

Research Article

Comparative Evaluation of Result of Percutaneous Cross K-Wire Verses Two Lateral K-Wire Fixation In Type-III Supracondylar Fracture Humerus in Childrens

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Abstract: *Background:* Supracondylar fracture of humerus is one of the most common fracture in the first decade of life. There are various modalities of treatment advised for the management of type III supracondylar fracture of humerus. At present closed reduction and percutaneous pin fixation is most widely accepted treatment method for displaced supracondylar fracture but controversy persists regarding the optimal pin fixation technique. But in cross k-wire fixation there is chance of complication, injury to median nerve, so two lateral k-wire technique prevent this complication. The purpose of this study was to compare the complication with percutaneous cross k-wire fixation and two lateral k-wire fixation in Gartland type III supracondylar fracture. *Method:* This prospective randomized controlled study was conducted at the department of Orthopaedics, MLB Medical college Jhansi up between oct 2010 to march.2012. There was totally 60 patients selected for the study between the age three to twelve years. We lost 2 patients for follow up, therefore only 78 patients were included for the study. They were allocated to Group-A (percutaneous cross k-wire fixation) n = 30, and Group – B (percutaneous two lateral k-wire fixation) n=30. Primary assessment was done for major loss of reduction and iatrogenic ulnar nerve injury. Secondary assessment was done for clinical alignment, elbow range of motion, radiographic measurements, Flynn grade, functions and complications. *Results:* The two groups were evaluated for pre-fracture characteristics and post reduction evaluation at first week, second week, fourth week, sixth week, three months and six months. The mean follow up in group A was 6 months and group B was 6 months. Both groups were also similar in sex distribution, pre-operative displacement, mode of injury and neurovascular status. No major loss of reduction was observed in both the groups where as there was no significant difference between mild loss of reduction, change in Baumann angle, change in Humero capitellar angle, Flynn grade, elbow extension and flexion, carrying angle, total range of motion (p>0.05). But there were two ulnar nerve injuries in group A. *Conclusion:* There was statistically no significant difference between two groups in terms of stability, duration of bone healing and loss of reduction but group A shows two cases of ulnar nerve injuries and in group B shows three cases malunion. So we conclude that percutaneous cross k-wire fixation is best technique for supracondylar fracture humerus in children but there is chance of iatrogenic ulnar nerve palsy.

Keywords: Gartland type III supracondylar fracture, percutaneous pin fixation, closed reduction

INTRODUCTION

Supracondylar fracture of the humerus in children is one of the most common fracture seen in orthopaedic outpatient department all over the world accounting for 50% to 70% of all elbow fracture in children in the first decade of life [1]. Traditionally this type of fracture is associated with high rate of malunion, nerve injury, and vascular complications [2-5]. In Vedas (2000 BC) in Charak samhitas and Sushruta (1000BC) describes healing of bone with diagnosis and treatment of fracture dislocation. Supracondylar fractures were mentioned in the works of Hippocrates. However, it was not until the 17th century A.D.

The various treatment modalities for the supracondylar fracture of humerus in children have developed with aim of reducing/preventing the frequent

Closed reduction and immobilization by traditional means has a long history 'finding its strong support in veterans such as Sir Astley Cooper' (1826) Sir Robert Jones (1921), Watson Jones (1952-1955) and Sir Charnley (1961), and is still widely accepted as an ideal treatment of supracondylar fracture of humerus fresh or old, however the instability of the reduction which increases as the initial swelling subsides is high [6].

Treatment of supracondylar fractures has included closed reduction [6] and casting in hyperflexion [7], traction [8], open reduction [9] and closed reduction with k-wire fixation [10].

The goal of all forms of treatment is the same, to obtain and maintain an anatomic reduction of the distal humerus to minimize complications such as nerve injury, compartment syndrome, Volkmann

ischaemic contracture, cubitus varus deformity and limitation of elbow movements. The non-operative management of type III supracondylar fracture of humerus including skin traction, skeletal traction and cast application has historically been associated with a greater incidence of failure to obtain and maintain the fracture reduction and subsequent complications as compared with surgical line of treatment [12-13].

