

**STUDY THE MANAGEMENT OF SUPRACONDYLAR FRACTURE HUMERUS IN  
CHILDREN WITH KIRSCHNER WIRE FIXATION**

**Dr. Shakti Swarup Panda<sup>1\*</sup> and Dr. Vikash Kumar<sup>2</sup>**

<sup>1</sup>Senior Resident, Department of Orthopaedics, Deen Dayal Upadhyay Hospital Hari Nagar New Delhi.

<sup>2</sup>DNB Resident, Department of Orthopaedics, Deen Dayal Upadhyay Hospital Hari Nagar New Delhi.

**\*Corresponding Author: Dr. Shakti Swarup Panda**

Senior Resident, Department of Orthopaedics, Deen Dayal Upadhyay Hospital Hari Nagar New Delhi.

Article Received on 23/10/2019

Article Revised on 13/11/2019

Article Accepted on 03/12/2019

**ABSTRACT**

Supracondylar fractures, the most common elbow injury in children, usually affecting the thin portion of humerus through olecranon fossa or just above the fossa through the metaphysis. Considering the high frequency and the complications that follows, the fracture is managed competently to secure an excellent result and to avoid or minimize the complications. **Aims and Objectives:** The present study was done to restore and maintain the functional anatomy of distal end of humerus with K wire fixation and restore the movement as early as possible and subsequently assess the result of the surgery with reference to restoration of function and deformity. **Materials and method:** The present study was conducted from May 2017 to Apr 2018 on 45 cases of fresh supracondylar fractures in children, who underwent open or closed reduction with K-wire fixation. Two cases had neurovascular deficit (compartment syndrome) and all were managed within 48 hours of presentation to the hospital. The average period of union was 4.08 weeks. **Results:** Based on Flynn's criteria the result were, 32(71.1%) patients obtained excellent results, 9(20%) had good results, 3(6.6%) had fair result and 1(2.2%) of them had unsatisfactory results. **Conclusion:** This study shows that anatomical reduction and K-wire pinning in the management of supracondylar fractures provides a convenient, cost effective modality with good results and full range of movement with relatively fewer complications.

**KEYWORDS:** Supracondylar fracture, K wire, Flynn's criteria.

**INTRODUCTION**

A supracondylar fracture is a fracture of the distal humerus just above the epicondyles. It is the second most common fracture in children (16.6%).<sup>[1]</sup> The incidence increasing steadily during the first 5 years and reaches the peak between 5-8 years.<sup>[2,3]</sup> It is 2 times more common in boys than in girls.<sup>[2]</sup> The local swelling, deformity and neurovascular complications vary from case to case. Vascular injury is 0.5%-0.8%.; nerve injury incidence is 6-16%, cubitus varus is 30%, which doesn't remodel with growth.<sup>[5,6,7,8]</sup> All these fractures demand an accurate assessment and precise planning in the further course of its treatment.

There are various modalities of treatment like closed reduction and immobilization in cast, traction by various methods and closed or open reduction and K-wire pinning. The fracture treated by closed reduction and plaster cast application alone may result in redisplacement and may lead to deformity later. Thus primary fixation with k wires maintains the reduction as well as allows early mobilization of the joint.

The goal of the study is to reestablish the anatomy of distal humerus perfectly with least complications and with enough stability to permit early painless, functional elbow motion.

**AIMS AND OBJECTIVES**

Aim is to restore and maintain the functional anatomy of distal end of humerus with percutaneous Kirschner's wire fixation and Objective is to restore the movement as early as possible and to evaluate the result of the surgery with reference to pain, restoration of function, deformity and prevention of complications of the fracture.

**MATERIAL AND METHODS**

A prospective, single center, study with sample size of 45 children was conducted from May 2017 to Apr 2018. All children with fresh supracondylar humerus fracture who presented to the orthopaedic outpatient or casualty meeting the inclusion criteria were included in the study.

**The inclusion criteria**

- 1) Age between three to twelve years.
- 2) Grossly displaced fractures.(Gartland type III)
- 3) Failed closed manual reduction.

4) Associated neurovascular injuries.

#### The exclusion criteria

- 1) Age less than three years and more than twelve years.
- 2) Gartland Type I and Type II fractures.

Temporary closed reduction was done in emergency department and above elbow posterior POP slab was applied 90 degree of flexion at elbow. The limb was elevated to reduce swelling at the elbow. All patients were taken for elective or emergency surgery after necessary routine investigations and radiographic preoperative work-up and due consent from the patient.

All patients were taken up under General Anaesthesia. For closed reduction patient was positioned supine with ipsilateral shoulder at the edge of the table and for open reduction lateral position with fractured elbow facing the surgeon, sand bags were placed beneath the arm, the forearm was left to hang freely with the elbow flexed.

