in the medial supracondylar ridge, requiring an osteotomy to unroof the median nerve from its bony tunnel, consistent with the location of the osseous window found on radiographs.

Osteotomy of the medial epicondyle and the pronator mass was performed to allow examination of the ulnotrochlear joint and revealed that the nerve was passing between the articular surfaces, with a groove in the cartilage corresponding with the location of the intra-articular portion of the nerve. The nerve was in continuity, although its diameter was not uniform along its course over the elbow (Figure 5). Microscopic examination of the attenuated portion of the nerve revealed no definitive fascicles. A nerve stimulator was used to test the attenuated portion of the nerve, but the nerve had no functioning traversing fascicles in this area. Therefore, the attenuated portion of the nerve was transected proximally and distally until micropathologic examination using hematoxylin-eosin staining of the cross section of the 2 ends confirmed a normal morphological appearance in the nerve. A cable nerve graft was created using portions of the medial antebrachial cutaneous and lateral brachial cutaneous nerves (Figure 6).

Postoperatively, the patient was placed in a long-arm cast for 4 weeks to let the medial epicondylar osteotomy heal. At 4 weeks postoperatively, she started therapy with a posterior splint for comfort, range of motion (ROM), scar massage, and desensitization techniques. At 8 weeks postoperatively, progressive strengthening was started, with continued desensitization techniques.

At 1-year follow-up, elbow ROM was 15° of hyperextension, 150° of flexion, and...
80° of pronation and supination. Muscle strength testing revealed no thumb flexion or abduction function, weakness of index finger distal interphalangeal flexion, and full strength of index finger proximal interphalangeal flexion and middle, ring, and small finger distal interphalangeal and proximal interphalangeal flexion. Grip strength was 40 lbs on the right side and 30 lbs on the nondominant, injured left side. Sensation testing revealed 10-mm static 2-point and Semmes-Weinstein at 3.6 (protective sensation level), 5-mm 2-point in the ring and small fingers (normal sensation level), and good light touch sensation over the medial and lateral portions of her forearms with no Tinel sign proximally. Informed consent was obtained from the patient’s family to report data from this case.

Discussion

Intra-articular median nerve entrapment must be suspected following pediatric elbow dislocation when concentric reduction fails, postreduction images demonstrate joint widening, or the patient has persistent clinical symptoms. Our case demonstrates the potential for delay in the diagnosis of the cause for neurological impairment following such an injury.

Initial diagnosis can be difficult for the following reasons: (1) difficult and confusing pediatric clinical examination not specifically indicative of complete median nerve injury, (2) radiographs or MRIs with subtle findings consistent with the etiology, which are not familiar to many orthopedists or radiologists given the rarity of the injury, and (3) EMG/NCS suggesting an intact median nerve encased in scar tissue.

This case demonstrated intraosseous entrapment of the median nerve following a posterior elbow dislocation in a pediatric patient. We hypothesized that the patient’s median nerve was entrapped in the ulnotrochlear joint at injury or during reduction. Because the injury went unrecognized prior to presentation to the senior author (J.E.P.), continued compression persisted for approximately 2 years. Matev’s sign represented median nerve entrapment in this location. Because the nerve was tethered in the joint for so long, new bone formed over the nerve in the medial supracondylar ridge, causing it to become entrapped in the bone, in addition to the intra-articular entrapment it had already sustained.

Conclusion

This case demonstrates the usefulness of objective intraoperative findings, such as a lack of fascicles on microscopy or pathology and failure of transmission of the attenuated nerve segment on nerve stimulation, in determining the viability of a nerve, as well as the use of intraoperative micropathology to limit the amount of nerve resected to that portion that is not viable. Furthermore, it demonstrates the potential role of a cable nerve graft in bridging such segmental defects in peripheral nerve repairs.

References