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TO COMPARE THE FUNCTIONAL AND COSMETIC OUTCOME OF SUPRACONDYLAR FRACTURES OF HUMERUS IN CHILDREN TREATED BY PERCUTANEOUS PINNING AND ORIF WITH KIRSCHNER WIRES.

Orthopaedics

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ABSTRACT

Supracondylar fractures were described in the early writings of Hippocrates during the 3rd and 4th century A.D (1). Until 1700s it was not written about supracondylar fractures in the classical medical literature. This fracture is common in the first decade of life due to causes like ligamentous laxity and anatomical structure of humerus tube(shaft) to flat transformation at lower end of humerus. Its incidence decreases with age(2). Supracondylar fractures of humerus need to be handled carefully to avoid drastic short term complications and vexing long term complications. The complications can be prevented by early and appropriate intervention. This can be achieved only by proper anatomical reduction and maintenance of reduction either by percutaneous pinning or ORIF. In our study we compared about the functional and cosmetic outcome of supracondylar fractures of humerus in children treated by percutaneous pinning and ORIF with Kirschner wires. Our sample size was 21 children under the age of 12 yrs with flexion or extension type of fracture which was treated by the modalities stated above. The patients were followed up for a period of 6 months to evaluate for the out-come.

KEYWORDS

Supracondylar Fractures, Kirschner Wires, Percutaneous Pinning.

1. INTRODUCTION

1.1) Supracondylar fracture of humerus is the most common fracture in the children under 7 years of age, comprising of 15% of all paediatric fractures(3) . This fracture is common in the first decade of life due to causes like ligamentous laxity and anatomical structure of humerus tube(shaft) to flat transformation at lower end of humerus. Its incidence decreases with age(2) .

1.2) It comprises about 55% to 75% of fractures around elbow in children. Boys have a higher incidence than the girls. It is more common in left side or the non dominant side. There are two types of supracondylar fractures, (3) i) Extension type -- 97% ii) Flexion type -- 3% Mechanism of injury in extension type is fall on the out stretched hand with hyper extension at the elbow with abduction or adduction, with dorsiflexed hand. Flexion type occurs as a result of direct blow to elbow from behind. Various modes of treatment are:- I.

1.) Closed reduction and casting. ii. Percutaneous Pinning. Open reduction and internal fixation. The early complications of supracondylar fractures include vascular and nerve injuries and the late complications include Volkmann's ischemic contracture, Myositis ossificans, Cubitus varus or valgus deformity, Tardy ulnar nerve palsy. Supracondylar fractures of humerus need to be handled carefully to avoid drastic short term complications and vexing long term complications. The complications can be prevented by early and appropriate intervention. This can be achieved only by proper anatomical reduction and maintenance of reduction either by percutaneous pinning or ORIF.

2. AIM AND OBJECTIVES

The aim of the study is a prospective study, to compare the functional and cosmetic outcome of supracondylar fractures of humerus in children treated by percutaneous pinning and ORIF with Kirschner wires at the department of orthopaedics, Sree Balaji Medical College, Chennai between February 2018 and April 2019.

3. MATERIALS AND METHODS

This prospective study was carried out from February 2018 and April 2019, at the Department of Orthopaedics, Sree Balaji Medical College, Chrompet, Chennai. The cases were included in the study, depending on the following inclusion and exclusion criterias. Inclusion criteria: I. GARTLAND'S type II and III supracondylar fractures. ii. Patient in the age group 2 to 12 years of age. iii. Closed fractures. Exclusion criteria : i. GARTLAND'S type I. ii. Open supracondylar fractures. iii. Patients with nerve or vascular injury. iv. Fractures with compartmental syndrome. All the patients were planned for surgery as early as anaesthetic fitness was obtained. Early intervention gives best results. But there were some restrictions. Criteria for percutaneous pinning: 1. Patients who came within 3 days of injury. 2. Without gross oedema of elbow 3. Without any contraindications for immediate surgery like LRI, and other anesthetic contraindications. Criteria for ORIF: 1. Patients who came 3 days after injury but not later than 7 days, in whom percutaneous pinning was seemed difficult. 2. Patients with gross oedema of elbow. 3. Patients in whom percutaneous pinning failed and required to be proceeded with ORIF in the same anaesthetic sitting. 4. Patients who have to wait for few days for anesthetic fitness for surgery. The following criteria were used: 1. Regaining the function of elbow. 2. Avoiding cubitus varus deformity. 3. Early mobilization. 4. Avoiding stiffness of elbow. 5. Surgical scar. The cases were analysed as per the following criteria : 1. Age 2. Sex 3. Mode of injury 4. Side of upper limb involved 5. Time interval between injury and surgery 6. Type of fracture - Extension type or flexion type 7. Nature of surgery done 8. Post operative complication 9. Hospital stay 10. No. of days after which bony union was achieved 11. Mobilization and timing for K- wire removal. 12. The cosmetic and functional outcome were assessed using FLNYSS' criteria. The results were graded using the FLYNNS' CRITERIA (4) . Results Cosmetic factor (loss of carrying angle in degrees) Functional factor (loss of motion in degrees) Excellent 0 - 5 0 – 5 Good 6 - 10 6 - 10 Fair 11 - 15 11 – 15 Poor > 15 > 15

