



COMPARISON OF OUTCOME WITH MEDIAL VERSUS LATERAL APPROACH FOR OPERATIVE FIXATION OF SUPRACONDYLAR HUMERAL FRACTURES IN PAEDIATRIC PATIENTS.

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ABSTRACT... Objectives: To compare the outcome in terms of carrying angle with medial versus lateral approach in the treatment of these fractures among children. **Study Design:** Randomized Clinical trial. **Setting:** Department of Orthopaedic Surgery Civil Hospital Bahawalpur and Nishtar Hospital Multan. **Period:** From June 2018 to September 2019. **Material & Methods:** A total of 154 children of both genders, aged 2-14 years having supracondylar humeral fracture of type II and III, with duration of fracture within 7 days, were enrolled. Patients were divided in two groups (77 in each group), group A and group B. Group A was managed by open reduction internal fixation (ORIF) with cross K-wire through medial approach and group B underwent lateral approach. **Results:** Out of 154 cases, 102 (66.2%) were boys and 52 (33.8%) were girls. Overall, mean age was noted to be 7.98 ± 2.23 years. Obesity was present in 16 (10.4%) cases. Mean duration of fracture was noted to be 4.21 ± 1.34 days while 106 (68.8%) had duration less than 5 days. There were 119 (77.3%) cases with history of fall and 35 (22.7%) had history of road traffic accidents (RTA). Sixty one (39.6 %) cases were classified as Gartland type II fractures while remaining 93 (60.4 %) were type III fractures. Excellent outcome with carrying angle $0-5^\circ$ in group A was noted to be 67 (87 %) while that of group B was 54 (70.1%) ($p = 0.011$). **Conclusion:** Medial approach for the treatment of pediatric SHF was noted to be superior in terms of postoperative carrying angle having satisfactory outcome in comparison with the lateral approach.

Key words: Children, Gartland, Supracondylar Fracture Humerus.

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INTRODUCTION

Supracondylar humeral fractures (SHF) are the commonest fractures amongst children¹⁻³, accounting around 15% of fractures in the paediatric age group. SHF can cause neurovascular complications that literature seem to note from 5-19% with displaced fractures. SHF frequently occur between 3-11 years of age with the highest incidence between 5-8 years.^{3,4}

SHF are extension and flexion fractures, about 97 to 99% are extension-type fractures occurring due to falling on the outstretched upper extremity with the elbow in full extension.^{5,6} While extension-type fractures are classified according to the Gartland classification, flexion-type fractures are classified according to the degree of displacement.⁷

The treatment goals of SHF include functional attainment as well as cosmetic acceptance of upper limb with a normal range of movement. Complications linked to surgical treatment regarding these fractures are said to be approach related.^{4,6}

An approach that guarantees safety, quickness and linked to appropriate exposure of the fracture site is required. Arif M et al⁸ from Bahawalpur conducted a study on 50 children with medial and lateral approach and demonstrated medial approach as safe and quick approach and successful outcome was 88% in children treated with medial approach and 72% in children with lateral approach.

We aimed to demonstrate safe and quick method

of treatment with satisfactory outcome in our population which would be beneficial for our next generation as these cases dominate in children. There is only one study on this topic in Pakistan⁸ conducted with very small sample size i.e. 50 patients.

This study has been designed with larger sample size to generate baseline database of our local population, so that the results can be more generalized on our local population. The objective of the current study was to compare the outcome in terms of carrying angle with medial versus lateral approach in the treatment of these fractures among children.

MATERIAL & METHODS

This was a randomized controlled trial, conducted at The Department of Orthopaedic Surgery, Civil hospital Bahawalpur and Nishtar Hospital Multan, June 2018 to September 2019. Using non-probability consecutive sampling, a total of 154 children of both genders, aged 2-14 years having supracondylar humeral fracture of type II and III, with duration of fracture within 7 days, were enrolled. All children with history of previous elbow fractures, having neuro-vascular compromise and maltreated by bone settlers (as reported by patient and confirmed on clinical record) were excluded from the study.

