

Original Research Article

Percutaneous transolecranon pinning and lateral pinning Vs lateral pinning in displaced supracondylar fractures of humerus in children: an observative study

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ABSTRACT

Background: Supracondylar fracture (humerus) is type of extra-articular fracture occurring in the distal metaphyseal site of humerus. It is almost exclusively a fracture of the immature skeleton, seen in children and young teenagers. Fractures around the elbow are a great challenge to orthopaedic surgeons. Clinical diagnosis may be difficult due to noncooperative patient and massive swelling around the elbow. Displaced type of supracondylar fractures poses problem not only in reduction but also in maintenance of reduced fracture and rapid inclusion of nerves and vessels.

Methods: The present study was conducted on 30 cases of displaced supracondylar fracture humerus in children, aged 2-14 years, who were treated by CRPP with either lateral entry of k-wires or a lateral wire and a vertical wire through olecranon (transolecranon).

Results: Both the Groups achieved 90% satisfactory results, but 10% unsatisfactory results recorded in Group A only rather than in Group B.

Conclusions: Although the transolecranon wire has the disadvantage of limiting the flexion and extension of the elbow, this does not influence the final-outcome much as the elbow is fixed in a POP splint for minimum 3 weeks-in all patients in both groups.

Keywords: Lateral pinning, Supracondylar fracture, Transolecranon pinning

INTRODUCTION

Supracondylar fracture (humerus) is type of extra-articular fracture occurring in the distal metaphyseal site of humerus. It is almost exclusively a fracture of the immature skeleton, seen in children and young teenagers.¹ Fractures around the elbow are a great challenge to orthopaedic surgeons.

Clinical diagnosis may be difficult due to noncooperative patient and massive swelling around the

elbow. Displaced type of supracondylar fractures poses problem not only in reduction but also in maintenance of reduced fracture and Rapid inclusion of nerves and vessels.^{2,3}

In children fracture in supracondylar region of humerus is the second most occurring fracture of limbs accounting 16.64% of total limb fractures in children with the distal radial fractures being the commonest (19.97% of all limb fractures in children).⁴ It comprises 60-75% of all elbow fractures in children.⁵⁻⁷ The rate of incidence of

this fracture increases steadily in the 1-5 years of age, attains pinnacle in age group of 5-8 years of age and decreases thereafter.^{8,9} Incidence of sex predominance is variable in different studies, however, most studies show male predominance.^{5,10} The fracture has a left sided predominance due to the fact when a child falls from a height, there is an attempt to hold on to something with the dominant arm and thus lands on ground with the non dominant arm.^{5,7}

According to direction of the distal fragment, in children humeral supracondylar fractures is divided into two types i.e. extension type 97.8% and flexion type 2.2%.¹

The carrying angle is measured clinically by goniometer as the angle is created by the medial border of forearm which is fully supinated and the medial border of humerus with extended elbow. Alternatively, it is measured by measuring the angle subtended by lines drawn from the midpoint of the wrist to the antecubital fossa, and the midpoint of the humeral head to the antecubital space with elbow fully extended and forearm supinated.¹¹

Radiographically it is measured by the angle between lines that runs parallel to long axis of both (humerus and ulna) on an AP view in an extended supinated forearm.¹²

It is around 10-15 degrees in males and 15-20 degrees in females and varies with the age, being less in children and more in adults.¹²⁻¹⁴ It is important to remember that Carrying angle exhibits considerable variation. Thus, comparison should be made with the contralateral side rather than with any normal standard.

METHODS

The present study was conducted on 30 cases of displaced supracondylar fracture humerus in children, aged 2 -14 years, who were treated by CRPP with either lateral entry of k-wires or a lateral wire and a vertical wire through olecranon (transolecranon).

The patients included in study were divided into two groups A and B, 15 in each group. Patient treated by lateral pin and transolecranon pin were kept in Group A and those treated with 2-3 lateral pins in Group B. Patients were subjected to detailed history, relevant investigations and thorough clinical examinations and included in study as per inclusion and exclusion criteria.

Post-operatively, operated limb was elevated, and patient was encouraged to move fingers for 1st 48hours the limb was observed for peripheral swelling, capillary return and any numbness in finger tips constantly. At 2nd post-operative day, check X-ray in AP and lateral views (Figure 1, 2) were done. At 3rd post-operative day discharge was given to most of the patients with oral antibiotics.

At 3 weeks post-operatively, X-rays were done for evidence of healing and K-wires were removed after clinical union was assessed, in which POP splint was applied for one more week, during this period the patient was encouraged to do intermittent active elbow flexion and extension exercises. If union was not appreciated clinically, wires were kept in place for one more week or till clinical union and POP splint removed 1 week after removal of k wires.

