

Comparison of Outcome of three Different Approaches for Supracondylar Humerus Fractures in Children

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ABSTRACT

Introduction Supracondylar humerus is one of the most common elbow fractures in children. It accounts for about 60% of all the elbow fracture. It is a challenging orthopedic presentation. It is more common in the children younger than 15. The bending structure and weak metamorphic sclerotin of distal humerus are the underlying cause behind these fractures. Fractures are classified according to the Gartland's criteria.

Study design: It is a retrospective study conducted at Sahara Medical College, Narowal and Pakistan Railway General Hospital, Rawalpindi for duration of six months from August 2022 to January 2023.

Material and Methods: The patients were aware of the study objective. The demographic features of each selected patient were recorded. There were total 150 patients included in this study. Patients were divided into three groups on the basis of type of approach used for the treatment of supracondylar humerus fracture; lateral approach, medial approach and posterior approach as group A, B and C respectively.

Results: The average age of patients was 7.61 ± 4.5 , 7.2 ± 3.6 and 6.5 ± 4.5 years for group A, B and C respectively. The reason of fracture was determined and the data revealed that most of the injuries were related to sports. P value was calculated and the data was statistically significant.

Conclusion: Our results suggest that as compared to posterior and medial, lateral approach is better as it showed significant radiological and functional outcomes. It can be used by surgeons as it takes less time and the complications rate is lower.

Keywords: lateral approach, supracondylar humerus and posterior approach.

INTRODUCTION

Supracondylar humerus is one of the most common elbow fracture in children. It accounts for about 60% of all the elbow fracture. It is a challenging orthopedic presentation. It is more common in the children younger than 15¹⁻³. The bending structure and weak metamorphic sclerotin of distal humerus are the underlying cause behind these fractures. Fracture are classified according to the Gartland's criteria. Gartland type 1 is unstable whereas type II has different angulation. The conversion of olecranon into the bending structure by the absorption of axial energy leads to hyper extensive elbow. The extension type fractures accounts for about 98% of the supracondylar humeral fractures.

The management of these fractures can be challenging, and several approaches have been described in the literature. Each approach has its own advantages and disadvantages, and the choice of treatment depends on several factors such as the severity of the fracture, the age of the child, and the experience of the surgeon. The three most commonly used approaches are closed reduction and percutaneous pinning, open reduction and pinning, and closed reduction and casting. Closed reduction and percutaneous pinning is a minimally invasive approach that involves the reduction of the fracture⁴⁻⁶. This technique has the advantage of being less invasive and having a shorter hospital stay and a faster recovery time than open reduction and pinning. However, it may not be suitable for more complex fractures or fractures with significant displacement, and there is a risk of nerve injury, especially with medial pin placement. Open reduction and pinning has the advantage of providing better visualization and is often considered as effective for more complex fractures or those with significant displacement. However, it is a more invasive procedure and requires a longer hospital stay and recovery time than closed reduction and pinning. Closed reduction and casting is less invasive than the other two approaches and may be suitable for less severe fractures or fractures in younger children⁷⁻⁹. However, it has a higher risk of loss of reduction and may require a longer period of immobilization and rehabilitation. Treatment of such fracture is challenging for the surgeons and treating pediatric elbow fractures is far more difficult and challenging for the orthopedics. The supracondylar femur injuries are the most difficult and challenging injuries. The scarcity of data is present in literature

about these approaches. There is need to study the outcomes of these approaches in detail¹⁰. Several factors are considered as the predictor of the outcomes such as degree of displacement, age and type of fracture. This study aimed to compare the outcomes of the three approaches in detail.

MATERIAL AND METHODS

It is a retrospective study at Sahara Medical College, Narowal and Pakistan Railway General Hospital, Rawalpindi for duration of six months from August 2022 to January 2023. The approval was taken from the ethical and review board committee of the hospital. The patients were aware of the study objective. The demographic features of each selected patient were recorded. The data was collected. There were total 150 patients included in this study. Patients were divided into three groups on the basis of type of approach used for the treatment of supracondylar humerus fracture; lateral approach, medial approach and posterior approach as group A, B and C respectively. The patients diagnosed with following conditions were excluded from the study

- The patients underwent re-surgery, open fracture in the past
- The patients diagnosed with neuro vascular injuries
- The patients diagnosed with compartment syndrome

The age range of the selected patients was between 6-9 years. The statistical analysis was performed by using the SPSS software. The data was collected and recorded and then the results were presented in the form of tables. Post-operative outcomes were compared for each group.

RESULTS

There were 50 patients in each group. The average age of patients was 7.61 ± 4.5 , 7.2 ± 3.6 and 6.5 ± 4.5 for group A, B and C respectively. The reason of fracture was determined and the data revealed that most of the injuries were related to sports. P value was calculated and the data was statistically significant.

The comparison of the outcomes of study groups indicated that the Average shaft condylar angle was $40\pm 8.3^\circ$, $44.1\pm 3.2^\circ$ and $42.3\pm 3.2^\circ$ for group A, B and C respectively. Whereas, the average Baumann angle was $21.2\pm 3.2^\circ$, $22.3\pm 3.2^\circ$ and $22.5\pm 4.3^\circ$ for lateral, median and posterior approach respectively. The operation time ranged from 40-45 minutes for all groups. Data

revealed that most of the patients had fracture on their right side. There were no significant complications found among the patients. There were 8 cases of pin tract infection reported in the medial approach group. There were 3 cases of nerve injury reported by posterior approach group.

