

Management of Displaced lateral Condylar Fracture of the Humerus in Children with Open Reduction and Internal Fixation (ORIF)

Haque MM¹, Layla KN², Shaila KN³, Hossain MS⁴, Shamsuddin IN⁵

DOI: <https://doi.org/10.3329/jafmc.v20i1.73854>

Abstract

Background: Amongst all fractures around elbow in children second most common is the lateral condylar fracture, commonly occurring in 6-10 years age group, contributing up to 5-20% of elbow fractures. Rotated and displaced fractures obviously require proper reduction and stabilization.

Objective: For evaluation of the results of open reduction internal fixation as the main treatment option.

Methods: We observe 30 children treated with ORIF at CMH, Bogura, out of them 25 male and 5 female. 2mm or more displaced fractures were included into the study group, demographic data and radiographs were taken from February 2017 to January 2019. Average age was seven years. 25 were Milch type II and 5 Milch type I. Fractures were managed with ORIF with two smooth k-wire of 2mm in diameter.

Results: Mean time of union was 4.7 weeks, k-wire removal on 36 days, and follow up period was 16.5 months. Two (6.66%) patient suffered with superficial wound infection which was treated by oral antibiotics. One (3.33%) develop 100 loss of humeroulnar motion. Four (13.33%) develop lateral spurring followed by one (3.33%) individual developed pseudo cubitus varus deformity. There were no other complications like malunion, nonunion, AVN, deep wound infection, cubitus valgus or varus deformity. According to Hardacre et al criteria 29(96.66%) patient reached excellent final result, 1(3.33%) achieved good result.

Conclusion: For displaced lateral condylar fracture open reduction internal fixation has excellent functional outcome.

Keywords: Lateral condyle fracture, Growth plate injury, ORIF, Radiological union, Functional outcome.

Introduction

Amongst all fractures around elbow in children second most common is the lateral condylar fracture, commonly occurring in 6-10 years age group, contributing up to 5-20% of elbow fractures.¹ Diagnosis of fracture is difficult both in radiologically and clinically, as fracture extended into the articular surface there is loss of function also. If the lateral condylar physical injury is not treated adequately the result may be seen months or years later. Milch classified this fracture into 2 types. Within type I-fracture line entering medially into the capitellar trochlear groove, is true Salter harries type IV fracture which is stable. In case of type II-that is frequently seen, fracture line expands into trochlea, construct elbow instability and displacement of the condyle.² Badelon classified this fracture according to the stage of displacement into 4types that includes type I=undisplaced, type 2=displaced <2mm, type 3=displaced >2mm and type 4=total displacement.³ Treatment is required for fracture healing and to avoid pseudoarthrosis, malunion, nonunion, deformities and functional disorder. There are modalities of treatment for such type of fracture. Undisplaced and minimally displaced fracture less than 2mm, treated by long arm cast immobilization yet close observation and radiographic follow up is needed in every week. The chance of displacement of the fracture was reported from 11% to 42% in such patient.⁴ Fracture with 2mm or more displacement along with instability, ORIF will be the right option for treatment, for complet displacement and unstable lateral condylar fracture is treated nonoperatively then there is chance of complication and cosmetic deformity. Lateral condylar fracture incorporates so many complications like condylar overgrowth, cubitus varus, cubitus valgus, growth plate physis interference, tardy ulnar nerve palsy, restricted elbow movement, AVN. The aim of the present study is to assess the clinical and functional out come and complication of lateral condyle fracture of humerus treated by ORIF with Kirschner wire.

1. **Maj Md Maksudul Haque**, MBBS, MS (Ortho), Orthopaedic Surgeon, Border Guard Hospital, Satkania, Chattogram (E-mail: maksudulhaque2005@gmail.com) 2. **Dr Khushbun Nahar Layla**, MBBS, MPhil, Lecturer, Department of Physiology, Ibrahim Medical College, Dhaka 3. **Dr Khyrun Nahar Shaila**, MBBS, MD (Dermatology), Consultant of Dermatology and Venereology Department, BIHS General Hospital, Dhaka 4. **Lt Col Mohammad Shakhawat Hossain**, MBBS, MS, FACS, Classified Surgical Specialist, Border Guard Hospital, Dhaka 5. **Maj Iman Noor Shamsuddin**, MBBS, DADMS Training, AHQ, AGs Br, Medical Directorate, Dhaka.

