

## ORIGINAL ARTICLE

# Compare the Functional Outcomes of Closed Reduction and Percutaneous Cross Pinning versus Lateral Pinning in Supracondylar Fracture of Humerus in Children

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## ABSTRACT

**Objective:** To determine results of treating supracondylar fracture of the humerus in children using percutaneous cross pinning versus two lateral pinning.

**Study Design:** Prospective study

**Place and Duration of Study:** Department of Orthopaedics, King Abdullah Teaching Hospital Mansehra from 1<sup>st</sup> November 2020 to 30<sup>th</sup> April 2021

**Methodology:** Eighty four patients of both genders were enrolled. Baseline demographic details of patient's age, sex and body mass index were recorded after taking consent. Patients aged between 2-14years were included. Children with supracondylar humerus fractures were enrolled and divided equally into 2-groups. Group I had 42 patients and received percutaneous cross pinning technique and group II had 42 patients underwent lateral pinning. Radiological and functional results were assessed by Flynn's criteria among both groups and frequency of complications was also observed.

**Results:** There were 50 (59.5%) males (25 in each group) and 34 (40.5%) were females (17 in each group. Mean age of the patients in group I was 5.14±9.88 years and in group II mean age was 6.14±8.35 years. Sports 60 (71.43%) was the most common cause of fracture followed by traffic accidents 17 (20.24%) and the rest were 7 (8.3%) fall from the height. Mean surgical time in group I was 30.42±6.09 minutes while in group II mean time was 34.24±2.16 minutes. Mean radiation time in group I was 3.98±9.44 sec and in group II radiation time was 2.11±1.1sec. According Flynn's criteria excellent results in group I were found in 25 (59.5%) cases, good results in 12 (28.6%) and fair results found in 5 (11.9%) while in group II excellent results were found in 23 (54.8%), good results in 15 (35.7%) and fair results in 4 (9.5%). Significantly no difference in outcomes was observed among both groups.

**Conclusion:** Both methods of treatment of supracondylar fractures of humerus are safe and successful however less operative and high time of radiation in cross percutaneous pinning compared to two lateral pinning has been found.

**Keywords:** Percutaneous cross pinning, Two lateral pinning, Supracondylar humerus fracture

## INTRODUCTION

Supracondylar fracture of humerus is the most common elbow injury in children and represent about 60% of all elbow injuries<sup>1,2</sup> and about 3% of all child fractures.<sup>3,4</sup> The average age group of patients is 7/2 years.<sup>5</sup> In the first decade of life, these fractures reach their highest.<sup>6</sup> Afterwards the incidence drops considerably.<sup>7</sup>

Supracondylar humeral fracture occurs owing to fall with an extended elbow.<sup>8</sup> In more than 95 percent of fracture is of extension type and in less than 5 percent flexion type. These fractures are classed as non-displaced fractures (type I), partially displaced fractures with intact reverse cortex (type II) and totally displaced fractures according to the criteria of Gartland (type III).<sup>9</sup> Fully displaced (Type III) fractures were associated with neurovascular injuries. Malunion, elbow rigidity, iatrogenic neurovascular injury and compartmental syndrome can complicate treatment.<sup>10</sup>

Various therapy options have been described including: flexion casting, extension casting, traction, closed reduction and percutaneous pinching with the Kirschner wires, and open reduction internal fixation. The preferred method is closed reducing and percutaneous

pinning. Emergency treatment was recommended to avoid vascular compromise and compartment syndrome.<sup>11</sup> Open reduction is done in irreducible fractures, vascular compromise and open injury.<sup>12</sup> The recommended method of percutaneous pin placement is different among the authors.<sup>13</sup> The inherent instability, the difficulty in achieving reduction, and the potential for loss of movement through a prolonged elbow immobilization make surgical treatment imperative.<sup>14</sup>

This study aims to determine treatment results in children between percutaneous cross pins and two lateral pins of the close supracondylar fracture of the humerus.

## MATERIALS AND METHODS

This prospective study was conducted at Department of Orthopaedics, King Abdullah Teaching Hospital Mansehra from 1<sup>st</sup> November 2020 to 30<sup>th</sup> April 2021 and consists of 84 patients. Patients age, sex and body mass index were calculated after taking informed consent. Patients who had open fractures, unfit for anaesthesia, previous fracture on the same elbow those who did not gave written consent were excluded. Patients aged 2-14 years who had supracondylar humerus fractures were enrolled and divided

equally into 2-groups. Group I had 42 patients and received percutaneous cross pinning technique and group II had 42 patients underwent for lateral pinning. Radiological and functional results were assessed by Flynn's criteria among both groups, frequency of complications was also observed. Categorical variables were assessed by frequency and percentage and descriptive variables were calculated by standard deviation. Data was analyzed by SPSS 23.0 version.

**RESULTS**

There were 50 (59.5%) males (25 in each group) and 34 (40.5%) were females (17 in each group. Mean age of the patients in group I was 5.14±9.88 years and in group II mean age was 6.14±8.35 years. Sports 60 (71.43%) was the most common cause of fracture followed by traffic accidents 17 (20.24%) and the rest were 7 (8.3 %) fall from the height (Table 1).

