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# To evaluate Clinico-radiological and functional outcome of "early mobilization" after stable internal fixation with k-wires in displaced fracture of lateral condyle humerus in children

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**Abstract**
**Background:** Lateral condyle fractures are the second most common pediatric elbow fractures, after those of the supracondylar region. They account for approximately 16.9% of those occurring in the upper limb. Most of them need to be managed operatively by open reduction and internal fixation with Kirschner wires followed by Splintage in an above elbow slab for at least 4 to 6 weeks. The present study was conducted to evaluate the functional outcome of early mobilization after stable internal fixation with 3 Kirschner wires.
**Methods:** A prospective study was conducted including 30 patients having displaced fracture of lateral condyle humerus in children over a period of one year. All the patients were followed up for a minimum of 6 months. Age incidence, sex distribution, mode of injury, side involved, fracture classification, complications and functional outcomes were noted.
**Results:** There were 22 males and 8 females. Average age was 6.18 years. 22 of them were Jakob III and 8 were Jakob II. Early mobilization was started in all patients from first post operative day. All fractures united by 6 weeks at time of wire removal. At the final follow up Dhillon functional score was evaluated and was found to be excellent in 24 patients, good in 5, fair in one and there was no patient with poor outcome.
**Conclusion:** Our results demonstrate that displaced fractures of lateral condyle humerus managed operatively by open reduction and stable fixation with 3 K-wires can be mobilized immediately after surgery without any risk of loss of reduction and with good final functional results.

**Keywords:** Paediatric lateral condyle humerus fracture, ORIF, stable fixation, early mobilization

## Introduction
Lateral condyle fractures are the second most common pediatric elbow fractures, after those of the supracondylar region. They account for approximately 16.9% of those occurring in the upper limb [1]. The fracture is usually secondary to a fall onto an extended arm. There is some debate whether the radial head pushes off the lateral condyle or whether the extensor-supinator muscle mass pulls off the lateral condyle with valgus extension stress [2].
The diagnosis can be difficult both clinically and radiologically, due to extension of the fracture line into the cartilagenous articular surface. Clinical examination will reveal swelling, tenderness, and ecchymosis. The key to the clinical evaluation of this fracture is the location of soft tissue swelling and pain concentrated over the lateral aspect of distal humerus. Radiographs especially oblique views, are necessary for diagnosis [3]. Fracture fragment most often lies postero-lateral which is best seen on internal oblique views. It is usually classified as Salter Harris type IV physeal injury [4]. Being an epiphyseal injury and a common occurrence, fracture of lateral condyle humerus in pediatric age group are commonly mal-treated, with error contributed right from parents to even physician. Common reasons for delayed presentations are ignorance on parents side, malpractice by some bone-setters, poorly done radiograph, inaccurate radiographic interpretation by the physician, and poor selection of treatment methods [5].

Displaced lateral condyle humerus fractures are usually managed by open reduction and internal fixation with k- wires followed by a period of immobilization in an above elbow POP slab for at least 4 weeks to 6 weeks. The aim of the present study was to evaluate functional results of immediate mobilization after stable internal fixation with k- wires.

## Methodology

**Study area, duration:** A prospective study of 30 cases of lateral condyle humerus fracture in pediatric age group treated by K-wire fixation was done from June, 2017 to June, 2018 at Maharaja Agarasen Medical College, Agroha, Hisar, Haryana, India.

Approval to perform our study was obtained from the Institutional Ethical Committee for Human Research of our institution.

### Inclusion criteria

- Lateral condyle humerus fractures >2 mm displaced
- Age less than 12 years
- Fracture less than 2 weeks old

### Exclusion criteria

- Patients with open fracture
- Un-displaced fracture (<2 mm displaced fracture)
- Poor skin condition
- Ipsilateral extremity fractures
- Re-fractures
- Metabolic bone disease or any medical condition which was a contraindication for surgery
- Parents/Guardians not giving consent

Initial assessment of the patients was performed in the accident and emergency centre of our institution. The injured limb was examined for deformity, wounds and neurovascular integrity. Antero-posterior, lateral and internal oblique radiographs of the elbow were performed. Fractures were classified using Jakob Classification. Only the patients having displaced fractures i.e > 2 mm displaced were included in the study. All the fractures were managed by open reduction and internal fixation with 3 K-wires using the lateral approach. Dissection was done in the plane between brachioradialis and tricpes. The dissection was carried down to the lateral humeral condyle. Soft tissue detachment was limited to only that necessary to expose the fragment, the fracture and the joint, the posterior soft tissues were left intact. The reduction was stabilized with 3 divergent or parallel K-wires. The stability of the fixation was confirmed under C-arm per-operatively. K-wires were buried inside the skin. Subsequently, an above elbow POP slab was applied in 90 degree flexion for post-operative pain relief. The POP slab was broken on the second post-operative day and gentle active elbow physiotherapy was initiated. The slab was removed on first post-operative dressing day (3rd day) and physiotherapy was continued without any POP slab. Patients were followed up weekly till radiological union and following which the K-wires were removed. The patients were followed upto a period of 6 months and the functional outcome were evaluated using the Dhillon functional score [5].

