International Journal Dental and Medical Sciences Research
Volume 5, Issue 1, Jan-Feb 2023 pp 366-371 www.ijdmsrjournal.com ISSN: 2582-6018

A Study of Surgical Management of Supracondylar Fractures of Humerus in Children by Closed Reduction and Percutaneous Pinning With Kirschner Wires

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Submitted: 17-01-2023 Accepted: 05-02-2023

ABSTRACT
AIMS AND OBJECTIVES: To study outcome of supracondylar fracture of humerus in children below 15 yearsof age by percutaneous pinning under c – arm control to evaluate stability of reduction,time for fractureunion,infection,deformity and range of movement
MATERIALS AND METHODOLOGY: A prospective randomized, single centre, controlled study was conducted at the orthopaedic department of Prathima Institute of Medical Sciences from November 2020 to November 2022. All the children between below 15 years age with supracondylar fracture, who presented to orthopaedic outpatient or casualty for the study. 30 cases of supracondylar fracture in children are selected for treatment in our series.
RESULTS:. The majority of the patients are in the age group of 5 to 9 years. The average age is 7 years. The majority of the patients are male children about 3 times more common than the females. Out of 30, 15 were fixed with 2 cross pins and 15 with 3 cross pins. The final result of our study shows that 53.3% of our patients end up with excellent result according to Flynn‟s criteria. 26.7% patients had good result whereas 20% patients had fair result. None of our patient ended up with a poor outcome.
- **Conclusion:** Supracondylar fractures of humerus in children by closed reduction and percutaneous pinning with kirschner wires provides very good results with minimal loss in range of movement and relatively lesser complications.

KEY WORDS : supracondylar fracture, Percutaneous pinning, kirschner wires,Humerus

I. INTRODUCTION

Injuries of the elbow lead to chronic pain and permanent restriction of motion limiting the use of hand in most activities. Positioning of hand for grip and prehension is dominated by freedom of motion at the elbow. Basic daily activities, from eating to perineal hygiene, requires a wide range of positions and movements at the elbow in both flexion and extension and forearm rotations. Any restricted motion of the neck, shoulder or wrist magnifies impairment of elbow. More complex tasks at workplace or in recreation, requires even greater functional demands.

SUPRACONDYLAR FRACTURE OF HUMERUS is one of the few fractures which when treated well may not bring credit to a reputed surgeon, but, if it is handled improperly, it can definitely bring discredit to a well-reputed surgeon.

II. MATERIALS AND METHODOLOGY

A prospective randomized, single centre, controlled study was conducted at the orthopaedic department of Prathima Institute of Medical Sciences from November 2020 to November 2022. All the children between below 15 years age with supracondylar fracture, who presented to orthopaedic outpatient or casualty for the study.

The inclusion criteria were:
1) Age less than 15 years.
2) Those presented within 2 weeks of injury.

The exclusion criteria are:
1) Age more than 15 years.
2) Open supracondylar fracture of humerus
3) Fractures requiring open reduction
4) Inability to perform neurological evaluation.
5) Associated fractures around elbow

All the children with suspected supracondylar fractures of humerus were seen either at casualty or orthopedic opd by orthopedic duty doctor or resident or the surgeon himself. They were assessed for vascular and neurological status. Anteroposterior and lateral view x rays are done for

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the injured elbow, and diagnosis was confirmed as supracondylar fracture of humerus. In this study, supracondylar fracture of humerus was classified according to Gartland's classification.

Limb was immobilized in a A/E pop slab with limb in 30-45 deg of flexion. Surgery was planned on either same day or next day after obtaining written, informed and valid consent.

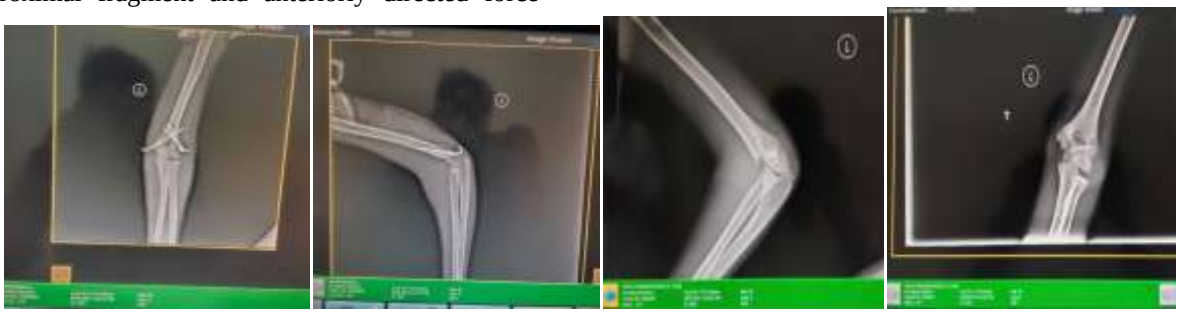
SURGICAL PROCEDURE:

All patients are treated under General Anaesthesia**.**The injured elbow, arm and forearm was scrubbed, painted, and draped well leaving the elbow, lower third of arm and upper third of forearm exposed. Traction along with 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 displacement were corrected by valgus or varus forces respectively. After that, 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. Reduction was confirmed under image intensifier in two views: Antero-posterior view or Jones View, Lateral View.

