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**Original Research Article**

# Clinical outcome of acute Monteggia fractures in children after open reduction and internal fixation of ulna

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## ABSTRACT

**Background:** Monteggia fracture dislocations are a rare but a complex injury. The fracture of the ulna associated with proximal radioulnar joint dissociation and radio capitellar dislocation. This injury comprises less than 1% of all pediatric forearm fractures and typically affects patients between 4 and 10 years of age. There are many options for treatment of these fractures. The present study was planned to assess the clinical outcome of patients treated with open reduction and internal fixation of ulna with plating.
**Methods:** The study was conducted in department of orthopedics, government medical college and hospital, Jammu from August 2018 to January 2021. 25 patients of Monteggia fractures were managed with open reduction and internal fixation of ulna with plating. Patients were evaluated at follow-up for pain, stability and disturbance of daily and sports activities. Functional outcome was assessed using elbow performance score.
**Results:** Mean age of study participants was 8.2 years and male children predominated our study constituting 17 patients (68%). 14 patients were Bado type 1, four patients were Bado type 2 whereas seven patients were Bado type 3. The outcome was excellent in 18 patients (72%) and no cases of failure were encountered.
**Conclusions**: Stable anatomical fixation by open reduction and internal fixation of ulna fractures with plating, that in turns leads to the stable reduction of radial head, in the management of acute Monteggia fracture dislocations in children has a very good outcome.

**Keywords**: Monteggia fracture dislocation, Internal fixation, Plating, Bado classification

## INTRODUCTION

An upper extremity injury involving a proximal ulna fracture with radial head dislocation was first described by Italian Surgeon Giovanni Monteggia.[1] The most common classification system used for this injury isBadoclassification.[2]A Bado type 1 lesion is an anterior dislocation of radial head associated with an apex anterior ulna diaphyseal fracture at any level. This is the most common lesion in children represents approximately 70% to75% of all injuries. A Bado type 2 lesion is a posterior dislocation of radial head associated with an apex posterior ulnar diaphyseal or metaphyseal fracture. This accounts for about 6% of Monteggia lesion in children. In type 3 Bado, there is lateral dislocation of radial head associated with a varus (apex lateral) fracture of the proximal ulna. This is the second most common pediatric Monteggia lesion. A Bado type 4 lesion is an anterior dislocation of the radial head associated with fractures of both the ulna and the radius. This type is relatively rare in children.

The key feature in the management of Monteggia fractures is to ensure the stability of the reduced radial

head. Therefore, the classification and treatment of Monteggia fractures has often focused on the radio capitellar dislocation. Various methods of treatment have used from time to time in pediatric Monteggia fracture dislocations. Non-operative methods have a 20% chance of loss of reduction and failure.[3,4] In the present study, we studied the outcome of acute Monteggia fracture dislocations in children with open reduction and plating of ulna.

## METHODS

This prospective study was conducted in department of orthopedics govt. medical college and hospital, Jammu from August 2018 to January 2021. 25 patients of acute Monteggia fracture dislocations were included in this study. All cases were followed up prospectively in the department. Informed consent was taken from patients and ethical clearance was taken.

### *Inclusion criteria*

Patients had age ≤15 years, either sex, closed injury and injury ≤10 days old were included in the study.

### *Exclusion criteria*

Patients having age >15 years, polytrauma patients, open injuries and injury >10 days old were excluded from the study.

The causes of injury included road traffic accident in 16 patients (64%), fall from height while in nine patients (36%) the injury was sports related. The functional outcome was studied using the scoring by Anderson et al.[5] Range of movement was taken as the main criteria, after physiotherapy. The results were graded as excellent, good and poor depending on the range of motion in flexion-extension and pronation-supination (Table 1).

**Table 1: Anderson's scoring system for functional assessment of elbow.**

| Result | Union | Flexion/extension at elbow joint | Supination and pronation |
|---|---|---|---|
| **Excellent** | Present | Less than 10 deg loss | Less than 25% loss |
| **Good** | Present | Less than 20 deg loss | Less than 50% loss |
| **Poor** | Present | Great than 20 deg | Greater than 50% loss |
| **Failure** | Non-union with or without loss of motion | - | - |


**Figure 1: (A and B) Pre-operative radiograph of a 7-year-old child with Monteggia fracture dislocation. (C and D) the post-operative radiograph of the same patient.**

All the patients were managed with open reduction and internal fixation with plating of ulna after achieving anatomical reduction. All operations were performed under general anesthesia using tourniquet. Radial head was reduced without any manipulation in all cases after anatomical reduction was achieved. A posterior above elbow POP slab was applied and sutures were removed after 2 weeks. The slab was removed at four weeks and range of motion was started. Physiotherapy was advised after 6 weeks of surgery. Patients were advised to carry out active exercises at home, like active flexion, extension, pronation and supination without applying load. Later, patients were advised to report for follow up after 8 weeks. Check radiographs were taken for assessment of radiological union (Figure 1). The patients were followed for a period of 1 year. The statistical tools used included percentage, range and mean.