RADIOLOGICAL CRITERIA USED:

The standard x-rays of the elbow included an anteroposterior view with elbow extended and a lateral view with elbow flexed to 90 degrees and the forearm in neutral. In the injured elbow it is often difficult to extend the elbow, so the Jones view may be taken. Minimally displaced fractures were identified with the help of anterior humeral line.

POST OPERATIVE PEROID:

The patients were reviewed every week for the first month and then biweekly for next 2 months and then fortnightly for the next 3 months, totalling a period of 6 months.

4. RESULTS

1. Age group distribution:

Age group varied from 2 to 12 years. Maximum percentage of patients belonged to the 6 to 8 age group.

Age group in years	No. of cases	Percentage
2 - 4	1	4.4%
5 - 6	2	9.2%
6 - 8	8	38%
8 - 10	6	28.4%
10 - 12	4	19.1%
Total	**21**	**100%**

2 Sex ratio:
There was a predominance of male children in the ratio of 57:43. This is probably because male children are involved more in outdoor activities and rough games than female children, who in turn prefer indoor games.

Sex	No. of patients	Percentage
Male	12	57.1%
Female	09	42.9%
Total	21	100%

3 Mode of injury:
Fall from height (i.e tree, walls) was the most common etiology. Fall from the cycle was the second most common cause, and Road traffic accident comes the third cause.

Mechanism of Injury	No. of patients	Percentage
Fall from height	13	61.82%
Fall from cycle	4	19.04%
Road traffic accident	4	19.04%
Total	**21**	**100%**

4 Side of elbow involved:
4 patients (i.e 19.04 %) had injury in the left humerus and only 17 patients (81.96%) had injury to the right side humerus.

Side of upper limb	No. of cases	Percentage
Right	4	19.04%
Left	17	81.96%

5. Time interval between injury and surgery:
81% of the patients were taken up for surgery within 24 hours either closed pinning or ORIF. Unless and other wise there were any contraindication like lower respiratory tract infection or specific anaesthetic contraindications, immediate fixation was done.

Time of surgery	No. of Patients	Percentage
Within 24 hours	17	81%
After 24 hours	4	19%

6. Type of fracture:
90.5% of the cases were of Extension type. Extension type of supracondylar fractures far out numbered flexion type of injuries. The only two case of flexion type had an etiology of fall from height with flexed elbow and landing on the elbow.

Type of injury	No. of Patients	Percentage
Extension type	19	90.5%
Flexion type	2	9.5%

7. Nature of surgery done:

Nature of surgery		Total
ORIF No.:(%)	Closed Pinning No.: (%)	21
10 (47.6%)	11(52.4%)	

8. Post operative complications:
Two patients (7.33%) developed ulnar nerve neuropraxia, which recovered completely within 5 weeks with physiotherapy. Three patients (14.28%) had pin site infection, which settled with IV antibiotics for 7 days. One patients (4.76%) had pin loosening and backing out.

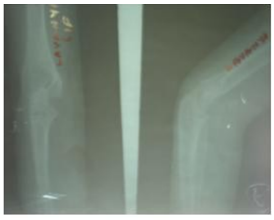
All the patients were graded as per the **FLYNN CRITERIA**. In our study, all the patients treated by both means either ORIF or closed reduction and percutaneous pinning had an excellent result, with mean loss of carrying angle of 3.8° and mean loss of flexion by 4.2°.

