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ORIGINAL ARTICLE

Outcomes of Percutaneous Cross K-Wire Fixation for the Management of Supracondylar Displaced Fractures of Elbow in Children

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ABSTRACT

Background: It is estimated that about 16–17 percent of all fractures in pediatric patients are supra-condylar fractures of the elbow. Different techniques are used for the management of supracondylar displaced fractures of elbow in children.

Objective: To find out the outcomes of percutaneous cross- K-wire fixation for the management of supracondylar displaced fractures of elbow in children

Methodology: This descriptive cross sectional study was carried out at Orthopedic Department of Khyber Teaching Hospital Peshawar for duration of one year from June 2021 to July 2022. A total of 80 patients were included in the current study. All the patients were followed for up to six months. At last follow-up, all patients were evaluated using Flynn's criteria. All the data analysis was done by using IBM SPSS version 23.

Results: On the basis of Flynn's criteria, excellent results were observed in 54 (67.5%) patients, good results in 20 (25%) patients, fair results in 4 (5%) patients while poor results were observed in 2 (2.5%). Based on the post-operative associated problems, pin-tract infections were observed in 7 (8.75%) patients, cubitus varus deformity was observed in 2 (2.5%) and temporary ulnar nerve deficit was observed in 5 (6.25%) patients.

Conclusion: Our study concludes that in children, type-II & III supra-condylar displaced fracture of elbow can be managed easily and effectively with a low rate of complications.

Keywords: Percutaneous cross- K-wire fixation; Supracondylar displaced fractures; Elbow

INTRODUCTION

It is estimated that about 16–17 percent of all fractures in pediatric patients are supra-condylar fractures of the elbow [1]. These fractures often occur in children between the ages of 5-8 years [2]. There are two different types of supra-condylar fractures of the humerus. Extension supra-condylar fractures accounts for 98 percent of all cases whereas flexion supra-condylar fractures accounts for just 2 percent of all cases [3, 4]. The most frequent and typical cause of extension-type supra-condylar fractures is a fall onto an extended hand. The most frequent kind of supra-condylar fracture is a flexion fracture, which is triggered by a direct fall on the elbow's angle [5]. In accordance with the displacement of the fracture, extension-type of supracondylar fractures are further grouped into three categories [6]. In type-I supracondylar fractures, there is no or minimum fracture displacement. In type-II supracondylar fractures, there is considerable fracture displacement with an intact posterior cortex. In type-III supracondylar fractures, there is no connection between the distal and proximal fragments with total fracture displacement. Patients who arrive to the emergency room with an elbow injury should have their care guided by the ATLS guidelines. It is important to conduct a thorough examination of the patient to rule out the possibility of additional injuries and treatment should be planned after this. Non-operative treatment using a backslab is an option for the safe management of type-1 extension type fractures. There are many ways to treat Type-II extension type fractures, such as placement of a back slab and closed reduction, closed reduction percutaneous pinning, traction and open reduction and cross K-wire fixation which is rarely used [7, 8].

The Gartland classification is the cornerstone of the current therapeutic strategy for this fracture. There was a 5% frequency of cubitus varus deformity following therapy, but Arino et al. observed roughly 21%, and 15% of patients managed with medial and lateral pins had an ulnar nerve deficit, according to chai [1, 9, 10]. There are several procedures that have been reported to be used for their treatment but majority of these procedures have a high risk of complications [7, 11, 12].

The most sophisticated method for treating all varieties of supra-condylar humerus fractures is closed reduction and percutaneous pinning [13, 14]. It is sometimes not feasible to perform a closed reduction and percutaneous pinning due to instability and comminution of fracture or early calus development. Due to unstable nature of type-III supra-condylar fractures, it should be further stabilised by two crossed K wires [15]. This study was piloted to determine the outcomes of percutaneous cross- K-wire fixation for the management of supracondylar displaced fractures of elbow in children**.**

