

“SUPRACONDYLAR FRACTURES OF HUMERUS IN CHILDREN- EXPERIENCED AT KMC HOSPITALS MANGALORE”

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ABSTRACT

Supracondylar fractures are the most common pediatric elbow fracture and carry significant potential for neurovascular compromise. These fractures of the distal humerus are frequently problematic in terms of diagnosis, treatment, and complications. Proper care requires appropriate assessment and prompt orthopedic care for those patients whose fractures pose the greatest risk for long-term complications. The present study aims to correlate different types of supracondylar fractures of humerus in children and mainly deals with the epidemiology of the fracture; outcome with relevance of non-operative method versus pinning and their complications. The observation cohort study conducted at Government Wenlock and allied specialty and super specialty hospitals of KMC, Mangalore. The study period from Jan 2004 to May 2006. Study included all children aged 12 years and below presenting with supracondylar fracture of humerus. A total of 62 cases were registered, out of which 56 cases were followed up for a minimum of 6 months duration. Collected data was analyzed by using SPSS-16.50 version. Univariate, chi-square goodness of fit, Logistic regression and Spearman rank correlation's was used to draw the significant inference. The average age of children was 7.01 ± 0.599 years. There was no significant difference for loss of fixation, late deformity. 98.38 % and 1.62% of the cases were closed and open type respectively. Extension was 61 (98.38%), flexion was 01(1.62%). Gartland types of different fracture was practiced and it was found to be type I 28 (45.90%), type II 13(21.32%), and type III 20 (32.78%) with posteromedial was 13 (65.0%) and posterolateral was 07(35.0%). Mode of management was significantly associated with prognosis ($p < 0.05$). The surgeon must have a detailed knowledge of the anatomy of the fracture and the correct reduction techniques.

KEYWORDS: KMC, Supracondylar Fractures, SPSS, Types, Mode of Management

INTRODUCTION

The Supracondylar fractures of humerus in children are the commonest fractures around elbow to be associated with complications. They comprise about 17% of childhood fractures. Difficulties in terms of treatment, especially to assess stability of reduction are unanswered. Though Volkmann's ischemic contracture is rarely seen, virus deformity is still the problem. This fracture still remains as a most challenging injury for the orthopedic surgeon to treat. Prudence lies in personalizing or individualizing treatment modality to suit each fracture. Due to high incidence, difficulties in reduction particularly type III fractures, interpretation of post reduction X-rays and complications these fractures need a special emphasis. Treatment of non displaced fractures is straightforward and noncontroversial and consists of above elbow posterior stab immobilization for 3 weeks. There are several treatment options for the management of displaced (Gartland's type II and III), fractures. By definition, all of these fractures require a reduction. Usually, even for severe type III fractures, closed reduction can be accomplished. Options exist with reference to the method of maintaining the reduction until healing of the fracture. These methods include above elbow slab immobilization, traction and percutaneous

pin fixation. If an adequate closed reduction cannot be achieved an open reduction should be performed; this is almost universally followed by pin fixation. The present study aims to correlate different supracondylar fractures of humerus in children and mainly deals with the epidemiology of the fracture, outcome with relevance of non-operative method v/s pinning and their complications.

MATERIALS AND METHODS

The observational cohort study conducted at Government Wenlock Hospital and allied KMC hospitals. The study period is from Jan 2004 to May 2006. Study included all children aged 12 years and below presenting with supracondylar fracture of humerus. A total of 62 cases were registered, out of which 56 cases were followed up for a minimum of 6 months duration. 5 cases could not be followed up, and the last one case with flexion type injury is yet to be followed. Patient history physical and clinical examination was done, X-rays, treatment, follow up visits were recorded systematically as per the self structured proforma. All eligible patients who meet their inclusion criteria were included in the study and excluded were patients, presenting with late complications like Gunstock deformity. Detailed clinical examination was carried out in the hospital and standard anteroposterior and lateral views of the elbow were taken and fracture type noted. All Cases were treated on emergency basis with one of, above elbow slab application, manipulative reduction and above elbow slab application, closed reduction and pinning, open reduction and pinning and traction. C-arm was used whenever required. Fractures were classified as per Gartland's classification. Cases requiring manipulation were tried closed reduction under general Anesthesia and immobilized in above elbow slab with elbow in 100-120° flexion and forearm in supination to full pronation depending on the type of displacement. Closed reduction was achieved as per Charlney's method and the adequacy of reduction was assessed under image intensifier. Pinning was either done by 2 cross pins or 2 lateral pins. In one case of open reduction, fracture site was accessed through the wound opening and cross pinning was done. 2 cases were treated with traction by immobilizing the elbow in extension over a Thomas Splint. Post-operative assessment was made radiologically by taking AP, LAT and Jone's views as required. Unacceptable cases were again tried closed reduction under general anesthesia. The choice of above elbow slab immobilization or pinning was decided by the operating surgeon.