Sample size of 154 (77 in each group) was calculated by taking P1 as 88%⁸ and p2 as 72%⁸ while power of test was considered as 80%. Approval from institutional ethical committee was sought for this study. Informed consent from patient's guardian/parents describing aims of this study along with explaining them that no risk involved to the patient was sought.

Onceregistered, all relevant baseline investigations were arranged for these children. Fractures were classified as per Gartland classification. Fractures as seen on X-Ray on anteroposterior and lateral view (showing displacement) were classified according to Gartland Classification, Type II as minimal to moderately displaced, and type III as severely displaced.

Patients were divided in two groups by draws method i.e. group A and group B. Group A was managed by open reduction internal fixation (ORIF) with cross K-wire through medial approach and group B underwent lateral approach.

The procedures were done employing general anesthesia. With the patient supine, the injured limb was placed on a hand table in abduction and external rotation. The surgery was performed by a senior consultant having minimum 03 years' experience after fellowship. Vascular injury and Compartment syndrome assessed post surgically. The patients were discharged 2nd day postoperatively and were called for follow up visits after every two weeks up to 12 weeks of period. Complications such as wound infection, nerve injury, pin tract infection and cubitus varus deformity and myositis ossificans assessed during follow up visits. Elbow range of motion started at 2 weeks after removing stitches and K wires removed at 04 weeks. The outcome was measured in terms of carrying angle at 12 weeks on anteroposterior and defined as satisfactory (loss of carrying angle 0–15°) or unsatisfactory (loss of carrying angle more than 15°). The radiographic measurement of carrying angle was taken tracing straight lines along the long axis of the humeral and ulnar diaphysis for obtainment of the humero-ulnar angle measured with a protractor during the visit. The weight was considered normal with BMI ranging from 18.5-22.9 Kg/m², overweight with BMI ranging from 23-27.5 Kg/m² and Obese as BMI more than 27.5 kg/m².

Mean and standard deviation (SD) were calculated for the age, BMI and duration of fractures. Frequencies and percentage were calculated for the categorical variables like gender, age groups, Gartland classification, residential status, etiology, socioeconomic status, obesity and outcome. Chi-square test applied to compare results in both the groups. Effect modifiers like age, obesity, etiology, Gartland classification, duration of fracture, residential status and gender were controlled by stratification. P value < 0.05 was considered as significant.

RESULTS

Out of 154 study cases, 102 (66.2 %) were boys and 52 (33.8 %) girls. Overall, mean age was 7.98 years with SD of 2.23 years. Mean age of boys was 7.83 years with SD of 2.34 years while that of girls was 8.27 years with SD 1.98 years. Most of the patients, 100 (64.9%) had their age ranging from 2 to 8 years.

There were 61 (39.6 %) cases who were classified as Gartland type II fractures while remaining 93 (60.4 %) were type III fractures. Excellent outcome with loss of carrying angle 0–5° (Flynn’s Criteria) in group A was noted to be 67 (87.0%) while that of group B was 54 (70.1%) and this difference was statistically significant (p = 0.018).

Eighty seven (56.6%) were from rural areas while 67 (43.4%) were from urban areas. Mean body mass index (BMI) 23.21 with SD of 3.74. Obesity was present in 16 (10.4%).

Mean duration of fracture was noted to be 4.21 days with SD of 1.34 days and 106 (68.8%) had

duration from less than 5 days. Most, 119 (77.3%) had history of fall and 35 (22.7%) had history of road traffic accidents. Regarding important complications iatrogenic ulnar nerve injury noted in 3 patients of group B however it improved afterwards. Compartment syndrome, vascular injury, Cubitus varus deformity and myositis ossificans were not seen in any group. Superficial wound infections improved with antibiotics in all patients.

DISCUSSION

General agreement on the treatment of displaced supracondylar fractures is scarce.⁹⁻¹² Detailed knowledge about the pediatric SHF is essential and a prerequisite to get long term proper functioning and cosmetic satisfaction.¹⁴⁻¹⁷

In the present study, 102 (66.2%) were boys while that of 52 (33.8%) were girls. Our results are very similar to what Khademolhosseini et al² also reported. Male gender preponderance with 67% boys while 32% were girls.

