

Original paper

Supracondylar Fracture of Humerus in Children A Follow up Study of Sixty Eight Cases

Saad Sahib AL-Nasir^{^*}

[^]Department of surgery/ Al-hyndia hospital/ Kerbala/ Iraq.

Abstract

Background: supracondylar fracture of humerus in children is extremely common. It accounts for approximately (65%) of all fractures and dislocations in children, constituting the most common pediatric elbow fracture.

Aim: the aim of this article is to study causes, pattern, and outcome of management of this important fracture and how to avoid and treat its complications.

Design: a descriptive case series study, to study the behavior and management of supracondylar fracture of humerus.

Patients & methods: our study was designed to study this type of important fracture by careful follow up of sixty eight (68) cases collected from the period (2001-2013) in Karbala, the cases were managed in Emam Hussien Medical City, Alhyndia general hospital and Alabbas private hospital.

Result: the peak age of incidence at six years, with male to female ratio of 4:1, type I and II need only conservative treatment. type III (majority need open reduction and internal fixation), stiffness of elbow was the common complication (28%) of cases.

Discussion: In our study the peak age of incidence was six, this compared well with reports published elsewhere, 38% of our patients were treated surgically and this also compared well with other articles.

Conclusion: supracondylar fracture of humerus need a proper and accurate treatment to avoid complications, and adequate radiological assessment is very important to decide type of management. Complications should be recognized and adequately treated to avoid permanent deformity.

Keywords: supracondylar fracture of humerus, Gartland classification, cubitus varus, elbow stiffness.

Abbreviations: k.wire: kirschner wire, SCFH: Supracondylar fractures humerus, ORIF: open reduction internal fixation.

Introduction

Supracondylar fracture of humerus is among the commonest fracture in children, the distal fragment may be displaced posteriorly or anteriorly, posterior angulation or displacement (95%) of cases suggest hyperextension, Injury usually due to a fall on the outstretched hand⁽¹⁾.

Gartland originally classified extension type fracture into three types according to the degree of displacement.

There have been several modifications of Gartland classification over the years, for example wilkin's classification⁽²⁾:

Type I – undisplaced fractures

Type II – displaced fractures with posterior cortex still in continuity.

IIa – less severely and merely angulated.

IIb – angulated severely and malrotated.

Type III – completely displaced fractures.

It is important in supracondylar humerus fracture to secure perfect realignment of the fragments as far as the angulation and rotation are concerned, lateral or medial

*For Correspondence: E-Mail dr.sad57@gmail.com

shift and antero-posterior displacement alone are not important⁽³⁾.

The American Academy Of Orthopaedic Surgeon (AAOS) has recently published a guidelines on the treatment of supra condylar humerus fracture, closed reduction pinning fixation was given to any displaced fracture (Gartland type two and type three)⁽⁴⁾.

Gartland type one supracondylar fracture can be treated effectively with long-arm splinting for the duration of therapy⁽⁵⁾.

Cubitus varus is the most frequent complication following the treatment of supracondylar humerus fracture in children⁽⁶⁾.

Patients And Methods

Design: A descriptive case series study. A sixty eight cases of supracondylar fracture was collected in Karbala for the period (2001-2013) and managed in Emam Hussien Medical City and Alhyndia general hospital.

Data was collected in data sheets designed for this study.

The fracture were classified according to the (Gartland classification):

The data on SCFH was separated and analyzed.

Definition SCFH is among the commonest fractures in children, the distal fragment may be displaced either posteriorly or anteriorly.

Children age range between (2-13) years (presented from a few hours to five days of injury, were included in this study).

Diagnosis of SCFH was made by history of falling on outstretched hand and extended elbow, on examination pain, tenderness and swelling, deformity, bruises, ecchymosis (around the elbow), radiological examination show SCFH either non displaced or displaced.

Five cases with an old SCFH having a cubitus varus deformity was included in this study and we managed them surgically by a supracondylar wedged corrective osteotomy.

Children with Gartland type I, had a significant swelling, a back slab was applied for them for three weeks.

Those children with Gartland type II had closed reduction done by manipulation under analgesia and four of them had the manipulation under general anesthesia the elbow was immobilized in a back slab slightly above the 90 degree of flexion with forearm in pronation or supination depending weather the distal fragment was in postero lateral or postero medial displacement.

None of gartland type II cases underwent open reduction and all cases closely observed by continuous radiological checkup at seven days interval.

Those children with Gartland type III A or III B, ten out of the thirty six cases had closed reduction with good alignment and back slab for three weeks. the remaining cases was admitted to the hospital, preoperative evaluation, and open reduction through posterior approach, incision started about four centimeters above elbow joint, and extended three centimeters distal to the joint. we did not approach the fracture laterally in all the cases, then triceps muscle incised as a tongue shape based distally. After proper reduction of the fracture two crossed k.wires were introduced crossing the fracture site into the proximal fragment, from the lateral & the medial condyle, and the k.wires penetrate the cortex for a short distance in order to give solid fixation, then wound closed, back slab applied.