MATERIALS AND METHODS

This descriptive cross sectional study was carried out at Orthopedic Department of Khyber Teaching Hospital Peshawar. The study duration was one year from June 2021 to July 2022. The study was approved from the ethical and research committee of the hospital. All the children of both the sex and age 2.5-12 years presenting with type-II and type-III supra-condylar fractures of elbow were included. All the children not in the age range of 2.5-12 years, old fracture of >7, extensive swelling of soft tissue, children having open fractures and children having neurovascular problems. A total of 80 patients were included in the current study. Complete history and clinical examination as done for all the participants. Informed consent was taken from the guardian of all children of the enrolled children. For pain relief and stabilization all the patients were positioned in elbow back slab. After close reduction, all the fractures were fixed by using two crossed K-wires. All the patients were followed for up to six months. At third week, sixth week and 12th week, X-rays were done after surgery for all the patients. All the information like formation of callus and displacement was documented on a pre-designed Performa. Physiotherapy was advised for all the participants after healing. To validate fracture reduction and identify the entrance places for K-wires, image intensifier was utilized. Based on the patient's age, K-wires of the proper size were employed. The opposite cortex was involved after one wire was inserted from the lateral side and one wire was inserted from the medial side. All patients had a back slab that went above the elbow. The operated limb was maintained elevated for at most one day after surgery. After two to three weeks, back slabs were taken out, and two to three more weeks, pins were taken out. After the pins were removed, X-rays were performed, and patients were recommended for physiotherapy. Exercises for flexion and extension were suggested to the patients.

At last follow-up, all patients were evaluated using Flynn's criteria. All the data analysis was done by using IBM SPSS version 23. Qualitative and quantitative variables were documented in the form of mean (standard deviation) and frequency (percentages).

RESULTS

Totally 80 patients were enrolled in this study. There were 52 (65%) males children whereas females children were 28 (35%) with the mean (sd) age of 5.9 (1.19) years. (Figure 1) Based on side of elbow involved, in 28 (35%) patients, right side elbow was involved while in 52 (65%) left elbow was involved. (Figure 2) On the basis of Flynn's criteria, excellent results were observed in 54 (67.5%) patients, good results in 20 (25%) patients, fair results in 4 (5%) patients while poor results were observed in 2 (2.5%). (Figure 3) Based on the post-operative associated problems, pin-tract infections were observed in 7 (8.75%) patients, cubitus varus deformity was observed in 2 (2.5%) and temporary ulnar nerve deficit was observed in 5 (6.25%) patients. (Figure 4) Full range of motion was observed amongst all our participants after six month.