Characteristics		Group A (n=77)	Group B (n=77)	P-Value
Gender	Male	48 (62.3%)	54 (70.1%)	0.307
	Female	29 (37.7%)	23 (29.9%)	
Age	2–8 Years	51 (66.2%)	49 (63.6%)	0.736
	9–14 Years	26 (33.8%)	28 (36.4%)	
Residential Status	Rural	45 (58.4%)	42 (54.5%)	0.626
	Urban	32 (41.6%)	35 (45.5%)	
Obesity	Yes	10 (13.0%)	6 (7.8%)	0.291
	No	67 (87.0%)	71 (92.2%)	
Duration of Fracture	< 5 days	54 (70.1%)	52 (67.5%)	0.728
	> 5 days	23 (29.9%)	25 (32.5%)	
Reason	Fall	61 (79.2%)	58 (75.3%)	0.564
	RTA	16 (20.8%)	19 (24.7%)	
Classification of Fracture	Type-II	29 (37.7%)	32 (41.6%)	0.621
	Type-III	48 (62.3%)	45 (58.4%)	
Outcome	Satisfactory (Loss of carrying Angle 0–15°)	67 (87.0%)	54 (70.1%)	0.011
	Unsatisfactory (Loss of carrying Angle more than 15°)	10 (13.0%)	23 (29.9%)	

Table-I. Outcome of Patients between Study Groups (n=154).

Complication	Group A (n=77)	Group B (n=77)	P-Value
Superficial wound infection	7 (9%)	5 (6.4%)	0.284
Pin tract infection	9 (11.6%)	7 (9%)	0.284
Iatrogenic ulnar Nerve injury	0	3 (3.8%)	0.301

Table-II. Complications between Study Groups (n=154).

Many other studies have shown male gender predominance ranging male representation as 53-83%.¹⁸⁻²²

In this study, most patients i.e. 100 (64.9%) had their age ranging from 2 to 8 years whereas mean age was 7.98 years with SD of 2.23 years. Khademolhosseini et al² also reported 6 years mean age children with supracondylar humeral fractures which is close to what we noted. Barr et al¹⁸ also reported 6 years mean age of these patients whereas Siddique et al¹⁹ reported 8.3 ± 3.67 years mean age of their patients.

Mean duration of fracture was noted to be 4.21 ± 1.34 days and 106 (68.8%) had duration less than 5 days. Majority of these patients i.e. 119 (77.3%) had history of fall and 35 (22.7%) had history of road traffic accidents. Of these 154 study cases, 61 (39.6%) were classified as Gartland type II fractures while remaining 93 (60.4%) were type III fractures. Similar results have been reported by Barr et al.¹⁸ Shabir et al²⁰ reported 35% type II and 65% type III Gartland classification while Maity et al²² noted 42% type II and 58% type III fractures which is similar to our results.

No statistically significant difference noted regarding complications between the groups. Superficial wound infection 9% (group A) and 6.4% (group B) while pin tract infection 11.6% (group A) and 7% (group B). Iatrogenic ulnar nerve injury noted in 3 patients of group B only however it improved afterwards.

Satisfactory outcome with loss of carrying angle (0–15°) in group A was noted to be 87 % while that of group B was 70.1% and this difference was statistically significant (p = 0.011). Arif et al⁸ from Bahawalpur conducted a study on 50 children with medial and lateral approach and demonstrated medial approach as safe and quick approach and successful outcome was 88% in children treated with medial approach and 72% excellent results in children with lateral approach. Another study from India by Maity et al²² has reported 80% satisfactory outcome in medial approach versus 73% through lateral approach. Eren et al²³ got 95% satisfactory outcome in patients treated with

medial approach while 90% with lateral approach.

CONCLUSION

Medial approach for the treatment of pediatric supracondylar humeral fractures was noted to be superior in terms of satisfactory outcome. Medial approach was turned out to be safe, reliable and provided desired outcomes while no major complications. All clinicians treating such patients can adopt medial approach for better outcomes.

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
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