At 6 weeks, radiological examination was again done to assess union and some patients were called at 8 weeks for radiological examination whose radiological union was not present at 6 weeks. Patients were advised all the exercises of the elbow and called for follow up in O.P.D. at 12 weeks when results were assessed on basis of Flynn's criteria. i.e. cosmetic factor (carrying angle loss) and functional factor (loss of ROM).



Figure 1: Postop AP radiograph.



Figure 2: Postop lateral radiograph.

The final results of our study of fixing the displaced supracondylar humeral fractures in children by CRPP

were assessed in accordance with the Flynn's criteria (Table 1).

Table 1: Flynn's criteria.

Grading	Cosmetic factor (Carrying angle loss in degrees)		Functional factor (Loss of ROM)
Satisfactory	Excellent	0-5	0-5
	Good	6-10	6-10
	Fair	11-15	11-15
Unsatisfactory	Poor	>15	>15

RESULTS

In our study the mean age is 7.2 years ranging from 2 to 14 years (Figure 3), Out of thirty patients, fourteen patients (46.7%) were male and sixteen (53.3%) were female (Figure 4), sixteen (53.3%) patients had injury of left humerus and rest fourteen (46.7%) had injury of right side, 21 (70%) patients had PM displacement of distal fragment and 9 (30%) patients had PL displacement of the distal fragment. In our study among 30 patients we had one (3.3%) Grade I open fracture from Group B, rest 29 were closed fractures from Group A and Group B (Table 2).

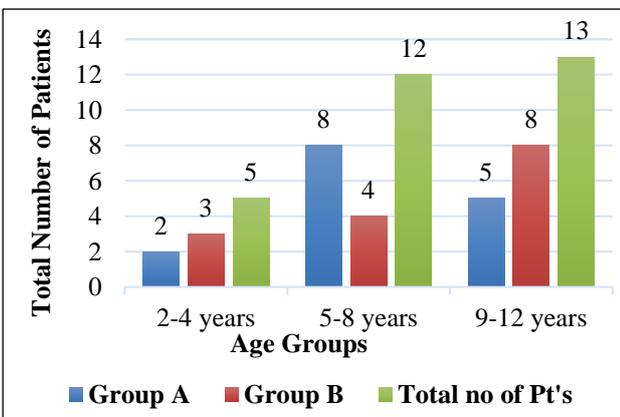


Figure 3: Age incidence.

Table 2: Fracture type (open and closed).

Fracture types	TOLP/LP group A	LP group B	No. of patients	(%)
Open fracture	0	1	1	3.3
Closed fracture	15	14	29	96.7
Total	15	15	30	100

In 15 patients, lateral entry wires were used as a method of fixation (Table 3), out of which 12 (40%) patients fractures were fixed with divergent K-wires and 3 (10%) with parallel wires (Group B) In rest 15 (50%) patients, one lateral wire and another trans-olecranon wire were used (Group A) (Figure 5).

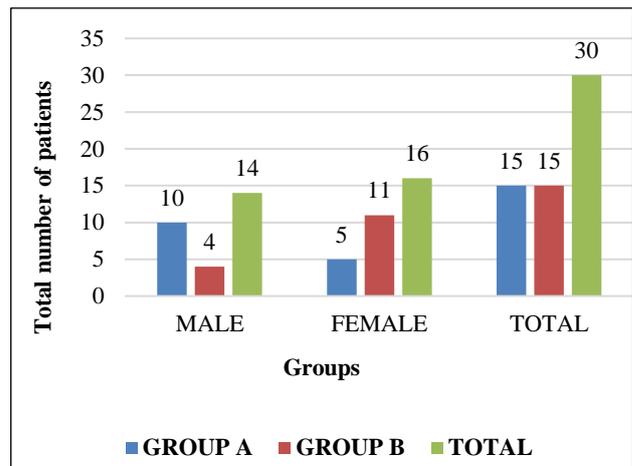


Figure 4: Sex incidence.

Table 3: Method of fixation.

Method of fixation	No. of Patients	Percentage (%)	
1 Lateral and 1 trans-olecranon (Group A)	15	50	
2-3 Lateral wires (Group B)	Parallel	3	10
	Divergent	12	40
Total	30	100	

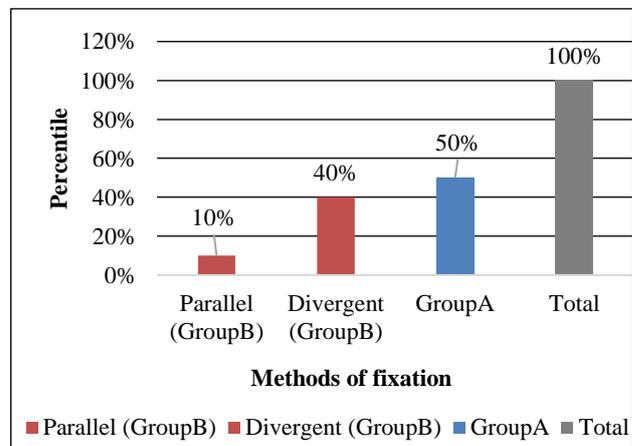


Figure 5: Percentile in method of fixation.

