

## Original Article

### Paediatric Elbow Injuries : Morphology and Outcomes

Satish Gopaldas Kripalani<sup>1</sup>, Hareshkumar Parmar<sup>2</sup>, Rajnikant Machhi<sup>3</sup>

**Background** : Elbow fractures in children are common and may have serious complications. The aim of our study is to estimate the morphology and outcome of fractures around Elbow joint in paediatric age group of patients.

**Materials and Methods** : Patients in the age group of 3-12 years with unilateral fracture around the Elbow joint were included in our study. Management protocol was decided after detailed history, examination and radiological investigations depending upon the type of fracture, displacement of the fracture and classification whether to go for conservative or operative intervention. The patients were followed up for a period of 12 months and the final outcome of patient for Elbow injury was assessed on the basis of MAYO ELBOW SCORE.

**Results** : Majority of our patients presented with Supracondylar Humerus Fracture (77%) while Medial Condyle Humerus Fractures were least common (3%). We did not have any patients of Olecranon Fracture or Epiphyseal separation injuries. Majority of the patients (75%) were taken for operative intervention whereas rest were managed conservatively. Overall it was observed that out of 52 patients with Elbow injuries excellent outcome was recorded in 46 patients. Good and fair outcomes were recorded in 3 patients each.

**Conclusion** : Excellent outcomes as per "MAYO ELBOW SCORE" were recorded in majority (88%) of patients and poor outcomes were not recorded in any of the patients. Minimal complications were recorded in our study : Cubitus varus deformity in 9% and restricted range of motion in 3% of patients.

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**Key words** : Adolescent, Child, Elbow Injuries, Elbow Joint.

Fractures around Elbow joint are common in paediatric population. Sometimes children having Elbow injuries may have serious complications like neurovascular injuries, cubitus varus deformity and Volkmann's contracture in supracondylar fracture, while nonunion, valgus deformity and late ulnar nerve palsy in lateral condyle fracture<sup>1</sup>.

Supracondylar Humerus Fractures account for 60% of all Pediatric Elbow Fractures, classically occurring as a result of fall on an outstretched hand<sup>2-4</sup>. Lateral Condyle Humerus Fractures are the second most common elbow fracture after the supracondylar Humerus Fracture<sup>5</sup>. Radial Neck Fractures are relatively rare in children, accounting for 1% of all fractures in children<sup>6,7</sup>. Olecranon and distal humeral epiphyseal separations are relatively uncommon injuries around the Elbow joint. The aim of our study is to estimate the morphology and outcome of fractures around Elbow joint in paediatric age group of patients.

#### MATERIAL AND METHODS

This prospective observational cohort study of 52

Department of Orthopaedics, Medical College Baroda & Sir Sayajirao General Hospital, Vadodara, Gujarat 390001

<sup>1</sup>MS (Ortho), Senior Resident

<sup>2</sup>MS (Ortho), Associate Professor and Corresponding Author

<sup>3</sup>MS (Ortho), Associate Professor

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#### Editor's Comment :

- Supracondylar humerus fracture is the commonest while medial condyle humerus fracture is the least common fracture around the elbow joint in paediatric age group.
- Excellent outcome can be achieved in these fractures with proper treatment protocol.

patients with Elbow injuries was undertaken at the Department of Orthopaedics of a state run Government Tertiary Care Institute from November, 2021 to September, 2023 after getting approval from Institutional Ethics Committee for Biomedical and Health Research. All the cases were treated between 15-11-2021 & 30-09-2022. Patients in the age group of 3-12 years with unilateral fracture around the Elbow joint managed conservatively or with operative intervention were included. The patients with concomitant head injuries, pathological fractures or polytrauma patients were excluded. The morphology of fracture was assessed as per classification or type of fractures. Management protocol was decided after detailed history, examination and radiological investigations depending upon the type of fracture, displacement of the fracture and classification. Majority of the undisplaced or minimally displaced stable fractures of Supracondylar Humerus, Medial Condyle Humerus were managed conservatively. Radial Neck Fractures with <30 degrees of angulation

were managed conservatively whereas fractures with 30-60 degrees of angulation were managed with manipulative closed reduction mainly with Patterson or Israeli maneuver followed by immobilization. Patients with displaced fractures or Radial Neck Fractures with >60 degrees angulation were taken for operative intervention. Conservatively managed fractures were kept immobilized in long arm cast or a posterior splint for atleast 3 weeks followed by active elbow range of motion exercises.