## Results

This is a prospective study of 30 cases of displaced fracture of lateral condyle humerus in children which were followed for a period of 6 months.

**Table 1:** Distribution of the cases according to the age

| Age Group | No. of Cases |
|---|---|
| 0-5 years | 14 |
| 5-10 years | 16 |
| Total | 30 |

In our study majority of the patient are between 5-10 years of age group (mean age = 6.18 years and minimum and maximum being 2.5 and 11 years respectively.

**Table 2:** Distribution of cases according to sex

| Sex | No. of Patients | Percentage |
|---|---|---|
| Male | 22 | 73.33 |
| Female | 8 | 26.66 |
| Total | 30 | 100 |

In our study, out of 30 patients there were 22 males (73.33%) and 8 females (26.66%). There is preponderance of male.

**Table 3:** Classification of fracture (JAKOB'S)

| Type of Fracture | No. of Cases | Percentage |
|---|---|---|
| Jakob I | Not included in study | |
| Jakob II | 8 | 26.66 |
| Jakob III | 22 | 73.33 |

In our study, out of 30 patients there were 8 Jakob type II and 22 patients of Jakob type III.

**Table 4:** Trauma-Surgery Interval

| Days | No. of Cases | Percentage |
|---|---|---|
| 0-5 | 14 | 46.66 |
| 5-12 | 16 | 53.33 |

The average time to surgery after episode of trauma in the present study was 4.3 days, ranging from 1 to 13 days.

**Table 5:** Complications

| Complication | No. of cases | Percentage |
|---|---|---|
| Lateral spurring | 14 | 46.66 |
| Superficial infection | 3 | 10 |
| Hypertrophic scar | 2 | 6.66 |
| Cubitus varus | 1 | 3.33 |

A single case of deep infection with k-wire backward migration occurred which was managed with implant removal followed by intravenous antibiotics. No major complications like tendon ruptures, nerve injury, vessel injury, non-union, mal-union, finger stiffness or implant failure was observed in the present study. Minor complications like superficial infection, hypertrophic scars, cubitus varus deformity and lateral spurring were observed. Three patient's developed superficial infection which got resolved with serial dressing and broad spectrum antibiotics. Two patients developed hypertrophic scars, one patient developed cubitus varus deformity and 14 patients developed lateral spurring on radiographs.

**Table 6:** Final Outcome (Dhillon functional Score)

| Final Outcome | No. of Cases | Percentage |
|---|---|---|
| Excellent | 24 | 80.0 |
| Good | 5 | 16.66 |
| fair | 1 | 3.33 |
| Poor | 0 | 0 |
| Total | 30 | 100 |

In the present study, out of 30 patients, 24 patients (80.0%) had excellent outcome, 5 patients (16.66%) had good outcome, 1 patient (3.33%) had fair outcome and none of the patients had poor outcome.