After confirming satisfactory alignment, reduction was maintained by percutaneous k-wire fixation. Above elbow posterior pop splint in 90^0 elbow flexion of forearm was applied.

Follow up:

- These patients were reviewed on 12^{th} post operative day on outpatient basis for suture removal K-wires were removed at 3 weeks post-operatively after X-Ray confirmation of satisfactory callus formation.
- Patient was encouraged to do active elbow flexion extension and supination – pronation exercise.
- Follow up was done on O.P.D. basis at 3^{rd}, 6^{th}& 12^{th} week post operatively.
- The follow up was done by clinical and radiological evaluation



Pre-op Radiographs **Immediate Post op radiograph**

At 6weeks Follow Up **Clinical follow-up Photographs**

III. OBSERVATION AND RESULTS

30 cases of supracondylar fracture in children are selected for treatment in our series by the method of percutaneous pinning of distal humerus under C-arm control, in the department of Orthopaedics at Prathima Institute of Medical Sciences, Karimnagar during the period of November 2020 to November 2022

The majority of the patients are in the age group of 5 to 9 years. The average age is 7 years, majority of the patients are male children(20)67% about 3 times more common than the

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females(10)33%. In present study 10 patients (33%) have right side injury and 20 patients (67%) have left side injury.30 patients (100%) have extension type injury and 0 patients have flexion type injury.Of the 30 cases in this study, 12(40%) had type II fracture and 18(60%) of them had type III fracture. 15 patients (50 % were treated with 2 K-wires and 15 patients (50%) were treated with 3 K wires

One patient is associated with pin tract infection. It subsided with conservative management. No other case was complicated by vascular or neurological deficit.

80% of the patients showed almost full range of movements by the end of 6 months, 20% of the patients had loss of 10-20 degrees of ROM.

80% patients had only 0-5 degrees change in carrying angle in the final follow up. 20% patients had 5-10 degrees change

The final result of our study shows that 53.3% of our patients end up with excellent result according to Flynn"s criteria. 26.7% patients had good result whereas 20% patients had fair result. None of our patient ended up with a poor outcome

TABLE 1:RANGE OF LIMITATION OF MOVEMENTS

S.No.	Limitation of ROM	No. of Cases	Percentage
1	$0\text{-}10^0$	24	80
2	$10\text{-}20^0$	6	20

GRAPH 1:RANGE OF LIMITATION OF MOVEMENTS

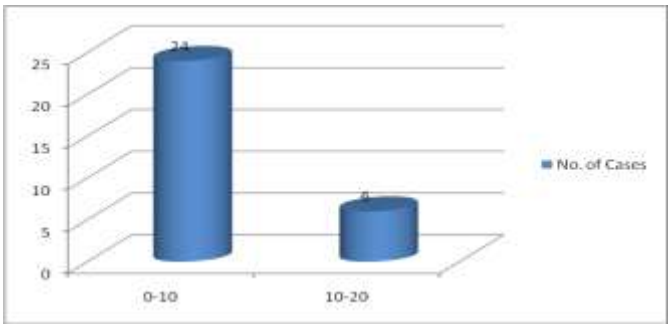

TABLE 2:CHANGE IN CARRYING ANGLE

S.No.	Change in Carrying Angle	No. of Cases	Percentage
1	$0\text{-}5^0$	24	80
2	$6\text{-}10^0$	6	20

