

# A Very Rare Presentation of Type 1 Monteggia Equivalent Fracture with Ipsilateral Fracture of Distal Forearm-approach with Outcome: Case Report

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## What to Learn from this Article?

Monteggia equivalent fractures are rare in children and associated distal forearm fractures still rarer. Separate approaches should be used to for proximal fractures in such cases, with anatomic fixation and close follow-up must be performed for monitoring growth disturbances.

## Abstract

**Introduction:** We report a case of Type 1 Monteggia equivalent injury with intact radio-capitellar congruity, associated with epiphyseal fracture of distal radius and distal ulna shaft in an 11-year-old boy. There are only a few cases of Monteggia or Monteggia equivalent injury with ipsilateral forearm fractures in children, and injury pattern being reported by us is not only rare but also the only case reported thus far to the best of our knowledge, Sood *et al.* described Type 1 equivalent with epiphyseal injuries of both radius and ulna Osada *et al.* also described injury pattern same as Sood *et al.* with epiphyseal separation in both distal radius and ulna. Our case was slightly different than above two in that distally, there was ulna shaft fracture with Salter Harris Type 2 epiphyseal separation in the radius.

**Case Report:** An 11-year-old, right-hand dominant boy presented in casualty with a history of fall one day back with pain, swelling and deformity in the left forearm with bleeding from left forearm and loss of movement of fingers and thumb of the left hand. On examination, there was a wound of size one centimeter on mid-forearm over the ulnar aspect. Extension of fingers and thumb at metacarpophalangeal joints was lost with intact sensations suggestive of posterior interosseus nerve involvement. No vascular was deficit was present. X-rays were performed which suggested type two epiphyseal separation proximal radius with fracture shaft ulna with lateral angulation in elbow and proximal forearm. Radiocapitellar joint congruity was maintained in the views performed. X-rays of wrist suggested fracture both bones distal forearm epiphysis in distal radius and distal shaft in ulna. The patient was operated with toileting, debridement, and open reduction of proximal ulnar fracture with K-wire. Proximal radius epiphyseal separation was approached by Kocher approach and fixed with two K-wires, while for distal radius epiphyseal separation open reduction and internal fixation was performed. Follow-up of the patient showed posterior interosseus nerve recovery and subsequent union of all fractures with good functional outcome.

## Author's Photo Gallery



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**Conclusion:** This type of lesion is rare in children probably because the annular ligament is relatively lax and the radial head dislocates more easily anteriorly, rather than occurrence of fracture as seen in our case, and associated fracture of distal forearm is a very rare injury.

**Keywords:** Monteggia equivalent, children, ipsilateral forearm fractures.

### Introduction

Monteggia fracture dislocation is an uncommon injury in children comprising only 0.4% of fall forearm fractures [1]. This fracture was first described by Giovanni Batista Monteggia in 1814. It was not until 1967 that Bado renamed this fracture as the Monteggia lesion and classified the adult injury into 4 types depending on the direction of radial head dislocation [2]. According to current classification, Type 1 variety is the most common (59%) followed by Type 3 variety (26%). He described two Monteggia equivalent injuries. Subsequently, Type 3 and 4 Monteggia equivalent lesions were described. Despite the increased understanding of Monteggia lesions, the injury continues to represent a challenge for the orthopedic surgeon. In 1943, Sir Watson-Jones wrote that “no fracture presents so many problems; no injury is beset with greater difficulty; no treatment characterized by more general failure [1]. There are few reports in the literature regarding the association of Monteggia lesion with ipsilateral limb fractures. Association of Type 1 Monteggia equivalent injury with fracture both bone distal forearm in children is very rare [3] and injury pattern described by us reported not once before in literature.

