

## COHORT STUDY OF DISPLACED SUPRACONDYLAR FRACTURE TREATED IN TERTIARY CARE INSTITUTE IN PONDICHERRY WITH RADIOLOGICAL ASSISTANCE WITH MEDIAL 'K' WIRE FIRST FROM 2008-2016

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### ABSTRACT

#### BACKGROUND

Supracondylar fracture in children when it is displaced, it is very difficult to reduce the fracture. That too after reduction, maintaining the reduction is very difficult. While reducing the fracture in closed reduction with lateral pinning first the result is not predictably good. Cross pinning will be giving mechanically stable fixation than lateral pinning alone. Lateral pinning alone imparts less rotational stability of fracture.

Our aim of study is to prevent rotational instability by putting medial pinning first by avoiding the ulnar nerve injury using radiological assistance followed by lateral pinning.

#### MATERIALS AND METHODS

One hundred and six cases of displaced supracondylar fracture were included in study. The mean age of the patient was 7 yrs. (3-12 yrs.), the male and female patient ratio was 72:34 and left side was involved in 63 patients whereas right side in 43 patients. The most common mode of trauma was fall from height on outstretched hand with elbow in extension. All the 106 patients were consecutively admitted. Patient had extension type of injury with 63 patients had Gartland type III fracture and 43 had Gartland type II fracture. Posteromedial displacement was noted in 63 patients whereas posterolateral displacement noted in 43 patients. In all cases, medial K wire was first inserted after closed reduction, then after stabilising the fractured rotation using image guidance. Lateral K-wire was removed on 3 weeks (21 days) and follow up was done at 6 weeks and 12 weeks when they were evaluated according to Flynn's criteria.

#### RESULTS

Results were graded according to Flynn's criteria.

#### CONCLUSION

Medial K wire technique provides stable fixation and rotational stability has been correlated according to this technique.

#### KEYWORDS

Displaced Type III Supracondylar Fracture, Medial K-Wire, Teardrop, Lateral Pinning, No Ulnar Nerve Palsy, Rotational Instability, Radiological Examination.

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#### BACKGROUND

Supracondylar humerus fracture is a common fracture in children. This injury accounts for 60% of all fractures around the elbow joint<sup>1-2</sup> and represent 3% of all fractures in children.<sup>3, 4</sup>

Displaced supracondylar fractures of humerus have always presented as challenge in their management. Many

mode of treatment are described for treating displaced supracondylar fracture like closed reduction and plaster cast application, Dunlop's skin traction, skeletal traction, closed reduction, percutaneous pinning in lateral epicondyle, cross pinning displaced fracture with arterial injury, open reduction<sup>5-7</sup> with initial first K-wire medially after reducing the fracture and then lateral pinning. Treatment of this displaced supracondylar fracture is combined with many complications including Volkmann's ischaemic contracture, nerve injury, arterial injury, myositis ossificans and cubits varus deformity.<sup>8-9</sup> The purpose of the study is to evaluate the role of closed/open reduction and medial first K-wire, then with lateral K wire pinning in displaced supracondylar fracture humerus.

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## AIMS AND OBJECTIVES

To determine the functional outcome of fracture supracondylar in children treated with putting medial K-wire 1<sup>st</sup> with radiological imaging.

In a prospective study, closed/open reduction and medial K-wire first with cross pinning for 106 displaced supracondylar fractures of the humerus was performed in our institute. The indication for crossed fixation was Gartland grade II and grade III displaced fractures. Out of the total 106, 63 were grade III and 43 were grade II. The usual cause was fall on outstretched hand while playing. Fracture older than 2 weeks were not included. There were 72 males and 34 females. The age of the patient ranged from 2 to 12 years (mean age 7.5 (8)) left elbow was involved in 63 and right side in 43 and 72 had posteromedial displacement, 34 had posterolateral displacement. There is no associated injury. Complication was absent/feeble pulse in 6 cases. Impending compartment syndrome in 30 cases.

Under supraclavicular block/general anaesthesia with the elbow in flexion and forearm in supination and external rotation elbow pulled mildly backwards with thumb with varus/valgus push fracture was reduced and checked under fluoroscopy. The angulations, rotational instability and displacement were corrected during entire procedure. The radial pulse was observed at regular interval. Radiological assessment of reduction was done by calculating Bowman's angle.<sup>10</sup>

