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Original research article

Observational prospective study of fresh supracondylar fractures of humerus in children aged less than 14 years, which were treated by closed reduction and stabilized by percutaneous Kirschner's wires

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Abstract

Introduction: Supracondylar fractures of humerus is a common injury in children. Accounting to 60% of the fractures around the elbow. The management of displaced supracondylar fracture of the humerus is one of the most challenging, since it requires accurate reduction and internal fixation to prevent complications. Conservative treatment results in malunion. Open reduction and internal fixation is more invasive and recovery is prolonged. Closed reduction and percutaneous pinning is preferred method of treatment for displaced supracondylar fracture of humerus in children. The objectives of this study is to report the results of closed reduction and internal fixation with percutaneous k wires in the displaced Gartland type 2 and type 3, supracondylar fracture humerus in children.

Materials and Methods: A prospective clinical study conducted at the Department of Orthopaedic Surgery, Govt medical college and hospital, Chandigarh from June 2020 to December 2021. This study consists of 30 cases of displaced supracondylar fracture humerus treated by closed reduction and internal fixation with k wires. The cases were selected according to inclusion and exclusion criteria. The final results were evaluated according to Flynn *et al*., criteria.

Results: In our study based on Flynn *et al*., criteria, the following results were made. Of the 30 cases, 21 patients obtained excellent results, 5 patients had good results, 3 patients had fair results, that is 29 patients had satisfactory results and one patient had poor result, that is unsatisfactory result. The results were comparable to other studies.

Conclusion: It can be concluded from the present study that closed reduction and internal fixation with percutaneous k wires, for displaced supracondylar fracture humerus in children gives good anatomical reduction, stable fixation and good functional outcome with minimum complication.

Keywords: Closed reduction, internal fixation, percutaneous, k wire, displaced supracondylar fracture humerus in children

Introduction

Supracondylar fracture of humerus are the most common pediatric elbow fractures, accounting 60% of the fractures around the elbow in children [1]. The rate of occurrence increases steadily in the first five years of life to peak at 5-7 years of age [2]. The high incidence of residual deformity and the potential for neurovascular complications make supracondylar humerus fractures a serious injury [3].

The management of displaced supracondylar fracture of the humerus is one of the most difficult of the many fractures seen in children [4]. Pitfalls in the management occur frequently and continue to trouble the doctor caring for these patients, especially with respect to displaced supracondylar fractures [5].

If the fracture is not treated properly it may give rise to many complications like volkmann's ischemic contracture, neurovascular injury, skin slough, myositis ossificans, elbow stiffness and malunion.

There is no controversy about management of the nondisplaced fractures. But many methods have been proposed for the treatment of displaced supracondylar fractures 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 closed reduction and percutaneous pin fixation [6].

The displaced supracondylar fractures of humerus are difficult to be reduced and equally difficult to maintain the reduction. cubitus varus deformity is the most common problem seen after malunion of supracondylar humeral fractures. It causes a cosmetic deformity and barely affecting the range of motion. Closed reduction with plaster of paris slab immobilization has traditionally been recommended for

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displaced supracondylar fractures, but loss of reduction and necessity of repeated manipulation is likely to go for malunion producing varus or valgus deformity of elbow and elbow stiffness [7].
Traction (skin or skeletal), which has also been used for many years, has been shown to be safe and reliable, but it has the drawback of requiring a long stay in the hospital [6].
Open reduction and internal fixation have generally been reserved for specific indications mainly for an open fracture, a fracture requiring vascular exploration, or an irreducible fracture [6]. Due to high chances of elbow stiffness.
Recent studies have shown good functional results with closed reduction and percutaneous fixation using 'K' wires and is the most commonly accepted treatment of displaced supracondylar fractures of the humerus in children.

Methodology
This is an observational prospective study, consisting of 30 cases of fresh supracondylar fractures of humerus in children aged less than 14 years, which were treated by closed reduction and stabilized by percutaneous Kirschner's wires. This study was conducted at Government medical college and hospital, Chandigarh, between June 2020 to dec 2021.

Inclusion Criteria
1. Both sexes.
2. Age less than 14 years.
3. Children with unstable displaced Gartland type II and type III fractures.

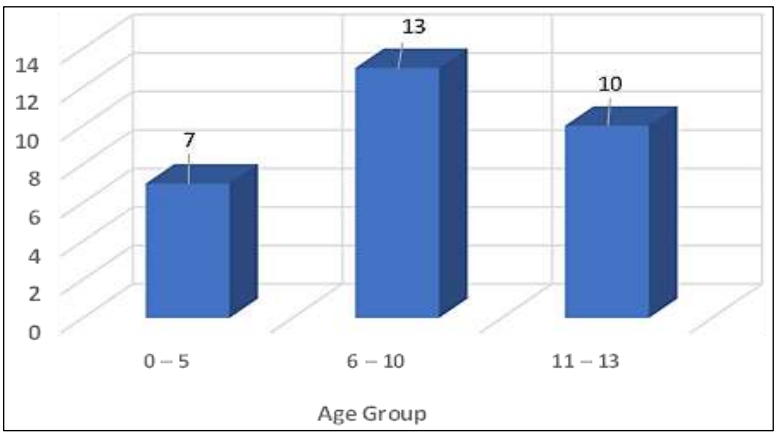
Exclusion Criteria
1. Age more than 14 years.
2. Un displaced Gartland type 1 fractures.
3. Compound, comminuted fractures.
4. Those who had previous attempt of manipulation.

