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ORIGINAL ARTICLE

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

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ABSTRACT

Objective: The aim of this study is compare the outcomes among three different approaches (lateral approach, medial approach and posterior approach) for supracondylar humerus fractures in children.

Study Design: Retrospective cohort study

Place and Duration: The study was conducted at Orthopedics department of Ayub Teaching Hospital, Abbottabad for duration of one year from January 2020 to December 2020.

Methods: There were one hundred and thirty five children had supracondylar humerus fracture were presented. Patients were aged between 3-12 years. Informed written consent was taken from authorities for detailed demographics age, sex, cause of fracture and side of fracture. Patients were categorized into three equal groups, group A had 45 patients and received lateral approach, group B had 45 patients and received medial approach and group C received posterior approach with 45 cases. Shaft Condylar Angle (SCA) and Baumann angle were used to analyze the radiological result. All children were assessed using Flynn's criteria for functional outcomes, and the results were divided into Excellent, Good, Fair and Poor. Post-operative outcomes among all the three groups were calculated and compared. SPSS 23.0 version was used to analyze complete data.

Results: There were 90 (66.7%) males (30 in each group and 45 (33.3%) females (15 in each group). In group A mean age was 6.88±5.45 years, mean age in group B was 7.11±5.33 years and in group C mean age was 7.17±5.66 years. Sports 85 (62.9%) was the most common cause of fracture followed by traffic accidents 30 (22.2%) and the rest were 20 (14.8%) fall from the height. According to radiological outcomes, Mean shaft condylar Angle in group A was 41.5±6.3, in group B was 41.8±1.9 and in group C was 40.1±3.8 respectively (P>0.05). Mean Bauman angle in group A was 18.8±6.11, group B was 19.4±7.5 and in group C 20.4±5.3 with (P>0.05). According to Flynn's criteria, excellent outcomes were observed in 33 (73.3%) in LA group, 24 (53.3%) in MA group and 22 (48.9%) in PA group, good results were observed in 11(24.4%), 19 (42.2%) and 21 (46.7%), fair outcomes in 1 (2.2%), 2 (4.4%) and 2 (4.4%).

Conclusion: As a result of this research, we have concluded that the lateral technique for supracondylar fractures is superior to the medial or posterior approaches in terms of radiological and functional results. However, there was no statistically significant difference between the three groups.

Keywords: Supracondylar fractures, Flynn's criteria, Functional outcome, Open reduction

INTRODUCTION

Among children younger than 15, supracondylar humeral fracture is the most common elbow fracture [1]. In children, this fracture is more likely to occur because of the bending structure and the weak metamorphic sclerotin of distal humerus, and the thin ridge of metamorphic bone between the coronoid and olecranon foci.2Fracture is characterised by Gartland's criteria as Gartland type I, which is stable and not displaced; Gartland type II or III fractures have different degrees of displacement and angulation.[2]

This form of fracture occurs when the olecranon, which is extended, absorbs the majority of axial energy and is converted to bending force at the humeral supracondylar, which results in hyper extensive elbows. The flexion-type supracondylar fracture is caused by a fall on the olecranon when the elbow is flexed. In Chinese youngsters, 98% of supracondylar humeral fractures (SCHF) are extension-type fractures, according to a study. Fracture portions of Gartland type I can be held in place using cast fixing [3,4]. After closed reduction of Gartland type II and type III fractures, no consensus has been obtained on the pinning technique and configuration [5]. If you're going to be using pins, you're going to have to choose between lateral entrance pins and crossing entry pins[6]. Although cross-entry pins are theoretically more stable, they increase the risk of ulnar nerve injury [7, 8] since the pins cross over each other. While it is possible to minimize ulnar nerve injury by using lateral entrance pins, it is possible to diminish the mechanical stability of the structure [9, 10].

Since Hippocrates, treating paediatric elbow fractures has remained a difficult task for surgeons.[11]

Injuries to the supracondylar femur can be among the most challenging to cure.[12]

This fracture can be treated in many ways depending on the type of fracture, the amount of displacement, swelling, and other complications. In addition to traction (both skin and bone), closed reduction and percutaneous pins, and open-reduction-and-internal-fixation, a variety of methods exist (ORIF). [13] ORIF is indicated for open fractures, fractures involving vascular damage, and fractures that have not been adequately reduced. Infection, non-union, and neurovascular damage are among of the most common consequences of this procedure. In the majority of cases, Flynn's criteria are used to assess the outcome. There were excellent, good, fair, and poor outcomes in 58-77.3 percent of cases; the remaining percentages ranged from 2 to 2.7 percent in each category (Mean: 2.35 percent). [14] The number of trauma patients is on the rise as a result of a growing number of RTAs and a changing human environment. A supracondylar humeral fracture is a common orthopaedic emergency presentation. [15]

Open reduction and k wire fixation in children with type III supracondylar fractures of the humerus was the primary goal of this investigation. Results from this study will be utilized to develop treatment guidelines for type III humeral supracondylar fractures.