Table 1: Characteristics of patients with supracondylar humerus fracture

Features	Group A (Lateral approach)	Group B (Medial approach)	Group C (Posterior approach)	P value
Gender				
Male	39	35	38	0.005
Female	11	15	12	0.54
Average age (years)	7.61±4.5	7.2±3.6	6.5±4.5	0.005
Fracture cause				
RTA	4	8	12	0.001
Falling from height	4	2	3	0.79
Sports related injury	32	30	26	0.34

Table 2: Comparison of outcomes of the study groups

Clinical variables	Lateral approach (n=50)	Medial approach (n=50)	Posterior approach (n=50)	P value
Side of surgery				
Left	16	17	10	0.005
Right	34	33	40	0.003
Operative time (min)	40±3.4	45±4.1	43±2.2	0.005
Radiological outcomes				
Average shaft condylar angle (degrees)	40±8.3°	44.1±3.2°	42.3±3.2°	0.000
Average Baumann angle (degrees)	21.2±3.2°	22.3±3.2°	22.5±4.3°	0.004
Complications				
Nerve injury	-	1	3	0.005
Pin tract infection	4	8	5	0.000

The functional outcomes were compared for three groups and it was found that excellent results were shown in 40, 37 and 19 patients of lateral, medial and posterior group respectively. Good outcomes were reported by 10,13 and 31 patients in lateral, medial and posterior group respectively. There was no case of poor outcome reported by patients.

Table 3: Functional outcomes as per Flynn's criteria

Functional outcomes	Lateral approach (n=50)	Medial approach (n=50)	Posterior approach (n=50)	P value
Excellent	40	37	19	0.12
Good	10	13	31	0.005
Fair	-	-	-	
Poor	-	-	-	

DISCUSSION

One of the most common type of elbow fractures that is reported among children is humeral super condyle fracture. There are two percutaneous abnormal decreases that are found in such fractures¹¹. Kirschner wire fixation is normally used for the treatment of this fracture as it is safe, inexpensive and simple technique to use¹². There are ways in which a wire can be positioned. There have been research going on to find the best possible position or approach that should be used to place pin¹³. It is not feasible to hyper flex the elbow beyond 120° as it can lead to decrease in radial pulse. As the triceps muscle does not give support in such case so the risk of losing the decrease is pertinent. Therefore, it is recommended to perform surgical procedure in

children for Gartlandtype III supracondylar fractures¹⁴. There were total 150 patients included in this study. Patients were divided on the basis of type of approach used for the treatment of supracondylar humerus fracture; lateral approach, medial approach and posterior approach as group A, B and C respectively. There were 50 patients in each group. The age of patients ranged from 6 to 9 years. The average age of patients was 7.61±4.5, 7.2±3.6 and 6.5±4.5 for group A, B and C respectively.

The reason of fracture was determined and the data revealed that most of the injuries were related to sports. In our study majority of the patients were male value was calculated and the data was statistically significant. Our results were in accordance with the previous studies where the average surgical time was 38 minutes¹⁵⁻¹⁶. The comparison of the outcomes of study groups indicated that the average shaft condylar angle was 40±8.3°, 44.1±3.2° and 42.3±3.2° for group A, B and C respectively. In previous studies the average shaft condylar angle was 41±3.3°, 39±7.2° and 41±6.3° for group A,B and C respectively¹⁷. In our study, the average Baumann angle was 21.2±3.2°, 22.3±3.2° and 22.5±4.3° for lateral, median and posterior approach respectively. The operation time ranged from 40-45 minutes for all groups. Data revealed that most of the patients had fracture on their right side. There were no significant complications found among the patients. There were 8 cases of pin tract infection reported in the medial approach group. In the previous studies there were 6 cases of pin tract infection found in the medial approach group¹⁸. There were 3 cases of nerve injury reported by posterior approach group. The functional outcomes were compared for three groups and it was found that excellent results were shown in 40, 37 and 19 patients of lateral, medial and posterior group respectively. Good outcomes were reported by 10,13 and 31 patients in lateral, medial and posterior group respectively. There was no case of poor outcome reported by patients. As per studies in case of lateral and medial group, 100% patients had excellent scores reported by patients¹⁹.

As per another study, 72% patients had excellent scores for lateral and medial approach. Studies have shown that operation time taken for medial approach is quite less than the other two approaches, our studies also showed medial approach being the most time consuming operation as it was done in 45 minutes²⁰. In our study the complication rate was quite low. There was no nerve injury reported by any patient that went through lateral approach for treatment. These studies resemble previous studies where no case of nerve damage was found in the lateral approach group²¹⁻²³. There was no significant difference found between the radiological and functional outcomes of all groups. In our study as per Flynn's criteria the functional outcomes were evaluated and results showed that the lateral approach used for treatment of super condyle fracture in children is better than the posterior and lateral approach as this approach showed maximum cases with excellent results. It can be used by surgeons as it takes less time and the rate of complications is less. The study has some limitations. The trial period was small and short observation time used for study. There is need for further research to get better and more precise results.

CONCLUSION

The study was carried out for the comparison of outcome of three different approaches for supracondylar humerus fractures in children. Our results suggest that as compared to posterior and medial, lateral approach is better as it showed significant radiological and functional outcomes. It can be used by surgeons as it takes less time and the rate of complications is less.

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