The high rate of complications associated with non-operative treatment lead to the evolution of current techniques of percutaneous k-wire fixation for these difficult fractures over the past three decades. Standardization of surgical technique for performing k-wire fixation with radiographic control has markedly reduced the incidence of poor outcomes. The advantages of percutaneous k-wire fixation methods include easier management of extensively swollen elbows, better maintenance of reduction and decreased risk of associated complications.

The present study is an attempt towards assessing and comparing the results of two methods of – crossed percutaneous k-wire fixation and two lateral k-wire fixation presently followed in the management of these difficult fracture.

MATERIALS AND METHODS

The inclusion criteria were:

- Age between three to twelve years.
- Those presented within 0 to 7 days.
- No previous fracture in the same elbow

The exclusion criteria were:

- Age less than three years and more than twelve years.
- Open fractures
- Fracture requiring open reduction
- Floating elbow Type 1, and type 2
- All the children with suspected supracondylar fracture are assessed for vascular and neurological status.
- Anteroposterior and lateral radiographs were done.

Fracture reduction

- Closed manipulation is done with the patient under general anaesthesia under the guidance of a C-arm image intensifier. Rang's technique with minor modification is used in a stepwise manner for performing closed reduction. Longitudinal traction is applied to the elbow in position of 30-40 degrees short of full extension
- While the traction is being applied, the medial and lateral displacements are corrected by applying a varus or valgus force at the fracture site.

- The rotation of the distal fragment is simultaneously corrected by rotating the forearm into pronation or supination.
- While the elbow is being flexed, a posteriorly directed force is applied to anterior portion of the arm over the proximal fragment and an anteriorly directed force is applied posteriorly over the distal fragment with both the thumbs. The forearm is held in pronation for postero-medial fractures and in supination for postero-lateral fractures.
- Radiologically, assessment of reduction is done by taking anteroposterior, lateral and Jones's views. If acceptable, then limb immobilised by above elbow POP slab.

Crossed Pinning

- After closed reduction either medial or lateral was passed first depending upon the displacement of the distal fragment, i.e. posteromedial and posterolateral respectively
- The pin was then directed upwards and medially at an angle of 35-40 degrees to the sagittal plane and 10 degrees posterior to the coronal plane of the humerus.
- Thus the pin is passed through the distal fragment and the medullary cavity of the proximal fragment to engage the farther cortex of the proximal fragment about 3 cms above the fracture line.
- After a provisional fracture stability is obtained with lateral pinning, the medial pin was inserted through the centre of the medial epicondyle in a similar manner. Then elbow was immobilized with posterior slab with elbow in 70 to 90 degree of flexion depending upon the swelling and neurovascular status.
- Radiographic evaluation was performed by antero posterior and lateral radiographs of the elbow. Clinical evaluation was graded according to carrying angle and elbow range of motion using the criteria of Flynn *et al.*
- At the three months and six months follow up child were evaluated for full function, minor limitation of function and major loss of function

Two Lateral Pin Fixation

For the lateral fixation technique two pins were inserted from lateral aspect of elbow across the lateral cortex to engage the medial cortex keeping the elbow in hyperflexion. For the pin construct to be acceptable and biomechanically stable one pin had to be placed in

lateral column and another in central column. Pins were placed either in parallel or divergent configuration with the adequate separation at fracture site.

RESULTS

60 cases of fracture supracondylar humerus in children were performed in this study 30 patients were

randomly divided in group A and managed by close reduction percutaneous cross k-wire fixation. Where as rest 30 (group B) were managed by percutaneous two lateral k-wire. Cases were followed at one, three, 6 weeks interval for 6 months.

Final Evaluation of results based on Flynn’s criteria.

