

## Original Research Article

# Comparison of radiological and clinical outcome among Kirschner wires versus 3.5 mm diameter cannulated cancellous screw internal fixation in treatment for the displaced lateral humeral condyle fractures in children

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## ABSTRACT

**Background:** Lateral humeral condyle fracture, the second most common injury around the elbow, accounts for 10-20% of all fractures of the elbow in children with a high incidence between two and 14 years.

**Methods:** This hospital based prospective randomized comparative study design was include patients of both sexes in age group of 2 to 14 years attending SMS hospital, Jaipur during April 2018 to June 2019 or till the sample size achieved, with due permission from the institutional ethic committee and review board and after taking written informed consent from the patient.

**Results:** 40 patients out of 50 were grouped as excellent (70.1%) while 13 were found good (22.8%) and only four patients were found poor (7.01%) as per Hardacre criteria of assessment of lateral condyle treatment in k wire group while excellent, good and poor results were found 68.4, 24.5 and 7.01% respectively in CC screw groups

**Conclusions:** The displaced fractures (displacement over 2 mm) can be treated successfully by open reduction and K-wires or screw fixation with excellent results.

**Keywords:** K-wire, CC screw, Lateral humeral condyle

## INTRODUCTION

Lateral humeral condyle fracture, the second most common injury around the elbow, accounts for 10-20% of all fractures of the elbow in children with a high incidence between two and 14 years.<sup>1</sup> One common mechanism of injury occurs when a varus load is applied to the elbow during a fall on an outstretched arm resulting in an oblique fracture of the lateral condyle. The radial head can also "push off" a fragment of the lateral condyle when a force is applied to the palm with the elbow flexed.<sup>2</sup>

Various treatment methods are recommended according to the degree of displacement. It has been generally accepted that lateral humeral condyle fractures with displacement >2 mm should be treated by open reduction and internal fixation. Therefore, most of the researchers recommend open reduction and Kirschner wires (K-wires) fixation in the displaced lateral condyle fracture.<sup>3</sup> Although K-wire is the most common metallic implant, a plaster splint or cast is required for a period of immobilisation. However, K-wire fixation has been associated with a relatively high incidence of complications, including pin site infection,

skin necrosis, pain and discomfort. Further, fixation with K-wires prevents early mobilization and does not provide sufficiently rigid fixation. Rare complications resulting from poor fracture healing and loss of fixation may be attributed to movement of the fragment due to tension from pull of the extensor musculature or compression or shear due to the joint reactive forces.<sup>4</sup>

Although some controversy exists with regard to the acceptable amount of displacement, fractures with displacement greater than 2 mm or 3 mm are generally thought to require open reduction and fixation to facilitate union and prevent deformity and articular incongruity. Because of concerns about the possibility of loss of fixation with brief use of K-wires or occurrence of infection with their prolonged use, authors have explored the use of screw fixation for lateral condyle fractures. In theory, screws should be better suited for resisting load in tension, provide more stable fixation, resulting in a higher union rate, with decreased duration of casting (possibly leading to an improved range of motion). Some authors suggest that screw fixation also promotes the union of fracture without significant complications. Few recently published reports suggest the use of cannulated cancellous (CC) screws for fracture fixation as it provides compression at the fracture site and is a more stable construct. It also allows early range of motion, shortens time to union and without any significant complication. However, there have been limited published reports comparing cannulated screws to K-wires in the displaced lateral condyle fractures.<sup>5</sup>

Here, we retrospectively reviewed patients treated with different internal fixation of K-wires or 3.5-mm diameter cannulated cancellous screws to evaluate the clinical outcome for the displaced lateral humeral condyle fractures.

## METHODS

### *Study design and duration*

This hospital based prospective randomized comparative study design was include patients of both sexes in age group of 2 to 14 years attending SMS hospital, Jaipur during April 2018 to June 2019 or till the sample size achieved, with due permission from the institutional ethic committee and review board and after taking written informed consent from the patient.

### *Sample size calculation*

As per JOA sample size was calculated 50 subjects for each of two groups at alpha error 0.05 and power 80% assuming obvious lateral prominence occurred in 36.7 and 12.5% patients with k-wires and with screws respectively in internal fixation for displaced lateral humeral condyle fracture in children (as per seed article). So, for this study, 50 internal fixations for displaced lateral humeral condyle fracture were taken with k wire and 50 internal fixations

for displaced lateral humeral condyle fracture were taken with screws.

### *Inclusion criteria*

Inclusion criteria for the study included the patients with displaced lateral humeral condyle fractures, patients of any sex in the age group 2 to 14 years, patients who are fit for surgery and patients and patient's attendants giving informed consent for the study.

### *Exclusion criteria*

Exclusion criteria for the study excluded the patients unfit in pre anaesthetic check-up, patients with immunocompromised status, patients on steroid therapy, malignancy of any types, patients with other comorbid conditions affecting outcome variables, patients of any sex, age less than two years or more than 14 years of age and compound cases.

### *Plan of action*

Patient fulfilling inclusion/exclusion criteria was recruited from OPD of orthopaedic department of orthopaedics, SMS hospital, Jaipur and was approached by investigator himself and detailed history and thorough general and systemic examination was done. Routine and special investigation including biochemical and radiological was done to fulfil inclusion and exclusion criteria.

