

A New Pediatric Monteggia Fracture Type 4 Variant

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Learning Point of the Article:

No matter what type of pediatric Monteggia fracture you are presented with, if a stable closed reduction cannot be achieved then do not hesitate in performing a stable open reduction and internal fixation, as restoring the anatomy will guarantee excellent end results.

Abstract

Introduction: Monteggia fracture-dislocations are rare and complex injuries that usually involve a fracture of the proximal ulna associated with a proximal radioulnar and radiocapitellar joint dislocations. These injuries comprise <1% of all pediatric forearm fractures. We report on a pediatric Monteggia fracture-dislocation variant that included an irreducible divergent ulnohumeral joint dislocation, an irreducible anterior radial head dislocation, and a proximal and distal radius and ulna fracture.

Case Report: A 6-year-old female came to our emergency room with a right elbow and forearm pain and deformity after a fall from a slide on the same day. X-rays revealed a divergent ulnohumeral joint dislocation, an anterior radiocapitellar joint dislocation, a proximal radioulnar joint dislocation, and a proximal and distal ulna and radius fracture. Closed reduction under sedation in the emergency room was not successful, with persistent ulnohumeral, ulnoradial, and radiocapitellar joint dislocations. The patient was taken to the operating room the next morning. She underwent open reduction and internal fixation of the proximal ulna fracture with a one-third tubular locking plate, and radial head dislocation open reduction. A stable reduction of the ulnohumeral joint was only possible after the fixation of the proximal ulna fracture. The most stable position for the radiocapitellar joint after its open reduction was at 70° of elbow extension and full forearm supination; the patient was casted in that position for 6 weeks.

Conclusion: Pediatric Monteggia fracture-dislocations are rare and complex childhood fractures, and new variants of this injury can have even more complex presentations. Open reduction and stable internal fixation addressing all components of this injury will lead to an excellent outcome.

Keywords: Pediatric monteggia fracture-dislocation, new type four variant, divergent ulnohumeral joint dislocation, irreducible dislocation.

Introduction

In 1814, Giovanni Battista Monteggia, an Italian surgeon, first described the injury that now bears his name as a fracture of the proximal third of the ulna and an anterior dislocation of the radial head [1].

In 1962, Jose Luis Bado, a Uruguayan orthopedic surgeon, published his classic monograph on the classification of Monteggia lesions. Bado described in this monograph the types of fracture-dislocation of the proximal radioulnar joint, with a

focus on type I Monteggia fracture with anterior dislocation of the radial head and fracture of the proximal ulna. He also discussed the other Monteggia fracture-dislocation types where the radial head dislocates posteriorly or laterally [2].

A Monteggia fracture-dislocation variant with a divergent elbow dislocation has not been reported in a pediatric patient before and was only reported once in an adult patient [3].

To our knowledge, no report has described the combination of injuries sustained by this pediatric patient which in its totality

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Author's Photo Gallery



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Figure 1: AP elbow X-ray showing the proximal ulna greenstick fracture, the subtle proximal radius shaft fracture (blue arrows), and the ulnohumeral, radiocapitellar, and proximal radioulnar joint dislocations.



Figure 2: A lateral forearm and elbow X-ray showing the distal radius Salter-Harris type 2 fracture, and the dislocated elbow, radiocapitellar, and proximal radioulnar joints. The subtle same level proximal radius fracture can be seen at the tip of the blue arrow.

constitute a new Monteggia type 4 variant.

Case Report

A 6-year-old female came to our emergency room with a right elbow, forearm, and wrist pain, swelling, and deformity after she fell from a slide on the same day. X-rays revealed a divergent ulnohumeral joint dislocation, anterior radiocapitellar joint dislocation, a proximal radioulnar joint dislocation, a proximal ulna angulated greenstick fracture with extension into the olecranon, a same level proximal radius minimally displaced fracture, a distal radius Salter-Harris type 2 fracture, and a distal ulna buckle fracture (Fig. 1, 2, 3).

Closed reduction under sedation in the emergency room was not successful, with persistent ulnohumeral, and radiocapitellar joint dislocations (Fig. 4).