## RESULTS

The present study included 25 children with Monteggia fracture dislocations which were managed with open reduction and internal fixation with plating. Mean age of the study participants was 8.2 years (range; 6-15 years). The males predominated in the present study. 17 patients (68%) were males and eight patients (32%) were females (Figure 2). Right limb was involved in 19 patients (76%). 14 patients (56%) presented with Bado type 1, four patients (16%) with Bado type 2 and seven patients (28%) with Bado type 3 Monteggia fracture dislocations. The outcome as studied using scoring by Anderson et al was excellent in 18 patients (72%), good in seven patients (28%) and no failures were encountered (Table 2). The only significant complication encountered during the

study was surgical site infection which occurred in two patients (8%) and was managed with serial debridement's and appropriate antibiotics.

**Table 2: Functional outcome achieved in the present study.**

| Outcome | Number of patients | Percentage (%) |
|---|---|---|
| **Excellent** | 18 | 72 |
| **Good** | 07 | 28 |
| **Poor** | 00 | 00 |
| **Failure** | 00 | 00 |
| **Total** | 25 | 100 |

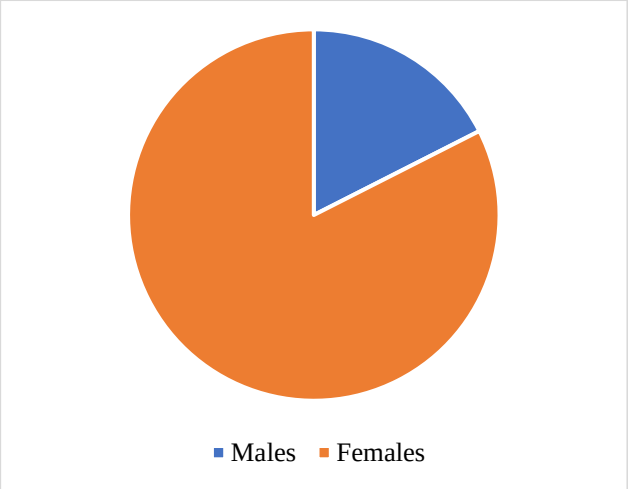


**Figure 2: Sex distribution.**

## DISCUSSION

There was total 25 patients who were included in the present study. Mean age of study participants was 8.2 years which ranged from 6 years to 15 years. Males constituted majority of the patients (68%) and only 32% were females. He et al also noted the same trend in their study.[6] Bado classification was used to describe Monteggia fracture dislocation. Bado classification based on the direction of the radial head in fracture; in type I the head is anterior, type II is posterior, type III is lateral and in type IV there is a dislocation of the radial head associated with a fracture of both the radius and ulna. 14 patients (56%) presented with Bado type 1, four patients (16%) with Bado type 2 and seven patients (28%) with Bado type 3 Monteggia fracture dislocations. Out of 25 patients, 76% had right side involvement. Bony union was obtained in all cases and radial head was maintained in their reduced position in subsequent follow-ups.

The radial head plays a key role in maintaining stability of the elbow joint. The factors like interval between injury and treatment, patient's age and the amount of joint incongruity plays an important role. Stoll *et al* reported that reconstruction could be successfully achieved in children up to the age of 10 years and at least four years after the injury.[7]

Monteggia fractures are rare, representing approximately 1% of all fractures around mid or proximal forearm. The ulnar fracture is readily diagnosed but, the radial head dislocation is often missed. The majority of radial head dislocations in children can be reduced with fixation of ulna fractures and by manipulation under general anesthesia but, if the diagnosis is made late, open reduction is commonly required.

The result of functional outcome of our study were evaluated by using Anderson et al scoring criteria. The outcome was excellent in 18 patients (72%) and no cases of failure were encountered. The only significant complication encountered during the study was surgical site infection which occurred in two patients (8%) and was managed with serial debridement's and appropriate antibiotics. He et al observed similar results in acute Monteggia fracture dislocations which were managed surgically.[6] Korani in his study achieved good results in 62.5% cases which is comparable to our study.[8]

### *Limitations*

The authors believe that the sample size in the present study is small.

## CONCLUSION

Stable anatomical fixation by open reduction and internal fixation of ulna fractures with plating, that in turns leads to the stable reduction of radial head, in the management of acute Monteggia fracture dislocations in children, has a very good outcome.

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