



Screw fixation for Lateral Condylar Fracture of Humerus in Children



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Abstract

Introduction: Lateral condyle fracture of humerus in children is the most common elbow fracture that involves the growth plate and the second most common elbow fracture children following supracondylar fracture of the humerus. The purpose of the study was to evaluate the clinical outcome of operative treatment of displaced lateral condyle fractures using cannulated cancellous screws.

Method: We reviewed 37 lateral condyle fracture of humerus in children treated with screw fixation, from July 2014 to June 2016. Patient with age 5 to 12 years, closed fracture with displacement >2mm, fracture with enough metaphysical fragment for screw and fracture <2 weeks were included. Patients with open fractures, anatomical elbow deformity, associated another injury in the same joint were excluded. Preoperative X-rays were used to classify fracture according to Milch classification. Postoperative X-rays were used to evaluate screw positions, fracture union, the presence of growth-plate arrest and avascular necrosis.

Results: There were 26 boys and 6 girls in the study, with an average age of 7.7 (peak age mode 7, range 5 to 12 years). Average follow-up was 14 months (range 8 to 24 months). The commonest mode of injury was fall from height (mainly tree) and it was seen in 24 patients (75%), and 8 patients (25%) had fractures caused by motor vehicle accidents. The final outcome was evaluated with Mayo Elbow Performance score. At final follow up 90.62% (n=29) had excellent outcome and 9% (n=3) had good outcome. There were no poor results.

Conclusion: Screw provides absolute stability which reduces the possibility of lateral prominence and promotes early fracture union. Absolute stability of fracture permits an early range of motion with early return to pre-injury state.

Keywords: Lateral condyle; Fracture; Screw fixation

Introduction

Lateral condyle fracture of humerus in children is the most common elbow fracture that involves the growth plate and the second most common elbow fracture children following supracondylar fracture of the humerus [1]. It accounts for 10-20% of all elbow fractures in children [2].

Displaced fracture results in both physal and articular incongruity. The goal of treatment is to re-establish the articular congruity to obtain near anatomical alignment. Various treatment modalities are available including surgical treatment with closed [3,4], arthroscopic assisted [5,6] or open methods versus nonoperative management with the cast. Operative treatment is considered for displaced fracture >2mm. Minimally displaced

fractures are amenable to nonsurgical management. Flynn et al. [7] noted that minimally displaced fractures healed quickly with abundant callus formation. Non displaced fractures are usually treated with cast immobilization, but close follow-up is required as later fracture displacement is a well-documented complication [8].

Although K-wire is the most common metallic implant, a plaster splint or cast is required for a period of immobilization. Few authors suggest that screw fixation promotes fracture union without significant complications [9,10]. There have been very few published reports comparing cannulated screws to K-wires in the displaced lateral condyle fractures [11,12]. Regardless of treatment, temporary elbow stiffness invariably occurs after these

injuries. However, screw fixation decreases immobilization period. The advantage of screw over K-wire is rotational stability, inter fragmentary compression at the fracture site, prevents secondary fracture displacement, decreases consolidation time and the risk of valgus deformity [13,14].

Screw fixation provides superior fixation compare to pin fixation, lower rates of lateral overgrowth, fixation loss and infection. Here, we retrospectively reviewed patients treated with a screw to evaluate the clinical outcome for the displaced lateral humeral condyle fractures in our set up.

Methodology

We performed an Institutional Review Board approved retrospective review of all the children with lateral condyle fracture treated with open reduction and screw fixation at our institution. We reviewed the medical records of 37 lateral condyle fracture of humerus in children treated with screw fixation, from July 2014 to June 2016. Patient with age 5 to 12 years, closed fracture with displacement >2mm, fracture with enough metaphysical fragment for screw and fracture <2weeks were included. Patients with open fractures, anatomical elbow deformity, associated another injury in the same joint were excluded.

Preoperative X-rays were used to classify fracture according to Milch [8] classification: type I - fracture line courses lateral to the trochlea through the capitulotrochlear groove and type II - fracture line extends into the apex of the trochlea. Postoperative X-rays were used to evaluate screw positions, fracture union, the presence of growth-plate arrest and a vascular necrosis.