The technique of closed reduction and internal fixation was traction along the longitudinal axis with elbow in extension and supination were given. At the same time counter traction was given by an assistant by holding proximal portion of arm. Medial or lateral displacements were corrected by valgus or varus forces respectively followed by posterior displacement and angulation was corrected by flexing the elbow and applying posteriorly directed force from anterior aspect of proximal fragment and anteriorly directed force from posterior aspect of distal fragment.(fig 1).

Open reduction was done by posterior approach or lateral approach based on pre-operative conditions, mode of injury and displacement of fracture. Triceps muscle was split vertically, ulnar nerve identified and isolated in posterior approach whereas in lateral approach brachioradialis retracted anteriorly and triceps posteriorly. The fracture site was exposed and hematoma evacuated. Fracture was reduced, and then medial, lateral pillar and olecranon fossa were palpated to assess the reduction. Reduction was confirmed under image intensifier in two views antero-posterior view or Jone's view and lateral view.

After achieving satisfactory reduction, either closed or by open technique, K-wires were introduced with the help of a drill. Medial pin entry was slightly anterior to the medial epicondyle and lateral pin was introduced from the centre of the lateral condyle. Both pins were directed 40° to the humeral shaft in sagittal plane and 10° posteriorly. Position of k wire was checked under image intensifier and precautions were taken to engage both cortices to cross above the fracture site and not to cross the olecranon fossa. K-wires were bent and kept at least 1 cm outside the skin and sterile dressing was applied along with above elbow posterior pop splint in 90° elbow flexion.

The patients were carefully observed for 1 to 2 days and then discharged. The above-elbow plaster slab was kept for minimum of three weeks and the pins and slab were removed in the outpatient department. Elbow Range of motion was started after removing slab. The follow-up schedule was: the first follow-up was after 1 week of surgery to inspect the wound; the second follow-up on the second week for suture removal. Within 3-4 weeks post-surgery, x-rays were taken to see fracture healing; if callus is formed, then slab and k-wire removed and physiotherapy started in the third follow-up and the fourth follow-up on the 12 week post-operatively to see the ROM and carrying angle of the elbow(fig 2).

#### RESULTS

In our study 45 cases of displaced supracondylar humerus fracture were treated with closed/open reduction and kirchner's wire fixation. There were 32 males (71.11%) and 13 females (28.88%). Their age ranged from 3-12 yrs (mean age being 8.73 yrs and median age being 10). Most of the injuries occurred on left side 31(68.88%) and the commonest mode of injury was fall while playing in 29 cases (64.44%). Other mode of injuries was fall from height in 11 cases (24.44%) and Road traffic accident in 5 cases (11.11%).

Closed fractures were commonest with 91.11% and open fracture constituted just 8.88% of which the commonest cause was following road traffic accident. Maximum number of cases i.e. 93.33% had extension type fracture, posteromedial displacement(53.33%) was found to be the commonest displacement followed closely by posterolateral(46.66%) type, whereas 6.66% had flexion type fractures. Closed reduction was the commonest method used for achieving reduction accounting 33 children (73.33%) whereas open reduction was used in 12 children (26.66%). Post operative complications were 7 patients (15.55%) had pinsite infection for which were treated by dressings and regular antibiotics. There was excessive granulation over three patients(6.66%) and one (2.22%) had ulnar nerve palsy while putting pin treated by immediate removal. maximum number of patients had an average stay of about 1 to 3 days(75.55%).

Slab was removed at an average of 3 weeks on follow up and physiotherapy started immediately after removal of slab and K-wires. The average period of union was 4.08 weeks. At final follow up the range of movement and grading was done as per Flynn's criteria; thirty two patients (71.11%) had excellent result, nine patients(20%) had good result, three patients(6.66%) had fair result while one patient(2.22%) had poor result.

Table 1

Series	Average age(Years)
Wilkins et al	6.7
Aronson and Prager et al	5.75
Yadav et al	8
Musa and Singh et al	7.06
<b>Present study</b>	<b>8.73</b>

Table no 2

Series	Male patient (%)	Female patient (%)
Wilkins et al	62.8%	37.2%
Aronson and Prager et al	75%	25%
Yadav et al	63.95%	36.04%
Musa and Singh et al	67%	33%
<b>Present study</b>	<b>71.11%</b>	<b>28.88%</b>

Table no 3

Series	Fall while playing	Fall from height	Fall following RTA
Musa and Singh et al	66.7%	23.3%	10%
<b>Present study</b>	<b>64.44%</b>	<b>24.44%</b>	<b>11.11%</b>

