

Outcome of Paediatric Supracondylar Fractures Of Humerus with Closed Reduction and Percutaneous Fixation with 2 Crossed K-Wires

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Abstract

Supracondylar fractures of humerus are common skeletal injuries in paediatric age group comprising 50-60% of elbow injuries. They are often associated with complications and are very notorious for neurovascular injuries between 5 to 10 years of age. Our objective was to evaluate the functional outcome with closed reduction and percutaneous cross k wire fixation. 60 patients of Gartland type III fractures admitted and treated in our hospital were taken for study. The results were assessed as per FLYNN CRITERIA. There were 48 excellent, 6 good, 4 fair and 2 poor results. Fair results were due to poor compliance to follow up and postoperative rehabilitation. There were 8 cases with pintract infection, 2 with elbow stiffness and 1 with cubitus varus. Closed reduction and percutaneous K wire fixation is very effective and minimally invasive way of treatment of displaced supracondylar humerus fractures. Crossed K wire seems biomechanically better way of stability of fracture reduction.

Keywords: Supracondylar fractures, closed reduction, percutaneous k wire fixation, Flynn Criteria, cross k wire

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Introduction

Supracondylar fracture humerus is very common skeletal injury in pediatric age group. It consists of 50 to 70% of elbow injuries¹. This fracture has a very potential for neurovascular injury between 5 to 10 years age². The most common mechanism of injury is fall on out stretched hand. About 70% of cases, non-dominant limb is commonly involved. Usually these fractures in younger children result due to falls sustained while playing, fall from stairs and missing a step while running and the falls are usually of high energy trauma to cause this type of fractures^{3,4}. Supracondylar fractures are of two types' flexion and extension depending on position of distal fragment. The distal part of humerus comprises of thin weak bone bounded by Olecranon and Coronoid fossae posteriorly and anteriorly respectively.

Due to fall on an outstretched hand, the elbow becomes fixed in extension, the forces are transmitted through this weak portion of bone which results into fracture. Magnitude of trauma and severity of fracture causes displacement of distal fragment posteriorly and the proximal segment thus lies anteriorly, the relative position of these fragments determine complications^{5,6,7}. The Fracture line traverse distal humerus at level of olecranon fossae. About 96% of total fractures

are extension types and remaining is flexion type. Gartland classified these fractures according to degree of displacement of distal humerus. Type I is undisplaced, type II is displaced but posterior cortex is intact, type III completely displaced, no contact between bone fragments^{8,9}. These should be treated properly to prevent complication like restriction of elbow movements, varus and valgus deformity, compartment syndrome, neurovascular compromise and myositis ossificans¹⁰. Various modalities of treatment have been advocated for these fractures which include closed reduction posterior slab support, closed reduction and casting, pin traction till reduction of swelling, closed reduction and percutaneous pinning under fluoroscopic guidance and open reduction.

Swenson technique of cross pinning is being used today with excellent results and less morbidity^{11,12}. In developing countries delayed presentation is much higher because of poverty, ignorance and poor health delivery system and time to reach tertiary care center. Type II and type III supracondylar fractures in children are usually reduced by close reduction technique and Gartland Type III Supracondylar Fractures of humerus after Closed Reduction are stabilized with percutaneous k-wire fixation, though open reduction and internal fixation is recommended, especially when closed reduction is not achieved. Two k wires inserted through medial and lateral cortex is key to success of stable fixation. Cross k wire fixation Provide best stabilization. In our study Flynn criteria for reduction assessment was used^{13,14}.

Material and Methods

This prospective descriptive study was conducted during 2013-2014. Sixty patients were included in this

study who were admitted to emergency ward of hospital for bone and joint surgeries. After explained and informed consent Gartland type III supracondylar fractures were included in the study. Open fracture, associated neurovascular injury and history of previous elbow fracture were excluded from the study.

After admission to emergency ward, detailed history and clinical examination (Age, Gender, injury side early or late presentation) of each patient was done, investigated accordingly. Pre-operative radiographs (Anterior-Posterior and lateral views) were utilized in each patient. Under general anesthesia, and under all aseptic precautions with C Arm facility, fracture reduction was done by traction and counter traction followed by controlled flexion at elbow and reduction confirmed with AP and lateral views on fluoroscopy with both pillars identified properly. After satisfactory C arm reduction, fracture was stabilized with 2 k wires 1 to 2 mm depending on age and bulk of arm of each patient.