All cases treated with manipulative reduction were admitted as in-patients and observed for a day or two as to the vascular status of limb. Cases were reviewed on the next immediate post-operative day, the next out-patient day, after three weeks, after 3 months and after six months. Follow up assessment was done clinically using goniometer as to the range of movement and varus or valgus deformity. Active elbow exercises were started from fourth week as tolerated by the child. Passive mobilization and forceful manipulation were strictly avoided. A neurological examination was performed to note recovery in cases with previous deficit. Finally, the functional outcome was assessed on the basis of Mitchell and Adams criteria. The outcome was considered excellent, when the elbow had normal shape and movement of the elbow with a change in carrying angle of less than 5 degrees and limitation of elbow movement of less than 10 degrees. Results were graded as good, when the change in the carrying angle was between 5-15 degrees and limitation of movement between 10-20 degrees. When the change in carrying angle was more than 15 degrees and limitation of movement more than 20 degrees, the results were considered poor. Collected data was analyzed by using SPSS-16.50 version. Univariate analysis, Chi-square goodness of fit, Descriptive statistics and frequency matched test were used to draw the significant inference.

RESULTS

Total 62 patients prospectively studied from 2004 to 2006. Heterogeneity among studies were assessed using the Q test. Pooled relative risk was estimated using the logistic regression and sperman rank correlation methods. The average age was 7.01±0.599 years.

Table 1: Association Parameters of Supracondylar Fractures

Sl.No	Variables	Age	Type	End Results	Sex
01	Age	1.0	.351**	.040	.044
	Sig. (2-tailed)		.005	.158	.735
02	Type		1.0	-.166	.036
	Sig. (2-tailed)			.107	.780
03	End results			1.0	.025
	Sig. (2-tailed)				.846
04	Sex				1.0
	Sig. (2-tailed)				

***Significant P<0.05**

Associated clinical parameters were defined by spearman correlation matrix .The age and therapeutic methods were positively correlated with age of the children (r=0.35*,p<0.05). After different modes of treatment and effective management of the patient s end result or outcome was statistically significant (r=0.846). 84.60 % of the fractured children were shown better prognosis as presented in Table (1)

Table 2: Logistic Regression of Different Parameters

SL.No	Variables	B	Std. Error	T	Sig.	Lower Bound	Upper Bound
01	Age	4.48	1.27	3.52	.001	1.93	7.03
02	Rx Type	.066	.600	.111	.912	-1.134	1.26
03	End results	.983	.338	2.908	.005	.306	1.65
04	Sex	.600	.680	.882	.381	-.761	1.96

Durbin-Watson 2.237, Co Efficient of Determination -88.0%

Propounded clinical parameters relation were discussed by using logistic regression method .The predicted model shows that age, Rx t and genders were statistically significant (p<0.05). **Durbin-Watson 2.237, Co efficient of determination -88.0%** **Table (2)** The risk of iatrogenic ulnar nerve injury was 4.3 (95% confidence interval, 2.1-9.1) times higher in cross pinning compared with lateral pinning. There was no significant difference for loss of fixation, late deformity, or Flynn criteria between the two types of pinning. 98.38 % and 1.62% of the cases were closed and open types respectively. Extension was 61 (98.38%), flexion 01(1.62%). Gartland type of different fractures was noticed and it was found to be type I 28 (45.90%), type II 13(21.32%), and type III 20 (32.78%) with posteromedial was 13 (65.0%) and posterolateral was 07(35.0%). The side involvement and matched frequency was recorded and it was found to be left side 38 (61.30%) and right side was 24 (38.70%). All the 28 type I cases were effectively treated with above elbow slab and type II cases were treated by manipulative reduction and above elbow slab and 2 cases were treated with pinning. type III cases were treated with manipulative reduction and above elbow slab application, two cases with traction and four cases with pinning. Treatment outcome in above elbow slab, manipulative reduction in type I, II and III is statistically significant (p<0.05) and positively correlated with age of the children (r=0.659*).

Late Complications

Late complications were encountered only in type III posterolateral cases, 2 cases had loss of carrying angle by more than 5° and 1 case developed myositis ossificans.

