



STUDY OF FUNCTIONAL OUTCOME OF SUPRACONDYLAR HUMERUS FRACTURES IN CHILDREN TREATED BY CROSS PINNING.

Dr. Rakesh Gosavi	Assistant Professor in Orthopaedics ACPM Medical College, Dhule, Maharashtra
Dr. Nandkishor Goyal	Professor in Orthopaedics ACPM Medical College, Dhule, Maharashtra
Dr. Vipin Singh	Jr2 in Orthopaedics ACPM Medical College, Dhule, Maharashtra
Dr. Sriram Raghavendra Kulkarni*	Jr1 in Orthopaedics ACPM Medical College, Dhule, Maharashtra *Corresponding Author

ABSTRACT Supracondylar fracture humerus are most common fractures in children. These fractures are most common in age group of 5 to 7 years. Boys have higher incidence of these fractures than girls. Left side predominates in all studies. 2/3rd of the children hospitalised with elbow injuries have supracondylar fractures. Nerve injury is common in 7% and vascular injury is common in 1%. There is difficulty in maintaining adequate reduction with only cast immobilisation. So stabilisation of reduction of fracture with K wire placed percutaneously is the universally accepted treatment. In our study there was no nerve or vascular injury. The median nerve is much more commonly injured, particularly the anterior interosseous nerve (AIN). Ulnar nerve is occasionally injured iatrogenically during pinning or in flexion type of fracture. We treated surgically these fractures with one lateral pin and one medial pin through distal humeral fragment and engaging the opposite cortex of the proximal fragment and medial pin to enhance the fixation. Our goal is union of fracture and restoration of normal anatomy with early recovery of function with full and painless motion of elbow joint. Baumann's angle (BA) and anterior humeral line (AHL) is used as universal guide to assess the fracture reduction in paediatric supracondylar humeral fractures. **Results** Time taken for union is minimum 3 weeks and maximum 4 weeks. 28% have excellent results and 60% have good results and 8% fair and 4% have poor results.

KEYWORDS :

INTRODUCTION

Supracondylar humerus fracture is one of the most common fractures in children between age group of 5 to 7 years. It is more common in boys than girls. Involvement of non-dominant arm is more common. About 65% children hospitalised with elbow trauma have supracondylar fracture. Neurological complication seen in 7% and vascular complications seen in 1%.

As conservative management with cast had risk of loss of reduction hence percutaneous pins became treatment of choice. Anterior interosseous nerve, branch of median nerve is most commonly involved and ulnar nerve has risk of iatrogenic injury during pinning. Two crossed pins through medial and lateral condyle has maximum strength while two lateral pins through distal to proximal fragment found adequate to align fracture. Biomechanical analysis crossed pinning versus lateral pinning conclude that divergence of lateral pins was superior to parallel configuration and crossed pins. Conclusion is crossed pins give axial rotation strength more. Recommendation is to give rotation stability. Two lateral pins divergent placement before medial pin.

Anatomical reduction with functional restoration with pain free and full range of elbow movements is the goal of treatment. To assess fracture reduction in supracondylar fracture Anterior Humeral line (AHL) and Baumann's angle (BA) is used as guide. Change in Anterior Humeral line and Baumann's angle had impacts on elbow movements and cosmetic results. Flynn criteria for carrying angle, elbow loss of motion is used for assessing and grading outcome.

AIM

This study targets to assess early functional outcome of supracondylar fracture treated with percutaneous pinning and objectively assessment of radiological and functional outcomes.

Ossification Process

Ossification begins at long bone centres and progresses distally. In arm and forearm bones ossification begins at diaphysis at the same time. In humerus ossification extends distally to condyle strength. Radius is ossified at neck level. Ulna is ossified between tip of olecranon and coronoid process. The bicipital tuberosity largely remains unossified. In humerus common epiphyseal centre fuses with distal humerus metaphysis. Medial epicondyle and metaphysis usually fuse after late teens.

Blood Supply To Distal Humerus In Paediatrics

Brachial artery present in cubital fossa anteriorly is major artery. Intraosseous blood supply to distal humerus comes through posterior course of anastomotic vessels.

Neurovascular Relation

In 75% supracondylar fracture medial displacement occurs. In medial displacement there is risk of Radial nerve injury by distal fragment and lateral displacement has risk of median nerve injury and brachial artery injury.

Gartland Classification

Extension Injury Classification

- TYPE I: Minimally displaced fracture with maintenance of AHL. Fracture line passes through ossification centre of capitulum.
- TYPE II: Displaced fracture with intact posterior cortex.
- TYPE III: Displacement with no cortical contact.

Flexion Type Of Injury Classification

- TYPE I: Fracture with no displacement.
- TYPE II: Fracture with displacement and anterior cortex intact
- TYPE III: Displacement with no cortical contact.