Patients with displaced Supracondylar Humerus Fractures were treated with closed reduction and k-wire fixation with mini-open ulnar nerve exploration for introduction of medial k-wire. Patients with Lateral Condyle Humerus Fractures underwent open reduction and internal fixation with k-wire or 4 mm cannulated screws. K- wires were removed after atleast 4 weeks when signs of union were seen radiologically which was followed by active Elbow range of motion exercises.

The follow-up protocol was to be started from first week post injury. Then second follow up was done after 4 weeks and third follow up after 8 weeks. Then patients were called for follow up at every three months. Any progressive deformity, union status and neurovascular abnormalities were looked for during follow up period. The final outcome was assessed following one year of injury using MAYO ELBOW SCORE. As per MAYO ELBOW SCORE results were graded as excellent with score more than 90, good outcome with score of 75-89, fair outcome with score of 60-74 and poor outcome with scores less than 60.

### OBSERVATIONS AND RESULTS

This prospective observational cohort study of 52 paediatric patients with Elbow injuries was carried out at Department of Orthopaedics from November, 2021 to September, 2023. Our study has patients with age of 3-12 years with mean age of 7 years. Majority of patients (48) had injury due to low velocity trauma mainly due to fall while playing whereas rest 4 patients had history of Road Traffic Accident. All the patients presented with closed fractures. Majority of our patients presented with supracondylar Humerus Fracture (77%) while Medial Condyle

Humerus Fractures were least common (3%). We did not have any patients of Olecranon Fracture or Epiphyseal Separation injuries. 40 patients presented with Supracondylar Humerus Fracture out of which 26 patients had Gartland Type 3, 11 patients had Type 2 whereas 3 patients had Type 1 fracture. There were no patients with Flexion Type Supracondylar Humerus Fracture. One patient with Type 3 Supracondylar Humerus Fracture had Anterior Interosseous Nerve Palsy which recovered after fixation within a duration of 4 weeks. Other patient with same kind of Type 3 supracondylar humerus fracture had pink pulseless hand which recovered after fixation with cross pinning.

Next common fracture in our study was Radial Neck Fracture. Six patients presented with Radial Neck Fractures out of which 5 patients with Judet Type 2 and 1 with Judet Type 3. Out of 4 patients of Lateral Condyle Humerus Fracture 3 had Weiss type 3 whereas 1 patient had Weiss Type 2. Two patients with medial condyle humerus fracture were managed conservatively with excellent outcome in both patients. Majority of the patients (75%) were taken for operative intervention whereas rest were managed conservatively. Overall it was observed that out of 52 patients with Elbow injuries excellent outcome was recorded in 46 patients. Good and fair outcomes were recorded in 3 patients each (Tables 1-4).

The most common complication observed in our study was cubitus varus deformity following

Outcomes	Gartland Type I		Gartland Type II		Gartland Type III	
	Conservative	Operative	Conservative	Operative	Conservative	Operative
Excellent	03	00	02	06	00	24
Good	00	00	01	00	00	01
Fair	00	00	02	00	01	00
Poor	00	00	00	00	00	00
Total	03	00	05	06	01	25

Outcomes	Weiss Type I		Weiss Type II		Weiss Type III	
	Conservative	Operative	Conservative	Operative	Conservative	Operative
Excellent	00	00	00	01	00	02
Good	00	00	00	00	00	01
Fair	00	00	00	00	00	00
Poor	00	00	00	00	00	00
Total	00	00	00	01	00	03

Outcomes	Judet Type I		Judet Type II		Judet Type III	
	Conservative	Operative	Conservative	Operative	Conservative	Operative
Excellent	00	00	02	03	00	01
Good	00	00	00	00	00	00
Fair	00	00	00	00	00	00
Poor	00	00	00	00	00	00
Total	00	00	02	03	00	01

Outcome	No of Patients	Percentage
Excellent	46	88.46
Good	3	5.76
Fair	3	5.76
Poor	0	0
Total	52	100

Supracondylar Humerus Fracture (5 patients). Other complications like restricted range of motion was observed in 2 patients with Supracondylar and Lateral Condyle Humerus Fracture. One patient had non-union following lateral condyle humerus fracture.