Table 3: Mode of Management of and Out Comes

Mode of Management	Good	Unsatisfactory
Myositis ossificans	Type III Posterolateral	1 case
Loss of carrying angle	Type III Posterolateral	2 cases

Comparison of Non-Operative Method vs Pinning

Comparing the outcome of non-operative methods vs pinning among type II and type III fractures separately was insignificant whereas the comparison among all types was very much non significant(p>0.05).

Type II

10 cases were treated with manipulative reduction and above elbow slab, 1 case with open reduction and crossed pinning and 1 case with manipulative reduction and lateral pinning (2 parallel pins).

Table 4: Pinning and Non –OP Method with Effective Mode of Management

Mode of Management	Excellent	Good
Pinning	1 (50%)	1 (50%)
Non-op method	10 (100%)	0
	11	1

P = 0.167 ns (Fishers exact test)

Type III

10 cases were treated with manipulative reduction and above elbow slab, 2 cases with manipulative reduction and crossed pinning, 2 cases with open reduction and crossed pinning and 2 cases with traction keeping the elbow extended and immobilized over a Thomas splint.

Table 5: Association between Nonoperative v/s Pinning Methods

	Excellent	Good	Unsatisfactory	Total
Nonoperative	10 (83.3%)	2 (16.7%)	0	12
Pinning	3 (75%)	0	1 (25%)	4
	13 (81.25%)	2 (12.5%)	1 (6.25%)	16

Chi square $\chi^2 = 3.692$, P=0.1578 ns

Table 6: Association between Nonoperative v/s Pinning Methods

	Excellent	Good	Unsatisfactory	Total
Nonoperative method	50	0	0	50
Pinning	3	2	1	6
	53	2	1	56

$\chi^2 = 26.415$, P < 0.0001 vhs

Table 7: Comparison of Incidence Using Wilkins and Present Series

Sl. No.	Incidence	% of Total No. of Fractures		P-Value
		Wilkins	Present Series	
1	Side involved Right Left	39.260.8	38.7061.30	0.02*
2	Sex incidence Male Female	62.837.2	56.4543.55	0.001*

3	Ipsilateral fractures	1.0	1.62	0.63
4	Open fracture	1	1.62	0.74
5	Volkman contracture	0.5	0	0.89
6	Flexion type	2	1.62	0.56
7	Nerve Injuries Radial Median Ulnar	7.741.23622.8	6.4533.466.60	0.01*

*Significant at 0.05 level (p<0.05)

DISCUSSIONS

Supracondylar fractures of the distal humerus are the commonly encountered injuries in children. The association with neurovascular compromise and the potential problems of accurately reducing a displaced fracture can make treatment difficult even for the skilled surgeon. While outcome can still be poor following this injury, changes in the management of these fractures over the last three decades have significantly reduced the risks and morbidity with which they were previously associated. Non-operative treatment of displaced fractures has been replaced by fracture stabilization with wires and it is this that has resulted in improved outcomes.^{1,2}

Ambulant children of any age are vulnerable to supracondylar humeral fractures but the peak incidence occurs between the ages of 5 and 7 years, with the left arm most commonly affected. As per this study boys are more prone to supracondylar humeral fractures compared to girls. Boys sustained the majority of fractures but the gender gap was negatively correlated and not statistically significant (p=0.080), reflecting a change in childhood activity. Fracture is usually caused by a fall on outstretched hand. Children under 3 years of age usually sustain the injury by falling from furniture, while older children sustain their fractures while playing.

It is very rare for this injury to be caused by physical abuse. Coincidental injury to any of the three major peripheral nerves around the elbow can occur and has a reported incidence of up to 33.40%. It may be detected immediately following the injury or may not be noted until after the subsequent treatment⁴. The anterior interosseous nerve appears to be the most susceptible to damage from the original injury and radial nerve dysfunction is slightly less common⁵. The ulnar nerve is the most vulnerable to iatrogenic injury (6.45%); Radial (33.40%); ipsilateral fractures (1.62%); Flexion type (1.62%) from medial wire fixation. Associated ipsilateral fractures need to be excluded but are rare (5%)⁶. The vast majority of supracondylar fractures are closed (98.38%).

CONCLUSIONS

This common childhood fracture at all times presents a significant challenge to the orthopaedic surgeon. However, the vast majority of these injuries can be treated successfully with timely effective and accurate management techniques. The surgeon must have a detailed knowledge of the anatomy of the fracture and the pertinent reduction techniques both closed and open. Closed reduction and pinning is the procedure of choice for displaced fracture. Nerve injuries are mostly neuropraxias, iatrogenic injury is mostly met with Ulnar N.

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