MATERIAL AND METHODS

This retrospective cohort study was conducted at Orthopedics department of Ayub Teaching Hospital, Abbottabad for duration of one year from January 2020 to December 2020 and comprised of 135 patients of both genders. Informed written consent was taken from authorities for detailed demographics age, sex, cause of fracture and side of fracture. Resurgery, open fractures, neuro vascular injuries and compartment syndrome were all excluded from the study.

Patients were aged between 3-12 years. Patients were categorized into three equal groups, group A had 45 patients and received lateral approach, group B had 45 patients and received medial approach and group C received posterior approach with 45

cases. Detailed operational notes were found in the clinical records that were evaluated. Supine and with elbow across chest, patient's lateral approach (LA) to supracondylar fracture was performed. A 5 cm incision was made from the lateral epicondyle to the distal humerus shaft under tourniquet control. Fascia and the triceps were dissected to expose the fractures and reduce them. The fracture was stabilised with a k wire from the lateral epicondyle after a manual reduction. K wires were inserted into the fracture site from the medial epicondyle through a tab incision that crossed the initial k wire. Underneath the epidermis the wires had been severed, bent and buried in place. The medial approach (MA) was performed in the supine position with the elbow across the chest under tourniquet control.

The distal humerus was dissected and the ulnar nerve was protected with a 5cm medial incision, followed by fracture reduction and crossed k wires, one from the medial epicondyle and the other from the lateral through a stab incision. The wires were bent and buried in order to protect the patient's skin. Supine, a tourniquet and limb were placed across the patient's chest and the posterior approach (PA) employed. Over the elbow, a 5 cm posterior midline incision was created. The ulnar nerve was found and protected. To aid in fracture reduction, the triceps was raised on both sides. The fracture was stabilized by two k wires, one from the medial and one from the lateral epicondyles. Cut, bent and implanted under the skin were K-wires.

An AP x-ray of the elbow was used to calculate the Baumann angle. The humerus shaft and the lateral condyle physeal line were sketched on separate lines. The Baumann angle is the angle at which the two lines meet (normal 9 to 26 degrees). For the calculation of Shaft Condylar Angle (SCA), two lines were drawn: one along the humerus shaft axis and one parallel to it; both lines were then divided into equal portions. Hmerus' metaphysis contains the SCAS angle, which is located at the intersection of these two lines. Temperatures of at least 40 degrees Fahrenheit are considered typical. All children were assessed using Flynn's criteria for functional outcomes, and the results were divided into Excellent, Good, Fair and Poor. Post-operative outcomes among all the three groups were calculated and compared. SPSS 23.0 version was used to analyze complete data.

RESULTS

There were 90 (66.7%) males (30 in each group and 45 (33.3%) females (15 in each group). IN group A mean age was 6.88±5.45 years, mean age in group B was 7.11±5.33 years and in group C mean age was 7.17±5.66 years. Sports 85 (62.9%) was the most common cause of fracture followed by traffic accidents 30 (22.2%) and the rest were 20 (14.8%) fall from the height.(table 1)

Table 1: Characteristics of enrolled cases

Variables	Group A	Group B	Group C
Gender			
Male	30	30	30
Female	15	15	15
Mean age (years)	6.88±5.45	7.11±5.33	7.17±5.66
Causes of fracture			
Sports	30	29	26
RTA	10	9	11
Falling	5	7	8

Table 2: Radiological outcomes among enrolled cases

Variables	Group A	Group B	Group C
Radiological outcomes			
Mean shaft condylar Angle (degree)	41.5±6.3	41.8±1.9	40.1±3.8
Mean Bauman angle (degree)	18.8±6.11	19.4±7.5	20.4±5.3

According to radiological outcomes, Mean shaft condylar Angle in group A was 41.5±6.3, in group B was 41.8±1.9 and in group C was 40.1±3.8 respectively (P>0.05). Mean Bauman angle in group A was 18.8±6.11, group B was 19.4±7.5 and in group C 20.4±5.3 with (P>0.05).(table 2)

Mean surgical time in group A was 30.27±2.16 minutes, in group B mean time was 33.14±3.35 minutes and in group C mean time was 33.78±4.65 minutes. Left side was the most common effected side among all groups.(table 3)

Table 3: Comparison of operative among groups with effected sides

Variables	Group A (45)	Group B (45)	Group C (45)
Mean surgical time (minutes)	30.27±2.16	33.14±3.35	33.78±4.65
Side			
Left	28	30	25
Right	17	15	20