Demographic data including the age of patients, gender, and mechanism of injury, clinical and radiological union, and complications of surgery were reviewed from patient charts. The mechanism of injury was classified as

- i. Fall from height
- ii. Motor vehicle accidents.

Surgical technique

General anesthesia was given to all the patients. The patient was placed supine on a radiolucent table. The affected limb was then prepped and draped free. Kocher's approach was used in all the patients. The fracture was reduced and under C-arm, the guide wire was placed perpendicular to fracture line. With the confirmation of proper alignment, 4 mm cannulated screw was passed after drilling and tapping to compress the fracture site. Stability was checked with elbow movement.

Postoperative management and assessment

Postoperatively, the elbow was immobilized with long arm posterior slab for a week followed by an arm sling. Active elbow range of motion was started once the pain subsides. The suture was removed after 2 weeks. The screw was removed after 5-6 months of surgery. The patient was followed up at 6 weeks, 3 months 6 month and one year. Clinical outcomes were evaluated using Mayo elbow performance score.

Results

A total of 37 cases were enrolled in the study. Out of which 4 cases got lost till last follow up, 1 was excluded due to re-fracture at six weeks follow up period. Only 32 patients with lateral condyle fracture treated with open reduction and screw fixation met inclusion criteria. There were 26 boys and 6 girls in the study, with an average age of 7.7 (peak age mode 7, range 5 to 12 years). There was more left sided (18 patients) than right-sided (14 patients) fracture. Milch type II (28, 87.5%) was more common than Milch type I (4, 12.5%). In all the patients, screws were placed in the metaphysis. Average follow-up was 14 months (range 8 to 24 months). The commonest mode of injury was fall from height (mainly tree) and it was seen in 24 patients (75%), and 8 patients (25%) had fractures caused by motor vehicle accidents. The final outcome was evaluated with Mayo Elbow Performance score. At final follow up 90.62% (n=29) had excellent outcome and 9% (n=3) had good outcome. No patient had a poor score in any of the follow-ups. All the patients had screw removal (Figures 1-4).

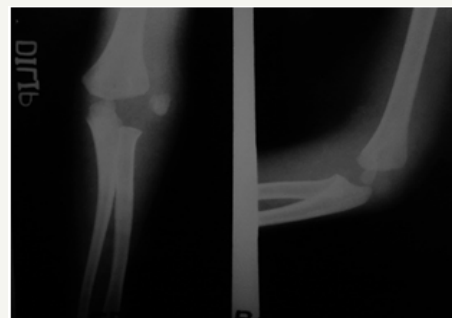


Figure 1: Preoperative.

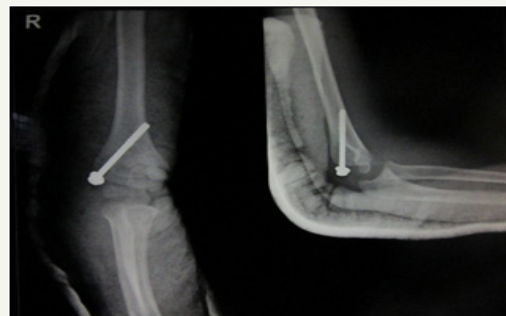


Figure 2: Postoperative.

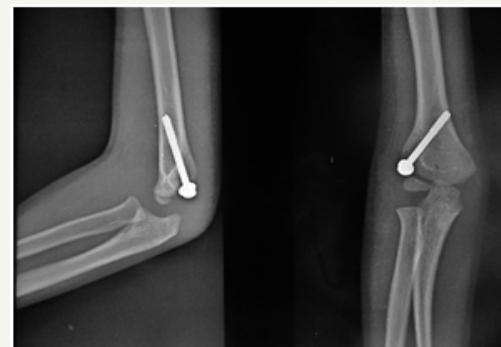


Figure 3: Five months follow up.

