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Percutaneous pinning versus open reduction k wire fixation in Gartland type iii supracondylar fracture of humerus in children

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Abstract

Background: In children, Supracondylar humeral fractures are regarded to be the second most common fracture. Supracondylar fractures can occasionally be one of the most difficult fractures to treat. Various treatment methods are available for this fracture, depending on its kind and associated conditions.

Objective: The aim of this study was to investigate the efficacy of open reduction K wire fixation and percutaneous pinning for children with Gartland type iii supracondylar humerus fractures.

Material and method: The current prospective study was conducted at the department of the Orthopedic Surgery Unit 2, of the Bolan Medical Complex Hospital, Quetta from January 1, 2022 to 31, December, 2023 after taking permission from the ethical board of the institute. A total of 88 children of both gender and different age groups (2 to 13 years old) were enrolled. The participants of the study were classified in to two groups. 44 underwent percutaneous pinning using an image intensifier and 44 had open reduction. At 2, 4, 8, and 12 weeks, both groups were evaluated clinically for function improvement and radiographically for fracture union. The efficacy of both techniques was evaluated using the Flynn grading system. Data was analyzed using SPSS version 23. The two methods' results were compared using the Chi-square test. $P < 0.05$ was regarded significant.

Results: A total of 88 individuals with Gartland type iii humerus fractures were included in this study, 44 in each group. Out of which 22(22.7%) were females and 68 (77.27%) were males. 34(77.2%) of the children in the percutaneous pinning group had excellent functional results, 8(18.1%) had good

functional outcomes, and 2(4.5%) had fair functional outcomes. 28 (63.3%) of the children in the open reduction group had outstanding functional results, 11 (25%) had good out comes 3 (6.8%) had fair and 2 (4.5%) had poor outcomes ($p > 0.05$). Hospital stay, surgical complications, intentional effects, and mean time for radiological union did not differ between the groups ($p>0.05$).
Conclusion: This study concluded that treating children with Gartland type iii supracondylar fractures of the humerus, percutaneous pinning is a safer and more effective technique than open reduction with K wire fixation
Key words: Percutaneous pinning; Open reduction; Gartland type iii supracondylar fracture; Humerus in children

Introduction

Supracondylar humeral fractures are regarded to be the second most common fracture in children.[1] About 55 to 75 percent of all elbow fractures are the result of this type of fracture.[2] A fall on a hand extended is the most common cause of them. Compared to the flexion type, the extension type is more common (97.7%).[3] Moreover, Gartland classifies extension types according to the extent of distal fragment displacement.[4] 85% of children between the ages of 4 to 11 years have Gartland type 3 supracondylar humerus fractures, which have an incidence of 16.7% .[5] It is more likely to affect men. These fractures have the potential to result in significant morbidity and several other effects.[6] Since Hippocrates, treating elbow fractures in children has proven to be challenging for surgeons.[7] Supracondylar fractures can occasionally be one of the most difficult fractures to treat.[8] Various treatment methods are available for this fracture, depending on its kind, associated conditions, edema, and displacement. Although closed treatment was recommended by some surgeons, it was ultimately shown to be useless.[9-10] A study reported that preferred method for treating children's Gartland type iii supracondyler humeral fractures is percutaneous pinning as it is safer and more successful than open reduction with K wire fixation.[11] The use of open or closed reduction for treating pediatric supracondylar fractures is up for debate. Therefore, the purpose of this study was to compare the efficacy of open reduction K wire fixation and percutaneous pinning for children with Gartland type iii supracondylar humerus fractures.

Material and method

The current prospective study was conducted at the department of the Orthopedic Surgery Unit 2, of the Bolan Medical Complex Hospital, Quetta from January 1, 2022 to 31, December, 2023. A total of 88 children of both gender and different age groups (2 to 13 years old) were enrolled while children with cancer, pneumonia, numerous fractures, open fractures, and systemic illnesses were excluded. The participants of the study were classified in to two groups .44 underwent percutaneous pinning using an image intensifier and 44 had open reduction. The ulna nerve was stabilized in every open reduction case using the posterior triceps splitting technique. This was accomplished with the arm resting on an armrest and the forearm dangling. At 2, 4, 8, and 12 weeks, both groups were evaluated clinically for function improvement and radiographically for fracture union. The efficacy of both techniques was evaluated using the Flynn grading system. Data was analyzed using SPSS version 23. The two methods' results were compared using the Chi-square test. $P < 0.05$ was regarded significant.

Results

A total of 88 individuals with Gartland type iii humerus fractures were included in this study, 44 in each group. Out of which 22(22.7%) were females and 68 (77.27%) were males .Major features of the study population is presented in **table 1**. 34(77.2%) of the children in the percutaneous pinning group had excellent functional results, 8(18.1%) had good functional outcomes, and 2(4.5%) had fair functional outcomes. 28 (63.3%) of the children in the open reduction group had outstanding functional results, 11 (25%) had good functional outcomes 3 (6.8%) had fair and 2 (4.5%) had poor outcomes ($p > 0.05$).

