

Outcome of Jakob type 3 Lateral Condyle Fracture treatment in Children through Campbell approach

TAUSEEF AHMAD BALUCH¹, GHULAM QADIR², MUHAMMAD IQBAL³, SUMBAL ARIF⁴, MOHAMMAD KHALID SYED⁵, SHAHZAD AZHAR NADEEM⁶

¹APMO, Orthopaedic Department, Mayo Hospital, Lahore.

²Assistant Professor Orthopaedic Department, Nishtar Medical University, Multan.

³Associate Professor King Edward Medical University/Mayo Hospital, Lahore

^{5,6}Assistant Professor King Edward Medical University/Mayo Hospital, Lahore

Correspondence to Dr. M Khalid Syed Email: kazmikhalid@yahoo.com, Cell: 0333-4287008,

ABSTRACT

Aim: To determine the union and functional outcome of lateral condyle humerus fracture in children by Campbell approach.

Methods: This study was conducted in OMC Hospital Lahore between 1-1-18 to 1-6-18. Mean age of the patients was 6.68 (range; 2-13) years including 11(66.66%) male and 5(33.33%) female. Patients were operated through Campbell posterior approach and fixed with smooth 2k-wire added by the back slab. Plaster break at the elbow after 4 weeks and active movements started with plaster. Plaster removed after 6 weeks and k-wires were removed within 6-8 week. All patients were followed on 2nd, 4th, 6th and at 12th week. At last follow up the patients were assessed for the union and functional out come through MEPS criteria

Results: Fractures were united in a mean time of 4.73 weeks with a range of 4-7 weeks. Outcomes were excellent in 5(33.33%) patients, good in 8(53.33%) and fair in 2(13.33%). No major complication was noted.

Conclusion: By using proper surgical approach Open reduction and internal stabilization with k-wire is an excellent method of fixing lateral condyle fractures in children even fractures were displaced (Jakob type 3) with excellent radiological and functional results

.Keywords: Jakob type III, Campbell approach, Lateral condyle, k-wire fixation, open reduction, range of motion

INTRODUCTION

These injuries usually occurred between the age of 3-14 years with the peak between 6-10 years. These fractures constitute about 18.5% of distal humerus fractures in children. 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 cartilaginous⁵. 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}. In Jakob type I fracture the articular surface is intact and fracture is undisplaced while type II fractures are displaced but fragments remained in the elbow joints and in type III fracture displaced from the joint plus usually rotated². Lateral condyle fractures are also classified by Milch into two types depending upon fracture line and its displacement⁵. 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. In Milch type II, fracture line passes through trochlea and is an unstable fracture with rotational and translational component⁷. Other commonly used classification is Badelonand⁸. All undisplaced fractures are managed in long posterior plaster splints with the forearm in supination

and 90 degree elbow flexion till union for 4-6 weeks and closely observed weekly for displacement⁵. 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 children³. Delayed union is very common and probable causes of delayed union are, lack of immobilization, fracture gap with synovial bathing, soft tissue. Interposition and inadequate reduction. Accurate reduction and stabilization with k wires or screws is mandatory for all displaced lateral condyle fractures⁹. The implants can be removed from 3rd to 8th week postoperatively with no much difference between early or late removal³.

The nucleus for capitulum and lateral ridge of trochlea are usually appeared at the age of 6 months and its appearance may be delayed up to 2 year. The nucleus for the medial epicondyle occurred between 5-8 years and remained separate. However, after nucleus for the trochlea appear between age 8-10 years and the lateral epicondyle center appeared around age of 8-9 years. The centers for the capitulum trochlea and lateral epicondyle fused and form a single center. Fusion of capitulum and trochlea usually completed at the age of 12 years, forming a single Centre, and this centre fused with metaphysis in adolescence, usually around 14 (female) and 17 (male) years of age.

