

Patterns of Elbow Fractures and Complications of Those Seen Late in Children Treated at KCMC in Northern Tanzania

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Background: Fractures around the elbow in children are common and difficult to diagnose radiographically. There is limited information on fracture patterns around the elbow in children from developing countries. This study aims to identify; fracture type around the elbow and misdiagnosed fractures by the referring doctor at peripheral health facility and complication on arrival at Kilimanjaro Christian Medical Centre (KCMC) tertiary hospital.

Methods: This cross sectional record reviewed every child with fracture around the elbow treated at KCMC as outpatient or inpatient during the period of January 2009 to December 2013. Files and their x-ray film were traced both the orthopedic surgeon and the radiologist discuss the findings and were recorded.

Results: During the study period 366 cases were entered into the study. Males accounted for 263 (72.1%) of cases. Malunion was the commonest late complication reported clinically at the time of arrival at KCMC seen in (6.8%) patients. The commonest fractures were humerus supracondylar in (82.2%), followed by lateral condyle in (1.9%). Misdiagnosed fracture at peripheral health facility were; (5%) supracondylar followed by 3 olecranon and others.

Conclusion: Fractures around the elbow should be handed carefully in suspicious cases discussion between orthopedic surgeon and radiologist is valuable. Refresher course to the referring doctor from the district will help to improve diagnosis.

Introduction

Fractures around the elbow in children is common account for 10% of all fractures in America²². Different studies have shown fractures around the elbow to be the second or third commonest from other fractures^{17,16,23}. These fractures in children present a challenge to orthopedics practitioners in diagnosis due to changing anatomy of their growing skeleton. Some are therefore either completely missed or misdiagnosed. If not timely diagnosed and treated may result into grievous complication which includes; neurovascular injuries, open fractures, malunion and elbow stiffness^{17,7,3}.

Effort has been made to reduce the chances of missing the fracture where a comparative x-rays of the sound limb were requested by junior staff to rule out fracture around the elbow. Finally it was concluded that a review from senior consultant skeletal radiologist and orthopedic surgeon was adequate to diagnose fracture around the elbow¹⁹. In Ethiopia 10% of the fractures were missed radiologically at the time of injury but diagnosed 2 to 3 weeks later by follow up x-rays³. Current literature in most of the studies patients were seen immediately after injury no late comers. The objective of this study was to describe; fracture type around the elbow, misdiagnosed fractures by the referring doctor at peripheral health facility and complication on

arrival at KCMC tertiary hospital as baseline information in developing countries. It is valuable to review elbow fractures with complications which will guide to improve diagnosis in primary health care facilities and give patients appropriate care in a timely fashion.

Patients and Methods

This was a cross-sectional record review hospital based study done at Kilimanjaro Christian Medical Centre which is one of the referral, teaching hospital situated in northern part of Tanzania. The department of orthopedic and trauma has 3 specialists and 15 residents. It manages patients both as in patient and out patients. There is also a department of radiology with, two specialists and eight residents. This makes KCMC hospital suitable for this research. All children aged 1-16years treated at KCMC inpatients and outpatients from January 2009 to December 2013. Inclusion criteria were all children diagnosed to have a fracture or malunion (deformity) around elbow at KCMC hospital. Exclusion criteria were those patient with missing information specifically age, side affected sex and x-ray films.

Hospital registration numbers of all children with elbow injuries or deformity were obtained from x-ray department registers, admission registers in orthopedic ward and operating theatre registers. The files and x-rays films were traced for data collection. X-ray films were interpreted. The help of senior consultant orthopedic surgeon or radiologist in those cases with ambiguity was sought. Information was collected on new fractures, which included those first diagnosed at Kilimanjaro Christian Medical Centre as well as those first seen at other health facilities for the injury. In addition complications for those that presented late were recorded. The data were entered, coded, labeled, and checked for missing values and then analyzed using the SPSS version 20 statistical packages. Data were classified and summarized in distribution of frequency tables, histograms and the statistical relationships between type of fracture and age were tested. Statistical significance were considered when $p\text{-value} \leq 0.05$.