**DISCUSSION**

The fractures around Elbow in children should be given special attention by the treating surgeon as such fractures can result into immediate complications as well as late deformities. The present study is comparable to the study done by Fahey in Chicago, and a study in Hong<sup>8-11</sup> and also can be compare to the study done in East Africa by Wamisho<sup>12</sup>. In our study it was found that Elbow injuries were found with Male:Female ratio of 3:1. This is comparable with the findings in other studies done by Fahey in Chicago where M:F ratio was 2:1 and a study in Hong (M:F = 2.7:1)<sup>8-11</sup>.

The most frequent type of fracture encountered in our study was Supracondylar Humerus (77%) followed by Radial Neck Fractures (12%) and Lateral Condyle Humerus Fractures (8%). These findings are comparable to the study done by Wamisho<sup>12</sup> where 69% Supracondylar Humerus Fractures were encountered.

Excellent outcomes were obtained in all Type 1 fractures which were managed conservatively. Excellent outcomes were also obtained in the patients who were operated for Type 3 fractures (92%) in our study. The outcomes were variable in patients who were managed conservatively for Type 2 fractures but excellent outcomes were seen in all patients who were operated for Type 2 fractures. In one of the studies it was found that Type 2 fractures resulted in both satisfactory (57.7%) and unsatisfactory outcomes (42.3%), regardless of the treatment<sup>13</sup>. It was found from our study that cubitus varus was one of the most common complications which developed after Supracondylar Humerus Fractures mainly among the patients with Type 2 and Type 3 fractures which were managed conservatively. On regular follow up of the patients with Lateral Condyle Humerus fractures it was found that the patients who underwent



Fig 1 — A/C/O Close Fracture Supracondylar Humerus Left with Anterior Interosseous Nerve Palsy (Gartland Type 3) Operative Intervention : Cr + K-wire Fixation

CLOSED reduction with internal fixation went on to develop NON-UNION suggesting that OPEN reduction followed by internal fixation should be preferred in such patients. Excellent outcome was obtained in all the patients of Radial Neck Fractures either managed conservatively or taken for operative intervention depending on fracture type, angulation and classification.

### CONCLUSION

This study was done on 52 paediatric patients who presented with Elbow injuries. Overall 75% of these patients were taken for operative intervention whereas 25% patients were managed conservatively which was decided as per fracture morphology, displacement and classification. Excellent outcomes as per "MAYO ELBOW SCORE" were recorded in majority (88%) of patients and poor outcomes were not recorded in any of the patients. Minimal complications were recorded in our study: Cubitus varus deformity in 9% and restricted range of motion in 3% of patients (Figs 1-8).

**Conflict of Interests :** The authors declare no conflict of interests.

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Fig 2 — A/C/O Close Fracture Radial Neck Right Without NVD (Judet Type 3)  
Operative Intervention : Cr + Tens Nailing

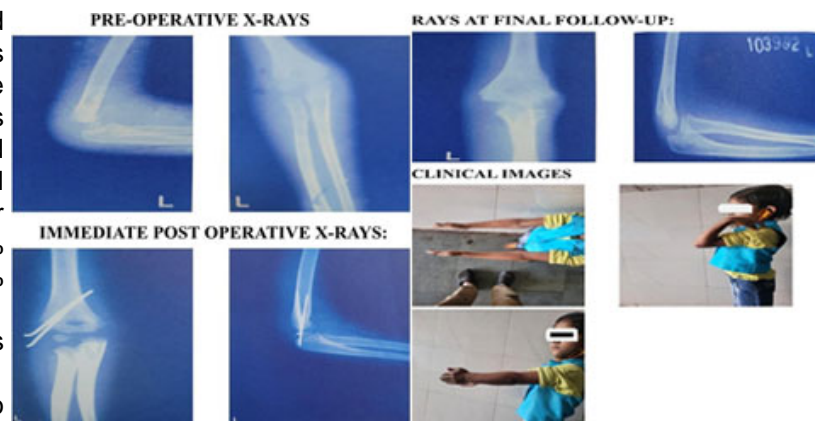


Fig 3 — A/C/O Close Fracture Lateral Condyle Humerus Left Without NVD (Weiss Type 2)  
Operative Intervention : Open Reduction + K-wire Fixation