The objective of our study was to determine the radiological and functional outcome of Jakob type 3 lateral condyle fractures of the humerus in children stabilized with k wires through Campbell approach

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METHODOLOGY

Inclusion criteria:

1. Either gender between 2-13 years
2. Fracture within 4 weeks
3. Jakob type 3 fractures

Exclusion criteria

1. (Jakob type 1 and 2) fractures
2. Open fractures
3. Fractures more than 8 weeks
4. Nonunion fractures
5. Poly trauma patients
6. Bilateral fractures
7. Pathological fractures

Fractures with neurovascular complication

Monteggia equivalent (fracture lateral condyle and ulna)

We conducted our study in OMC Hospital Lahore between 1-1-18 to 1-6-18. All children 3-12 years old of either sex, admitted through outpatient department. After approval of the ethical committee, all patients were assessed clinically and radiologically. For functional assessment MEPS system was used.

MEPS (The Mayo Elbow Performance Score): It has 4 parts test which is rated on a 100 point scale

less than 60 very poor

60-74 fair

75-89 good

90 -100 excellent

1. pain 2 range of motion 3. stability 4. daily function

PAIN-

45 no pain

30 mild pain

15 moderate pain

0 severe pain

RANGE OF MOTION

20 arm got more than 100 degree of flexion

15 angle between 100-50

5 elbow bends 50 or less

STABILITY

10 elbow stable

5 mild unstable elbow

0 unstable elbow

ADL (daily activities) 5 points

Combing your hair

Performing personal hygiene

Eating

Putting on shirt and shoes

Surgical approach and operative procedure: The Campbell approach (triceps aponeurosis tongue) was used in all cases. This approach provides easy access to elbow joint and exposes the joint surface to a wide range. Repairing the tendinous portion of the triceps fascia makes an important role in preventing triceps weakness.

After anesthesiologist clearance and informed consent, the patients are placed supine. Nonsterile tourniquet is applied around the arm as proximally as possible. A sand bag is placed under the ipsilateral scapula to allow the arm to easily drape across the chest. With the forearm across patient's chest, the posterior skin incision drawn is drawn lateral to the tip of olecranon, which minimize the scar

irritation when leaning the elbow on the table. Skin flaps are raised medially and laterally. The ulnar nerve is identified and secured. The inverted V-shaped incision is made on triceps muscle fascia tendon. A tendinous portion of triceps muscle is cut as tongue shape. It is elevated and deep muscle are split. Tongue shape aponeurosis drawn downward to fully exposed the joint. We carefully exposed the fracture site and reduced the fragment fracture back to its anatomical location by joy-stick method and stabilized with two k-wires. Bone graft was applied in 4(26.66%) where bony mass was minimum. Bone graft was taken from locally proximal ulna. Minimal or no posterior dissection was done to avoid capitellum necrosis^{7,11}. Joint surfaces were restored to normal. 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 intervals on 2nd, 4th, and 6th and on 12th week. Final assessment was done radiologically for union and functionally with MEPS criteria.

RESULTS

Out of 15 patients, male was 11(66.66%) and female were 5(33.33%). The mean age was 6.68 years (range 2-13 years). The mechanism of injury was fall in 9(60%), road traffic accident in 5(33.33%) and trauma was in 1(6.66%). In 11(73.33%) right extremity and in 4(26.66%) left side was involved. The dominant hand was involved in 14(93.33%) cases. There was lateral condyle prominence in 12 of our cases (80%). 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 2(13.32%) cases of superficial infection around pins and were treated with oral antibiotics and removal of K wires. There was no major complication like avascular necrosis, nonunion or neurovascular injury. Follow up was continued and extended from 2 weeks to 5 months. At the last follow up visit all children achieved had full range of elbow motion. Parents were satisfied with the appearance of the extremity and painless functional range of motion. Results were evaluated according to MEPS criteria with 33.33% results were excellent, 53.33% was good and 13.33% were fair. There was no poor result.

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 extension¹³. Displaced fractures, therefore, need anatomic reduction and stable fixation for at least 3 weeks is already reported in the literature^{2,6,14}. Were moved k-wires routinely after radiological union at 4.73 weeks (range 4-7 weeks) but can be removed even after three weeks^{3,14,15}. We do practice prophylactic intravenous antibiotics¹⁶. Our results depicted

that 5 patients out of 15 were grouped as excellent (33.33%) while 8 were found good (53.33%) and only 2 patient was found fair (13.33%) as per MEPS criteria of assessment of lateral condyle treatment¹². 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 4mm partially threaded AO screws in 9 cases. They concluded that surgical stabilization of lateral condyle fractures in children's 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 nonunion¹⁴. 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 2 cases (13.33%) 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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