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CLINICAL AND FUNCTIONAL OUTCOME OF DISPLACED SUPRACONDYLAR HUMERUS FRACTURE IN CHILDREN OPERATED WITH K-WIRE FIXATION

Orthopaedics

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ABSTRACT

Background: This is a study done on 30 children to see the outcome of percutaneous K-wire fixation as the treatment of choice in fractures supracondylar humerus in children.**Materials and Methods:** Thirty cases of displaced fracture supracondylar in children managed with Percutaneous K wiring. The age group of children under study was (02-14 year). The fracture was immobilised for three weeks. Follow up was done at 3, 6, 9 and 12 weeks and all the complications were recorded. Evaluation was done on the basis of Flynn's criteria by measuring loss of elbow motion and carrying angle.**Results:** Out of 30 patient 21 patients had excellent results, 6 patients had good results, 2 patients had fair result and 1 patient had poor result according to Flynn's criteria.**Conclusion:** Percutaneous pinning in Gartland type 3/4 supracondylar humerus fractures in children is an excellent modality of treatment with good functional outcome and minimum complications.

KEYWORDS

Supracondylar humerus fracture, K-wire fixation, percutaneous pinning, Gartland classification, Flynn's criteria, closed reduction, functional outcome, lateral pinning,cross k wire

INTRODUCTION

Supracondylar humerus fractures (SHF) are the most common elbow fractures in children, particularly between the ages of 5 and 7 years, and constitute approximately 3% of all pediatric fractures[1].These fractures are prevalent in the non-dominant hand between the ages of 5 and 8, with boys being more afflicted than girls.The classification of these fractures by Gartland was modified by Wilkins to allow for the rotational deformity: type I (undisplaced), type IIA (angulated, posterior cortex intact, no rotation), type IIB (angulated, posterior cortex intact, rotational deformity),and type III (displaced with no cortical contact)[3].These fractures are often complicated by neural and vascular injuries and malunion leading to cubitus varus deformity.[2].

There are various treatment option available for fracture supracondylar humerus like close reduction and POP casting,skeletal traction, CRIF with k-wire, ORIF.Conservative management with pop casting leads to various complications like loss of reduction, malunion, cubitus varus deformity. Open reduction is recommended if closed reduction cannot achieve the desired anatomic reduction.ORIF with k wire gives anatomical reduction but it has some disadvantages like more blood loss, chances of infection, elbow stiffness, longer hospital stay.

AIMS and : Clinical and Functional outcome of displaced supracondylar humerus fracture in children operated with K-wire fixation.

OBJECTIVES:

To evaluate the Functional and radiological outcome of pediatric supracondylar fracture of the humerus treated by closed reduction and fixation by k-wires.

REVIEW OF LITERATURE:

While closed manipulation and percutaneous Kirschner wire stabilization is the accepted treatment of displaced supracondylar fractures of the humerus in children, there is still argument on the optimal configuration of those Kirschner wires Danielsson and Pettersson used only one pin and noted a loss of reduction.[4]

Swenson, Flynn et al., and Nacht et al. [5] have introduced two pins through the medial and lateral epicondyles, respectively. The two-wire cross-fixation is the most commonly used and good results have been reported, but injury of the ulnar nerve when inserting the medial wire has been documented ranging from 2 to 8% Bloom et al. reported three lateral divergent pins were equivalent to cross pinning and both were stronger than two lateral divergent pins[6] Gottschalk et al reported that construct strength increased when pin size was increased from 1.6 to 2 mm, but did not increase when a third pin was added[7]

MATERIALS AND METHODS

Study Design: Hospital-based prospective study.

Study area: The study was conducted in the Department of Orthopaedics at Government Medical College Surat.

Study Period: November 2023 to November 2025

Study population: All the children with Gartland type II,III or IV fracture who presented to the orthopaedic outpatient or casualty.

Sample size: The study consisted of a total of 30 subjects.
Sampling Technique: Simple Random technique.

Inclusion Criteria:
1.Age between 2 to 14 years.
2.No previous fracture in the same elbow.
3.Closed Fracture of Gartland type2,3 or 4.

Exclusion criteria:
1.Age less than 2 years and more than 14 years.
2.Open fractures.
3.Surgically unfit patients
4.Patient with neurovascular injury.