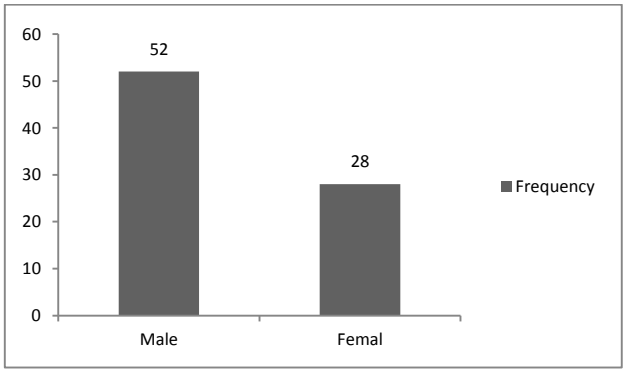

Figure 1: Gender wise distribution of patients

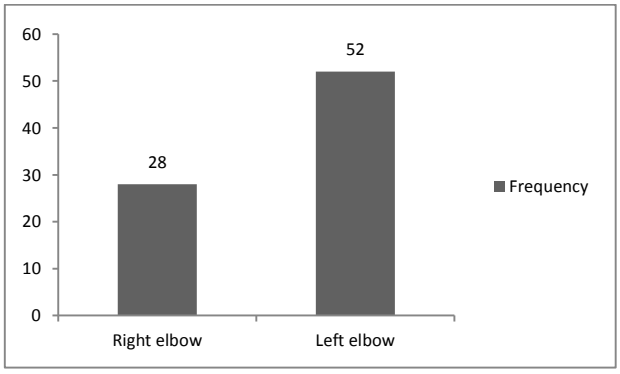

Figure 2: Distribution of patients based on side of elbow involved

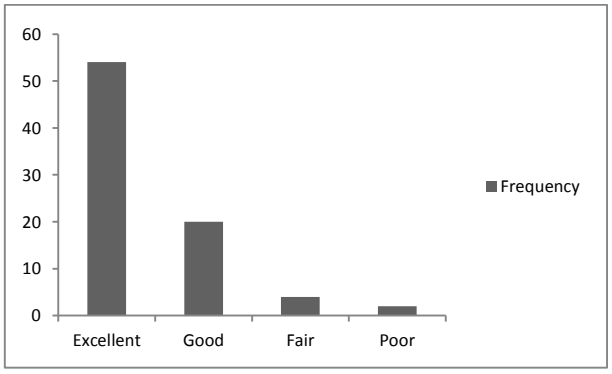

Figure 3: Outcomes on the basis of Flynn's criteria

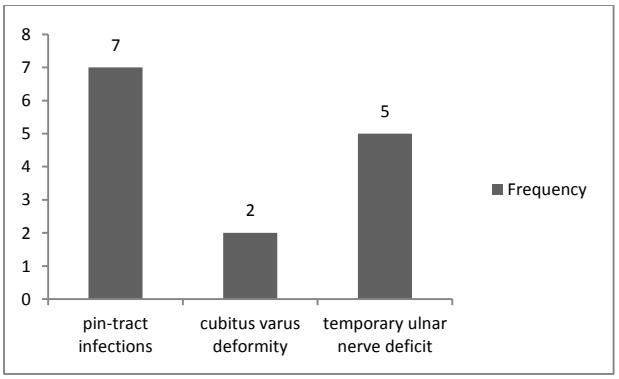

Figure 4: Post-operative associated problems in enrolled patients

DISCUSSION

In children, supra-condylar fractures of the elbow are quite prevalent [16]. Supracondylar fractures of type III are very unstable and must be treated surgically [17, 18]. Type-II & Type-III supracondylar elbow fractures are often treated with closed reduction and K-wire fixation [19].

In our study, on the basis of Flynn's criteria, excellent results were observed in 54 (67.5%) patients, good results in 20 (25%) patients, fair results in 4 (5%) patients while poor results were observed in 2 (2.5%). In accordance with our study, a previous study done by Kallio et al. reported excellent outcomes in 90% patients while 10% patients were observed with poor outcomes based on Flynn's criteria [19]. Another study carried out by Eberhardt et al. reported excellent response in 93% patients, good response was observed in 7% and poor response was not observed in any patients [19]. A current study from Pakistan carried out by Awal Hakeem et al. reported excellent, good, fair and poor outcomes in 70%, 24%, 4% and 2% respectively based on Flynn's criteria [20].

In our study, full range of motion was observed amongst all our participants after six month. In accordance with our study, another study carried out by Shannon et al. reported full range of elbow motion in all of the cases [21]. Comparable results were also reported by another study [20].

In the current study, based on the post-operative associated problems, pin-tract infections were observed in 7 (8.75%) patients, cubitus varus deformity was observed in 2 (2.5%) and temporary ulnar nerve deficit was observed in 5 (6.25%) patients. Other studies reported high frequency of pin-tract infections as post-operative problem after percutaneous cross- K-wire fixation of supracondylar displaced fractures of elbow in children [22, 23]. Almost similar results were reported by a current study done in Pakistan [20]. Another study reported pin-tract infections in 30% cases [11]. An earlier study done by El-Adl et al., reported cubitus varus deformity in 8.6% cases [24]. Other studies reported incidence of temporary ulnar nerve deficit in 2-8% cases [25]. The major drawback of our study was single center and small sample size. Other studies on large sample size by including multiple centers should be carried out for better results.

CONCLUSION

Our study concludes that in children, type-II & III supra-condylar displaced fracture of elbow can be managed easily and effectively with a low rate of complications.

REFERENCES

1. Beaty J. Supracondylar fractures of the distal humerus. Fractures in children. 2001:610-6.
2. Jlidi M, Bouaicha W, Lamouchi M, Sbaihi S, Zaier A, Daas S. Anterior trans-olecranial dislocation of the elbow in children: A case report of an unusual form of elbow dislocation and review of literature. Int J Surg Case Rep. 2022;95:107178.

