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A Prospective Study of Closed Reduction with Lateral Pinning In Supracondylar Humerus Fracture in Children

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Abstract :*Supracondylar fractures of humerus is the most common pediatric elbow injury. Displaced supracondylar fracture of humerus is more demanding to treat as it needs needs anatomical reduction and internal fixation to prevent future complications. In our study , we reported the results of closed reduction and K wire fixation using lateral pinning in displaced type III Gartland supracondylar fractures of humerus in children. It included 30 patients , majority of them had fall while playing . Closed reduction under image intensifier and K wire fixation using lateral pinning is safe and effective method of treatment of displaced supracondylar humerusfracture..It gives more stable fixation, better anatomical reduction and minimal complications.*

Keywords :*Supracondylar humerus fracture, Kirschner wire (K wire), Closed reduction*

I. Introduction

Supracondylar fractures of the humerus is the most common type of elbow fracture in children , accounting for 3% of all pediatric fractures.(1) The occurance rate increases progressively in the first 5 years of life to peak , between 5-7 years of age (.2) It need accurate anatomical reduction and fixation . If it is not treated properly it may give rise to many complications such as volkmann's ischemic contracture , neurovascular injury , myositis ossificans , stiffness of elbow and malunion.(3) Various modalities of treatment have been prepared for the treatment of displaced supracondylar fracture of the humerus in children , such as closed reduction and plaster of paris slab application , skin traction overhead skeletal traction , open reduction and internal fixation and percutaneous pin fixation.(4) Closed reduction with cast immobilization and treatment with traction has traditionally been recommended for displaced supracondylar fractures, but difficulty in reduction , loss of reduction postoperatively or during follow up leads to malunion and elbow stiffnes.(5)

In displaced pediatric supracondylar fractures , closed reduction and not pinning is the most widely accepted treatment and has been shown to decrease risk associated with this fracture.(6,7) Studies has shown that the crossed medial and lateral pinning techniques offer increased stability for unstable fractures , in particular.(8,9) However , the utilization of a medial pin remains controversial due to the reported increase in incidence of iatrogenic ulnar nerve injury.(10,11) Babal et al(12) found that neuropathies associated with supracondylar humerus fixation , 92.3% of those associated with the placement of a medial pin were ulnar nerve palsies. With such varying result , it is difficult to assess the benefit to risk ratio of augmented pin construct versus iatrogenic ulnar nerve injury. The purpose of this study was to assess the clinical and functional outcome of closed reduction and percutaneous lateral pinning for Gartland type 3 supracondylar humerus fractures.

II. Material And Methods

30 closed /open extension type of supracondylar fractures (Gartland type III) were treated by closed reduction and percutaneous lateral K wire fixation between Nov 2013 to Nov 2015 at trauma centre of our institute. It was a prospective experimental study without control including children < 15 years , type III Gartland supracondylar fracture , closed or open . It excluded age > 15 years and patients medically unfit for surgery due to general medical condition. Radiograph of the elbow joint were taken in both antero posterior and lateral views. A trail closed reduction was done and POP slab was applied and patient taken to operation theatre.

The lateral pins were placed at the centre of lateral epicondyle obliquely across fracture site to engage the opposite cortex of the proximal fragment. The fracture were secured with 1.2 – 2 mm K wires depending upon the age of the patient at angle of 30^0 in coronal plane to engage in opposite cortex on both side. Fracture stability was assessed , the elbow extended and carrying angle was measured and compared to non affected side(Fig 1). The pins were bent and cut off outside the skin to allow removal in the outpatient department. Post operatively , the extremity was placed in well padded posterior splint with elbow flexed to 90^0 . Patients were

called for follow up after 3 week and POP slab was removed . Active range of motion exercises were encouraged and advised given to patients and their attendants regarding avoiding massages and passive stretching of elbow joint. The K wires were removed after 4-6 weeks with further follow up done at 3 months and 6 months . The patients were examined clinically and radiologically , assessed for range of motion and carrying angle. The final results were evaluated by Flynn's criterion[13] . The results were graded as excellent , good , fair and poor according to loss of range of motion and loss of carrying angle.

III. Results

In our study , 19 patients(63.3%) were between age group 3-6 years . Age group 7-9 years, had 5patients (16.6%) (Table 1).The average age of patients was 5 years .The most common cause of supracondylar humerus fracture was fall while playing , 27 patient(90%)followed by fall from vehicle, 3 patients(10%) (Table 2). Majority of the patients, 24(80%) underwent surgery on the 1st day of injury and 6 patients(20%) were operated within 3 days of injury . Post operative complications included superficial pin tract infection in 2 patients , migration of K wire in 1 patient and malunion- varus in 2 patients. 22 patients had loss of range of motion between 0- 5^0 and one patient had 15^0 loss of range of motion. 19 patients had carrying angle loss of 0- 5^0 , 3 patients had loss of carrying angle $>15^0$ and remaining patients had loss of carrying angle between 6-15^0. Functional results based on Flynn's grading[13] system showed that we had satisfactory result in 28 patients (93.3%) and 2 patients(6.6%) had unsatisfactory results(Table 3).