MATERIALS:

Sterile drape and Gloves
Scalpel with knife
Drill
Multiple K-wires(1.5mm,2mm,2.5mm)
K-wire bender
K-wire cutter
Hook
Gauze piece
Povidone iodine and spirit

METHODS.

Supracondylar fractures may be divided into extension and flexion types, depending on the direction of displacement of the distal fragment. Extension-type fractures, which account for approximately 97% to 99% of SCH fractures are usually caused by a fall onto the outstretched hand with the elbow [9]in full extension.

The direction of fracture displacement often indicates whether the medial or lateral periosteum remains intact. With a posteromedially displaced fracture, the medial periosteum is usually intact and vice versa Medial displacement of the distal fragment places the radial nerve at risk, and lateral displacement of the distal fragment places the median nerve and brachial artery at risk. Technique of CRIF with k-wire through percutaneous lateral pinning Under general anaesthesia the patient is placed supine with an arm table. Ensure adequate AP and lateral images can be obtained without the arm being moved.Closed reduction done by traction, medial/lateral correction, reduction of extension reduction is confirmed by image intensifier by taking AP and lateral view. After adequate reduction achieved percutaneous lateral

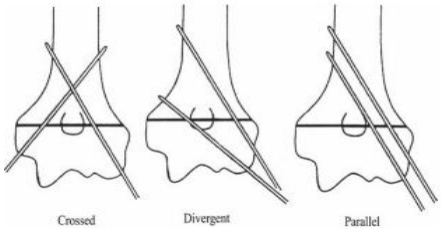
pinning with k wire (1.5/2mm) is performed under image intensifier by keeping the elbow in flexion and forearm in pronation to prevent displacement.

In our study we have included patients treated either by lateral pinning or by cross pinning and their functional outcomes.

The two main issues with crossed pin versus lateral-entry pinning of SCH fractures are: (1) Risk of ulnar nerve injury and (2) risk of loss of reduction.

Fractures with medial comminution may not have the dramatic displacement of most type III fractures, but must be treated with operative reduction because collapse of the medial column will lead to varus deformity in an otherwise minimally displaced supracondylar fracture.[10]

The Three types of pinning technique as given by Le Et al are[8]



RESULTS:

Flynn's criteria for cosmetic and functional assessment of results

Result rating	Cosmetic factorCarrying angle loss	Functional factorLoss of motion
Excellent	0–5	0–5
Good	6–10	6–10
Fair	11–15	11–15
Poor	>15	>15

Demographic Profile
Age Distribution
The study included a total of 30 patients.
The mean age of the patients was 7.27 ± 2.65 years

Sex Distribution
There was a clear male predominance in the study population.
- Male patients: 21 (70%)
- Female patients: 9 (30%)

Fracture Characteristics
Mechanism of Injury (Extension vs. Flexion)
- 100% (30 out of 30) of the cases recorded were of the Extension type. There were no flexion-type fractures observed in this cohort.

Gartland Classification
The fractures were categorized based on the Modified Gartland classification:
- Gartland Type IV: 16 cases (53.33%)
- Gartland Type III: 14 cases (46.67%)

Type of Displacement
The direction of distal fragment displacement was predominantly posteromedial.
- Posteromedial displacement: 24 cases (80.00%)
- Posterolateral displacement: 6 cases (20.00%)

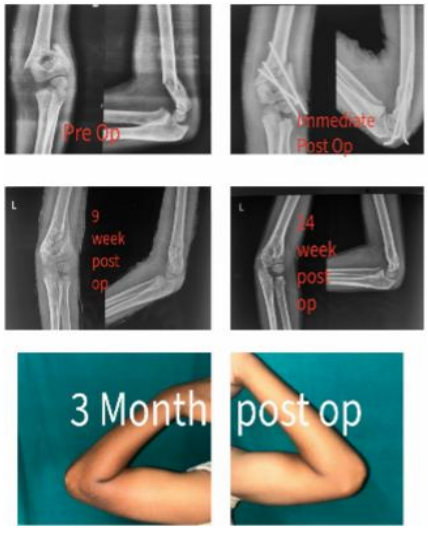
Surgical Management
Type of Pinning Done
All patients underwent surgical fixation using either cross pinning or lateral pinning techniques.
- Cross Pinning: 19 cases (63.33%)
- Lateral Pinning: 11 cases (36.67%)

Observation: Cross pinning was the preferred method of fixation for the majority of the displaced supracondylar fractures.