Permission to conduct the study was sought from the KCMC Research Ethical Committee. All confidentiality and regulations of the patient medical information's was followed

Results

Three hundred and sixty six children with fracture around the elbow were included in the study. Their x-films were available for analysis. There were 264 (72.1%) males and 102 (27.9%) females (Table 1). The mean age was 7.3 years and most of the fractures occurred at 4-10 years of age (Figure 1). Out of 366 injured children the commonest fracture type was humerus supracondylar in 303 (82.2%), followed by lateral condyle in 7 (1.9%) , lateral epicondylar fracture were 6 (1.6%) and medial epicondylar 6 (1.6%), head of radius 6 (1.6%) , olecranon 4 (1.1%), undiagnosed fractures are those fractures which came after healing with complications and initial radiological films were not available (Table 2). Table 3 shows fractures which were not initially diagnosed at primary health facility of which supracondylar fracture (n=11) was the commonest.

Table 1. Distribution of sex according to age

Sex	Age Groups			No. (%)
	Under 5	5 - 10	Above 10	
	No. (%)	No. (%)	No. (%)	
Male	51(70.8)	175(73.2)	38(69.1)	264(72.1)
female	21(29.2)	64(26.8)	17(30.9)	102(27.9)

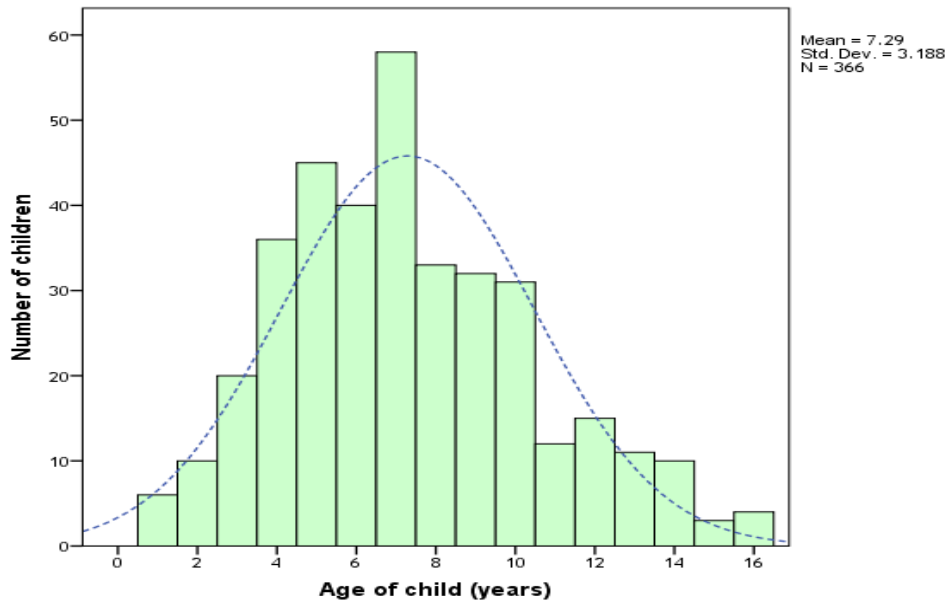


Figure 1: Age Distribution

Table 2. Distribution of elbow fractures according to age.

Type of fracture	Total (n=366)	Age (years)			p-value
		Under 5 (n=72)	5 - 10 (n=239)	Above 10 (n=55)	
		No. (%)	No. (%)	No. (%)	
Supracondylar	303 (82.8)	62 (86.1)	207 (86.6)	34 (61.8)	<0.001
Lateral condyle	7 (1.9)	1 (1.4)	6 (2.5)	0 (0.0)	0.442
Lateral epicondyle	6 (1.6)	1 (1.4)	4 (1.7)	1 (1.8)	0.980
Medial epicondyle	6 (1.6)	1 (1.4)	2 (0.8)	3 (5.5)	0.051
Head of radius	6 (1.6)	0 (0.0)	3 (1.3)	3 (5.5)	0.041
Olecranon	4 (1.1)	1 (1.4)	2 (0.8)	1 (1.8)	0.790
Undiagnosed	10 (2.7)	1 (1.4)	5 (2.1)	4 (7.3)	0.077

