

A Comparative Study of Management of Supracondylar Fracture of Humerus in Children by Two Techniques: An Institutional Based Prospective Study

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Abstract

Background: Supracondylar fractures of the humerus are the most frequent fractures affecting the paediatric elbow and their correct management is important because they can cause catastrophic complications. Hence; the present study was undertaken for comparing the efficacy of two different techniques of management of Supracondylar Fracture of Humerus in Children. **Subjects and Methods:** A total of 30 children with displaced supracondylar fractures who presented to the emergency department were recruited in this study. Group 1 consisted of patients who were treated with medial lateral pin fixation, and group 2 consisted of patients who were treated with 2 lateral parallel pin fixations. Treatment was carried out in all the patients under septic conditions under the hands of skilled and experienced orthopaedic surgeons. Outcome was assessed in all the patients and was compared. All the results were summarized in Microsoft excel sheet and were analysed by SPSS software. **Results:** Mean elbow extension loss among subjects of group 1 was 7.08 degree while among the subjects of group 2 was 7.09 degree. Mean elbow flexion loss among subjects of group 1 was 9.57 degree while among the subjects of group 2 was 10.28 degree. Non-significant results were obtained while comparing the mean elbow extension and elbow flexion loss among subjects of both the study groups. **Conclusion:** Both the techniques can be used with equal efficacy for treating supracondylar fractures of humerus in children.

Keywords: Humerus, Supracondylar, Techniques.

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Introduction

Supracondylar fractures of the humerus are the most frequent fractures affecting the paediatric elbow and their correct management is important because they can cause catastrophic complications. Until recently, many doctors believed that conservative treatment is the optimal solution for the treatment of fractures of the distal humerus.^[1-3] In 1937 Eastwood describes so called “Bag of bones” technique, which involves the manipulation of the compressive distal fragment, elbow immobilization in flexion of 120° and a neck cuff. Evans warns that, despite the relatively satisfactory mobility in the joints, often the final result of conservative treatment of fractures of the distal humerus in children “weak and unstable elbow.”^[4] Method of medial-lateral pin fixation provides good stability of fixation but carries the risk of ulnar nerve injury. 2-lateral pin fixation avoids pin penetration over the medial aspect of the elbow but the stability that this technique provides might not be adequate to maintain reduction.^[5] Hence; the present study was undertaken for comparing the

efficacy of two different techniques of management of Supracondylar Fracture of Humerus in Children.

Subjects and Methods

The present study was planned in the Department of Orthopedics, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi, India. It included comparison of outcomes of treatment with medial-lateral pin fixation and 2 lateral-parallel pin fixation of management of Supracondylar Fracture of Humerus in Children. Ethical approval was obtained from institutional ethical committee and written consent was obtained from parents/guardians of all the patients after explaining in detail the entire research protocol. A total of 30 children with displaced supracondylar fractures who presented to the emergency department were recruited in this study.

The inclusion criteria were as follows:

- Patients less than 12 years of age
- Patients that presented within 3 days of injury;

- Patients with negative history of previous fracture in either elbow
- Patients with absence of any concomitant fracture or other injury in the same limb that will alter the treatment protocol of the supracondylar fractures.

All the patients were randomly and broadly divided into study group as follows:

Group 1 consisted of patients who were treated with medial lateral pin fixation, and group 2 consisted of patients who were treated with 2 lateral parallel pin fixations. Treatment was carried out in all the patients under septic conditions under the hands of skilled and experienced orthopaedic surgeons. Outcome was assessed in all the patients and was compared. All the results were summarized in Microsoft excel sheet and were analysed by SPSS software. Chi-square test and independent t test were used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

Results

Table 1: Demographic and clinical data

Parameter		Group 1	Group 2
Mean age (years)		11.5	10.9
Gender	Males	9	8
	Females	6	7
Injury to admission time (hours)		6.5	7.2

Table 2: Comparison of elbow extension loss and elbow flexion loss

Parameter	Group 1	Group 2	p- value
Elbow extension loss (degree)	7.08	7.09	0.26
Elbow flexion loss (degree)	9.57	10.28	0.81