Table-1: Modified Flynn’s criteria and overall rating

Result	Rating	Carrying angle loss(°)	Flexion loss(°)	Extension loss(°)
Satisfactory	Excellent	0-4.9	0-4.9	0-4.9
	Good	5.9.9	5.9.9	5.9.9
	Fair	10-14.9	10-14.9	10-14.9
Unsatisfactory	Poor	≥15	≥15	≥15

Table -2: Modified Gartland Classification of supracondylar humeral fracture

Type I	<ul style="list-style-type: none"> • Non displaced or minimally displaced (by <2mm), • Intact anterior humeral line • Posterior fat pad ± • Periostium intact circumferentially
Type II	<ul style="list-style-type: none"> • Displacement >2mm • Posterior cortex presumably intact but hinged • Anterior humeral line does not pass through middle third of capitellum • No rotational deformity
Type III	<ul style="list-style-type: none"> • Displaced with no meaningful cortical contact • Extension in sagittal and rotation in frontal plane • Periostium extensively torn • May be associated with soft tissue and neurovascular injury
Type IV	<ul style="list-style-type: none"> • Multidirectional instability • Incompetent periosteal hinge • Circumferentially • Unstable both in flexion and extension

Table-3: Comparative evaluation results

Grading	Cross k-wire(30)		Two lateral K-wire(30)	
	No. of cases	Percentage	No. of cases	Percentage
Excellent	24	80%	20	66.67%
Good	3	10%	5	16.67%
Fair	2	6.67%	3	10%
Poor	1	3.33%	2	6.66%

Discussion

Children aged between 3-12yrs who were treated by close reduction with either by or crossed percutaneous K-wire fixation or two lateral k-wire were studied. The cases were reviewed prospectively for functional outcome following the both type of management. The peak incidence in my series was age between 5-8 yrs. Boys were more commonly affected than girls. Fall on out stretched arm was the most common mode of injury. Posteromedial displacement of distal fragment was observed in most of the cases. 30

cases were treated with crossed percutaneous K-wire fixation and rest 30 cases treated with two lateral k-wire. The average follow up period was 6 months. Two cases developed pre op absent radial pulse. and one case of radial nerve palsy. Two cases developed post of ulnar nerve palsy and two cases developed pintract infection in percutaneous k-wire fixation. Two cases developed malunion in two lateral k-wire technique and one case in percutaneous k-wire fixation. In this study the following percutaneous cross k-wire was excellent 80%, and good in 10%, 6.67% fair and 3.33% with poor

results. Where other group in two lateral k-wire of treatment show excellent 66.6%, and good 16.66% with 10% fair and 6.66% poor results Consistently satisfactory functional and cosmetic results are excellent in crossed pinning.



Fig-1: Type – III supracondylar fracture of humerus



Fig-2: Two lateral k-wire fixation



Fig-3: Medial and lateral pin fixation

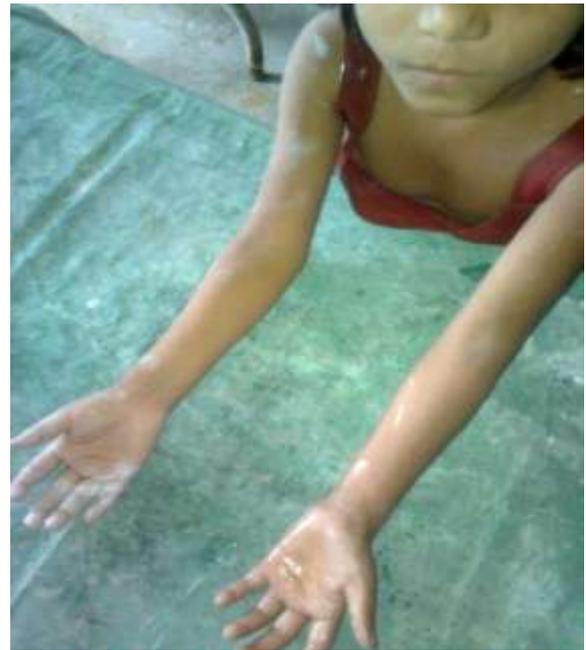


Fig-5: Movement of like Extension and Flexion in elbow joint

CONCLUSION

Patient were treated as percutaneous cross k- wire fixation Over all observation that closed reduction and percutaneous cross pinning is an excellent method of treatment of supracondylar fracture in children. Cross medial pinning is the treatment of choice in these fracture with careful technique which safeguards the ulnar nerve.

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