

Irreducible Monteggia Variant in a 11-Year-Old Boy Treated by Ulnar Osteotomy

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PRESENTATION OF CASE

A 11-year-old boy, right hand dominant, allegedly had injury to his right elbow when a teacher twisted his forearm in school. He presented with complaints of pain over right elbow and had limited range of motion. No other injuries were sustained. Clinical examination showed swelling and tenderness over elbow and proximal forearm with no obvious deformity. Also, range of movements (flexion and extension of elbow and supination and pronation of forearm) were restricted. No distal neurovascular deficits were found. No external injuries were found.

The initial x ray of elbow showed anterior dislocation of the radial head with anterior bowing of the ulna at the proximal and middle 1/3 junction.

Closed reduction and immobilization with long arm slab was attempted but on check x ray it was found to be dislocated even with 100 degrees of flexion and full supination. So, the patient was taken to the theatre and under general anaesthesia, again closed reduction was attempted but could not be reduced and was found to be unstable. After scrubbing, painting and draping with tourniquet applied at arm, through Kocher's approach radial head was exposed and was found to be dislocated with injury to the annular ligament. After clearing the interposing soft tissue, radial head was still irreducible. Hence was planned for ulnar open wedge osteotomy for lengthening to aid with reduction. Osteotomy was done at the metaphyseal-diaphyseal junction and stabilized with a 1/3rd semitubular plate with 2 proximal and 2 distal screws of appropriate size. Radial head reduction was obtained and annular ligament repair was done to support and prevent lateral subluxation. After thorough wash skin was closed in layers and long arm slab was applied. Post op wound inspection done every 3rd day and suture removal done on day 12 followed by long arm cast in neutral rotation for 3 weeks.

Follow up of the patient on 5th week post op and mobilization started.

Follow up at 2nd month showed improving range of motion.

Follow up at 3rd month post op and patient had reasonably good range of motion with united osteotomy site on x-ray.

An informed consent was obtained from the patient and his parents for the treatment of the injury and publication of radiographic and clinical materials.

DIFFERENTIAL DIAGNOSIS

Injuries associated with post traumatic radial head dislocation with anterior bowing of the ulna are -

- 1) Monteggia fracture dislocation and its variants.
- 2) Elbow dislocations.
- 3) Fractures around the elbow.

Congenital dislocation of elbow (as seen in Ehlers Danlos syndrome, Nail patella syndrome, Ulnar dysplasia, Radioulnar synostosis, Dyschondroplasia).

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CLINICAL DIAGNOSIS

With history of trauma and clinical examination showing oedema and restricted range of movements, fracture/dislocation around elbow was suspected and x-ray was taken. x-ray showed anterior dislocation of radial head with anterior bowing of right ulna.

PATHOLOGICAL DISCUSSION

Monteggia fracture was originally described by GIOVANNI BATISTA MONTEGGIA as an anterior dislocation of the radial head and fracture of the proximal ulna and comprises of 5-10% of all forearm fractures. The mechanism of injury has been described by many authors but BADO'S classification is the most commonly and widely used.¹ Most widely accepted theory is that isolated Monteggia fracture dislocation is caused by hyperpronation as described by Evans.² However Tompkins postulated that hyperextension of the elbow plays a significant role in causing this injury.³ Tan et al conducted a finite element analysis on two cadaveric specimens and found that radial head dislocation is due to traction force rather than a transverse force. They also identified that the force transmission occurs through the annular ligament forcing the radial head out of the ligament.

True or classical Bado's classification divided Monteggia fracture dislocation into 4 types based on the direction of radial head dislocation. Several variants have been further described in children.

Type 1- anterior dislocation of the radial head with apex anterior angulation of ulna fracture

Type 2- posterior dislocation of the radial head with apex posterior angulation of ulna fracture.

Type 3- lateral or anterolateral radial head dislocation with apex lateral angulation of ulna fracture.

Type 4- anterior dislocation of radial head with fracture of the radius shaft at or distal to level of ulna fracture.

According to Penrose, with forearm in neutral rotation and slight flexion force is transmitted distal to proximal, a type 2 lesion is seen. Also, posterior elbow dislocation could be considered as a type 2 equivalent.⁴ Certain injuries were classified by Bado as equivalents to the classical Monteggia lesion - in view of similar mechanism of injury, radiographic pattern, or methods of treatment. These were known as Monteggia Equivalents Injuries.⁵⁻¹⁰

Type 1¹- Isolated anterior radial head dislocation (with plastic deformation of ulna)

- Isolated radial neck fractures.
- Pulled elbow syndrome.