According to Flynn's criteria, excellent outcomes were observed in 33 (73.3%) in LA group, 24 (53.3%) in MA group and 22 (48.9%) in PA group, good results were observed in 11(24.4%), 19 (42.2%) and 21 (46.7%), fair outcomes in 1 (2.2%), 2 (4.4%) and 2 (4.4%). In this study no any poor outcomes observed among all the three groups.(table 4)

Table 3: Comparison of outcomes according to Flynn's criteria

Variables	Group A	Group B	Group C
Outcomes			
excellent	33 (73.3%)	24 (53.3%)	22 (48.9%)
Good	11(24.4%),	19 (42.2%)	21 (46.7%)
Fair	1 (2.2%)	2 (4.4%)	2 (4.4%)
Total	45	45	45

DISCUSSION

Humeral supercondylar fractures are the most common type of elbow fracture in children. It is a distal humerus metaphysis that has been fractured. [16] Two percutaneous decreases in diameter For children with supracondylar fractures of the humerus, the Kirschner wire fixation approach is simple, safe, and inexpensive. There are two ways to position the K-wires. There are two types of pinching: lateral and cross. Orthopedic literature is littered with arguments on the best way to place pins. Due to the decrease in radial pulse while hyperflexing the elbow beyond 120o, closed reduction and casting of type III fractures might be problematic because of the necessity to hyperflex the elbow beyond 120o to maintain reduction. [17] Because the triceps muscle does not provide the necessary support, a failure to do so increases the danger of losing the decrease. [18] Because of this, the surgical treatment of Gartlandtype III supracondylar fractures in children is recommended.

In current study 135 patients of both genders had supracondylar humerus fracture were presented. Patients were aged between 3-12 years. Patients were categorized into three equal groups, group A had 45 patients and received lateral approach, group B had 45 patients and received medial approach and group C received posterior approach with 45 cases. There were 90 (66.7%) males (30 in each group and 45 (33.3%) females (15 in each group). IN group A mean age was 6.88±5.45 years, mean age in group B was 7.11±5.33 years and in group C mean age was 7.17±5.66 years. Sports 85 (62.9%) was the most common cause of fracture followed by traffic accidents 30 (22.2%) and the rest were 20 (14.8%) fall from the height. Our results were comparable to the studies conducted in past.[19,20] Mean surgical time in group A was 30.27±2.16 minutes, in group B mean time was 33.14±3.35 minutes and in group C mean time was 33.78±4.65 minutes. Left side was the most common effected side among all groups.

In our study mean shaft condylar Angle in group A was 41.5±6.3, in group B was 41.8±1.9 and in group C was 40.1±3.8 respectively (P>0.05). Mean Bauman angle in group A was 18.8±6.11, group B was 19.4±7.5 and in group C 20.4±5.3 with (P>0.05). According to Flynn's criteria, excellent outcomes were observed in 33 (73.3%) in LA group, 24 (53.3%) in MA group and 22 (48.9%) in PA group, good results were observed in 11(24.4%),

19 (42.2%) and 21 (46.7%), fair outcomes in 1 (2.2%), 2 (4.4%) and 2 (4.4%). In this study no any poor outcomes observed among all the three groups. These results were comparable to the previous study.[21] Kizilay et al [22] used lateral, medial, and posterior approaches to treat 11 children each. In the lateral and medial group, 100% of the children had great functional outcomes, while in the posterior group, 72% had outstanding results and 27% had good results. Open reduction can be performed using either the lateral or medial method if closed reduction fails, according to these authors. 33 patients were treated using a medial approach and 34 with a posterior approach by Sahi and Zehir[23]. The operating time for the medial route was much less than the posterior approach, although the radiological and functional outcomes were nearly identical.

Ulu dag [24] handled 25 patients with medial approach and 13 with lateral approach. The radiological and functional outcome was identical in both approaches. Among the children operated with medial approach three experienced pin tract infection and one had compartment syndrome for which fasciotomy was done. Eren and Ozkut[25]treated 20 children with lateral approach and 20 with medial approach. Post surgical assessment was done at 19.8 months. Excellent functional result was seen in 90 percent ,excellent in 5 percent and fair 5 percent children treated with lateral technique. On the basis of our experience, the lateral technique for supracondylar fracture was superior to the medial or posterior approaches in terms of radiological and functional outcome in our patients. However, there was no statistically significant difference between the two groups. The lateral approach may be preferred by the surgeon since it requires less operational time and has a lower complication rate.

CONCLUSION

As a result of this research, we have concluded that the lateral technique for supracondylar fractures is superior to the medial or posterior approaches in terms of radiological and functional results. However, there was no statistically significant difference between the three groups.

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