First k wire was introduced from lateral side and then with small stab on medial side, ulnar nerve was pushed posteriorly behind medial epicondyle with help of thumb of one hand and medial pin was inserted. After satisfactory k wire position antiseptic dressing was done and posterior long arm Slab support applied with limb kept in neutral position and up to 90 degree flexion. Patients were discharged from hospital from first postoperative day onwards with majority discharged on second postoperative day. Regular follow up was done at 1 week, 3 week 5 week. Posterior slab was removed after 3 weeks and range of motion exercises started with k wires removed at 5 weeks. After removal of k wires patients were followed at 3rd week, after 1 month and then after every 3 monthly. Clinical assessment was done according to Flynn criteria and radiological examination was made by assessing the Baumann's angle in first and final X-rays. Displacement of 12° was declared major, 6 to 12° as mild and less than 6° as no displacement. Final follow up was done after one year using Flynn Criteria table A.

Results

In our Study 35 Patients were male and 25 were Female and 57 Patients were of extension type, 3 flexion type. Left side was involved in 45 Patients 15 in right. Age was from 3 to 10 years with maximum patients in 5 to 8 years of age. As per Flynn Criteria 48 were excellent, 6 Good, 4 were fair and 2 remained poor. Results in our study were excellent in terms of carrying angle and functional outcome attainment of full range of motion. Four cases were graded fair which resulted because of poor compliance to follow up, these Patient reported lately in early days of follow up. During early course of follow-up 2 Patients presented with elbow stiffness and diminished range of motion due to myositis ossificans and both had restriction of elbow flexion and extension, 8 patients reported with

pin tract infection, 1 Patient with Cubitus varus with late presentation and had history of fall on operated limb managed with long arm slab support. None had neurovascular compromise. Union was achieved without any serious complication.

Discussion

Success of treatment of displaced supracondylar in children depends on achieving and maintaining good, acceptable reduction with clinical and radiographic union and absence of complications. Our study focused on type III fractures which are usually unstable, the displacement and rotation associated with these fractures leads to cubitus varus.

In our study extension type fractures were 57 with non-dominant limb predominantly involved, similar to study conducted by Cekanuska¹⁵. Which may be partly related to reflex response of falling human body to protect dominate side. Percutaneous pinning (PCP) has been used for these fractures utilizing either parallel or crossed wires (separate near and far cortex). Cross pinning is considered better choice of stabilization, give biomechanical advantage as well as parallel pins do not allow full extension at elbow during early followup¹³. We didn't encounter any loss of reduction during follow up, both clinical and published series have shown that these cross pins provide strong stability and prevent the displacement after fracture reduction. There is higher risk of nerve injury in close reduction and percutaneous pinning, with 0 to 5 % incidence of iatrogenic ulnar nerve injury cause by medial pin. In our study we had no case of nerve injury, which is quite excellent than other studies^{16, 17, 18}. We attribute this to the technique of proper posterior displacement of ulnar nerve after medial stab incision, before passing the medial pin.

We did not come across any feature suggestive of compartment syndrome. Ring D et al found two patients with compartment syndrome with closed reduction and cast immobilization¹⁹. Our results match with Williamson DM et al who managed the supracondylar fracture by traction, manipulation, reduction and percutaneous pinning (PCP)²⁰ and also with Harrington P et al, who observed 83% good to or excellent results²¹. The incidence of deep pin infections and osteomyelitis rate is quite very low but in our study 8 patients had superficial Pin tract infection which resolved with oral antibiotics^{22,23,24}. This infection is attributed to personal hygiene's as all patients with pin site infection has were from poor socioeconomic status with no care about pop which was not taken good care. Due to availability of C Arm and other facilities in our emergency operation theatre, our results are better than previous published studies from developing countries.