In Group A, 6.7% of patients had excellent results and 53.3% had good and 20% had fair results overall 80% which were satisfactory and 20% patients had poor results which were unsatisfactory. In Group B, 20% patients had excellent results 66.7% had good results and 13.3% had fair results overall 100% patients had

satisfactory results and no unsatisfactory results were recorded in this group.

Both the groups achieved 90% satisfactory results, but 10% unsatisfactory results recorded in Group A only rather than in Group B (Table 4) as following:

Table 4: Overall results.

Grading		TOLP/LP Group A	LP Group B	No of Pt's	Percentage
Satisfactory	Excellent	1	3	4	13.3%
	Good	8	10	18	60%
	Fair	3	2	5	16.7%
Unsatisfactory	Poor	3	0	3	10%
Total		15	15	30	100%

DISCUSSION

Supracondylar fracture of humerus is the most common fracture of elbow in children, and one of the most difficult fractures to treat. While some authors have relied on remodelling capability of distal humerus to compensate for inadequate reduction, most authors agree that accurate reduction with minimum soft tissue trauma is required to achieve the best possible functional results.

Many different methods have been suggested for management of supracondylar humerus fractures. A cast requires the elbow to be kept in acute flexion to maintain reduction. However, this increases the risk of ischemia and its irrevocable sequelae. Treatment by traction may give good cosmetic results but at the expense of function, requires prolonged stay in hospital and constant surveillance by frequent radiographs. Simple closed manipulation has been considered to be adequate in minimally displaced fractures, but with varying displacement, the results may be both cosmetically and functionally unacceptable. Open reduction of supracondylar humerus fractures has been believed to cause severe stiffness, infection and myositis ossificans, mainly after lateral or posterior approach. Closed percutaneous K-wiring of these fractures has many advocates, but it is difficult in severe swelling and there occurs a probability of pin track infection and injury to nerve, mainly to the ulnar nerve with a placement of medial pin ulnar nerve gets injured.

Age incidence in the study by Wael et al, was 6.1 years while that in Ippolito's study was 7.3 years.¹⁵ However, the age incidence in our study is 7.2 years which is well comparable with Study by Ippolito et al. This further proves the increased incidence of this fracture in young children.

In the study by Aronson and Prager, left side was involved in 65% of cases whereas Nacht et al observed a

55% involvement of the left side.¹⁶ In our study, incidence of left sided involvement (53.3%) was slightly higher as compared to other series but still reinforces the observation of higher incidence of involvement of left side as found in other series.

Pirone at al, found the incidence of PM displacement of the distal fragment to be 81% whereas Aronson-Prager and Wilkins et al, observed 75% incidence of PM displacement.¹⁷ In this study also, PM displacement was noted in 70% cases which is comparable with the observation in other series.

In their study, Devkota et al, noted loss of reduction post-operatively in 1.96% cases; Lee et al, observed the same to be 7%, whereas Balakumar et al in their study observed post-operative loss of reduction in 18.2% cases.^{18,19} In this study, an incidence of loss of reduction of the fracture post-operatively was 10%.

Mean loss of movements at final follow up in the study by Maity et al, was 3.86 degrees whereas Foad A et al, observed a mean loss of movements of 18.3 degrees.^{20,21} In our study, mean loss of movements of the injured limb in comparison to the uninjured limb at 12 weeks post-operatively was noted to be 10 degrees.

All the 30 cases were presented with Gartland grade 3 fractures in which we were able to obtain, excellent results in 13.3% of total 30 Pt's out of which Group A having 6.7% and Group B having 20%, good in 60% of total 30 Pt's out of which Group A having 53.3% and Group B having 66.7%, fair in 16.7% of total 30 Pt's out of which Group A having 20% and Group B having 13.3% and poor results in 10% total 30 Pt's out of which was found in Group A only. Hence can be concluded that the surgeon should be very careful in achieving anatomical reduction before insertion of K wires and with proper placement of wires for better

results of grade III displaced humeral supracondylar fractures in children.

CONCLUSION

The data was assessed, analyzed, evaluated and the following conclusions were made-Supracondylar fractures of humerus are common in boys and girls. Although the transolecranon wire has the disadvantage of limiting the flexion and extension of the elbow, this does not influence the final outcome much as the elbow is fixed in a POP splint for minimum 3 weeks-in all patients in both groups. Since we have used smooth pin for the transolecranon trans-articular fixation of the fracture, we have not seen any feature of articular damage-in any case on final follow up X-rays. With both the techniques, consistently satisfactory results can be obtained both cosmetically and functionally. Early mobilisation of the elbow should be encouraged after K wire removal at 4 to 6 weeks to prevent stiffness. The pin placement can be individualised according the fracture and the stability of the fracture, as in final follow up no significant differences in seen in both the groups.

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