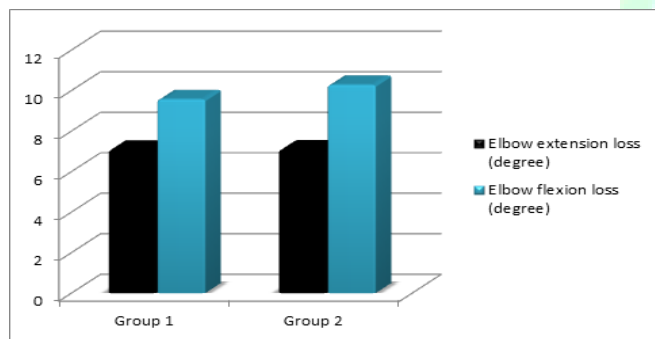


Figure 1: Comparison of elbow extension loss and elbow flexion loss

In the present study, a total of 30 children were enrolled who were admitted with supracondylar fractures. Mean age of the patients of the group 1 and group 2 was 11.5 years and 10.9 years respectively. There were 9 males and 8 males among subjects group 1 and group 2 respectively. Mean injury to admission time among subjects of group 1 and group 2 was 6.5 hours and 7.2 hours respectively.

In the present study, mean elbow extension loss among subjects of group 1 was 7.08 degree while among the subjects of group 2 was 7.09 degree. Mean elbow flexion

loss among subjects of group 1 was 9.57 degree while among the subjects of group 2 was 10.28 degree. Non-significant results were obtained while comparing the mean elbow extension and elbow flexion loss among subjects of both the study groups.

Discussion

Supracondylar fractures of the humerus account for 55% to 80% of total elbow fractures in children and up to two-thirds of paediatric elbow injuries requiring hospitalization. Supracondylar fractures usually occur as result of a fall from height or from sports or leisure. Their incidence has been estimated at 177.3 per 100 000.^[6,7]

Although they can occur throughout childhood, the median age is approximately six years, with higher incidence between five and eight years. There is a higher incidence of supracondylar fractures in boys, affecting the non-dominant arm 1.5 times more frequently.^[8,9] Hence; the present study was undertaken for comparing the efficacy of two different techniques of management of Supracondylar Fracture of Humerus in Children.

In the present study, a total of 30 children were enrolled who were admitted with supracondylar fractures. Mean age of the patients of the group 1 and group 2 was 11.5 years and 10.9 years respectively. There were 9 males and 8 males among subjects group 1 and group 2 respectively. Mean injury to admission time among subjects of group 1 and group 2 was 6.5 hours and 7.2 hours respectively. Maity A et al compared the efficacy of medial and lateral entry pinning with lateral entry pinning for percutaneous fixation of displaced (Gartland type II and type III) extension type supracondylar fractures of the humerus in children. 160 patients who satisfy the inclusion and exclusion criterias were enrolled in the study, with 80 patients in each group. All the percutaneous pinning was done according to a uniform standardized technique. The patients were re-evaluated as outpatients at three weeks, six weeks and three months after the surgery. There were no significant differences between the two groups with regard to base-line characteristics, withdrawals and complication rate. At three months follow-up visit, patients were evaluated by recording the various outcome measures. There were no significant differences between the two groups with regard to the various outcome measures such as carrying angle, passive range of elbow motion, Flynn grading, Baumann angle, change in the Baumann angle and loss of reduction grading. If a uniform standardized operative technique is followed in each method, then the result of both the percutaneous fixation methods will be same in terms of safety and efficacy.^[10]

In the present study, mean elbow extension loss among subjects of group 1 was 7.08 degree while among the subjects of group 2 was 7.09 degree. Mean elbow flexion loss among subjects of group 1 was 9.57 degree while among the subjects of group 2 was 10.28 degree. Non-significant results were obtained while comparing the mean elbow extension and elbow flexion loss among subjects of