### Case Report

An 11-year-old, right-hand dominant boy presented in casualty with history of fall from window on his left hand 1 day back with pain, swelling and deformity in the left forearm with bleeding from left forearm which was dressed at local hospital and loss of movement of thumb and fingers of left hand. On examination, there was a wound of size 1 cm on mid-forearm over the ulnar aspect (Fig. 1). Extension of fingers at metacarpophalangeal joints and thumb was lost with intact sensations suggestive of posterior interosseus nerve involvement. Wrist movements could not be assessed due to pain in the wrist. No vascular deficit was present. X-rays were performed which suggested type two epiphyseal separation of the proximal radius with fracture shaft of the ulna with lateral angulation (Fig. 2). Radiocapitellar joint congruity was maintained in the views performed. X-rays of wrist suggested fracture both bones distal forearm, with Salter-Harris Type 2 epiphyseal injury in distal radius and fracture of distal shaft of ulna (Fig. 3). Intravenous antibiotics were started, and splintage was given, and the patient kept for surgery the following morning.

Surgery was performed under tourniquet. Fractures of proximal radius and ulna were approached using separate incisions (Fig. 4), as recent literature supports use of separate approaches to decrease the chances of radio-ulnar synostosis as seen with Boyd’s approach [4]. It also avoids contamination of the closed proximal radius fracture. Open wound was thoroughly debrided and irrigated. The debrided wound was extended both proximally and distally and open reduction of ulna was easily performed. Ulna was fixed first using a 2 mm Kirschner wire. Proximal radius was approached using Kocher approach. Skin incision was started just proximal to lateral epicondyle of the humerus continuing distally toward direction of proximal ulna. Plane between extensor carpi ulnaris and anconeus was identified and dissection continued in line of extensor



Figure 1: Pre-operative clinical picture.



Figure 2: Pre-operative X-rays elbow.



Figure 3: Pre-operative whole forearm X-rays.

carpi ulnaris fibers, keeping the forearm pronated to protect the posterior interosseus nerve. Joint capsule was identified and incised and fracture was reached. Fracture was easily reduced as ulna had been fixed earlier,

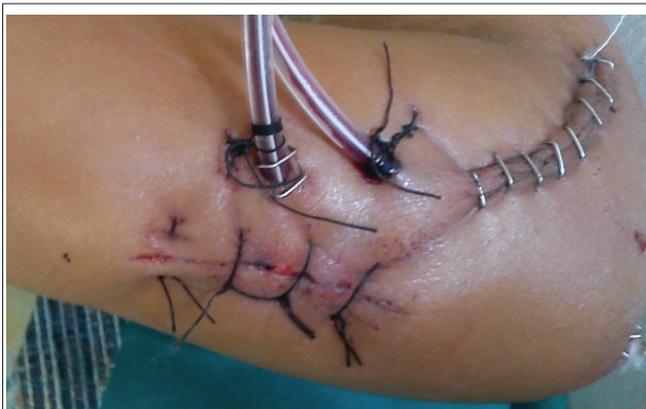
and fixed with two crossed smooth K-wires avoiding radio-capitellar joint (Fig. 5). Annular ligament was found to be intact intraoperatively. Posterior interosseus nerve was not explored as we presumed the nerve injury was neuropraxia. For the distal forearm fracture, only the radius was fixed after open reduction using dorsal approach to avoid vigorous closed manipulation. Distal ulna shaft was left as it seemed to fall back in place after other fractures were fixed. Wounds were closed over separate drains, and plaster slab was applied in mid-prone position.

At 4 weeks follow-up, patient's posterior interosseus nerve neuropraxia had recovered as expected. Proximal and distal K-wires of radius were removed and plaster slab applied in supination for further 2 weeks (Fig. 6). Elbow range of motion was started at 6 weeks along with pronation and supination. X-rays showed union at this stage in all the fractures. Ulna K-wire was removed at 12 weeks. At final follow-up at 6 months, fractures were consolidated (Fig. 7) with near normal range of motion (Fig. 8-10). Patient's father was advised regular follow-up of child, as premature closure of physis is expected secondary to epiphyseal separation, as noticed in the final follow-up X-rays of the distal radius.

### Discussion

Monteggia fracture dislocation is relatively uncommon in children. Three mechanisms of injury have been described which are direct trauma, hyperpronation, and hyperextension [1].