- Ulnar diaphysis fracture with radial neck fracture.
- Both bone forearm fracture (radius fractured above proximal and mid 1/3rd junction).
- Anterior dislocation of radial head with ulnar diaphysis and olecranon fracture.
- Fracture of olecranon with Salter Harris type 1 physeal injury to proximal radius.

Type 2- Posterior elbow dislocation in children.

Type 3- Oblique fracture of ulna with varus malalignment with displaced fracture of lateral condyle of humerus.

Type 4- Distal humerus fracture with proximal third ulnar diaphysis fracture and distal radial metaphyseal fracture with anterior dislocation of radial head.

Lett's classification of paediatric Monteggia fracture dislocation.

- A- Anterior bend of ulnar shaft with anterior dislocation of radial head (plastic deformation).
- B- Greenstick fracture of ulnar shaft with anterior dislocation of radial head.
- C- Anterior complete fracture of ulnar shaft with anterior dislocation of radial head.
- D- Fracture of ulnar shaft with posterior dislocation of radial head.
- E- Fracture of ulnar shaft with lateral.

Jupiter classification of Posterior Monteggia Fractures-

- II A- Fracture of ulna involves distal olecranon and coronoid process.
- II B- Diaphyseal ulna fracture.
- II C- Ulna fracture distal to coronoid process, involving metaphyseal diaphyseal junction.
- II D- Ulna fracture extending from the diaphysis to olecranon.

DISCUSSION OF MANAGEMENT




In children most of the injuries can be treated by closed reduction of the ulna and radial head, but requires careful follow up as dislocations can be missed and leads to functional loss. Complete transverse or short oblique fractures can be treated by open reduction and intramedullary nailing, however plates and screws are often required for long oblique and comminuted fractures.¹¹⁻¹³

Chronic or neglected lesions are those that are diagnosed after 4 weeks. These are more commonly seen in children and are frequently associated with chronic radiocapitellar instability along with non-union /malunion of the ulnar fracture that leads to shortening, pain and limited pronation-supination. In such cases open reduction of radiocapitellar joint, annular ligament reconstruction and corrective osteotomy of ulna malunion / non-union to maintain ulnar length are various treatment option.¹¹

In our case, initial closed reduction was attempted but acceptable reduction could not be attained. Another attempt for closed reduction made under anaesthesia under fluoroscopy and it was found to be unstable hence open reduction was planned. Through Kocher's approach radial head was exposed between interval of anconeus and extensor carpi ulnaris. Annular ligament was found to be torn. Ulnar osteotomy planned to achieve accurate length to aid with reduction and stability. Angulation of wedge of osteotomy decided under fluoroscopy as angle at which reduction was attained and stable .Osteotomy site stabilized using a semitubular plate. Annular ligament repaired. Skin closed in layers and stapled. Long arm slab applied in 90 degrees of flexion and supination as maximum stability attained in this position.

FINAL DIAGNOSIS

Type 1 Monteggia variant lesion – irreducible by closed methods.

	<p>Figure 1a. <i>Plain Radiographs of Right Elbow Showing Anterior Dislocation of Radial Head</i></p>
	<p>Figure 1b. <i>Plain Radiographs of Left Elbow Showing Contralateral Normal Side</i></p>
	<p>Figure 2. <i>Plain Radiograph Showing Failed Closed Reduction. Hence Planned for Open Reduction</i></p>

	<p>Figure 3. <i>Fluoroscopic View Showing the Plastic Deformation of Ulna with Anterior Radial Head Dislocation</i></p>
	<p>Figure 4. <i>Immediate Post-Op X-Ray Showing Reduced Radial Head with Ulnar Osteotomy Stabilized with Plate</i></p>
	<p>Figure 5</p>
	<p>Figure 6. <i>Follow Up Plain Radiograph at 3rd Month Showing United Osteotomy Site and Healed Surgical Scar</i></p>
	<p>Figure 7. <i>3rd Month Follow up Showing Active Range of Pronation and Supination</i></p>
	<p>Figure 8. <i>Flexion and Extension Range of Motion at 3rd Month</i></p>
	<p>Figure 9. <i>Range of Movements at 3rd Month</i></p>

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