The patient was taken to the operating room the next morning. Under general anesthesia, the proximal ulna fracture was addressed first and was fixed with a 3.5 mm one-third tubular locking plate. The fracture extension into the olecranon process did not allow for fixation with a flexible nail. After fixation of the proximal ulna, the divergent elbow dislocation was easily reduced by closed manipulation. Closed reduction of the radial head was not successful. An open reduction of the radial head

did show that the obstacle to reduction was the annular ligament, which was subluxed from around the head of the radius and interposed between the radial head and the capitulum. Two 2-0 Tycron sutures were used to tag the annular ligament and apply gentle traction on it. A hemostat was used to dilate the annular ligament and bring it over to its anatomic location around the radial head. The proximal radius and the distal radius and ulna fracture were stable and in anatomic alignment and did not require internal fixation.

The most stable elbow position for the radiocapitellar joint intraoperatively following its open reduction was in 70° of elbow extension and full forearm supination, so the patient was casted in that position for 6 weeks (Fig. 5). We felt that the radiocapitellar joint was stable enough without adding a smooth trans-capitellar Kirschner wire.

The cast was removed after 6 weeks, and she gradually regained range of motion and strength with a home exercise program.

At her 10 months follow-up, her elbow, forearm, and wrist range of motion were normal, and her X-rays showed a well-aligned elbow joint (Fig. 6a, 6b). The plate was removed 2 months later.



Figure 3: The extension of the proximal ulna fracture into the olecranon can be seen on this elbow lateral X-ray, in addition to the mildly displaced proximal radius shaft fracture and the incongruent elbow joint.



Figure 4: This emergency room post-closed reduction and casting X-ray shows the persistent radiocapitellar and ulnohumeral joint dislocations. The proximal and distal ulna and radius fractures show improved alignment (blue arrows).



Figure 5: Postoperative X-ray shows the upper limb casted in 70° of extension and full supination which was the most stable position for the radiocapitellar joint following its open reduction.



Figure 6: (a and b): A 10 month follow-up AP and lateral X-rays showing an anatomical alignment of the elbow joint. The plate was removed 2 months later.

Discussion

Bado classified the Monteggia lesion into four types, also including type one and type two equivalent lesions. He has described seven Type 1 equivalent injuries, including type 1 equivalent number six, which consists of posterior dislocation of the elbow and a fracture of the ulnar diaphysis with or without a fracture of the proximal radius, and type 1 equivalent number seven, which is associated with various wrist lesions including a Galeazzi lesion. He also stated that Monteggia types three and four have no equivalents [4].

It is accepted that good results can be achieved after closed reduction and casting in a child with Monteggia fracture, as the type of fractures in this age group is usually either a plastic deformation, a buckle fracture, or a greenstick fracture, which are usually stable after a closed reduction. This is contrary to the situation in adults, where plate and screw fixation of the ulna is usually needed [5].

Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient's parents have given their consent for patient images and other clinical information to be reported in the journal. The patient's parents understand that his names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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In our case, closed reduction achieved good alignment of the proximal and distal ulna and radius shaft fracture but failed to reduce the associated elbow, proximal radioulnar, and radiocapitellar dislocations (Fig. 4). Intraoperatively, the proximal ulna fracture was found to be more unstable than what the plain X-rays suggested; the fracture was found to be with some comminution and an extension into the posterior olecranon. Stable reduction of the elbow joint was only possible after rigid fixation of the proximal ulna. The radial head obstacle to reduction was the entrapped annular ligament, and, even after open reduction, that joint was not completely stable through the full arc of elbow motion; its most stable position was in 70° of elbow extension and full forearm supination.

Conclusion

Pediatric Monteggia fracture-dislocations are rare and complex childhood fractures, and new variants of this injury can have more complex presentations. Open reduction and internal fixation addressing all components of the injury will lead to an excellent outcome [6, 7, 8, 9, 10].

Clinical Message

No matter what type of pediatric Monteggia fracture you are presented with, if a stable closed reduction cannot be achieved then do not hesitate in performing a stable open reduction and internal fixation, as restoring the anatomy will guarantee excellent end results.

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