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Dr. Lokesh Gupta
Assistant Professor, Department of orthopaedics, SLBS government medical college and hospital, Ner Chowk, Mandi, Himachal Pradesh, India

Dr. Lakshya Prateek Rathore
Senior resident, Department of orthopaedics, SLBS government medical college and hospital, NerChowk, Mandi, Himachal Pradesh, India

Correspondence
Dr. Lokesh Gupta
Assistant Professor, Department of orthopaedics, SLBS government medical college and hospital, Ner Chowk, Mandi, Himachal Pradesh, India

An atypical type of Monteggia equivalent: A case report

Dr. Lokesh Gupta and Dr. Lakshya Prateek Rathore

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Abstract
Monteggia fracture dislocations comprise about 5-10 % of all forearm fractures in adults and was first described in 1814. Since then there has been many descriptions of Monteggia equivalents. We present a case of 47 year old adult with segmental comminuted fracture of ulna with anterior radial head dislocation managed by closed intramedullary nailing. We further propose that based on the basis of its features and mechanism of injury.

Keywords: monteggia fracture dislocation, monteggia equivalent

Introduction
Giovanni Battista Monteggia first described this injury in 1814 where he depicted fracture of the proximal ulna with a dislocation of the radial head and was eponymously named Monteggia fracture dislocation [2]. Later in 1967 Bado classified these injuries into four main types wherein he also described several Monteggia equivalents possessing similar characteristics to his types 1 and 2 [3]. There were no equivalents for type 3 and 4. Bado type 2 fractures have been subdivided into four types by Jupiter and his colleagues [4]. In type 2a, the fracture of the ulna involves the distal part of the olecranon and the coronoid process. In type 2b, the fracture is at the metaphyseal-diaphyseal junction distal to the coronoid, and in type 2c, the fracture isdiaphyseal. The fourth subtype, type 2d, extends into the proximal half of the diaphysis of the ulna. Acomplex variation of the type 2 Monteggia with associated ulnohumeral dislocation has also been reported [5]. Since then various types and their equivalents have been described in the literature. We present a rare case which can be included under type I Monteggia equivalent.

Case report
A 47 year old man presented to our hospital 6 hours after injury with a history of road traffic accident while driving a motorbike. His chief complaints were pain, swelling and inability to use his right forearm. The patient was keeping the forearm pronated and there was no external injury. There was crepitus and local tenderness along the ulna and a painful mechanical block to flexion at the elbow. Antero-posterior and lateral radiographs showed there was a segmental fracture of the ulna with proximal fracture line at the junction of proximal and middle third diaphysis and distal at the junction of middle and distal one third ulna (figure 1 and 2).

Fig 1

Fig 2

There was comminution at both the fracture sites with a large butterfly fragment at the distal fracture site with a radial angulation at the distal site. There was also an anterior dislocation of the radial head at the elbow. There was no distal neurovascular deficit present. The patient was taken up for surgery the same day and operated with closed reduction and pinning of ulnar shaft fracture with a long 2.5mm k wire after closed reduction of radial head. However radial head was found to be dislocatable, probably due to ulnar comminution and hence it was fixed with a radio-capitellar k wire. Above elbow plaster of paris back slab was given. Postoperative x-rays (figure3 and 4) showed acceptable reduction of ulna with maintenance of ulnar length. Radiocapitellar joint was reduced and congruent. Trans-articular k wire was removed at 5 weeks and active assisted elbow range of motion was started. Six weekly follow up radiographs showed gradual healing of the fracture with union achieved at 3 months. The intramedullary k wire was removed at 10 months follow up (figure 5 and 6). At one year follow up patient has good DASH score and excellent MAYO elbow score with good functional range of motion at both the elbow and the wrist.

Fig 3

Fig 4

Fig 5

Fig 6

Discussion

Monteggia fracture dislocations in adults comprise less than 5% of all forearm fractures. After the first description by Monteggia in 1814 as fractures of the proximal ulna with a concomitant dislocation of the radial head, they were further classified by Bado in 1967 where he has referred to these as "Monteggia lesions" [6, 7] Bado also described injuries that possessed similar characteristics and called them Monteggia equivalents. The variants have been classically described for Monteggia type 1 and 2 and there were no equivalents for type 3 and 4.

Monteggia equivalents described by Bado [7]

Type 1

Anterior dislocation of the radial head (in children, the pulled elbow). Fracture of the ulnar shaft with fracture of the proximal third or neck of the radius. Fracture of the neck of the radius. Fracture of the ulnar diaphysis and olecranon with anterior dislocation of the radial head Posterior dislocation of the elbow; fracture of the ulnar shaft with or without proximal radius fracture. Fracture of the proximal radius.