Results
This is a descriptive study, conducted on 30 patients with closed displaced supracondylar fractures were treated by closed reduction and percutaneous fixation with Kirschner wires and follow up done at 4 weeks, 12 weeks and 24 weeks post-operatively. The following observations were made from the data collected during this study.

1. Age: The age of patients ranged from 3-13 years. The average age was 8.3 years.
Majority of the patients i.e., 13 (43.3%) were from 6-10 years age group, followed by 10(33.3%) patients in 11-13 years age group.

Table 1: Age Distribution (graph 1)

Age in years	No. of patients	Percentage
0-5	7	23.3
6-10	13	43.3
11-13	10	33.3
Total	30	100



Graph 1: Age Distribution

2. Sex: Of the 30 patients, Majority of the patients were males i.e., 17 (56.6%) and 13(43.3%) patients were females.

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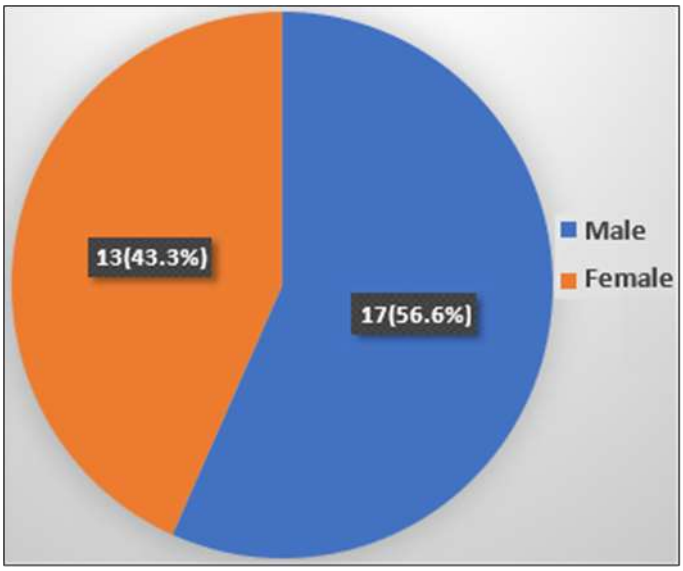
Table 2: Sex Distribution (graph 2)

Sex	No. of patients	Percentage
Male	17	56.6
Female	13	43.3



Graph 2: Sex Distribution

Discussion

A supracondylar fracture of the humerus is one of the most common injuries in children. The management of displaced supracondylar humerus fracture is one of the most difficult of the many fractures seen in children.

The aims of the treatment of supracondylar fractures are to achieve functionally and cosmetically satisfactory results and to avoid complications. Assuring a low cost and decreasing the hospitalization period are very important for both surgeons and patient's parents.

In this study, 30 children of Type II and Type III supracondylar fracture of humerus were treated with closed reduction and percutaneous K-wire pinning. The purpose of this study was to evaluate the efficacy of closed reduction and per cutaneous pinning and to access of carrying angle, loss of range of motion and to find out the complications encountered with this modality of treatment.

1. **Age incidence:** The Supracondylar fractures occurred most frequently in Children between 5 and l0 years of age as reported in other studies. In this Present study the average age was 8.3years, which is similar to other studies [9].
2. **Sex distribution:** In this present study, 17 (56.6%) were male patients and 13 (43.3%) were female patients, which is same as other studies, showing a male preponderance.
3. **Side of injury:** In this study, 19 (63.3%) had left sided injury and 11 (36.6%) of them had right Sided injury, the non-dominant extremity is most commonly affected. the other series of study mentioned below also show a preponderance to left sided fractures.
4. **Mode of injury:** The major cause of fracture in our study was fall while playing i.e. In 25 patients (83.3%) and 5 patients had history of fall from height. which is similar to other studies.

In Edward E Palmar *et al*., [70] series of 78 patients with supracondylar fractures 69 patients sustained injury due to fall while playing.

Farnsworth CL *et al*., [71] 29 (82.9%) patients had fall from height and 6 (17.1%) had fall while playing, which is similar to other studies.

1. **Type of fracture:** In the present study, based on the Gartland's classification, 9 (32.1%) patients had Type II fracture and 19 (67.8%) of them had Type 3 fracture. Comparable to other studies.
2. **Type of displacement:** In the present study 28 (93.33%) were extension type and 2 (6.66%) was flexion type. Most common is extension type, as is seen in other studies.

Conclusion

- Supracondylar fracture of humerus is one of the commonest fractures in childhood.
- Common in 6-10 years age group.
- Incidence is higher in boys.
- Left sided injury is more common than right side.

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- Due to the frequent occurrence of complications a detailed neurovascular examination is a must in all cases.
- Anatomical reduction is the key to obtaining good results, which can be achieved by closed reduction and percutaneous pinning.
- It does not expose the patient to an undue risk of infection and elbow stiffness unlike open reduction and internal fixation.
- It reduces the length of hospital stay, thus reduces the cost of treatment.
- With the fracture stabilized by pins, an elbow with severe swelling can be extended beyond 90°, thus vascular compromise is avoided.
- Hence from our study, we conclude that closed reduction and percutaneous k-wire fixation under C - arm guidance is a simple, cheap and effective method of treatment of displaced supracondylar fracture (type II and type III) humerus in children with excellent functional and cosmetic results and relatively fewer complications.

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