Table no 4

Series	Right side	Left side
Wilkins et al	39.2%	60.8%
Aronson and Prager et al	35%	65%
Yadav et al	35.02%	64.97%
Musa and Singh et al	40%	60%
<b>Present study</b>	<b>31.11%</b>	<b>68.88%</b>

Table no 5

Series	Extension type	Flexion type
Wilkins et al	98%	02%
Musa and Singh et al	100%	00%
<b>Present study</b>	<b>93.33%</b>	<b>06.66%</b>

Table no 6

Series	Posteromedial	Posterolateral
Wilkins et al	75%	25%
Aronson and Prager et al	75%	25%
Yadav et al	70.05%	29.94%
Musa and Singh et al	73%	27%
<b>Present study</b>	<b>53.33%</b>	<b>46.66%</b>

Table no 7

Series	Ulnar nerve palsy	Pin tract infection	Excessive granulation at pin tract	Cubitus varus
Aronson and Prager et al	5%	00%	00%	00%
Yadav et al	3.04%	26.39%	00%	00%
Musa and Singh et al	10%	13.33%	00%	6.66%
<b>Present study</b>	<b>2.22%</b>	<b>15.55%</b>	<b>6.66%</b>	<b>00%</b>

Table no 8

series	Satisfactory result			Unsatisfactory result
	Excellent	Good	fair	
Aronson and Prager et al	94%	4%	2%	00%
Yadav et al	73.6%	20.8%	2.5%	3.04%
Musa and Singh et al	80%	10%	7%	3%
<b>Present study</b>	<b>71.1%</b>	<b>20%</b>	<b>6.6%</b>	<b>2.22%</b>

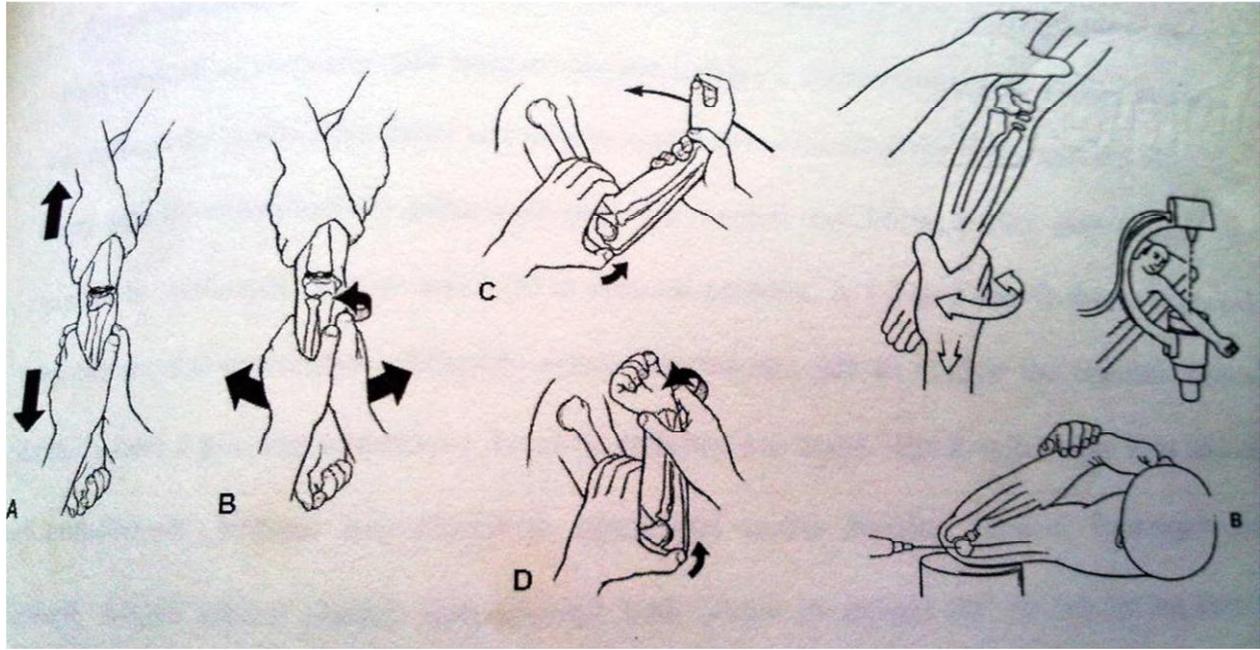
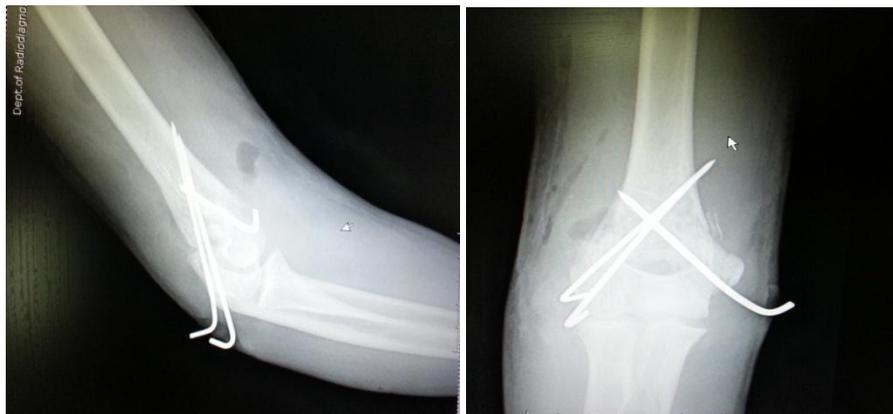