Type 2

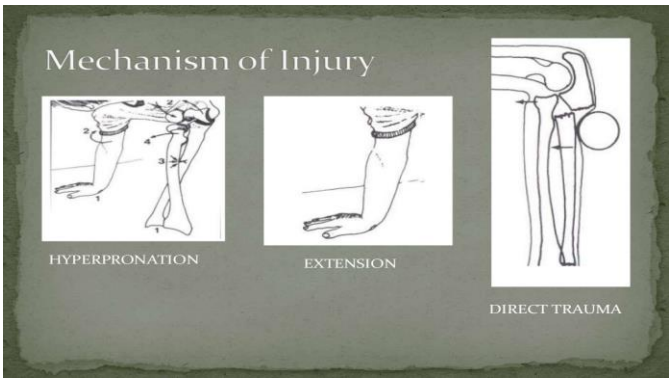
Dislocation of the radial head with an epiphyseal fracture

Radial neck fracture

In the type 1 equivalents there has been a mention of ulna at two sites namely the olecranon and the ulnar diaphysis but there has not been a mention of classically segmental diaphyseal fracture of the ulna. In our case there was no fracture of the olecranon, instead there was a cortical break at the junction of proximal and middle one-third and a second fracture line at the junction of middle and distal one-third of ulna.

Mechanism of injury in type 1 Monteggia and its equivalents is deemed to be pronation with or without axial loading. Although our patient could not reiterate the exact manner in which he fell from his bike but the aforesaid mechanism can

be used to explain the injury pattern in our patient. The radial head in our case was dislocated anteriorly which has been classically described due to pronation injury. Also axial loading of the forearm added with a high energy mechanism (road traffic accident in our case) can lead to a segmental fracture of the bone. Another mechanism that can be proposed is direct trauma by an external object causing fracture of the ulna which translates anteriorly in a pronated forearm and causes anterior displacement of the radial head (figure 7). Thus various factors like direction of radial head dislocation, direction of angulation of ulnar fracture and the fracture pattern can be used to retrogradely predict the fracture mechanism as has been previously described in literature [13].



(Courtesy: emergency care institute, New South Wales)

Fig 7

Hence it can be reliably predicted that our patient shares the mechanism of type 1 Monteggia lesion and can be considered as an atypical variant of the type 1 equivalent of the same.

The patterns of fracture in our patient were different at both sites. Proximal fracture was a short oblique fracture with some comminution pointing towards a high energy compressive force. The distal fracture site, however, had a butterfly fragment with comminution which can be hypothesized to be caused by a bending force with a high energy mechanism [8].

This fracture configuration is frequently associated with high energy mechanism and devascularisation of the segmental fracture fragment meaning these injuries are associated with increased morbidity and long term complications such as: delayed union, non-union and/or infection. Hence an optimum treatment plan is of utmost importance. Traditionally plating of the forearm fracture has shown to give excellent results [9] but due to various reasons like possible extensive soft tissue injury as per mechanism, longer exposure for plating of both fracture sites, risk of infection and devascularisation of fracture fragments, the preferred mode of treatment was chosen to be intramedullary nailing. Intramedullary nailing is routinely used in paediatric fractures of the forearm bones but in adults it has not shown to provide length and rotation correction effectively. However, there are reports where nailing is recommended in adults and is seen to provide acceptable results [10] as was the scenario in our case. Postoperative immobilisation is not recommended in a stable fixation with a cooperative patient, however it is generally preferred for the early post-operative period for soft tissue healing and to limit pain and when the fracture is comminuted [11]. Although Bado did not describe any type 3 or 4 equivalents there has been mention of the same in literature [12, 1]. At 11 months of follow-up our patient had good range of motion with some restriction of pronation. The patient showed excellent mayo elbow score and DASH score.

Conclusion

The "Monteggia lesion" as described by Bado has been classically described to have two types of variants. One of the examples of type1 variant does describe fracture in the ulna and the olecranon, however, as far as the knowledge and research of the author is concerned, there has not been any mention of a segmental comminuted fracture of the ulnar diaphysis with anterior dislocation of the radial head. Hence based on the above described fracture characteristics and mechanism of injury, it is postulated that such a fracture pattern shall fall in the type1 variant of the Monteggia variant as an atypical type.

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