OBJECTIVE

1. Functional outcome after closed reduction and percutaneous pinning.
2. Post procedure fracture anatomical reduction and its relation with elbow function.
3. Complication assessment after surgery.

MATERIAL AND METHODS

Study Site- Study conducted in Department Of Orthopaedics, ACPM Medical College, Dhule

Study Population:

Children under 14 years of age with closed supracondylar fracture. Total patients were 25.

Study Design:

Retrospective Observational Study

Study Duration:

January 2020 to January 2023

Methodology

Children with closed supracondylar fracture after taking consent from parents selected for study.

Surgical Procedure :

Supine position with elbow in less than full extension and forearm supine, longitudinal traction given with countertraction at arm medial or lateral displacement corrected. A varus angulation reduced by pronation. Angulation and posterior displacement corrected by flexing the elbow. Check reduction under C-arm in AP and Lateral. A reduction is considered acceptable if Bowman angle restored and AHL pass through capetullum. K wire of size 1.5 or 1.8 were used for reduction maintainance. Lateral and medial crossed pinning decided according to fracture configuration.K wire kept 1cm outside skin after bending. Above elbow posterior slab given in elbow flexion of 90° and supine position.

Follow Up Evaluation:

First follow up done at 3 weeks,check X-ray is done without removing the slab. If fracture is healing K wire and immobilisation is kept for one more week and than K wire is removed and limb mobilisation is started.Next follow up is done at 1.5 months and 3 months and data is recorded.Functional assessment is done according to Flynn's criteria and radiological assessment is done by Baumann's angle and anterior Humeral line.

OBSERVATION AND RESULT:

- There were 20 patients in the age group of 0 to 8 years which accounts to 80% and 5 patients were in the age group of 9 to 14 years which accounts to 20%.
- There was male predominance with 60% male and 40% females with left side supracondylar fractures in 64% patients and 36% on right side.

Gartland Classification:

There were 13 patients of Type 2 which accounts to 52% and 12 patients of Type 3 which accounts to 48%

Complications:

Pin tract infection seen in 3 patients,Terminal elbow stiffness in 1 patient and 1 patient had taken massage(so result is stiffness of elbow joint)

DISCUSSION:

Supracondylar fracture is one of the most common paediatric elbow fracture. Peak incidence 5 to 7%.Mean duration of union was 3.4 plus minus 0.5 weeks.Minimum union time 3 weeks(60%) and maximum union time 4 weeks (40%).We also compared male and female patients and gartland type 2 and type 3 and not found any statistical difference between them.In our study in 56% AHL passed through capetullum middle 3rd while in 28% passed through anterior 3rd in 1% AHL passed anterior to capetullum with maximum flexion(20%) at 12 weeks elbow extension was not affected in our study.The AHL passing through anterior 1/3rd has maximum mean loss of motion while AHL passing through posterior has minimum motion loss. Flynn's criteria was poor for anterior capetullum passing AHL while excellent(16%) in AHL passing middle and good in (40%).We assess Baumann's angle and found little predictive value on functional outcome and quality of reduction in frontal plane might better evaluated by comparison of carrying angle clinically.

CONCLUSION:

Early primary fixation of supracondylar fracture humerus in paediatric age group is essential for good functional outcome and to avoid prolonged immobilisation and complications. There was significant correlation between radiological and functional outcome.

According to Flynn criteria in functional outcome AHL passing middle 3rd had maximum satisfactory outcome. AHL is in middle 3rd of capetullum and placing K wire to stabilise fragment helps in preventing displacement of fragment and had good and early functional outcome.

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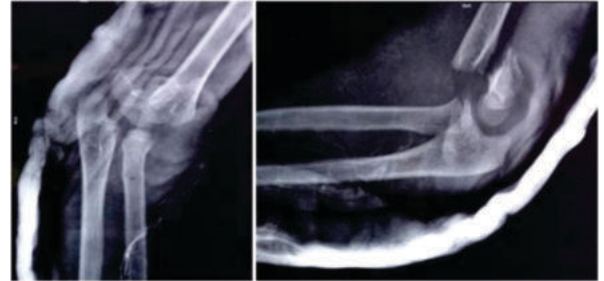
Conflicts Of Interest: Nil

Acknowledgement:

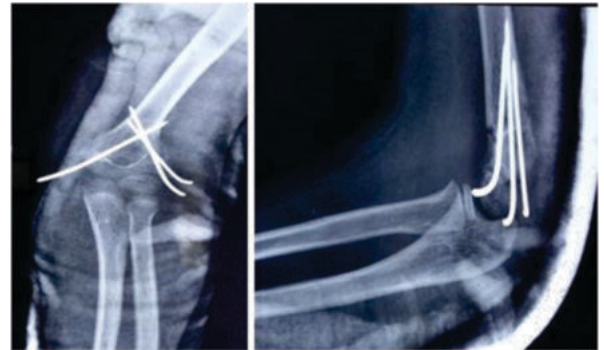
Thanks to Department Of Orthopaedics and Department Of