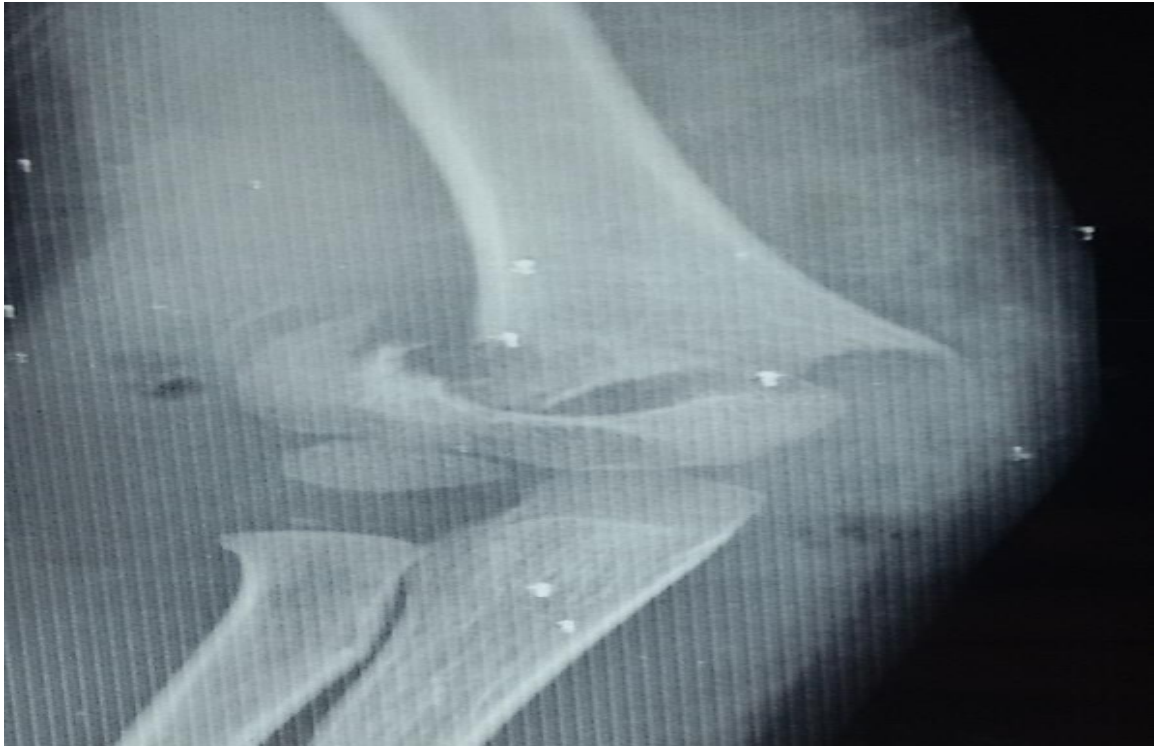


Fig.1



Fig.2

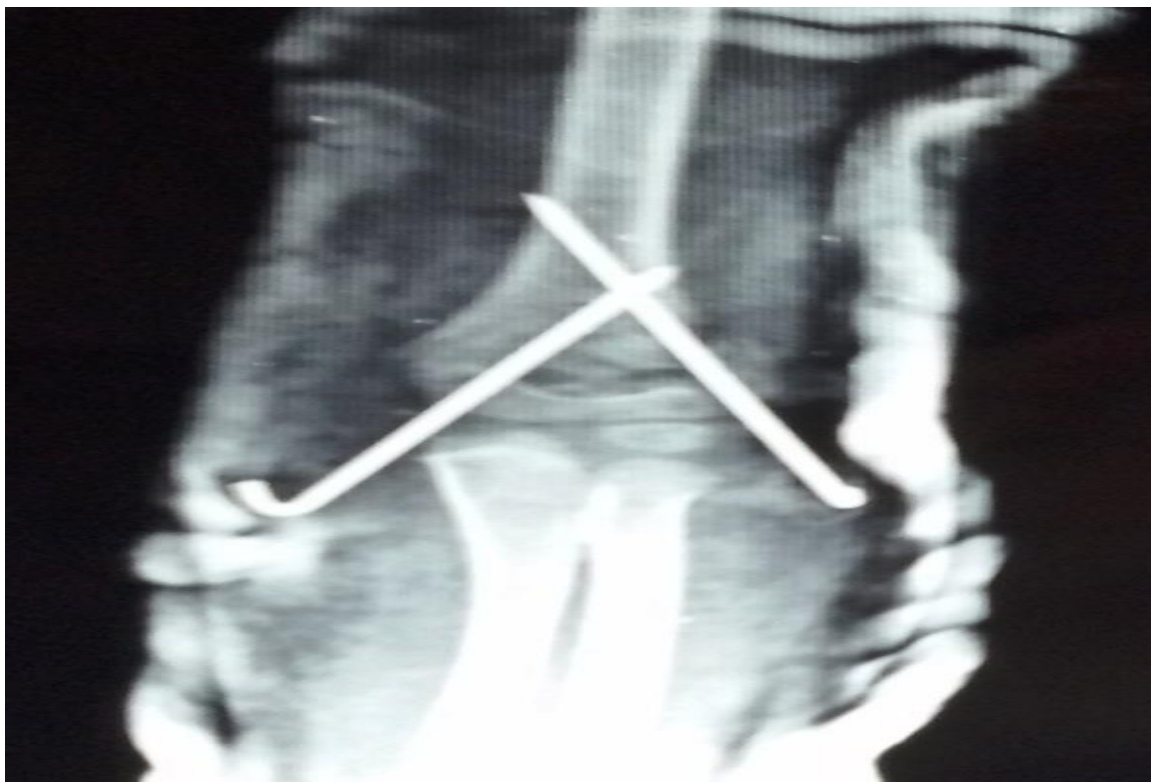


Fig.3



Fig.4

Fig. 1 to 4: Showing Preoperative Radiograph and Post-Operative Check Radiographs Demonstrating Adequate Reaction and Fixation.