Postoperatively the patient closely observed by checking the vascularity and nerve function, an antero-posterior & lateral radiological views with the elbow flexed (jones view) were taken to be sure that the reduction was perfect, and this was repeated at weekly interval.

Stiches were removed after ten days, active & passive exercises of the elbow started early to avoid elbow stiffness which is a very common complication after SCFH.

Back slab removed after three weeks, and physiotherapy started.

K.wires removed after (35-45) days according to fracture healing.

Those five cases with cubitus varus deformity which were included in the study ,admitted to the hospital and prepared for surgery after proper radiological assessments, a supracondylar corrective wedge osteotomy was done through a lateral approach ,and after taking a proper wedge from the bone , fixation done by a two k.wires introduced from the lateral condyle, back slab applied, stitches were removed after (10) days, the back slab removed after (21) days.

The k.wires removed according to the healing of the fracture ,usually after (45) days.

The data was analyzed using spss (statistical package for social sciences) version 17. the mean I SD was evaluated , the percentage of different categories was calculated .

Result

Sixty eight children with SCFH in the data sheets were analyzed for this study.

Forty two cases, (majority of cases) were aged between (5-7) years with a peak age of a six years (13cases), (30.8%) of all cases.

There was no fracture in children below two years was recorded in this study. (Table1.)

SCFH mostly affect boys more than girls

Table. 1 Age and sex distribution

Age group	Number of cases	Male	Female	Total
2-3	6	4	2	6
4-5	18	14	4	18
6-7	24	21	3	24
8-9	14	10	4	14
10-11	4	3	1	4
12-13	2	2	0	2
Total	68	54	14	68

Fifty four children, were boys, and fourteen were girls, giving a male to female ratio of (4:1), and in age group (2-3) there is a narrow gap between male & female, at age group (6-7) there was a sharp rise in male to female ratio, (the majority of cases were male). (Table 1)

Regarding the cause of injury majority had a history of fall ,usually from height or on motion during play, road traffic accident (mainly pedestrian) contributed the remainder. (Table 2)

There were two cases with compound fracture in which the proximal end of the fracture (the shaft) penetrated the skin to the out side.

Table. 2 the cause of the fracture

Cause	Number	%
Fall	60	88%
R.T.A	8	12%
Total	68	

There were (18) cases (26.4%) being gartland type I , (14) cases (20.5%) type II, (36) cases (52.9%) type III. (Table 3)

Type II fracture require closed reduction and back slab for three weeks.

Majority of type III required open reduction and internal fixation with crossed k.wires. (table 4).

All type I fractures had excellent result (which mean that there were no complications, good when there were complications but can be corrected, and poor when there was persistent deformity), and 2% of type 3 had poor result (table 5).

Table. 3 distribution of cases according to Gartland classification

Type	Number	%
Type I	18	26.4%
Type II	14	20.5%
Type III	36	52.9%
Total	68	

Table. 4 treatment modality applied as correlated with fracture type

Type	Backslab with. Out manipulation	Backslab with Manipulation	ORIF	Total
Type I	18	0	0	18
Type II	0	14	0	14
Type III	0	10	26	36

Table. 5 the outcome after different treatment modalities

Outcome	Type I	Type II	Type III
Excellent	100%	79%	84%
Good	—	21%	14%
Poor	—	—	2%

Regarding the complications, which we faced, the early complications (wound infection happened in two cases after internal fixation), and permanent complications (there were four cases of malunion mainly cubitus varus, two of them occurred after back slab and manipulation, and two occurred after open reduction and internal fixation) .

Nerve palsy (radial nerve) occurred in one case as a complication to tightly applied tourniquet and this child was completely recovered from this palsy after six months with physiotherapy.

One patient developed myositis ossificans which was difficult and resistant to treatment .

Stiffness of elbow joint occurred in (19) cases (28%). (table 6)

Table. 6 shows the complications encountered during the treatment

Type	Backslab with. Out manipulation	Backslab with Manipulation	ORIF	Total
Malunion	0	2	2	4
Elbow stiffness	3	10	6	19
Wound infection	—	—	2	2
Nerve palsy	—	—	—	—

Indeed the major complication that we faced in this study was the elbow stiffness, and we saw that stiffness developed markedly if the time of elbow splint exceeded the three weeks, and we always told the child's family to restrict to this period of splintage.

Twelve of the children with elbow stiffness, had full recovery over three months of physiotherapy.

Four of them, remain with partial recovery, and three of them remain with significant deformity (limited extension, 90 - 150 degree) for six months follow up. (table 7) .

