

Outcome of Lateral Condyle Fracture of Humerus in Children Stabilized with K-Wires

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ABSTRACT

Objective: To determine the radiological and functional outcome of open reduction and internal stabilization of lateral condyle humerus fracture in children.

Methods: This study was conducted in Orthopedic unit, Mardan medical complex, Mardan with a total number of 38 patients. The study duration was from 15 March 2017 to 14 March 2019. All the children had mean age of 6.68 (range; 2-14) years including 25 male and 13 female patients. Among them, 25 patients had Milch Type II while rest had Milch Type I fracture. All the patients were operated and stabilized with k-wire added by the back slab. Plaster removed after 6 weeks and k-wires within 4-6 week. All patients were followed on 2nd, 4th, 6th and at 12th week. At last, follow up the childrens were assessed for the union, carrying angle and elbow range of motion through Hardacre criteria.

Results: All fractures united in a mean time of 4.73 weeks with a range of 4-7weeks. Outcomes were excellent in 78.98% patients, good in 18.42 % and poor in 2.63%. No major complication reported in any case.

Conclusion: Open reduction and internal stabilization with k-wire is an excellent method of fixing lateral condyle fractures in children with excellent radiological and functional results.

Keywords: Lateral condyle, k-wire fixation, open reduction, range of motion

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INTRODUCTION

The commonest elbow injury after supracondylar fracture is the lateral condyle fracture in children of 6 to 7 years old with a frequency of 13 to 18%.¹⁻⁶ Children falling on outstretched hands and varus push to the elbow or axial compression of lateral condyle with radial head sustains lateral condyle fracture.^{7,8} It is a difficult diagnosis, especially when undisplaced with minimal pain and deformity because most of the condyle is cartilaginous.⁵ It is diagnosed with clinical suspicion and localized tenderness and confirmed with X rays of the elbow i.e. anteroposterior, lateral and internal oblique.^{5,6}

Lateral condyle fractures are classified by Milch into two types depending upon fracture line and its displacement.⁵ Milch type I fracture is equivalent to Salter-Harris IV and fracture line passes through

trochleocapitellar groove crossing the ossification center of the lateral condyle.⁴ In Milch type II, fracture line passes through trochlea and is an unstable fracture with rotational and translational component.⁷

Other commonly used classifications are Badelon and Jacob.^{2,8} In Jacob type I fracture the articular surface is intact and fracture is undisplaced while type II and III fractures are displaced and displaced plus rotated respectively.²

All undisplaced fractures are managed in long posterior plaster splints with the forearm in supination and 90° elbow flexion till union for 4-6 weeks⁸ and closely observed weekly for displacement.⁵ It is a notorious fracture because of the potential complications and is known as "fracture of necessity", as correcting the malunion of lateral condyle is more difficult than correcting the malunion of supracondylar fractures in children.³ Accurate reduction and stabilization with k wires or screws is mandatory for all displaced lateral condyle fractures.⁹ The implants can be removed from 3rd to 8th week postoperatively⁹ with no much difference between early or late removal.³ The aim of each treatment

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option is to establish a union and to avoid any complications.¹⁰

The objective of our study was to determine the radiological and functional outcome of lateral condyle fractures of the humerus in children stabilized with k wires.

METHODS

We conducted our study in the department of orthopedics, Mardan medical complex, Mardan from 15 March 2017 to 14 March 2019. All children 3-13 years old of either sex, admitted through casualty or outpatient department with traumatic fracture of lateral condyle confirmed by plain x-rays were included in the study. Undisplaced fractures, open fractures, pathological fractures and fractures with associated injuries were excluded. After approval of the ethical committee, all patients with lateral condyle fractures were assessed clinically and radiologically. They were assessed clinically for swelling, tenderness, crepitus, deformity, signs of compartment syndrome, neurovascular compromise. Radiologically patients were assessed on three recommended views; Anteroposterior, lateral and oblique for categorization. All fractures were classified according to Milch classification proposed by Henry Milch.⁵

SURGICAL TECHNIQUE

After anesthetist clearance and informed consent, all children were given single prophylactic intravenous antibiotic Cefuroxime according to body weight before before inflation of pneumatic tourniquet in a supine position on the table. All surgical reduction and fixation underwent through a lateral approach. The plane of dissection was between brachioradialis and triceps. We carefully exposed the fracture site and reduced the fragment fracture back to its anatomical location and stabilized with two k wires. Minimal or no posterior dissection was done to avoid capitellum necrosis.^{7,11} Joint surfaces were restored to normal. Because the displaced fracture line is posterolateral, an attempt is made to press it anteromedially. Far cortex penetration was felt through tactile sensation. Hemostasis was secured in each case after deflation of the tourniquet

and wound was closed with prolene 2/0 and a sterile dressing was applied. Post operatively long back slab was applied in elbow flexion and forearm supination for 4 to 6 weeks. Wire and slab were removed in OT under sterile conditions after radiological confirmation of union and then rehabilitation was started. All patients were followed in the outpatient department at regular interval on 2nd, 4th, and 6th and on 12th week. Final assessment was done radiologically for union and functionally with Hardacre criteria¹² as shown in Table I.