both the study groups. Skaggs DL et al assessed outcome of operative treatment of supracondylar fractures of the humerus in children. Of 141 children who had a Gartland type-2 fracture (a partially intact posterior cortex), seventy-four were treated with lateral pins only and sixty-seven were treated with crossed pins. Of 204 children who had a Gartland type-3 (unstable) fracture, fifty-one were treated with lateral pins only and 153 were treated with crossed pins. The use of a medial pin was associated with ulnar nerve injury in 4% (six) of 149 patients in whom the pin was applied without hyperflexion of the elbow and in 15% (eleven) of seventy-one in whom the medial pin was applied with the elbow hyperflexed. Two years after the pinning, one of the seventeen children with ulnar nerve injury had persistent motor weakness and a sensory deficit. Fixation with only lateral pins is safe and effective for both Gartland type-2 and Gartland type-3 (unstable) supracondylar fractures of the humerus in children.^[11] Foad A et al compared the stability and risk of nerve injury between fractures treated by medial-lateral pin fixation and those treated by 2-lateral pin fixation. Patients were randomised to treatment either with medial-lateral pin fixation (n=34) or with 2-lateral pin fixation (n=32). The extension and flexion loss was 7.14 degrees and 8.68 degrees respectively in medial-lateral pin fixation, and 7.11 degrees and 11.26 degrees respectively in 2-lateral pin fixation. The Baumann angle difference was 5.96 degrees in medial-lateral pin fixation, and 5.30 degrees in 2-lateral pin fixation. The difference in the medial epicondylar epiphyseal angle was 6.07 degrees in medial-lateral pin fixation and 6.92 degrees in 2-lateral pin fixation. Statistical analyses show that these differences are not significant. Both methods of fixation were comparable in terms of stability, duration of bone healing, and risks of injury to the nerve.^[12]

Conclusion

From the above results, the authors conclude that both the

techniques can be used with equal efficacy for treating supracondylar fractures of humerus in children.

References

1. Davis R.T., Gorczyca J.T., Pugh K. Supracondylar humerus fractures in children. Comparison of operative treatment methods. *Clin Orthop Relat Res.* 2000;(376):49–55.
2. Wilkins K.E. Fractures and dislocations of the elbow region. In: Rockwood C.A., King R.E., Wilkins K.E., editors. *Fractures in children.* 3rd ed. JB Lippincott; New York: 1991. pp. 526–617.
3. Kumar R, Trikha V, Malhotra R. A study of vascular injuries in pediatric supracondylar humeral fractures. *J Orthop Surg (Hong Kong)* 2001 Dec;9(2):37–40.
4. Gordon JE, Patton CM, Luhmann SJ, Bassett GS, Schoenecker PL. Fracture stability after pinning of displaced supracondylar distal humerus fractures in children. *J Pediatr Orthop.* 2001 May-Jun;21(3):313–318.
5. Cheng J.C., Lam T.P., Maffulli N. Epidemiological features of supracondylar fractures of the humerus in Chinese children. *J Pediatr Orthop B.* 2001;10(1):63–67.
6. Gartland J.J. Management of supracondylar fractures of the humerus in children. *Surg Gynecol Obstet.* 1959;109(2):145–154.
7. Scola E, Jezussek D, Kerling HP, Yedibela S. Dislocated supracondylar humerus fracture in the child. Surgical technique and outcome with dorsal approach. *Unfallchirurg.* 2002 Feb;105(2):95–98.
8. Kallio PE, Foster BK, Paterson DC. Difficult supracondylar elbow fractures in children: analysis of percutaneous pinning technique. *J Pediatr Orthop.* 1992;12:11–15.
9. Davis RT, Gorczyca JT, Pugh K. Supracondylar humerus fractures in children. Comparison of operative treatment methods. *Clin Orthop Relat Res.* 2000;376:49–55.
10. Maity A, Saha D, Roy DS. A prospective randomised, controlled clinical trial comparing medial and lateral entry pinning with lateral entry pinning for percutaneous fixation of displaced extension type supracondylar fractures of the humerus in children. *J Orthop Surg Res.* 2012; 7: 6.
11. Skaggs DL1, Hale JM, Bassett J, Kaminsky C, Kay RM, Tolo VT. Operative treatment of supracondylar fractures of the humerus in children. The consequences of pin placement. *J Bone Joint Surg Am.* 2001 May;83(5):735–40.
12. Foad A1, Penafort R, Saw A, Sengupta S. Comparison of two methods of percutaneous pin fixation in displaced supracondylar fractures of the humerus in children. *J Orthop Surg (Hong Kong).* 2004 Jun;12(1):76–82.

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