Those five cases of cubitus varus which we treated them surgically, four of them was completely cured with good alignment, only one case remain with mild cubitus varus.

Discussion

SCFH is a common fracture of the childhood.

In our study the peak age of incidence was six, this compared well with reports published elsewhere. Mcrae reports a peak incidence at eight years ⁽⁷⁾ .

The majority of patients were boys (79%) ,which is a high percentage if compared with other studies, for example in a study

of 225 patients with SCFH there were 95 male and 130 female⁽⁸⁾.

Table. 7 the outcome of the patient who developed elbow stiffness after six months follow up

Outcome	Number	%
Full recovery	12	63
Partial recovery	4	21
Significant deformity	3	15
Total	19	

Before the age of five years, incidence of male to female showed no high difference, indicating that the behavior of the girls and boys in this stage of life nearly the same, later on the incidence on the boys increase drastically so the ratio of male to female becomes 7:1 at the age of six years. (table 1) .

Common cause of injury is a fall on an outstretched hand resulting in hyperextension injuries, this is the commonest type of injury as reported in many studies, this is may be due to that the lower humeral metaphysis was flat and with weak cortex .

Sixty cases (Eighty eight (88%)) of our cases fell down either from a height or during playing, the remaining eight children (12%) knocked down by a vehicle ,motorcycle and other moving objects.

In this study we did not classify the fracture as a hyperextension or a flexion injury, instead we used Gartland classification.

The results in table 3 regarding distribution of cases according to Gartland classification were near to other articles (Cekanauskase et al, (70%) (63 patients) of their patients were Gartland type III , type II (25.5%) , while (4.5%) were type I)⁽⁹⁾ .

Type I fracture in our study appear to be much fewer than type II & type III , the reason might be that the radiographs of the elbow in children were a challenge as a substantial portion of the elbow consists of an unossified cartilage that is radiologically non-visible.

The outcome of treatment was very good as expected in type I fracture.

Only (79%) of type II fractures had an excellent results, while (84%) of type III fractures had an excellent results (which mean that there were no complications.

There was no vascular complications in our study except the absence of radial pulsation for a short period of time, which returns back to normal after manipulation.

Elbow stiffness in various degrees occurred in (19) of our patients (28%) and it was a troublesome complication for us ,since the parents of the child were very anxious about this point, which may took a long time (1-3 months) for a full recovery, and in some patients a significant range of stiffness may remain.

Full recovery was the usual outcome of elbow stiffness, but four of our patients remained with partial recovery, and three patients remained with significant deformity.

Cubitus varus the second common complication that happened as a sequele after management of this fracture , it happened in four of our patients , proper and careful reduction (closed or opened), is therefore important to avoid such complication.

Neuroapraxia of the ulnar nerve did not occurred in our study, because we paid too much attention during introduction of the k.wires near the medial epicondyle in order not to injure the ulnar nerve

Conclusion

Supracondylar fracture is the commonest childhood fracture , when it was compared with other fractures that we saw in our hospital.

Adequate radiological evaluation and classification is important to decide the type of management.

It needs a proper and accurate treatment to prevent the complications such as compartment syndrome, elbow stiffness, cubitus varus.

Casting alone is adequate treatment for Gartland type I, which must be done carefully and closely observed to avoid compartment syndrome.

Displaced fracture Gartland type II & III must be adequately reduced before casting or during open reduction to avoid malunion, when complication occurred, it should be recognized and adequately treated to avoid permanent deformity.

Reference

1. Apley's system of orthopaedics and fracture, ninth edition, 2010, p:758.
2. www.orthopaedicsone.com, closed reduction and percutaneous pinning of supracondylar fracture, 2012/07/25, 2014 update.
3. Watson-Jones, Fracture and Joint Injuries, seventh edition 2009, p:523.
4. American Academy Of Orthopaedic Surgeon: Rosmonth, IL; the treatment of pediatric supracondylar humerus fracture, Editor 2011.
5. Ladenhauf HN, Schaffert M, Bauer J, Gartland type I supracondylar humerus fracture in children: is splint immobilization enough?, current opinion in journals, www.com-pediatrics.com, 2014.
6. Solfelt D.A, Colep A: supracondylar osteotomy for treatment of cubitus Varus in children Bone and Joint J 2014; 96-B:691-700.
7. McRae R, Esser M, Practical Fracture Treatment, Churchill Livingstone, Elsevier Science Limited 2003, Pg 145-156.
8. Trauma monthly. 2012 January; 16 (4) : 160-163.
9. Cekanauskas E, Degliute R, Kalesinskas RJ. Treatment of supracondylar fracture in children according to Gartland classification. Medicina (Kaunas) 2003; 39: 379 – 83.