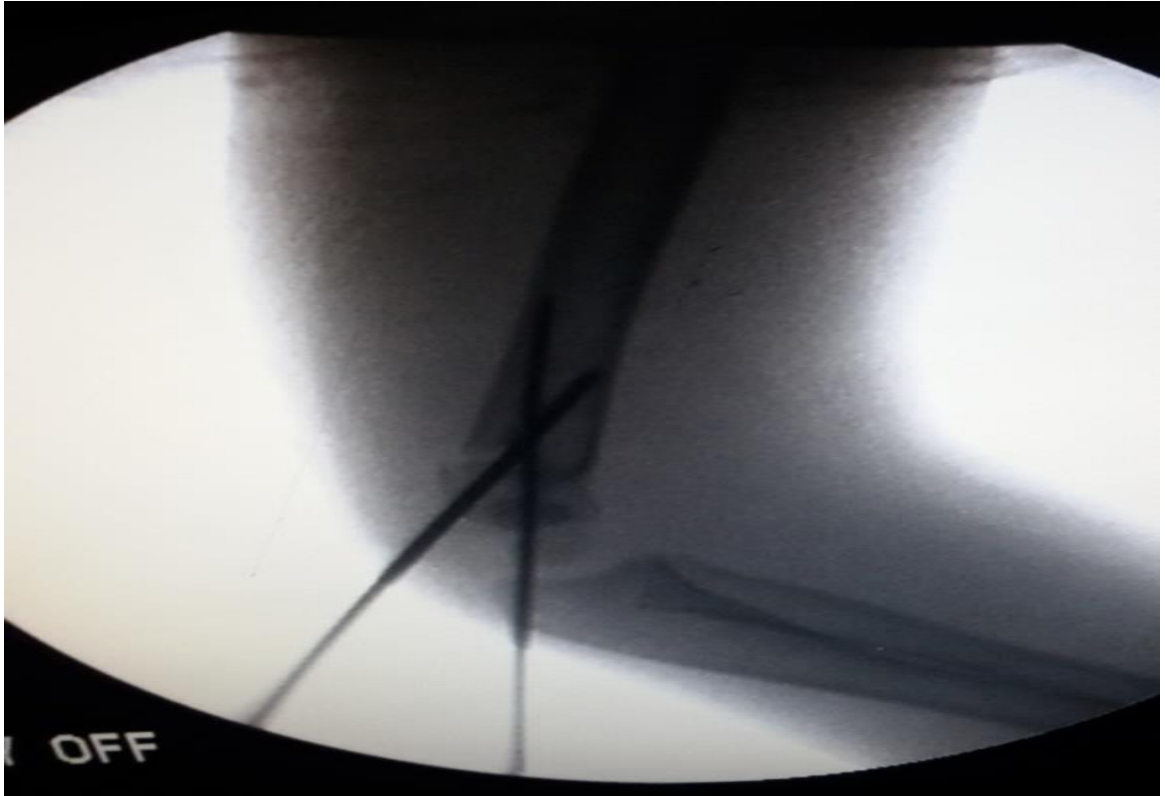


Fig.5: Showing Reduction and Fixation under C Arm

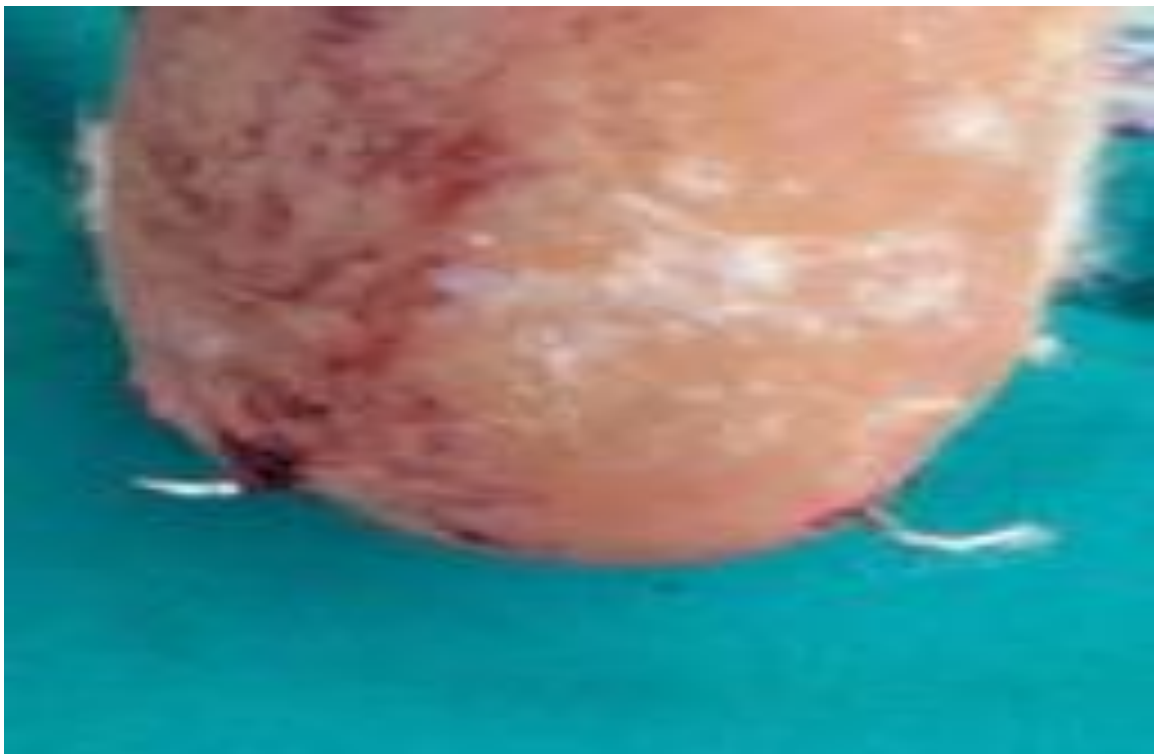


Fig.6: Showing Clinical Picture at Time of Fixation

Table A: Showing Flynn Criteria

Results	Cosmetic Factor-Loss of Carrying Angle (Degree)	Functional Factor- Loss of Motion (Degree)
Excellent	0 – 5	0 – 5
Good	6 – 10	6 – 10
Fair	11 – 15	11 – 15
Poor	>15	> 15

Conclusion

In conclusion, the results of the present study show that closed reduction and crossed pinning of displaced supracondylar fractures of humerus in children is a safe and effective method. Use of strict intraoperative criteria to obtain anatomic reduction and stable fixation minimizes the risk of development of cubitus varus deformity later. Mini-open technique for placement of medial pin reduces risk of iatrogenic ulnar nerve injury.

Conflict of Interest: None

Source of Support: Nil

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