3. Bajwa G. Evaluation of results of medical approach following operative treatment of supracondylar fractures in children: a study of 60 consecutive cases. J Pak Orthop Assoc. 2009;21(1):1-5.
4. Mahan ST, May CD, Kocher MS. Operative management of displaced flexion supracondylar humerus fractures in children. Journal of Pediatric Orthopaedics. 2007;27(5):551-6.
5. Anjum R, Sharma V, Jindal R, Singh TP, Rathee N. Epidemiologic pattern of paediatric supracondylar fractures of humerus in a teaching hospital of rural India: A prospective study of 263 cases. Chinese Journal of Traumatology. 2017;20(3):158-60.doi:https://doi.org/10.1016/j.cjtee.2016.10.007.
6. Brubacher JW, Dodds SD. Pediatric supracondylar fractures of the distal humerus. Curr Rev Musculoskelet Med. 2008;1(3):190-6.
7. Mazda K, Boggione C, Fitoussi F, Penneçot G. Systematic pinning of displaced extension-type supracondylar fractures of the humerus in children: a prospective study of 116 consecutive patients. The Journal of bone and joint surgery British volume. 2001;83(6):888-93.
8. Roessingh dB, Reinberg. Open or closed pinning for distal humerus fractures in children? Swiss Surg. 2003;9(2):76-81.
9. Flynn JC, Matthews JG, Benoit RL. Blind pinning of displaced supracondylar fractures of the humerus in children: sixteen YEARS'EXPERIENCE with long-term follow-up. JBJS. 1974;56(2):263-72.
10. Chai K. A Prospective study on supracondylar fractures of the humerus in children: comparing the results of closed manipulation and plaster cast with closed manipulation and percutaneous cross K wiring for the treatment of displaced fractures. 2000.
11. Shannon FJ, Mohan P, Chacko J, D'Souza LG. "Dorgan's" percutaneous lateral cross-wiring of supracondylar fractures of the humerus in children. Journal of Pediatric Orthopaedics. 2004;24(4):376-9.
12. Gordon JE, Patton CM, Luhmann SJ, Bassett GS, Schoenecker PL. Fracture stability after pinning of displaced supracondylar distal humerus fractures in children. Journal of Pediatric Orthopaedics. 2001;21(3):313-8.
13. Sibinski M, Sharma H, Sherlock DA. Lateral versus crossed wire fixation for displaced extension supracondylar humeral fractures in children. Injury. 2006;37(10):961-5.
14. Ariño VL, Lluch EE, Ramirez AM, Ferrer J, Rodriguez L, Baixauli F. Percutaneous fixation of supracondylar fractures of the humerus in children. The Journal of bone and joint surgery American volume. 1977;59(7):914-6.
15. Kohler R, Ducret H, Willemen L, LORGE F. Cubitus varus post-traumatique. Cahiers d'enseignement de la SOFCOT. 2000;72:210-21.
16. Yadav U, Singhal R, Tonk G, Aggarwal T, Verma A. Crossed pin fixation in displaced supracondylar humerus fractures in children. Indian J Orthop. 2004;38(3):166-9.
17. Boparai R, Sharma R, Kapila R, Pandher D, Diwan R. Supracondylar fractures in children-closed reduction vs open reduction. Indian J Orthop. 2006;40(2):103-7.
18. Labelle H, Bunnell WP, Duhaime M, Poitras BI. Cubitus varus deformity following supracondylar fractures of the humerus in children. J Pediatr Orthop. 1982;2(5):539-46.
19. Eberhardt O, Fernandez F, Ilchmann T, Parsch K. Cross pinning of supracondylar fractures from a lateral approach. Stabilization achieved with safety. J Child Orthop. 2007;1(2):127-33.
20. Ali A. Supracondylar displaced fractures of elbow in children treated with closed reduction and percutaneous K-wire fixation. Pak J Surg. 2018;34(1):58-61.
21. Queally JM, Paramanathan N, Walsh JC, Moran CJ, Shannon FJ, D'Souza LG. Dorgan's lateral cross-wiring of supracondylar fractures of the humerus in children: A retrospective review. Injury. 2010;41(6):568-71.
22. Mehlman CT, Strub WM, Roy DR, Wall EJ, Crawford AH. The effect of surgical timing on the perioperative complications of treatment of supracondylar humeral fractures in children. JBJS. 2001;83(3):323.
23. Gupta N, Kay RM, Leitch K, Femino JD, Tolo VT, Skaggs DL. Effect of surgical delay on perioperative complications and need for open reduction in supracondylar humerus fractures in children. Journal of Pediatric Orthopaedics. 2004;24(3):245-8.
24. El-Adl WA, El-Said MA, Boghdady GW, Ali A-SM. Results of treatment of displaced supracondylar humeral fractures in children by percutaneous lateral cross-wiring technique. Strategies Trauma Limb Reconstr. 2008;3(1):1-7.
25. Brown IC, Zinar DM. Traumatic and iatrogenic neurological complications after supracondylar humerus fractures in children. J Pediatr Orthop. 1995;15(4):440-3.