Patient was randomised into two groups by tossing coin for 1<sup>st</sup> patient and subsequent pt. was allocated in alternative groups.

Pre-operative X-rays were used to classify fracture on the basis of Milch classification.

In control groups internal fixation with K-wire was done as per standard treatment guideline by an identified orthopaedic surgeon.

In case group internal fixation with cannulated cancellous screw was done by same orthopaedic surgeon to eliminate surgeon's bias.

### *Data analysis*

Data was recorded as per Performa. The data analysis was computer based; SPSS-22 was used for analysis. For categoric variables chi-square test was used. For continuous variables independent samples' t-test was used. P value <0.05 was considered as significant.

## RESULTS

K wire group showed mean age 6.01 years and CC screw group showed 6.21 year. Comparison of mean score of age showed statistically non-significant results.

**Table 1: Age wise comparison of the study groups.**

Variables	Mean (year)	SD	P value
<b>K wire</b>	6.01	0.21	0.67
<b>CC screw</b>	6.21	1.1	

**Table 2: Gender wise comparison of the study groups.**

Gender	K wire (%)	CC screw (%)
<b>Male</b>	37 (64.9)	38 (66.6)
<b>Female</b>	20 (35.1)	19 (33.3)

P value=0.45

Male was recorded higher as compared to female in both groups.

**Table 3: Milch classification wise comparison of the study groups.**

Classification	K wire (%)	CC screw (%)
<b>I</b>	21 (36.8)	20 (35.1)
<b>II</b>	36 (63.1)	37 (64.9)

P value=0.51

Milch classification II was recorded higher as compared to Milch classification I in both groups.

**Table 4: Radiographic union (weeks) wise comparison of the study groups.**

Variables	Mean	SD	P value
<b>K wire</b>	4.6	0.12	0.89
<b>CC screw</b>	4.41	0.11	

K wire group showed mean radiological union at 4.6 weeks and CC screw group showed at 4.41 weeks. Comparison of mean radiological union score showed statistically non-significant results.

**Table 5: Disappearance of fracture line (weeks) wise comparison of the study groups.**

Variables	Mean	SD	P value
<b>K wire</b>	4.7	0.18	0.85
<b>CC screw</b>	4.89	0.11	

K wire group showed mean disappearance of fracture line at 4.7 weeks and CC screw group showed 4.89 weeks. Comparison of mean disappearance of fracture line score showed statistically non-significant results

**Table 6: Follow up (weeks) wise comparison of the study groups.**

Variables	Mean (week)	SD	P value
<b>K wire</b>	12.5	1.25	0.59
<b>CC screw</b>	13.1	1.59	

K wire group showed mean follow up score 12.5 weeks and CC screw group showed 13.1 weeks. Comparison of mean follow up score showed statistically non-significant results.

**Table 7: Frequencies statistics according to Hardacre et al criteria.**

N (%)	K wire	CC screw
<b>Excellent</b>	40 (70.1)	39 (68.4)
<b>Good</b>	13 (22.8)	14 (24.5)
<b>Poor</b>	4 (7.01)	4 (7.01)

P value=0.77

Our results depicted that 40 patients out of 50 were grouped as excellent (70.1%) while 13 were found good (22.8%) and only four patients were found poor (7.01%) as per Hardacre criteria of assessment of lateral condyle treatment in k wire group while excellent, good and poor results were found 68.4, 24.5 and 7.01% respectively in CC screw groups.

## DISCUSSION

Displaced lateral condyle humeral fractures are most common fracture in children. There is a general agreement that the displaced lateral condyle fracture needs to be treated by open reduction and internal fixation. And internal fixation with K-wires or cannulated screws has been reported to stabilise the displaced fractures.<sup>4</sup> Achieving anatomical reduction is often not possible because of remodelling of the fracture fragment, sclerosis and smoothening of the fracture line and new bone formation. For these various reasons, in long standing untreated non-union, difficulty occur in the reduction of the fracture fragment. In case of highly displaced fracture, it sometimes becomes very difficult rather impossible to bring the fragment into normal position without violating the soft tissue attachments on the displaced fragment. As extensive soft tissue stripping may later result in avascular necrosis of the fracture fragment, and hence many recommend that these fractures should be left alone<sup>5</sup> It is in between 3 and 12 weeks of presentation that falls under Gray zone of the treatment modality. If these fractures are treated nonoperatively, the possible complications are malunion, non-union, instability of the elbow joint, stiffness, cubitus valgus/varus, and tardy ulnar nerve palsy. Whereas, if these fractures are treated operatively, precarious blood supply to the fractured fragment due to excessive stripping of the soft tissues, may later results in avascular necrosis of the fracture fragment. Despite the inherent risk associated with the surgery, there are reports in the literature of successful outcomes of ORIF of these established non-union cases.<sup>6,7</sup>

## Limitations

Limitations of the study were like-the time duration was limited and the sample size was less.

## CONCLUSION

This study has demonstrated several conclusions in treatment for lateral humeral condyle fractures with K-wires or screws. First, the displaced fractures (displacement over 2 mm) can be treated successfully by open reduction and K-wires or screw fixation with excellent results.

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