Functional Outcome :Out of 30 patient 21 patients had excellent results, 6 patient had good results, 2 patient had fair result and 1 patient had poor result according to Flynn's criteria.Out of 19 cross pinning 15 had excellent results and 6 out of 11 patients operated with lateral pinning had excellent outcome.

One patient postoperatively after cross pinning had ulnar neuropraxia which improved after 3 months.

Five patients had Pin tract infection which were managed with daily dressing and short course of IV antibiotic.



COMPLICATIONS

1. Vascular injury and compartment syndrome. Hand perfusion, not presence or absence of a pulse, appears to be predictive of the need for arterial repair and risk of compartment syndrome.Choi et al.42 reported on 25 pulseless patients whose hand was well perfused at presentation and none (0%) required vascular repair or developed a compartment syndrome.[11]

2. Neurologic Deficit. AIN palsy is the most common followed by Radial nerve palsy.AIN palsy presents as paralysis of the long flexors of the thumb and index finger without sensory changes.

3.There are also chances of Elbow Stiffness which is more common in flexion variety and rarely seen in extension variety.

4. Pin tract infections can occur which may lead to pin migration but it generally resolve with pin removal and antibiotics

5.Myositis ossificans and non union

6.Cubitus varus deformity can occur in setting of SC humerus malunion.

CONCLUSION:

The demographic analysis revealed a clear male predominance, with an average patient age of approximately seven years.

According to Flynn's criteria for measuring the loss of elbow motion and carrying angle, the overall functional and cosmetic outcomes were highly favorable. Specifically, an overwhelming majority of the patients (27 out of 30) achieved either excellent or good results, underscoring the efficacy of the procedure.

This study also emphasizes that prompt operative reduction is crucial, especially to prevent long-term deformities like cubitus varus.

In short, percutaneous K-wire fixation stands as a safe, minimally invasive, and excellent treatment of choice for displaced pediatric supracondylar humerus fractures.

REFERENCES:

[1] Qiu X, Deng H, Su Q, Zeng S, Han S, Li S, et al. Epidemiology and management of 10,486 pediatric fractures in Shenzhen:Experience and lessons to be learnt. BMC Pediatr. 2022;22:161. doi: 10.1186/s12887-022-03199-0.
[2] Meyer CL, Kozin SH, Herman SJ, Safier S, Abzurg JM. Complications of pediatric supracondylar humeral fractures. Instr Course Lect.2015;64:483–91

[3] Wilkins KE. Fractures and Dislocations of the Elbow Region In Rockwood. In: Wilkins KE, King RE, editors. Fractures in Children.vol. 3. Philadelphia: J.B. Lippincott; 1991. p. 509–828
[4] Danielsson L, Pettersson H (1980) Open reduction and pin fixation of severely displaced supracondylar fractures of the humerus in children. Acta Orthop Scand 15:249 [PubMed]
[5] Swenson AL (1948) Treatment of supracondylar fractures of the humerus by Kirschner wire trans-fixation. J Bone Joint Surg Am 30:993–997
[6] Bloom T, Robertson C, Mahar A, et al. Biomechanical analysis of supracondylar humerus fracture pinning for slightly malreduced fractures. J Pediatr Orthop. 2008;28(7):766–772.
[7] Gottschalk HP, Sagoo D, Glaser D, et al. Biomechanical analysis of pin placement for pediatric supracondylar humerus fractures: Does starting point, pin size, and number matter? J Pediatr Orthop. 2012;32(5):445–451.[8] Lee YH, Lee SK, Kim BS, et al. Three lateral divergent or parallel pin fixations for the treatment of displaced supracondylar humerus fractures in children. J Pediatr Orthop. 2008;28(4):417–422
[9] Rockwood and Wilkins' fractures in children (9th ed.). Lippincott Williams & Wilkins.
[10] De Boeck H, De Smet P, Penders W, et al. Supracondylar elbow fractures with impaction of the medial condyle in children. J Pediatr Orthop. 1995;15(4):444–448
[11] Choi PD, Melikian R, Skaggs DL. Risk factors for vascular repair and compartment syndrome in the pulseless supracondylar humerus fracture in children. J Pediatr Orthop. 2010;30(1):50–56.