CASE ILLUSTRATION
CASE -1 PERCUTANEOUS PINNING

PRE – OP

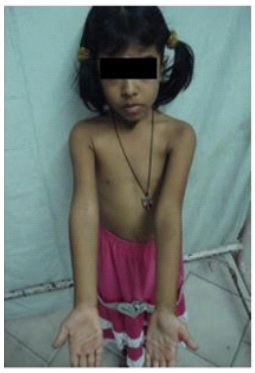
POST - OP

3 WEEKS POST OP



6 MONTHS FOLLOW UP

CASE ILLUSTRATION -1
PERCUTANEOUS PINNING → 6 MONTHS FOLLOW UP



FULL EXTENSION
NO VARUS OR VALGUS

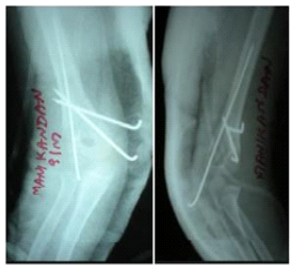
FULL FLEXION

POSTERIORLY NO SCAR

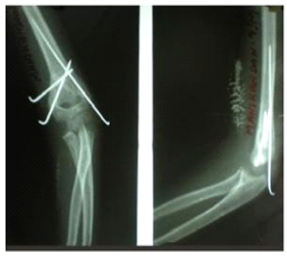
SMALL SCAR OVER ENTRY
POINT OF K-WIRE

Case-2 Open Reduction And Internal Fixation

PRE – OP



POST - OP



3 WEEKS POST – OP

6 MONTHS FOLLOW UP

CASE ILLUSTRATION - 2
ORIF → 6 MONTHS FOLLOW UP

FULL EXTENSION
NO VARUS OR VALGUS

FULL FLEXION

POSTERIOR LARGE SCAR

DISCUSSION

Mercer Rang said "Pity the young surgeon whose first case is a fracture around elbow"[5]. Proper training is needed to adopt recent advances by young surgeons to deal with these challenges [6]. Though this statement is for the young surgeons, even experienced surgeons sometimes have difficulty in treating supracondylar fractures.

Supracondylar fracture of humerus in children are still difficult to handle because of the age group involved, the neurovascular structures and difficulty in achieving and then maintaining anatomical reduction by closed means.

To obtain a perfect result after a supracondylar fracture of the humerus, an accurate anatomical reduction is needed. It is essential to minimize additional trauma to the already traumatized joint and periarticular tissues. This is more in ORIF, though it may also happen if repeated attempts at closed reduction are made in percutaneous pinning. It is therefore advicable that if a couple of trails of closed reduction fails, it is best to proceed with open ORIF.

Fracture healing is slightly delayed in cases treated by ORIF, due to further stripping of periosteum per operatively, in addition to that has happened during the injury.This iatrogenic damage to the periosteum is not there in percutaneous pinning.

The best treatment for supracondylar fracture of the humerus must provide an excellent functional result and an elbow of normal cosmetic appearance with minimal risk to the patient. Either of the procedures ORIF or percutaneous pinning have their merits and demerits.

Criteria	Orif	Percutaneous Pinning
Surgical Expense	More	Less
Stay in hospital	More	Less
Mobilisation	Late	Early
Cosmetic appearance	Big scar	No scar
Union	Late	Early
Technical difficulty	Less	More
Surgical time	More	Less
Chance of infection	More	Less
Soft tissue damage	More	Less

From the functional stand point, limitation of flexion of the elbow is considered more disabling than the extension. Next impairment comes the change in carrying angle, which may result in tardy ulnar nerve palsy.

The patient may develop cubitus varus deformity, which disturbs the patient cosmetically. More over the patient treated by ORIF may have a large scar in addition to that.

It is generally agreed that accurate reduction is not necessary for an excellent functional result because of the great remodeling power in younger children (Attenburg Et Al, Laurance 1957). But it is also true that the cosmetic end results of such a treatment are often poor and are therefore not acceptable.

Union is never a problem in treating supracondylar fracture of humerus in the paeditric age group, but the problems to be kept in mind are

i) Early neurovascular injury
ii) Long term complications like Volkmann's ischemic contracture, Myositis ossificans, Cubitus varus or valgus deformity and Tardy ulnar nerve palsy.

Of all these complications, cubitus varus is by far the most common complication.

Kaewpornsawan study[7] states that both treatments gave good results. Closed reduction should be performed first and, if it fails, then open reduction can be perfo rmed. This will produce good results in the hands of an experienced surgeon.

CONCLUSION

Though both the procedures either ORIF or percutaneous pinning, gave excellent results functionally as per we conclude that closed reduction percutaneous pinning is a superior option for supracondylar fractures of humerus for the following simple reasons

1. The cosmetic results are always better.
2. They are cost effective.
3. Hospital stay is less.
4. Complications are fewer and rare.
5. Union was earlier.

But not all supracondylar fractures budge to the reduction manoeuver and have to be opened up for ORIF, in order not to accept anatomical reduction which in variably gives poor cosmetic results and lands up with cubitus varus or tardy ulnar palsy making a future surgery almost inevitable. The earlier the intervention, closed reduction is possible and percutaneous pinning is satisfactorily achieved. This is by far more satisfying as far as two functional and cosmetic outcomes are concerned. We would be wrong if we do not confess that this follow up study is a very short one (of 22 months) and adequate long time follow up may reveal cubitus varus and tardy ulnar palsy, which are amoungst the most common complication. This is pitfall of this study.

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