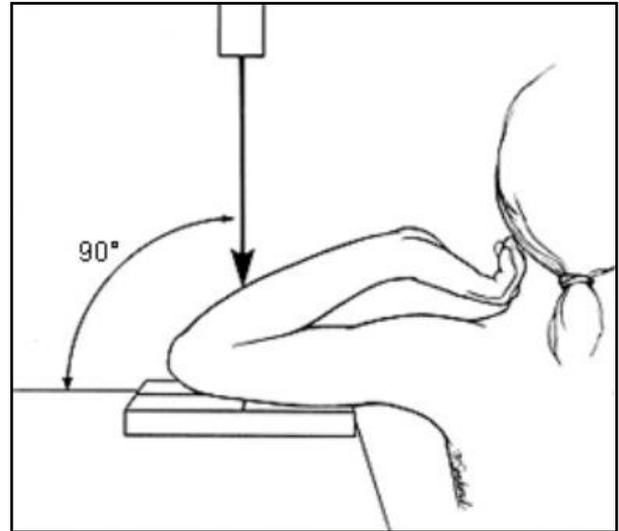
The reduction was clinico-radiologically acceptable. The assistant held the elbow in the same reduced position and K-wire (1.0 to 2.0 mm) were passed from the medial epicondyle at an angle of 35-45° to the sagittal plane of the humerus and 100° posterior to coronal plane of humerus. The pin thus passed through the distal fragment to engage the cortex of the fracture line. The lateral pin was inserted in lateral epicondyle in same manner. The pin should cross each other 1.5-2 cm above the fracture line.<sup>11,12</sup> The ulnar nerve in the ulnar groove is easily avoided. We have not encountered a single ulnar nerve injury till now. Final reduction pin placement was checked by both AP and lateral view with the C-arm image intensifier control. The pins were cutoff subcutaneously and clinical assessment was done by amount of flexion possible after saline irrigation wound was closed subcutaneously and skin was sutured. After dressing above elbow POP slab support was given and immediate postoperative check radiography was obtained. All patients received preoperative prophylactic antibiotics.<sup>13,14</sup> The patients were discharged on third postoperative day and patients were asked to come for review in following week. First time, seventh day; second time, 15th day; third time on 21st day; fourth visit on 28th day; fifth visit on 35<sup>th</sup> day and sixth visit on 42<sup>nd</sup> day. On 22 day, K-wire was removed and radiological examination was done on 3<sup>rd</sup>, 4<sup>th</sup> and final visit of 12<sup>th</sup> month.

The following information were recorded-

1. Passive range of elbow motion (flexion/extension, supination/pronation).
2. Loss of range of elbow motion.

3. Carrying angle of both sides.
4. Baumann's angle.
5. Difference in Baumann's angle between the radiography at immediate postoperative and at 3 months followup visit.

Results were assessed to Flynn's criteria.<sup>6</sup> In Flynn's criteria, patients are evaluated according to the functional and cosmetic factors, loss of flexion or extension clinically and any deviation of carrying angle radiologically.



**Figure 1. X-Ray Jones's View has been taken**

## Inclusion Criteria

- Displaced supracondylar fractures in children.
- Age 3 years to 12 years.

## Exclusion Criteria

- Age <3 years and >12 years.
- Associated fracture in humerus.
- Patients lost followup.

## RESULTS

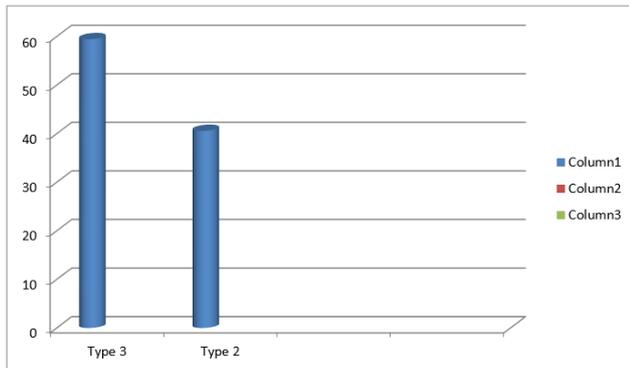
The study was conducted in Aarupadai Veedu Medical College and Hospital from January 2008 - December 2016 in Department of Orthopaedics. In paediatric, supracondylar fracture of humerus with 106 patients treated with closed/open reduction with image intensifier putting medial 1<sup>st</sup> K-wire.

