Original Research Article

Comparative evaluation of result of conservative versus percuteneous K-wire fixation in type III supracondylar fracture humerus in children

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Abstract

Background:At present closed reduction and percutaneouspin fixation is most widely accepted treatment method for displaced supracondylar fracture but controversy persists regarding the optimal pinfixation technique.But in Indian continent people not accept operative treatment and no c-arm available everywhere so there is required closed reduction (conservative) management. **Method:**Total 60 patients selected for the study between the age 3-12years.They were equally allocated to Group-A(percutaneous k-wire fixation)and Group–B (close reduction above elbow stable application).Primary assessment was done for major lossof reductionand iatrogeniculnar nerve injury.Secondary assessment was done for clinical alignment,elbow range of motion,radiographic measurements, Flynn grade, functions and complications. **Results:** Both groups were evaluated for pre-fracture characteristics and postreduction evaluation at 1st, 2nd, 4th & 6th week, and 3rd & 6th months. No major loss of reductionwas observed in boththegroups,whereas there wasno significant difference between mild lossof reduction,Flynngrade,elbow extension and flexion,carrying angle,total range of motion ($p>0.05$), but there were 3 ulnar nerve injuries in group A. **Conclusion:**There was statisticallyno significant difference between 2 groups in termsof stability,duration ofbone healing and loss of reduction butgroupA shows 3 cases of ulnar nerve injuries and in group B shows 3 cases malunion.So,we conclude that percutaneous k-wire fixation is best technique for supracondylar fracture humerus in children but there is chance of iatrogenic ulnar nerve palsy.

Keywords:LV Diastolic Dysfunction, Type 2 diabetes mellitus, Diabetic Cardiomyopathy. Glycemic control.

Introduction

Supracondylar fractureofthe humerus in children is one of the most common fracture seen in orthopedic outpatient department all over the world accounting for 50%to70%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.In Vedas (2000bc) in Charak Samhitas and Sushruta (1000bc) describe 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. that medical literature included methods of treatment of these fractures. Desault in 1800, stated that the poor results were due to poor management and not inevitable with this injury (when Watson Jones stated That prognosis of supracondylar fracture is excellent, where'Lyman Smith' stated there is a high rate of occurrence of residual deformities following its malunion, and though a number of treatment modalities have developed,since times immemorial each have their limitations and the dilemma continues as to which treatment modality would best serve a particular case of a displaced supracondylar fracture of humerus taking all factors in to consideration and though the recent trend is towards closed reduction and percutaneous k- wire fixation ,certain studies cast doubt on its being the sole treatment option in all cases and in all situation ,a brief review of history of the treatment option that developed over the years follows.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 subside is high.Treatment of supracondylar fractures has included closed reduction and casting in hyperflexion, traction, open reduction and closed reduction with k-wire fixation. 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.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 education and decreased risk of associated complications. The

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present study is an attempt towards assessing and comparing the results of two methods of – crossed percutaneous k-wire fixation and closed reduction and above elbow pop cast application presently followed in the management of these difficult fracture.

Materials and method

This prospective randomized controlled study was conducted at the department of Orthopaedics,Maharaja Suheldev autonomous state medical college Baharaich up between April 2019 to March.2020. There was totally 60 patients selected for the study between the age three to twelve years.They were allocated to Group-A(percutaneous k-wire fixation)n=30,andGroup–B(close reduction above elbow stable application)n=30.Primary assessment was done for major loss of reduction and iatrogeniculnar nerve injury. Secondary assessment was done for clinical alignment,elbow range of motion,radiographic measurements, Flynngrade,functions and complications.

- **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 then twelve years.
  - Fracture requiring open reduction
  - Floating elbowType 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 Jone'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 he fractures 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.

Results

60 cases of fracture supracondylar humerus in children were performed in this study.30 patients were randomly divided in group1 and managed by close reduction percutaneous k-wire fixation. Whereas rest30(group 2) were managed by conservative method. 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 overallrating

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

Table 2:Modified Gartland Classification ofsupracondylar humeral fracture

Type-1	• Non displaced or minimally displaced(by <2mm), • Intactanterior humeral line • Posterior fatpad± • Periosteum intact circumferentially
Type-2	• Displacement>2mm • Posterior cortex presumably intact but hinged • Anterior humeral line does not pass through middle third of capitellum
Type -3	• Displaced with no meaningful cortical contact • Extensioninsagittalandrotation in frontal plane • Periosteum extensivelytorn • May be associated with soft tissue and neurovascular injury • Collapse of medial column
Type-4	• Multidirectional instability • Incompetent periosteal hinge Circumferentially • Unstable both in flexion and extension

Table 3:Comparative evaluation results

Grading	Conservative(30)		K-wire(30)	
	No. of cases	Percentage	No. of cases	Percentage
Excellent	15	50%	20	66,.66%
Good	8	26.6%	5	16.66%
Fair	4	13.3%	3	10%
Poor	3	10%	2	6.66%

Discussion

- Children aged between 3-12yrs who were treated by close reduction with either by conservative or crossed percutaneous K-wire fixation 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 then 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 closed reduction A/E Pop slab application and 30 cases were treated with crossed percutaneous K-wire fixation.
- The average follow up period was 6 months.
- Two cases developed pre op absent radial pulse.one case have median and one case of radial nerve palsy.
- Two cases developed post of ulnar nerve palsy and two cases developedpin tract infection in percutaneous k-wire fixation.
- Four cases developed malunion in conservative and one case inpercutaneous k-wire fixation.
- . In this study the following percutaneous k- wire was excellent 66.66%, and good in 16.66%, 10% fair and6.66% with poor results.
- Where other group in conservative type of treatment show excellent 50%, and good 26.66% with 13.33% fair and 10% poor results Consistently.satisfactory functional and cosmetic results are excellent in crossed pinning.

Conclusion

Patient were treated conservatively as well as percutaneous k-wire fixation Over all observation that closed reduction and percutaneous 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.

Fig 1:Type– III supraondylar fracture of humerus

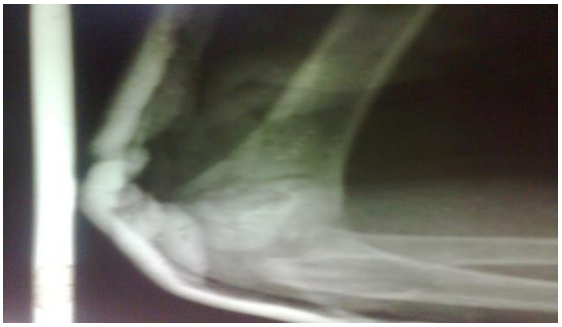

Fig 2:Conservative

Fig 3:Medialand lateral pin fixation

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