ORIGINAL ARTICLE

PERCUTANEOUS K-WIRE FIXATION OF SUPRACONDYLAR FRACTURE IN CHILDREN

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ABSTRACT: BACKGROUND: Displaced supracondylar fractures of the humerus in children are common injuries treated by orthopedic surgeons. Various methods are used for treating these fractures. Closed reduction and K wire fixation has shown better results. **METHODS:** twenty five cases with Gartland type III supracondylar humeral fractures were treated with closed reduction and percutaneous lateral pin fixation with Kirschner wire and followed up for 6 months. **RESULTS:** Patients were assessed on the basis of Flynn's criteria. Results were excellent in 18 patients and good in 7 patients. There were no fair or poor results. **CONCLUSION:** It is concluded that closed reduction and lateral pin fixation is a safe and effective treatment modality for displaced supracondylar fractures with several advantages.
KEYWORDS: Displaced supracondylar fractures; Closed reduction; Crossed pin fixation.

INTRODUCTION: Most common fracture in children around the elbow is supracondylar fracture of humerus. Displaced supracondylar fractures have a high probability of neurovascular injuries and if not reduced and stabilized in optimal position may lead to serious residual deformity. Different treatment modalities have been reported ranging from skeletal traction,[1] closed reduction and plaster immobilization; closed reduction and percutaneous K wire fixation to open reduction and K wire fixation. The purpose of this study is to assess the ability of closed reduction and percutaneous lateral K wire fixation to obtain and maintain adequate reduction and thereby achieve satisfactory end results.

MATERIALS AND METHODS: Twenty five patients with type 3 supracondylar fracture humerus treated in Sree Gokulam medical college hospital between June 2013 to February 2014 were prospectively followed. Permission from institutional ethical committee was obtained. Demographic variables, mode of injury, injury-surgery interval, complications and need of secondary procedures were recorded. Fracture was classified according to Gartland classification system. Children between 7-13 years who had sustained type 3 supracondylar fracture humerus were included in the study.

Patients with pathological fractures, ipsilateral multiple fractures, late presentations, open fractures and patients who required open reduction were excluded from study. All patients were operated within 24 hours of sustaining the injury. The patients were evaluated as described by Flynn and their results compared with the contra lateral normal elbow.[2] Under general anaesthesia, using c-arm fluoroscopy closed reductions were done.[3] When satisfactory reduction had been achieved, then fixations were done by two or three K-wires of 1.6 or 2.0 mm size applied from lateral aspect.

Lateral pins were inserted through a stab wound over lateral epicondyle. A well-padded above-elbow posterior slab in 90 degree flexion was applied. The patients were discharged after 24-72 hours. The above-elbow plaster slabs were kept for around three weeks. K wires and plaster were removed in the outpatient (OPD) clinic when radiological union was found satisfactory.

Elbow Range of motion exercises were started after removing the POP slab. Patients were followed-up on the 7th day to inspect the wound; the second follow-up on the second week for wound inspection and to see the pin configuration. X-rays were taken to see the callus formation after 2-3 weeks; patients were followed up regularly to see the ROM and carrying angle of the elbow. At 6 months patients were assessed clinically and radiologically and results were evaluated on the basis of Flynn criteria.[2]

Table 1. Flynn's criteria

Results/Rating	Cosmetic factor Carrying angle loss (degrees)	Functional factor Movement loss (degrees)
Excellent	0 to 5	0 to 5
Good	5 to 10	5 to 10
Fair	10 to 15	10 to 15
Poor	>15	>15

RESULTS: Out of 25 children 14 were males and 11 were females. Children between 7 -13 years were included in study (mean age 9.8 years). 21 children (84%) sustained the injury following fall and 4 children (16%) following RTA. Average duration of injury surgery interval was 15.3 hours. Post-operatively, no patients sustained ulnar nerve injury. One patient got pin tract infection which were superficial and healed after removing pins and oral antibiotic administration. Union was seen in all patients at the 2-3 weeks post-operatively before removing the K-wires. The time required for clinico-radiological union ranged from 2 to 5 weeks with an average of 3.5 weeks. Results were analyzed at 6 months using Flynn's criteria and graded as excellent, good, fair and poor. Results were excellent in 18 children (72%) and good in 7 patients (28%).There were no fair or poor results. There were no complications like vascular injury, compartment syndrome, myositis ossifications, significant mal-union and non-union. None of the patients required a secondary procedures.

Fig. 1: Pre OP X-ray

Fig. 2: Post OP X-ray

Fig. 3: X-ray at 6 months

Flexion at 6 months

Extension at 6 months

DISCUSSION: Complications like myositis ossificans, conversion to open procedures, higher incidence of inadequate reduction, compartment syndrome etc. are common in children with supra condylar fracture humerus.[4-7] To reduce the frequency of such complications many authors have recommended emergent treatment of this fracture.[8,9] The average injury surgery interval in our study was 15.3 hours. Our study also supports the concept that early intervention of supracondylar fractures resulted in excellent clinical results and fewer complications.

Surgical fixation of supracondylar fracture resulted rarely in deep infections and osteomyelitis, we too did not encounter any. But pin tract infections rates of 2%-6.6% have been reported with percutaneous fixations.[10,11,12] In the present series one patient sustained pin tract infection which healed well with oral antibiotics and removal of wires.

Percutaneous pinning allowed immobilization of elbow in less than 90 degrees, which prevents venous outflow obstruction and significantly reducing the risk of compartment syndrome.[13] It also prevents tenting of Ulnar nerve[14,15] and also brachialis is allowed to heal in a more elongated state which hastens regaining of extension during mobilization.[16]

The most common complication of supracondylar fractures of the humerus is malunion leading to cubitus varus deformity.[17] The cause of varus deformity is coronal rotation or tilting of the distal fragment or a combination of both.[18,19] The most important factor correlating with the final varus deformity following closed reduction and percutaneous pinning is the difference in Baumann's angle between the operated and normal side.[17,12] In all our patients, Baumann's angle was restored to within 4 degree of the uninjured side. None of our patients developed malunion and cubitus varus deformity.

Many studies have shown that two crossed pins placed from the medial and lateral condyles provide the greatest resistance to rotational displacement of the fracture fragment.[20,21,22] But some recent studies proved that two or three lateral entry pins to be as stable as cross pinning.[23,24] Our study also supports these recent studies. None of our patients had significant loss of reduction during follow-up following lateral pin configuration. The concern with cross pinning is the risk of injury to ulnar nerve by the medial pin.[14,25,26] Hence by opting for lateral pin configuration we are completely avoiding the risk of ulnar nerve injury without compromising the stability of fixation.

From the present study it could be concluded that closed reduction and percutaneous lateral pin fixation is a safe and effective modality for the treatment of displaced supracondylar fractures. With the advantages of decreased duration of hospital stay, stable fixation and early mobilization it also reduces the incidence of mal union and cubitus varus deformity if the surgical technique is followed strictly.

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