In this method, treating the supracondylar fracture, we achieved anatomical reduction and alignment in all the cases. There were no ulna nerve injury. Forty four (41.50%) patient regained full range of movement within 6-8 weeks of pin removal. There is no cubitus varus deformity seen in this series. Postoperative Baumann's angle was 15.50 (range 10 degrees to 22 degrees); 32 patients (30.19%) showed good result and 30 patients (28.31%) showed fair result. 30 patients came with impending compartment syndrome and they also had mild restriction of flexion and extension, but no loss of supination and pronation. No one had ulna nerve injury,<sup>15</sup> one median nerve injury has been reported and he didn't recover after long time follow up and six patient's had

brachial arterial injury and all underwent exploration and it has been repaired after exploration, 10 patients had superficially pin tract infection and one patient had it for long time with long time antibiotic treatment, the infection subsided. No myositis ossificans has been reported. Based on Flynn's criteria, 44 (41.50%) had excellent result, 32 (30.19%) had good result and 30 (28.31%) had fair result. We did not have any poor result so far.<sup>6</sup>

Gartland Type	Percentage
Type 3	59.44
Type 2	40.56

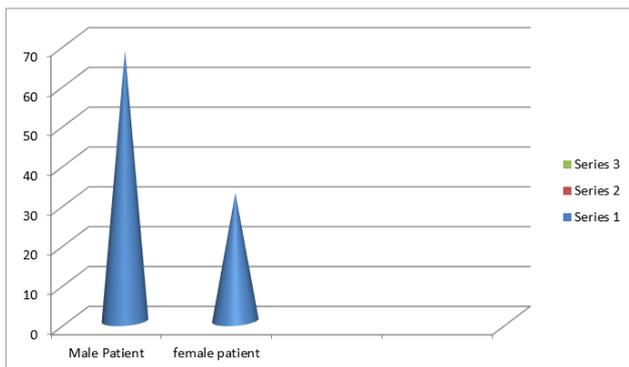
**Table 1. Classification of Supracondylar Fracture**



**Chart 1. Classification of Supracondylar Fracture Showing Type-2 and Type-3**

Supracondylar Type 3	Percentage
Male patient	67.92
Female patient	32.08

**Table 2. Male and Female Ratio**

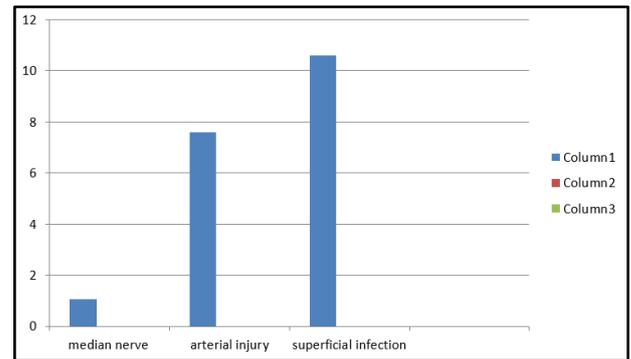


**Chart 2. Male and Female Ratio**

**With Complication**

Complication	Percentage
Median nerve palsy	1.06
Arterial injury	7.42
Superficial skin infection	10.6

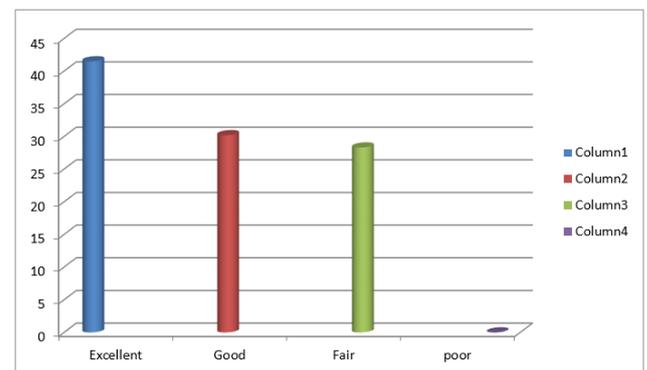
**Table 3. Complication of Fractures**



**Chart 3. Complication After Surgery**

Gartland Grade	Excellent	Good	Fair	Poor
Displaced supracondylar fracture, both type 2 and 3	44 (41.50)	32 (30.19)	30 (28.31)	0
Cosmetic and functional outcome	0-5	6-10	11-15	>15

**Table 4. Flynn's Criteria of Analysing the Result of Corrected Supracondylar Fracture Humerus**



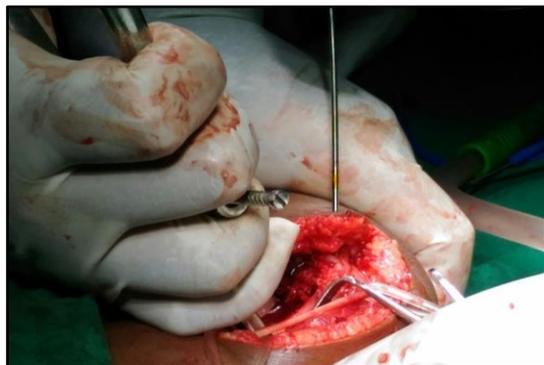
**Chart 4. Flynn's Criteria of Analysis Supracondylar Fracture Results**