Materials and Methods

We reviewed 30 children with displaced fracture of the lateral humeral condyle treated from February 2017 to January 2019 in CMH, Bogura. 2mm or more displaced fractures were included in the study group, their mean age was seven years (3 to 12). During this period admitted patients demographic data along with results of 30 patients were obtainable at follow up. Initial evaluation was performed in the casualty department, the fractured elbow was assessed for deformity, wound and neurovascular integrity. Routine radiographs were taken with anteroposterior, oblique and lateral views of both elbows of all the children, fracture was classified using Milch classification. Initially above elbow plaster of Paris were given and all the patients were operated within five days of injury. After anesthesia consultation, all patients of displaced lateral humeral condylar fracture were consented and listed for open reduction internal fixation with Kirschner wires (k-wire) in the operation theatre. Patient was in supine position, a single dose of intravenous prophylactic antibiotic was administered prior to anesthetic induction, after that tourniquet was applied. We used lateral Kocher incision for surgical procedure in all patient. A gentle dissection of the fracture fragment was done with minimum stripping of the soft tissue attachment to reduce the chance of AVN of fracture fragment then the fracture was identified, accurately reduced and was stabilized with two k-wires of 2mm in diameter. After closure of the wound an above elbow cast was applied in neutral position. After operation the elbow was immobilized for four to six weeks. We follow up all the patient weekly upto radiological union at the fracture site was apparent and subsequently wires were removed on outpatient department, following removal of popall patients were mobilized with rigorous physiotherapy. Radiographs were taken post operatively, at six weeks, three months and one year following operation. We write down the demographic data, result was evaluated clinically to see ROM, complications, deformity and radiographs were assessed. All were inquired about residual pain and whatever they performed daily activities and sports. The results were classified according to the criteria of Hardacre et al.⁵

Table-I: Assessment of treatment outcome of lateral humeral condyle fracture (Hardacre criteria)

Excellent	Full range of motion
	Normal carrying angle and appearance
	No symptoms
Complete healing of fracture	
Good	Efficient range of motion
	Loss of extension less than 15 degrees
	Mild and subtle deformity
	No arthritic or neurological symptoms
Complete healing of fracture	
Fair	Loss of motion to the extent of disability
	Alterations in carrying angle and Prominent deformity
	Presence of arthritic or neurological symptoms
	Presence of nonunion or avascular necrosis

Mean follow up period was 16 months (11-32 months) for assessment of cubitus varus or valgus, carrying angle detected on anteroposterior radiograph of both elbow. Data were analyzed by SPSS.

Results

At first, we diagnosed thirty patients of displaced humeral lateral condylar fracture then included in the study group. Out of them, 25 were male and 5 were female. Age ranged within 3 to 12 years and the mean age was seven years. According to the Milch classification, 5 were categorized as Milch type I and 25 as Milch II. Fracture was united radiologically within mean time 4.7 weeks (4-6 weeks), consequently k-wire removal was done on 5.1 weeks. Mean follow up period was 16.5 months (range 11-32 month). Following our management two (6.66%) patient developed superficial wound infection which was treated by oral antibiotics. One (3.33%) patient had 100 loss of humeroulnar motion. Four (13.33%) patients developed lateral condylar hypertrophy. Pseudo cubitus varus deformity developed in 1(3.33%) patient due to lateral condylar hypertrophy.