Fig. 1: Technique of closed reduction.

Figure 2



Pre operative x ray



Post operative x ray



6 weeks follow up



final follow up range of movement

## DISCUSSION

Supracondylar fractures are the most common injuries around the elbow and management of displaced supracondylar fractures is one of the most difficult, of the many fractures seen in children. Much concern has been expressed over the reduction as well as maintenance of fracture reduction and adequate circulation to the limb. Initial treatment and definitive treatment of this fracture is of utmost importance.

In the present study, the average age was 8.73 years ranging from 3 – 12 years.

The average age in other studies are compared [Table no 1]. 32(71.11%) were male patients and 13(28.88%) were female patients. The sex distribution in other studies, there is a significant male preponderance when compared. There is a male preponderance in all studies is due to the fact that outdoor exposure of the male children are more when compared to female.[Table no 2].

Twenty nine patients sustained injury while playing which is the commonest cause of injury followed by eleven patients who sustained injury from a fall from height and five patients had an injury following RTA. The modes of injury when compared with other studies [Table no 3]. 31 (68.88%) had left sided injury and 14 (31.11%) of them had right sided injury Other studies also show a preponderance of left side as compared to right which might be because of the fact that the non-dominant side usually breaks the direction of force of fall.[Table no 4].

Of the total 45 cases, forty two patients had extension type of injury whereas three patients had flexion type which justifies the literature that extension type of fracture is the commonest. Comparisons of incidence of the type of fracture in other studies show extension type of fracture to be the commonest presentation [Table no 5]. Twenty four cases had posteromedial displacement; sixteen of them had posterolateral displacement. Compared to other studies posteromedial displacement is found to be the commonest amongst all. [Table no 6].

The post-operative complications faced in our study were seven patients had pin tract infections, three patients

developed excessive granulation at pin site and lastly one patient developed ulnar nerve palsy. Nominal pin tract infection with no resultant deformity arising post fixation was seen in when compared to other studies [Table no 7].

Result of our study was calculated according to the Flynn's criteria and was found to be excellent in thirty two patients (71.11%), good in nine patients(20%) and fair in three patients(6.66%). So accumulatively satisfactory results were obtained in 97.77% and poor or unsatisfactory in 2.22%.[Table no 8].

## CONCLUSION

- Displaced supracondylar fracture of the humerus is one of the commonest childhood injuries.
- The commonest mode of sustaining injury being fall on an out stretched hand which results in extension type of fractures.
- The goal of treatment for supracondylar fracture humerus in children being normal functional recovery of movement and good cosmetic result.
- This study shows that anatomical reduction and K-wire pinning in the management of supracondylar fractures provides good results and full range of movement with relatively fewer complications.

## REFERENCES

1. David DA, Bruce IP. supracondylar fractures of humerus – a modified technique of closed pinning. CORR, 1987; 219: 174-178.
2. Pirone AM, Graham HR, Krajbich JI. Management of displaced extension type supracondylar fractures of the humerus in children. JBJS, 1988; 70-A(5): 641-650.
3. Hamid RM, Charles S. Crossed pin fixation of displaced supracondylar fractures in children. CORR, 2000; 376: 56-61.
4. James RK, James HB. Rockwood Wilkin's fractures in children. 5<sup>th</sup> ed. Philadelphia. Lippincot, William & Wilkins, 2001.
5. John AH, Tachdjian's pediatric orthopaedics. 3rd ed. Philadelphia. Saunders, 2002.
6. Jeffrey LN, Malcolm LE, Stanley MK, Paul AL, Marianne D. supracondylar fractures of humerus in children treated by closed reduction and percutaneous pinning. CORR, 1983; 177: 203-209.

7. Canale TS. Campbell's Operative orthopaedics. 10<sup>th</sup> ed. Philadelphia. Mosby, 2003.
8. Robert EL, Ryan WS, Peter MW. Supracondylar fractures of humerus. OCNA, 1999; 30: 120-124.