GRAPH 2;CHANGE IN CARRYING ANGLE

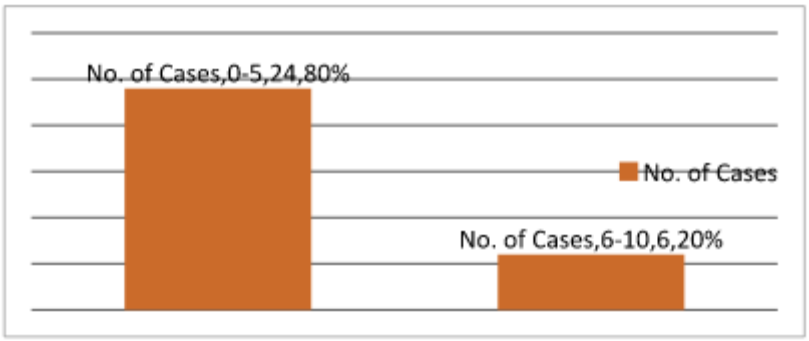

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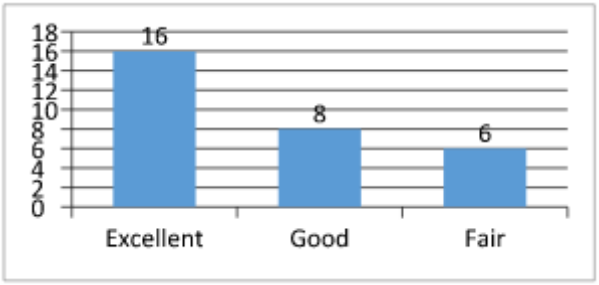
TABLE 3; GRADING OF RESULTS IN OUR SERIES

S.No.	Grade	No. of Cases	Percentage
1	Excellent	16	53.3
2	Good	8	26.7
3	Fair	6	20

GRAPH 3: Grading of results in our series



IV. DISCUSSION

Supracondylar fractures of humerus are common fractures occurring in childhood. Prompt and effective treatment should be given to these injuries to achieve best possible. As its improper treatment is associated with the complications, it makes the Orthopaedic surgeon to devote a large proportion of time into learning the basic principles of their management. Effective treatment followed by physiotherapy are mandatory to get good results.

Our series consists of thirty cases of supracondylar fractures of humerus in children, treated by the method of percutaneous pinning of distal humerus under C-arm control.

We selected the cases of supracondylar fracture humerus which require K-wire fixation.

- **AGE INCIDENCE:-** In the present study, the average age was 7 years, which is similar to the average age in other studies.

TABLE 4

SERIES	AVERAGE AGE (YRS)
Sharma et al[74]	6.7 yrs
Ippolito et al[77]	7.3 yrs
Edmonds E W et al[75]	5.8 yrs
PRESENT STUDY	7

It was found that the injury in children was caused by low energy trauma. Most of them were due to fall on outstretched hand. In our series the case no 3 patient has fallen from a tree, ten (10) cases fell down from bicycle, nineteen (19) cases fell down while playing at home or school.

2. **SEX DISTRIBUTION:-** In the present study, 20(66.7%) were male patients and 10(33.3%) were female patients, which is similar to other studies, showing a male preponderance.

TABLE 5

SERIES	MALE (%)	FEMALE (%)
Sharma et al[74]	83.33	16.67
Wilkins KE et al[1]	62.8	37.2
Fowles et al[76]	81	19
PRESENT STUDY	66.7%	33.3%

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- **SIDE OF INJURY:-** In the present study, 20(66.7%) had left sided injury.

TABLE 6

SERIES	RIGHT SIDED	LEFT SIDED
Wilkins KE et al[1]	39.2	60.8
Fowles et al[76]	43	57
Mazda K et al[78]	44	56
PRESENT STUDY	33.3%	66.7%

The other series also show a preponderance of left sided fractures.

4. **TYPE OF FRACTURE:-** Of the 30 cases in this study, 12(40%) had type II fracture and 18(60%) of them had type III fracture.

TABLE 7

SERIES	Type II	Type III
Zamzam et al[79]	37.9	62.03
Zhong et al[80]	35	64.95
PRESENT STUDY	40%	60%

As in the other studies, there is a preponderance of type III fractures in this study.

5. **POST-OPERATIVE COMPLICATIONS:-** In this study, 1 patient had pin tract infection, which improved after antibiotic therapy.

TABLE 8

SERIES	ULNAR.N PALSY	PTI	CUBITUS VARUS
PIRONE et al[81]	-	1	14
HAMID et al[82]	-	1	-
PRESENT STUDY	-	1	-

According to my study percutaneous pin fixation technique using 2 to 3 crossed pins yielded excellent to good results provided adequate care is taken for, pre-op evaluation, intra-op reduction, care of ulnar nerve by small opening for medial pin entry, adequately sized k-wires (1.5 to 2.5 mm) depending on the age and bone stock, adequate immobilization, regular follow-up & timely vigorous physiotherapy.

6. **RESULTS:-** Of the 30 cases, 24 cases obtained satisfactory results (16 excellent and 8 good results) and 6 cases obtained unsatisfactory results.

TABLE 9

SERIES	% OF SATISFACTORY RESULTS	% OF UNSATISFACTORY RESULTS
JEFFREY et al	76%	24%
PIRONE et al	80%	20%
RICHARD et al	80%	20%
PRESENT STUDY	80%	20%

This study has satisfactory results comparable to other studies.

V. CONCLUSIONS

Supracondylar fractures of humerus in children by closed reduction and percutaneous pinning with kirschner wires provides very good results with minimal loss in range of movement and relatively lesser complications

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