The direct blow theory was actually proposed by Monteggia, who noted that the fracture occurs with a direct blow to the forearm first produces fracture through the ulna. Then, by continued deformation or direct pressure, the radial head is forced anteriorly with respect to the capitellum, causing radial head dislocation. Evans proposed hyperpronation theory based on cadaveric dissections. He proposed that hyperpronation forcibly rotates the radius over middle of the ulna resulting in either anterior dislocation of radial head or fracture of proximal one-third of radius, along with fracture of shaft of ulna. Tompkins analyzed both the above theories and proposed these injuries were caused by a combination of static and dynamic forces. His study postulated three steps in fracture mechanism: Hyperextension, followed by radial head dislocation due to pull of biceps. Subsequently, weight of body is transferred to the ulna leading to ulnar fracture in tension. Radial head dislocation is a more common than radial neck fracture as annular ligament is more lax. In addition, a combination of Monteggia lesion along with ipsilateral distal forearm fracture is a very rare injury. Such injuries are also called bipolar fractures of the forearm, as described by Castillo Odena [5]. A thorough search for similar injuries was done in literature, and only limited number of similar injuries have been reported so far. The previous injury patterns reported are mostly in combination with radial head dislocation [6, 7, 8, 9, 10], and only six had Monteggia equivalent injuries [3, 11, 12, 13, 14]. Only two cases have been found



**Figure 4:** Wounds on first wound inspection showing separate incisions and drains.



**Figure 6:** Post-operative wrist X-rays.



**Figure 5:** Post-operative elbow X-rays.



**Figure 7:** X-rays at removal of radius K-wires.



**Figure 8:** Final follow-up X-rays.



**Figure 9:** Final follow-up clinical pictures showing full flexion and extension.



**Figure 10:** Clinical picture showing nearly full pronation and supination.

so far to have Type 1 Monteggia equivalent injury with ipsilateral forearm fracture in a child, with our case being the third. Sood *et al.* described a case of Type 1 Monteggia equivalent injury with epiphyseal injury of distal radius and ulna. They had fixed the ulna using dynamic compression plate, which would need the second surgery for removal. They had reduced the radial neck under direct vision. They performed closed manipulation under image intensifier for the distal forearm. However, their patient developed signs of median nerve compression and needed carpal tunnel decompression and fixation of distal radius with K-wire [11]. We had used long K-wire for fixation of proximal ulna shaft fracture instead to avoid second surgery for implant removal, along with open reduction of both proximal and distal radius. Our case had an uneventful postoperative period. Osada *et al.* also described injury pattern nearly same as us where initially closed reduction was attempted with no success and subsequently three out of four fractures were treated with open reduction and internal fixation with K-wires. They had a follow-up up to 30 months with proximal radius epiphysis partially closed, and ulnar diaphysis and the radial neck were posteriorly convex 20° and 18°, respectively.

This type of lesion is rare in children probably because the annular ligament is relatively lax and the radial head dislocates more easily anteriorly, rather than occurrence of fracture. The various complications associated with such injuries include posterior interosseus nerve palsy as seen in our case, compartment syndrome, median nerve involvement, myositis ossificans, and elbow stiffness [1]. In fact, to the best of our knowledge, there are only two similar reported cases of this type of lesion in children in the English literature, due to this laxity of the annular ligament.

### Conclusion

Radial head dislocates more easily in a child due to elasticity of annular ligament. Hence, the occurrence radial epiphyseal injury as seen in our case is a rare occurrence in Monteggia injuries. Ipsilateral fractures of forearm with such injury pattern are very rare. Separate approaches should be used for radial neck and ulna fracture. Kocher approach is preferable for radial neck fracture over Boyd's approach as it decreases chances of radio-ulnar synostosis. Posterior interosseus nerve need not be explored in such cases. Anatomic reduction of all fractures should be performed. The child should be monitored for growth disturbances in future. These precautions prevent any untoward complication and may lead to overall good functional and radiological outcome.

### Clinical Message

Monteggia fracture dislocation in a child is rare, and Monteggia equivalent injuries still rarer as children have lax annular ligament. Separate incisions should be used to for fixing such fractures, and radial neck should be approached using Kocher's approach.

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