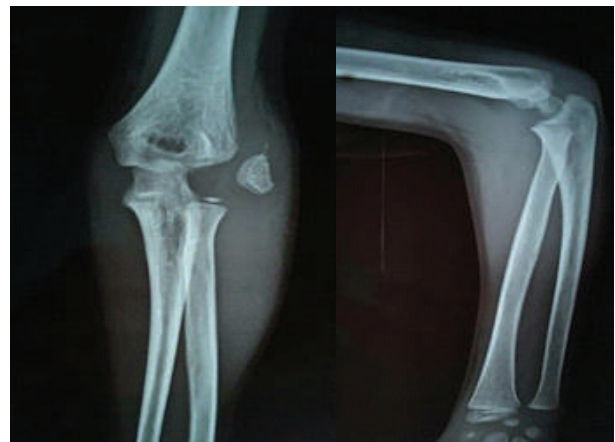


Figure-1: X ray showing fracture lateral condyle anteroposterior and lateral view of a 6 years old boy.

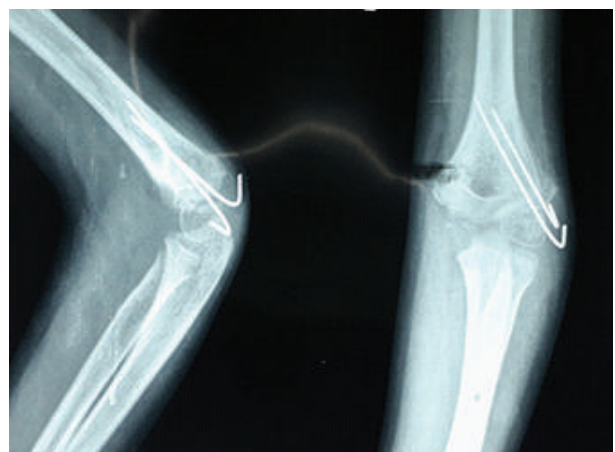


Figure-2: Postoperative x ray showing lateral condylar fracture treated by ORIF with two parallel K wire.

There were no cases of residual pain, cubitus valgus, fishtail deformity, nonunion, malunion or avascular neurosis. Full range of motion achieved in all patient finally, and were joyful, engaged in sports and daily life activities. Excellent final outcome reached in 29 patients (96.66%), 1(3.33%) obtained good result and none of them had fair result.

Discussion

Fracture lateral condyle of the humerus commonly occurs in children as a result of fall on the outstretched hand and the radial head apply valgus force to humeral condyle. As it is an intra-articular injury so anatomical reduction and fixation is mandatory to avoid some late complication. The results of this study reveal open reduction and k-wire fixation to displaced fracture of lateral humeral condyle, leading to outstanding outcome without significant complication. In literature many studies reported the effectiveness of open reduction internal fixation. In a study, Boz u et al⁶ reported 57 fracture of lateral humeral condyle managed by open reduction and pin fixation for four weeks shows excellent outcome in 78% and good outcome in 21.7%. Song et al⁷ on a study showed 63 children with lateral condyle fracture where good result was reported in 46(73%) cases, treated with operative and nonoperative technique in two groups, approved that closed reduction and internal fixation was fruitful in bulk of the cases with minimal displacement and ORIF for those fractures with more than 2mm displacement. Skak et al⁸ found cubitus varus in 3 and cubitus valgus in 6 cases from 28 child with lateral condyle fracture treatment. In this study, 29(96.66%) patients with excellent result, 1(3.33%) patient achieved good results after open reduction internal fixation. We removed k-wire after radiological union was evident and the mean time was 36days (5.1wks). Leonardo A et al⁹ in a study showed average time for radiological union and removal of k-wires was 33days (4.5weeks) that corresponds with our study. In the present study we unburied all the k-wire. Exposed wire may increase the chance of infection with the incidence report vary from 1 to 28%.¹⁰ There is advantage of k wire removal in the OPD if we keep the k-wire exposed. In these cases there were only 2(10%) had superficial wound infection but no deep infection. In a study Mc Ganogle et al¹¹ reported no justification in burying wires which required an additional general anesthesia and recommended leaving the wires outside the skin for 4 to 6 weeks. Lateral spurring (hypertrophy of lateral condyle) is a noticeable x ray finding found in children following fracture of lateral condyle of the humerus. Those who are treated surgically lateral spurring incidence 91% and 59% in case of conservatively treated patient.¹² In this series 4 cases (20%)grew lateral spurring. Thomas et al reported 40% lateral spurring.¹² As a sequel in this study single patient developed pseudo cubitus varus deformity, It was pain free,