Table 1 Age-Wise Distribution Of Patients

Age In Years	No. Of Patients	Percentage
1-3	**3**	**10.0**
4-6	**19**	**63.3**
7-9	**5**	**16.6**
10-12	**2**	**6.6**
13-15	**1**	**3.3**

Table 2 Causes Of Supra Condylar Fracture Of Humerus

Cause	No.o f Patients	Percentage
Fall While Playing	27	90
Fall From Vehicle (2 Wheeler 3 Wheeler)	3	10

Table 3 : Functional Result Based On Flynn's Grading

Results	Ratings	No. Of Patients	Percentage
Satisfactory			
	Excellent	**19**	**63.3**
	Good	**7**	**23.3**
	Fair	**2**	**6.6**
Unsatisfactory	**Poor**	**2**	**6.6**

Fig 1 (A, B)Radiograph Showing Fixation Of Supracondylar Humerus Fracture With Lateral Pinning

IV. Discussion

In our study of 30 patients , 80% of the patients were between 3-9 years age group with an average age of 5 years. Majority of our patients,27 (90%) sustained fractures due to fall while playing ,remaining had fall from vehicle(2 wheeler , 3 wheeler) . In Edward et al[13] series of 78 patients with supracondylar , 69 patients had sustained injury due to fall while playing .In our study of 30 patients, 24(80%) patients were operated within 24 hours of injury . In the series of Fransworth et al[14] , 70% patients sustained supracondylar fracture due to fall of which 25 (83.3%) patients were operated on the 1stday of injury . In Ramsey et al[15]study of 15 cases, all cases were operated within 24 hours of injury . In Weiland et al[3]study of 58 cases, 51 patients were

operated within 24 hours of injury. We had 2 cases of superficial pin tract infection out of which 1 case got subsided with antibiotics in 2 weeks and 1 case was controlled after removal of K wire but there was no deep or bone infection. In Srivastava et al[16] study of 42 patients , about 14% of cases had superficial skin tract infection . In Ramsey et al[15] study of 15 cases , one patient had pin tract infection that healed after 2 weeks of treatment . In our study we had 2 cases of cubitus varus deformity but patients had good range of motion .In our study , 22 patients had loss of range of motion of $0\text{-}5^0$, 5 patients had $6^0\text{-}10^0$, 2 patients had $11^0\text{-}15^0$ and one patient had $>15^0$ loss of range of motion. In Weiland et al[3] study of 52 patients , 5 patients suffered a moderate loss of range of motion ,one patient had extention loss of 10^0 , three patient had flexion losss of $<10^0$ and one patient had both flexion – extension loss of $>10^0$. In our study , at final follow up $0\text{-}5^0$ loss of carrying angle was seen in 19 patients and 3 patients had $>15^0$ loss of carrying angle. In Ramsey et al[15] out of 15 patients , 12 were considered essentially normal with carrying angle loss of $< 3^0\text{-}4^0$ but three patients had $5^0\text{-}15^0$ of varus deformity without significant motion at elbow. In Weiland[3] et al study of 52 patients , 5 patients had varus angulation of $<10^0$, 6 had $10^0\text{-}20^0$ and 2 had varus deformity of $>20^0$ .In our study , all patients had radiological union between 4-5 weeks of follow up.

The primary advantage of using only lateral pinning to correct supracondylar humerus fracture is to decrease the risk of iatrogenic ulnar nerve injury . Iatrogenic nerve injury often occurs with the placement of medial pin and can occur after a correctly placed medial pin . Brown et al[17]reported that even with a medial pin that is correctly placed, there is a risk of damaging the ulnar nerve. Bronwyn et al[18] found that there is a iatrogenic ulnar nerve injury for every 28 patients treated with cross pinning as opposed to lateral pinning. Zamzam et al[19]found that type III fractures that were fixed with lateral only pinning with 2 pins were predisposed to postoperative instability , late complications and need for medial pin. However , with regard to torsional instability , Larson et al[20] found that there was no statistically significant difference between lateral pins versus cross pinning techniques in synthetic humeri.

In our study , we maintained adequate acceptable alignment without increasing the need for reoperation. Our results were similar to Lee et al [21] who performed lateral pinning for all fractures over a four year period with excellent outcomes. Kocher et al[22] also found excellent results with lateral pinning in completely displaced type III supracondylar fractures of humerus in a randomized trial.

V. Conclusion

Closed reduction and percutaneous lateral pinning with K wire give stable fixation, with minimal soft tissue damage and negligible complication. It is safe and effective treatment for displaced supracondylar fracture of humerus in children . Our study has few limitations like small sample size and absence of long term follow up.

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