Table 3: Types of misdiagnosed fracture

Type of fracture	Total cases referred (n=223)	Misdiagnosis at Referral Centre	
		Cases Misdiagnosed (n=18)	
		Number	%
Supracondylar	214	11	5
Lateral epicondyle	4	2	1
Olecranon	3	3	1
Medial condyle	1	1	0.5
Head of radius	1	1	0.5

Table 4: Complications According to District of Residence.

District	Cubitus varus(25)		p-value	Other complication(15)		p-value
	Present	Absent		Present	Absent	
	No (%)	No (%)		No (%)	No (%)	
Moshi	11 (5.2)	199 (94.8)		4 (1.9)	206 (98.1)	
Hai	2 (8.0)	23 (92.0)		1 (4.0)	24 (96.0)	
Siha	0 (0.0)	16 (100.0)		3 (18.8)	13 (81.2)	
Same	2 (5.1)	37 (94.9)		0 (0.0)	39 (100.0)	
Arusha	7 (21.9)	25 (78.1)		2 (6.2)	30 (93.8)	
Mwanga	2 (12.5)	14 (87.5)		0 (0.0)	16 (100.0)	
Other	1 (3.6)	27 (96.4)	0.021	5 (17.9)	23 (82.1)	<0.001

Malunion (cubitus varus) was the commonest late complication reported clinically more than three weeks after injury most of the patient were coming from Moshi urban and rural. Seen in 25 (6.8%) of children. Other complications accounted for 4.1% (n=13) patients. Among other complications, stiffness (n=10) was the commonest (Table 4).

Discussion

In this study male were predominantly affected this has also been found in several studies regarding fractures around the elbow. This can be explained by the fact that male are the ones who are involved in more risky games activities^{2, 17, 10}. The most affected age group in this study was between 4-10 years of age. Similar results were also seen in different studies where by more than three fourth of the fractures happened at around 5-10 years of age. This peak is thought to be associated with the fact that the capsule and ligaments supporting the elbow have been revealed to have greater tensile strength than the bone itself, which leads to preferential fracture of the vulnerable humerus supracondylar region when sufficient force is applied across it^{2, 3, 7}.

The commonest fracture type was humerus supracondylar seen in more than two third, followed by lateral condyle and epicondylar fracture. Similar findings were seen in several studies^{17, 3, 9} Studies in developed countries humerus supracondylar fracture were less than two third this could be due to difference social life and social structures example formal play ground^{12, 7, 10}. Fracture not identified initially at primary health care facility most common were supracondylar which correlate with the number of children referred with humerus supracondylar. This is different from other comparative studies. Other type of fracture includes; olecranon, lateral epicondyle, medial condyle, head of radius. In other studies the supracondylar fracture were correctly diagnosed. Other fracture types were also misdiagnosed because they involve the growth plate which is not so clear on radiograph^{3, 19}.

Malunion (cubitus varus) was the commonest late complication reported clinically in this study at the time of arrival. Among other complications, stiffness was the commonest. The remaining four other complications included: chronic Osteomyelitis, compartmental syndrome and fracture blisters. Biruk in his follow up for missed fracture 2 children presented with malunion (cubitus varus).

Other studies only neurovascular and soft tissue injuries were seen. All patients in these other studies were seen immediately after injuries and 10 weeks later all had good recovery^{7, 17}.

Conclusion

Diagnosis of fractures around the elbow should be handled cautiously to reduce complications and in suspicious cases patient should be referred early for discussions between orthopedic surgeon and radiologist.

Recommendation

Feedback and refresher course to the referring doctor will keep them up to date. This study has a limitation being a retrospective may bias on complication seen at arrival. This study was intended to guide future studies.

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