did not affect the range of movement and daily activities which is in accordance with the published literature.^{12,13} Cubitus varus angulation is an important complication of lateral condyle fracture, deformity in most of the time begin and causes symptoms rarely and require surgical correction. In this study there were no true cubitus varus deformity, one of these patient developed 100 loss of humeroulnar motion which was gradually improving by physiotherapy. In this study, all patients achieved union within 6 weeks. There were no cases of malunion, nonunion or avascular necrosis. According to the criteria of Hardacre et al⁵, this study demonstrates 96.66% excellent final outcome and 3.33% good result. It corresponds with the study of Leonidou A et al where 96% patients achieved excellent result and 4% had good result.⁹

Conclusion

To achieve excellent functional outcome and to prevent complications, open reduction internal fixation is the right option for displaced lateral condylar fracture.

References

- Bauer AS, Bae DS, Brustowicz KA, Waters PM. Intra-articular corrective osteotomy of humeral lateral condyle malunions in children: Early clinical and radiographic results. *J Paediatric Orthop*. 2013; 33(1):20-5.
- Campbell WC, Canale TS, Betay JH. "Fractures and dislocations in children" in *Campbell's Operative Orthopaedics*, 11th ed, Mosby. 2008:1569-72.
- Badelon O, Bansahel H, Mazda K, Vie P. Fracture of the external condyle of the humerus in children. A propose of a series of 46 cases. *Rev Chir Orthop Repar Atrice Appar Mot*. 1986; 72(Suppl 2):66-9.
- Gooi SG, Chee Ek, Wong CL, Mohana R, Khoo EH, Thevarajan K. Retrospective review of kirschner wire fixation and casting for displaced lateral Condylar fracture of the humerus in children. *Malaysian Orthopedic J*. 2008; 2(2):17-20.
- Hardacre JA, Nahigian SH, Froimson AI, Brown JE. Fractures of the lateral condyle of the humerus in children. *J Bone Joint Surg*. 1971; 53:1083-95.
- Boz U, Ulusal AE, Vuruskaner H, Aydinoglu Y. Functional results of displaced lateral condyle fractures of the humerus with four weeks k-wire fixation in children. *Acta OrthopTraumatol Turc*. 2005; 39(3):193-8.
- Song KS, Kang CH, Min BW, Bae KC, Cho CH, Lee JH. Closed reduction and internal fixation of displaced unstable lateral condyle fractures of the humerus in children. *J Bone Joint Surg (Am)*. 2008; 90(12):2673-81.
- Skak SV, Olsner SD, Smaabreke A. Deformity after fracture of the lateral humeral condyle in children. *J Pediatric Orthop B*. 2001; 10(2):142-52.
- Leonidou A, Chettiar K, Graham S, Akhbari P, Antonis K. Open reduction internal fixation of lateral humeral condyle fractures in children. A series of 105 fractures from a single institution. *Strategies Trauma Limb Reconstr*. 2014; 9(2):73-8.
- De SD, Bae DS, Waters PM. Displaced humeral lateral condyle fractures in children: should we bury the pins? *J Pediatr Orthop*. 2012; 32(6):573-8.
- McGonage L, Elamin S, Wright DM. Buried or unburied k-wires for lateral condyle elbow fractures. *Ann R Coll Surg Engl*. 2012; 94(7):513-6.
- Thomas DP, Howard AW, Cole WG, Hedden DM. Three weeks of kirschner wire fixation for displaced lateral condylar fractures of the humerus in children. *J Pediatr Orthop*. 2001; 21(5):565-9.
- Pribaz JR, Bernthal NM, Wong TC, Silva M. Lateral spurring (overgrowth) after pediatric lateral condyle fractures. *J Pediatr Orthop*. 2012; 32(5):456-6.