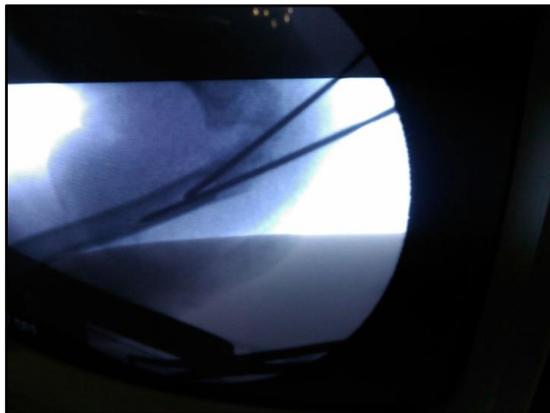
**Figure 2. Type 3 Gartland Supracondylar Fracture**



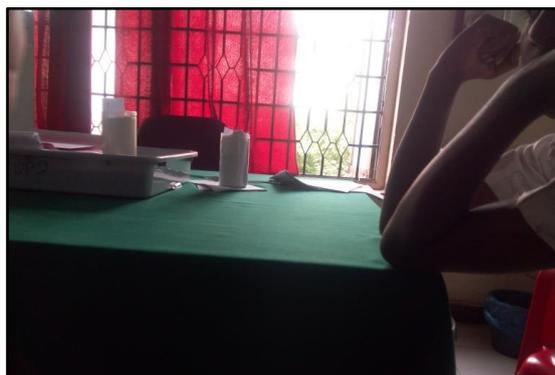
**Figure 3. Open Reduction of Type 3 Supracondylar Fracture Humerus**



**Figure 4. Inserting Medial First K-Wire**



**Figure 5. C-Arm Picture of Inserting K-Wire**



**Figure 6. Patient Came for Review after Full Union**



**Figure 7. Extension of Elbow**



**Figure 8. Flexion of the Elbow**



**Figure 9. Grade 3 Supracondylar Fracture Humerus**



**Figure 10. Postoperative X-Ray after Closed Reduction**

## DISCUSSION

Managing Gartland type 3 supracondylar fracture is a challenging task. In that, there is no single technique is suitable for all type of fracture. There is no particular timing for surgery, approach for open reduction and configuration of fixation wires.<sup>14</sup> Closed reduction and percutaneous K-wire fixation is the preferred treatment through lateral pinning, but we are manipulating the fracture and reducing with the help of image intensifier using teardrop in medial epicondyle of elbow. Percutaneous K-wire has been inserted in medial epicondyle.

In case of impending compartment syndrome, we tried open reduction and fixation with K-wire through medial approach, it has been accepted.

Although, surgical treatment creates risk of infection, the improved outcome (as per (Flynn's criteria)) and decreased risk of neurovascular complication outweigh the risk.<sup>16</sup> It is safe procedure giving good result.<sup>17,10</sup> Weiland reported higher incidence of cubitus varus<sup>18,19,20</sup> with the use of lateral approach. Direct visualisation of ulnar nerve throughout the length of incision eliminates the chance of iatrogenic injury. Anatomical reduction reduce the chance of malunion (cubitus varus deformity). Decompression of haematoma reduces the risk of compartment syndrome.<sup>21</sup> In case of closed reduction using teardrop sign in the elbow and palpate the ulnar nerve. Then, percutaneously K-wire has been inserted in medial epicondyle by this method injury to ulnar nerve has been avoided.<sup>22</sup>

In our study, medial pinning done in percutaneous fashion using radiological image intensifier taking teardrop of the elbow as a marker for inserting the pin. Fracture was reduced by giving traction in extension and externally rotating the distal fragment with countertraction at arm and fracture site is given compression by thumb and moulded. Then two k-wires inserted on each side i.e. medial and lateral. An immediate check x-ray was taken and at every visit of patient during followup.

Late presentation were seen in this study and patient presented with impending compartment syndrome. We have reported 30 cases of late presentation and they had reduction of range of motion. Average delay for these cases was 2-5 days and mean delay being 3.3 days. In our study one patient had median nerve palsy and six patient had feeble pulse and underwent exploration, but all the six patients didn't have any arterial injury and 10 patients had superficial pin tract infection, which was cured by antibiotic treatment.<sup>23,24</sup>

## CONCLUSION

We conclude the primary operative management of the displaced Gartland's type 2 and type 3 supracondylar fracture of the humerus in children using medial K-wire 1<sup>st</sup> pinning is relatively good and uncomplicated technique. This approach prevents external rotation and cubitus varus deformity. Radiologically, teardrop sign in medial epicondyle of humerus guides us for proper insertion of pin inside medial epicondyle. We have not appreciated any ulna nerve injury. Anatomical and cosmetic results are good in case of

open reduction wound will be in medial side, so the wound won't be visible to others. This approach is mainly used to avoid rotational instability.

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