Case Illustrations:

Case No. 1



Preop



Post op

Follow Up after 12 weeks



Flexion(Showing functional results)

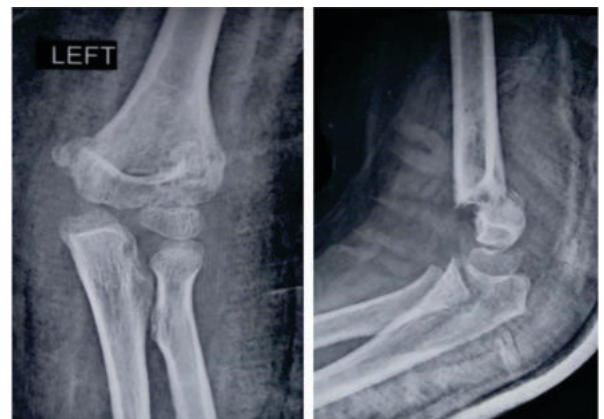
Showing functional results



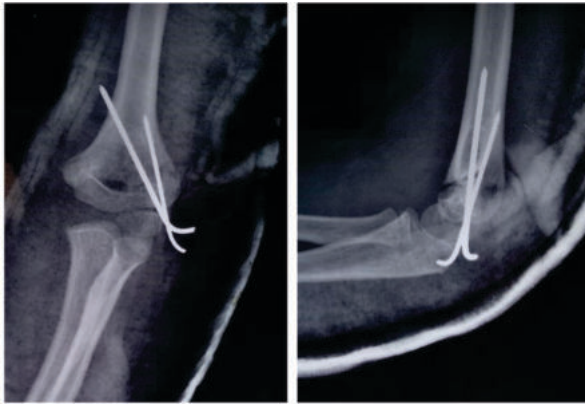
Extension

No Deformity

Case No.2

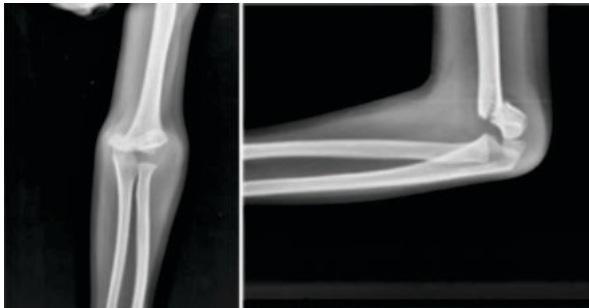


Preop

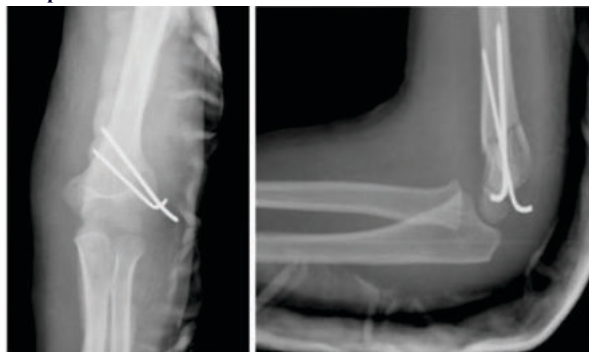


Post Op

Case No.3



Preop



Postop

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2. Cheng JC, Lam TP, Maffulli N. Epidemiological features of supracondylar fractures of the humerus in Chinese children. *Journal of pediatric orthopedics. Part B*. 2001 Jan;10(1):63-7.
3. McIntyre W. *Supracondylar fractures of the humerus. Management of paediatric fractures*. New York: Churchill Livingstone. 1994;11:167-98.
4. The incidence of left side fracture was more (64%) than that of right side (36%).
5. In our study we found fall while playing (68%) as the predominant mode of injury followed by fall from height such as rooftop/stairs/bed (32%)
6. We found all supracondylar humerus fracture are of extension type. Not a single case of flexion type of supracondylar humerus fracture was noted.
7. Out of 25 patients, we found 52% patients with Gartland type 2 and 48% patients with type 3.
8. The mean duration of union was 3.4±0.5 weeks in our study for the study population, minimum time for union being 3 weeks (60%) and maximum time for union being 4 weeks (40%).
9. In our study we found that there is correlation between radiological and functional outcome. AHL crossing middle third of capitulum had maximum satisfactory outcomes while AHL missing capitulum had poor outcome according to Flynn criteria. But we did not found any strong correlation between Baumann's angle and functional outcome. However more sample size and longer follow-up needed to validate our findings.
10. Cheng JC, Lam TP, Shen WY. Closed reduction and percutaneous pinning for type III displaced supracondylar fractures of the humerus in children. *Journal of orthopaedic trauma*. 1995;9(6):511-5.