Hospital stay, surgical complications, intentional effects, and mean time for radiological union did not differ between the groups (p>0.05). **Table 2.**

Table 1.Demographic features of the study population

Characteristics	Open reduction group	Percutaneous Pinning Group
Frequency of participants	44	44
Mean STD	7.3 ± 1.23	7.6 ± 0.34
Sex		
Female	9(20.45%)	11(25%)
Male	33(75%)	35(79.54%)
Effected side		
Left	18(40.9%)	20(45.45%)
Right	26(59%)	24(54.5%)
Mean presentation in days	1.5 ± 0.77	1.6 ± 1.03

Table 2: Comparison of efficiency of two techniques in both groups

Variable	**Category**	Percutaneous Pinning	**Open Reduction**	**Value of P**
Hospital mean stay	**Mean STD**	**3 ± 0.97**	**5 ± 0.64**	**0.232**
Complication of surgical procedure				
Nerve injury		**4(9%)**	**0**	**0.071**
Pin tact (infection)		**8(18.1%)**	**11(25%)**	
Superficial infection		**zero**	**13(29.54%)**	
Displacement of fracture		**zero**	**zero**	
Vascular system injury		**zero**	**zero**	
Anesthesia		**zero**	**zero**	
Functional consequences ((Flynn's criteria)				
Poor		**0**	**2(4.5%)**	**0.619**
Fair		**2(4.5%)**	**3(6.8%)**	
Good		**8(18.1%)**	**11(25%)**	
Excellent		**34(77.2%)**	**28(63.63%)**	
Duration of radiological union in weeks	**Mean STD**	**4.12 ± 0.77**	**4.67 ± 1.17**	**0.492**

Discussion

A total of 88 individuals with Gartland type iii humerus fractures were included in this study, 44 in each group. In this study 68 (77.27%) were males. Similar results were obtained in previous Turkish studies that showed a greater percentage of males (73.4%) with supracondylar Gartland type iii humeral fractures than females.[12] Of the patients in the group that underwent percutaneous pinning, 26 (59%) had right humeral involvement. Among children, the right humerus was implicated in 24 (54.5%) of the cases

while the left humerus in 20 (45.45%) of the cases, with the left humerus being implicated in 18 (40.9%) of the cases. According to a previous study carried out in Pakistan, children's left humerus was more engaged (69.1%) than their right humerus. The data did not support this finding.[13] In our study For both the open reduction and percutaneous pinning groups, the average presentation time was 1.5 ± 0.77 days & 1.6 ± 1.03 days, respectively. A study conducted by Zulfiqar et al., also showed similar findings. Patients who received percutaneous pinning treatment were discharged from the hospital earlier than those who received open reduction K wire fixation .[14] One possible explanation for this might be the small sample size. Our findings are consistent with another study that found participants treated with percutaneous pinning as opposed to open reductions K wire fixation had been released earlier.[15]Operational problems, including nerve injury and pin tract infections, were seen in 4 (9%), and 8 (18.1%), of the percutaneous pinned group in the current investigation. On the other hand, 13 (29.54%) and 11 (25%), respectively, of the open reduction group experienced surgical complications such superficial infections and pin tract infections ($p > 0.05$). Compared to closed reduction, the surgical site is more exposed to germs in open incisions, which results in a greater risk of bacterial infection. Our investigation's outcomes were comparable to those of a previous Spanish study.[16] According to a previous study conducted in Pakistan, 16% of individuals who had percutaneous pinning developed a pin tract infection.[17] The present study revealed that 34(77.2%) of the children in the percutaneous pinning group had excellent functional results, 8(18.1%) had good functional outcomes, and 2(4.5%) had fair functional outcomes. 28 (63.3%) of the children in the open reduction group had outstanding functional results, 11 (25%) had good functional outcomes 3 (6.8%) had fair and 2 (4.5%) had poor outcomes ($p > 0.05$). These results are similar to those of a previous study.[18] The average duration for the radiographic union was 4.66 ± 1.16 weeks for the open reduction group and 4.12 ± 0.77 weeks for the percutaneous pinning category ($p > 0.05$). These findings are consistent with those of a previous study.[19] The main drawbacks of our study are the limited sample size. To get better results, a long-term study with a large sample size must be carried out.

Conclusion

This study concluded that treating children with Gartland type iii supracondylar fractures of the humerus, percutaneous pinning is a safer and more effective technique than open reduction with K wire fixation, despite the fact that there was no statistically significant difference in the two treatment approaches' efficacy. The reason for this is that there are fewer issues, shorter hospital stays, and less obvious surgical scars.

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