RESULTS

A total of 38 children were enrolled in our study which included 25 boys (65.8%) and 13 girls (34.2%) with mean age 6.68 years(range 2-14years). The mechanism of injury was fall in the majority (84.2%) of cases. Majority(65.8%,n=25) had Milch type II and 13 patients (34.2%) had type I fracture. In 26 children (68.4%) right extremity was involved and in 12 patients (31.6%) left side was involved. The dominant hand was involved in 31 cases (81.6%). There was lateral condyle prominence in 10 of our cases (26.3%).

The mean time to fracture union as evidenced by x-rays is 4.73 weeks with a range of 4 to 7 weeks. There were 3 (7.9%) cases of superficial infection around pins and were treated with oral antibiotics. There was no major complication like avascular necrosis, nonunion or neurovascular injury.

Follow up was continued and extended from 2 weeks to 22 months. At the last follow up visit all children achieved had full range of elbow motion with some 15 degrees of deficit to full extension was noted in only in 6 cases. Parents were satisfied with the appearance of the extremity and painless functional range of motion.

Results were evaluated according to Hardacre criteria with 78.98% results were excellent and 18.42% was graded as good. There was only one(2.63%) poor result in this study. This was due to the limitation of motion because of the lack of interest with physical therapy protocols.

Table I: Hardacre criteria

<p>Excellent: Patient has no symptoms. He has full range of elbow motion. The carrying angle is normal and the fracture has healed radiologically.</p>

Good:

Patient has efficient range of elbow motion. Less than 15 degree of loss of elbow extension. The elbow deformity is subtle and mild. No joint arthritis is noted. Neurology is intact. Fracture has healed radiologically.

Poor:

Gross elbow extension deficit. Abnormal noticeable carrying angle. Joint arthritis present. Some neurological deficit noted. Radiologically non union of fracture or avascular necrosis noted.

DISCUSSION

Our study results confirmed that all lateral condyle fractures stabilized with k wires heals without any major complications or deficits. Being an epiphyseal injury, it is subjected to late complications like premature closure of physical plate, growth disturbance, and varus or valgus deformities. Due to muscles attachment fracture fragment is prone to displacement and loss of elbow extension.¹³ Displaced fractures, therefore, need anatomic reduction and stable fixation for at least 3 weeks is already reported in the literature.^{2,6,14} Close reduction and pinning is an option in some cases but image intensifier availability is the main problem in our set up. We removed k-wires routinely after radiological union at 4.73 weeks (range 4-7weeks) but can be removed even after three weeks.^{3,14,15} We do practice prophylactic intravenous antibiotics.¹⁶

Our results depicted that 30 patients out of 38 were grouped as excellent (78.94%) while 7 were found good (18.42%) and only one patient was found poor (2.63%) as per Hardacre criteria of assessment of lateral condyle treatment.¹² Our results are comparable with Boz⁸ who reported excellent results in 78.3% and good in 21.7% of the patients. Leonidou² reported 96% excellent and 4% good results. Mahmood et al¹⁸ documented excellent results in 73.5% patients, good in 13% patients, fair in 8.6% and poor in 4.3% patients of late presented cases of lateral condyle fixation. They used k-wire fixation in 16 cases and 4 mm partially threaded AO screws in 9 cases. Their demographics were similar to ours in terms of male to female ratio, Milch type ratio, mean age at fracture and same duration of plaster splint but slightly more time to union. They concluded that surgical stabilization of lateral condyle fractures in children should be done even in delayed cases. Song⁶ had 73% success rate with fixation but majority of their patients were managed with closed reduction and pinning.

In our study, all the fractures united in a mean time of 34 days. Gooi²⁰ had achieved union in 28 days after stabilization with two k-wires while Shaikh and colleagues¹⁷ reported mean union time of 38 days for their 30 cases.

There was no case of nonunion in our study. Boz⁸ operated 69 cases of displaced lateral condyle fractures and reported no case of nonunion. In the study of Thomas¹⁴ 104 cases were fixed with k-wires for 3 weeks and reported a single case of nonunion⁽¹⁴⁾.

We deliberately left k-wires exposed in some cases for easy removal at union later on. Leaving the k-wires exposed is a risk factor for minor infection but is easy in the outpatient department.^{2,21,22} In our study, the superficial infection was noted in 3 cases (7.9%) around k-wire that was managed with oral antibiotics and k wire removal. Chao²³ reported 16.7% rate of infection while Weiss²⁴ reported it to be 3.8%. In another study, Hung²⁵ used k-wires and screws as fixation implants and found 36% infection rate in cases fixed with k-wires while no infection developed around the screw.

We had a few limitations. Firstly our sample size is small. Secondly a comparison of outcome of early and delayed fixation was not done. Thirdly, various fixation implants and modes of stabilization were not compared. We recommend further studies to address the above aspect of lateral condyle fixation.

CONCLUSION

Open reduction and internal stabilization with k-wire is an excellent method of fixing lateral condyle fractures in children with excellent radiological and functional results.

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Authorship and contribution Declaration

Khalid Khan, Conception and design of the study

Haziq Dad Khan, interpreted the data

Tariq Ahmad, acquisition of data

Sahibzada Aneesullah, Drafted the manuscript

Zahir Khan, Final approval of the version for publication

Mukhtiar Ali, Revised the manuscript critically for important intellectual content

Rahim Khan, interpreted the data