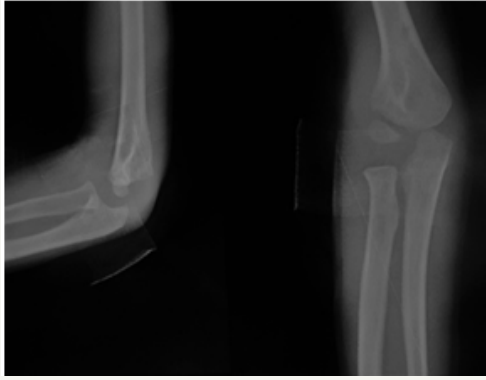


Figure 4: Post-implant removal.

Discussion

Open reduction and internal fixation are indicated for displaced lateral condyle fracture of humerus in children [13]. Internal fixation with K-wires or cannulated screws has been reported to stabilize the displaced lateral condyle fractures. K-wire fixation requires 4 to 8 weeks of postoperative elbow immobilization with a plaster splint or cast in most instances [15,16].

In the present study, all displaced fractures (over 2 mm) were treated by open reduction and internal fixation with a cannulated screw. Screw provides absolute stability. We didn't use plaster splint to support fractures postoperatively. Active elbow range of motion exercise was started as elbow becomes painless. The disadvantage of screw fixation is screw removal and growth plate-related complications, mainly with screws across the physis [17].

Sharma et al. [18] reported that AO cancellous screw compresses the fracture site, permitting early elbow mobilization and avoiding loss of elbow motion. They also mention that screw fixation is technically more demanding procedure compared with K wire fixation. Postoperatively screws were removed at 8 to 10 weeks. Four patient had various deformity which was <4 and 3 patients had mild fishtail deformity.

Wirmer et al. [19] recommended the use of Screw/wire fixation in the operative treatment of lateral condyle fracture of humerus in children. Ayubi et al. [11] also showed the better result with fracture treated with a screw for children age more than 5 years with displacement >2mm. They suggested removing implant 3-4 month after radiological union.

Li et al. [20] in their retrospective study compared Kirschner wires (K-wire) and AO cannulated screw fixation in treatment for the displaced lateral humeral condyle fractures. They found no statistically significant difference in clinical outcome between the two groups and concluded that although the second operation is required for screw removal, screws can reduce the possibility of lateral prominences and promote the elbow function.

Lateral prominence (15.6%, 5 patients) was the common complication we found in our study which was comparable with Hasler et al. [21] (15%) and Shirley et al. [12] (13%). Long-term follow up is required to evaluate premature capitellar growth plate arrest. Thomas et al. [22] reported that 40% of patients with

K-wires had an obvious lateral prominence. They proposed that the excessive bone formation beneath the osteoperiosteal flap as the cause for lateral prominence. It may be due to the wide dissection of periosteum and the formation of bone callus [20]. We advise to protect the periosteum in the metaphyseal fragment and avoid wide dissection. No patient developed skin infection and a vascular necrosis in our study. However, the only disadvantage was need of additional surgery for screw removal, thus increasing the cost and hospital stay.

The final assessment in our series was evaluated with Mayo Elbow Performance score. At final follow up 90.62% (29 patients) had an excellent outcome and 9% (3 patients) had a good outcome. There were no poor results. The better functional outcome may be due to early fracture union leading to an early return to activities. Early mobility also reduces school absenteeism. Clinical outcomes in the study done by LiWC et al. [20] using Hardare criteria had 65.62% excellent, 34.38% good result and poor in none, which is comparable with our study.

There were some limitations to our study. This includes retrospective nature with a small sample size and short follow up. Although we demonstrated that screw fixation results in lower complication, longer follow up are required. A larger randomized trial of screw fixation versus K-wire fixation is needed to clarify the results.

Conclusion

Displaced lateral condyle fractures can be treated successfully by open reduction and internal fixation with single partially threaded cancellous screw with excellent results. Screw provides absolute stability which reduces the possibility of lateral prominence and promotes early fracture union. Absolute stability of fracture permits an early range of motion with early return to pre-injury state.

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