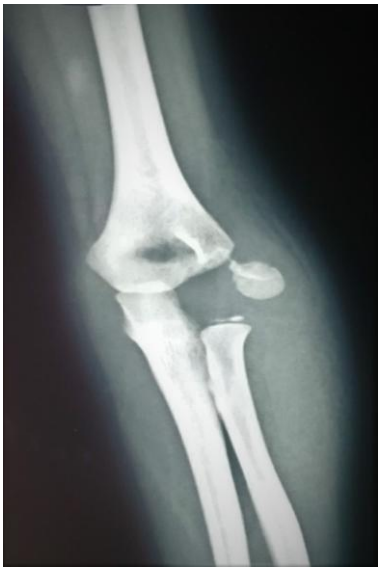

**Fig 1:** Pre-op (AP view)

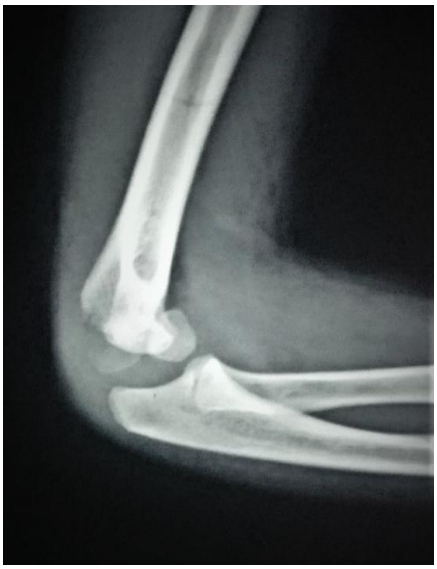

**Fig 2:** Pre-op (Lateral View)

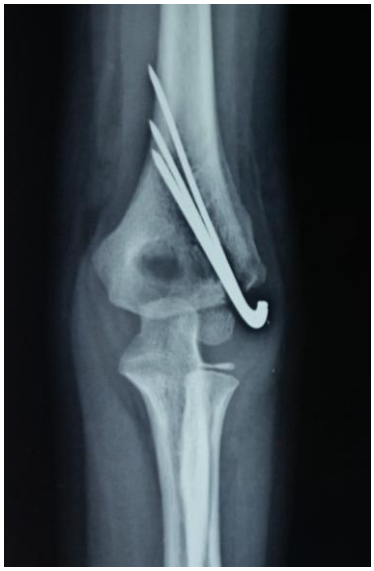

**Fig 3:** Post-op (AP view)

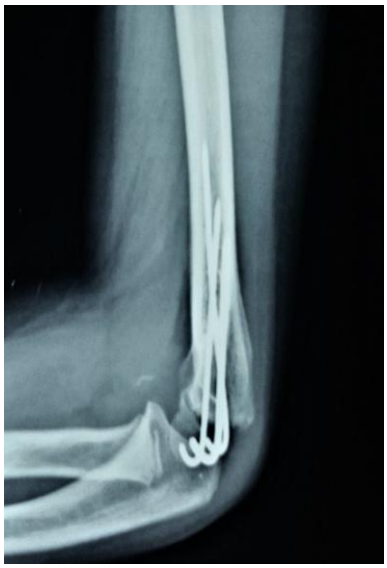

**Fig 4:** Post-op (Lateral View)

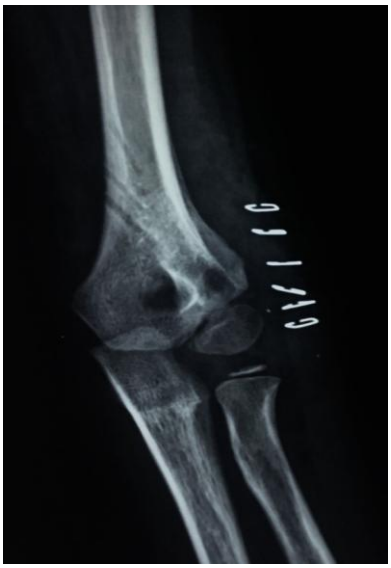

**Fig 5:** Post K-wire removal

**Fig 5:** Functional results

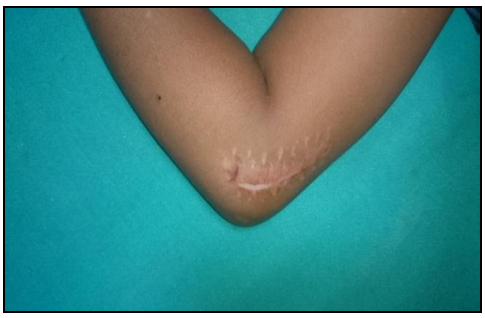

**Fig 6:** Operative Scar

## Discussion

The present study was conducted on 30 patients. The average age of patients in the present study was 6.18 years. It is comparable to studies conducted by *et al.* Song and Leonidou *et al.* [3, 6].

In our study, out of 30 patients there were 22 males and 8 females. There is preponderance of males in our study. The study conducted by Song *et al.* and Leonidou *et al.* also shows male preponderance [3, 6].

In the present study only the displaced fractures were included in the study and the fractures were classified using the Jakob's classification. There were 8 Jakob II and 22 Jakob III fractures in the present study.

Mean trauma to surgery interval in the present study was 4.3 days ranging from 1 to 13 days which is similar to that reported by Silva *et al.* and Pennock *et al.* but longer than

Song *et al.* In our series, the reason for prolonged trauma surgery interval was mostly due to ignorance from parents side, many of the patients were first taken to local bone setters and presented late [3, 7, 8].

All the fractures achieved union in the present study without any requirement of revision surgery. In the study conducted by Liu *et al.*, Song *et al.* and Koh *et al.* there were no cases of non-union but in the study conducted by Silva *et al.* they had 2 cases of non-union out of 191 patients (0.01%) [1, 3, 7, 9].

The mean Dhillon functional score in the present study calculated at 6 months was 5.77. In the study conducted by Liu *et al.* the mean Dhillon functional score at final follow up was 5.6, their mean follow up was 48 months. In the study conducted by Patwardhan *et al.* from June 2007 to December 2009, the mean Dhillon functional score was 5.65. In the study conducted by Koh *et al.* the mean Dhillon functional score was 5.66, their mean follow up period was 19.8 months [1, 9, 10].

Our final functional results were better compared to the other studies. The reason for better result was probably due to early mobilization after stable fixation with 3 k- wires.

## Conclusion

Our results demonstrate that displaced fractures of lateral condyle humerus managed operatively by open reduction and stable fixation with 3 K-wires can be mobilized immediately after surgery with better functional outcome and without any risk of loss of reduction. Radiologically, all fractures united by 6 weeks at time of wire removal.

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