Mean surgical time in group I was 30.42±6.09 minutes while in group II mean time was 34.24±2.16 minutes. Mean radiation time in group I was 3.98±9.44 sec and in group II radiation time was 2.11±1.1 sec. Left side was the most common effected side among both groups, in group I was 28 (66.7%) and in group II was 24 [57.14%] (Table 2).

According Flynn's criteria excellent results in group I were found in 25 (59.5%) cases, good results in 12 (28.6%) and fair results found in 5 (11.9%) while in group II excellent results were found in 23 (54.8%), good results in 15 (35.7%) and fair results in 4 (9.5%) [Table 3].

Table 1: Baseline details of enrolled cases (n=84)

Variable	Group I	Group II
Mean age	5.14±9.88	6.14±8.35
Gender		
Male	25 (29.8%)	25 (29.8%)
Female	17 (20.23%)	17 (20.23%)
Cause of Fracture		
Sports	30 (38.33%)	30 (36.67%)
RTA	8 (8.33%)	9 (8.33%)
Fall from height	4 (2.33%)	3 (5%)

Table 2: Comparison of operative and radiation of time among both groups with effected sides

Variable	Group I	Group II
Mean operative time (min)	30.42±6.09	34.24±2.16
Mean Radiation time (sec)	3.98±9.44	2.11±1.1
Effected Side		
Left	28 (66.7%)	24 (57.14%)
Right	14 (33.3%)	18 (42.86%)

Table 3: Post-operatively outcomes according to Flynn's criteria

Outcome	Group I	Group II
Excellent	25 (59.5%)	12 (54.8%)
Good	12 (28.6%)	15 (35.7%)
Fair	5 (11.9%)	4 (9.5%)

Table 4: Frequency of complications

Complication	Group I	Group II
Superficial infection	5 (10%)	2 (4.8%)
Pin loosening	3 (6.7%)	2 (4.8%)
Nerve neuropraxia	1 (2.4%)	4 (10%)

Most common complication in group I was superficial infection 5 (11.9%) followed by pin loosening 3 (7.14%) and

ulnar nerve neuropraxia found in 1 (2.4%) but in group II ulnar nerve neuropraxia was the most common complication found in 4 (9.5%) followed by superficial infection and pin loosening in 2 [4.8%] (Table 4).

**DISCUSSION**

Supracondylar humerus fractures have long been one of the most common and difficult fractures among pediatric age groups. Anatomical reduction and steady internal fixation are the main goals of the treatment. During the initial evaluation of each patient, thorough clinical examination with proper evaluation is necessary. The gold standard in the therapy of these injuries was closed reduction with K-wire fixation. The benefit of K-wires is the convenience of usage, the lower costs and less hospitalized stay.<sup>15,16</sup>

Total eighty four patients aged between 2-14 years were treated. 59.5% patients were males and the rest 40.5% were females. Patients were equally divided into two groups. Mean age of the patients in group I (cross pinning) was 5.14±9.88years and in group II (lateral pinning) mean age were 6.14±8.35years. These findings were comparable to the previous studies.<sup>17,18</sup> We found that sports 60 (71.43%) was the most common cause of fracture followed by traffic accidents 17 (20.24%) and the rest were 7 (8.3 %) fall from the height.<sup>19,20</sup>

Mean surgical time in group I was 30.42±6.09 minutes while in group II mean time was 34.24±2.16 minutes. Mean radiation time in group I was 3.98±9.44 sec and in group II radiation time was 2.11±1.1 sec. Left side was the most common effected side among both groups, in group I was 28 (66.7%) and in group II was 24 (57.14%).<sup>21</sup> In the present study, results were assessed according to Flynn's criteria, in group I excellent results in group I were found in 25 (59.5%) cases, good results in 12 (28.6%) and fair results found in 5 (11.9%) while in group II excellent results were found in 23 (54.8%), good results in 15 (35.7%) and fair results in 4 (9.5%). There was no significant difference in outcomes among both groups. These results are similar to some prior researches which showed effective and safe results of both cross-pinning as well as two lateral pinning.<sup>22,23</sup> Rijal and Pandey<sup>24</sup> have achieved 82% good results and 18% good results in cross-sectional case pinning and 71% good results and 29% good results in lateral case pinning. In their study, Ariño et al<sup>25</sup> revealed that 69.3% were good, 15.3% were good and 14.8% fair, while 0.5% showed bad outcomes. Raffi et al<sup>26</sup> have reported 72% positive findings and 28% good lateral results in their experiment.

Most common complication in group I was superficial infection 5 (11.9%) followed by pin loosening 3 (7.14%) and ulnar nerve neuropraxia found in 1 (2.4%) but in group II ulnar nerve neuropraxia was the most common complication found in 4 (9.5%) followed by superficial infection and pin loosening (4.8%) was assess in our study.<sup>27</sup> Pirone et al<sup>28</sup> also experienced reduced pin infections, there were (5%) and (1%) less pin tract infections than our studies. We conclude that fixation of supracondylar humerus fracture Gartland type II and III may be done using percutaneous cross or lateral pinning in children, both methods are safe and effective. The safety

and efficacy of lateral pinning and cross pinning were therefore equally good in our investigation.

## CONCLUSION

Both methods of closed reduction and internal fixation for the treatment of supracondylar fractures of humerus are safe and effective, however less operative and high time of radiation in percutaneous cross pinning compared to two lateral pinning has been found.

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