

Outcomes Of Open Reduction And K-Wire Fixation Of Late Presenting Paediatric Supracondylar Humeral Fractures Using Inverted V-Y Tricepsplasty Approach and Calloclasis

Dr Pathik Vala*, Dr Rutvik Shah**, Dr Takshay Gandhi***

*Assistant Professor, **Senior Resident, ***Assistant Professor, Department of Orthopaedics, AMC MET Medical College, Ahmadabad, Gujarat

Abstract: Background: Supracondylar humerus fracture is a common paediatric injury. The current preferred treatment option for the displaced supracondylar fracture is early closed reduction and percutaneous pinning. Neglected displaced fractures of supracondylar humerus are becoming common in developing countries like India. Hence we prospectively evaluated the results of 10 malunited and neglected paediatric supracondylar humeral fractures using inverted V-Y tricepsplasty approach and callus osteoclasia (Calloclasis). Material and Method: This prospective study included 10 extension type malunited paediatric supracondylar fractures that were operated from September 2017 to September 2018. Exposure of the distal humerus was done using Posterior inverted V-Y tricepsplasty approach. The entire callus tissue was circumferential removal, anatomic reduction of the displaced bony fragments was achieved and then fixation with one/two Kirschner wires was done. K-wires were removed at around 3rd/4th week postoperatively and patients were followed up monthly up to the 6 months. Result: All fractures united in a mean duration of 7.1 weeks. At last follow-up after 6 months on average, 9 (90%) patients had satisfactory outcomes. Restricted range of motion was noted in 1 patient which had unsatisfactory result. Conclusion: Open reduction with pinning is preferred technique in patients presenting with late supracondylar fracture humerus with removal of callus and correcting deformity at the same time [Vala P Natl J Integr Res Med, 2019; 10(1):36-39]

Key Words: Supracondylar Humeral Fractures, Late Presentation, Osteoclasia, Tricepsplasty.

Author for correspondence: Dr Rutvik Shah, Department of Orthopaedics, AMC MET Medical College, Ahmadabad, Gujarat. E-mail: rutvikshah90@gmail.com

Introduction: Supracondylar fracture of humerus is one of the most common fractures in children and it constitutes about 17% of all paediatric fractures.¹ These fractures are classified using the modified Gartland classification and most of them are of extension type.^{2,3} Displaced supracondylar fractures are conventionally treated with closed reduction and percutaneous pinning on emergency basis.⁴ If attempts at closed reduction fail, then open reduction of the fracture followed by cross-pinning should be considered. The main reasons for the delayed presentation are lack of medical facilities or social and financial constraints resulting in malunion and shortening of triceps thus makes late reduction more difficult.⁵

Late presentation is defined as fractures presenting 2 days after injury.^{6,7} However, authors from developed countries define "delay" as more than 8-12 hours in their studies and there is no significant difference in the outcome of the early and delayed groups in their studies.⁸⁻¹¹ Surgical exposure can be accomplished by a variety of approaches. The approaches are lateral, medial, posterior and anterior. There is no clear evidence in the literature regarding which of the surgical approaches brings about the best outcomes as well as minimizing

complications.^{12,13} Hence we prospectively evaluated the results of late open reduction of 10 malunited paediatric supracondylar humeral fractures using inverted V-Y tricepsplasty approach and Calloclasis.

Materials and Methods: This prospective study was carried out from September 2017 to September 2018 at L.G. Medical hospital and ethical clearance was obtained from institutional ethics committee. The study included patients of neglected supracondylar humerus fractures who presented around 1 month after initial trauma. Patients with flexion type of fracture, open fractures, neurovascular injury, history of massaging, those who presented within 48 hours of injury or those presenting very late after 3 months of initial injury were excluded from this study. We operated 10 paediatric supracondylar fractures and all were extension-type (3 Gartland type II and 7 Gartland type III displaced fractures). All patients had taken initial treatment either in the form of manipulation by any bonesetter or a trial of reduction and above elbow slab application in some private clinic and presented to us late. Fall while playing and fall from a height were the predominant modes of injury.

All the patients in this study were treated by open reduction and internal fixation (ORIF) through posterior approach. The procedure was done under general anaesthesia with the patient in lateral position. The tourniquet inflated and a midline straight skin incision was made. The ulnar nerve was safely exposed and separated. Exposure of the distal humerus was done using inverted V-Y tricepsplasty approach (Proximally based triceps tongue), so that the supracondylar region could be circumferentially reached.

The fractures in many patients were found almost united, callus was visible though they were not remodelled. The entire callus tissue was circumferential removed from the underlying original supracondylar area to expose the fracture ends. Manipulation and anatomic reduction of the displaced bony fragments was achieved and then fixed with at least one/ two cross K-wires.

Thus complete correction of the deformity and full range of movement of the elbow joint was achieved intraoperatively. After the triceps repair and skin closure, an above elbow slab was applied in approximately 30 degrees of elbow flexion. Slab was removed at 2nd week and active range of motion exercises was started. K-wires were removed at around 4th week postoperatively. Regular follow-up (Clinical and radiological) was done monthly up to the 6 months. The functional outcome was assessed using Flynn criteria.¹⁴ Excellent, good and fair outcomes were considered satisfactory (Table-1).

Table 1: Grading System developed by Flynn et al

Outcome	Loss of Carrying Angle (°)	Loss of Motion (°)
Satisfactory		
Excellent	0-5	0-5
Good	6-10	6-10
Fair	11-15	11-15
Unsatisfactory		
Poor	>15	>15

A total of 10 children completed follow up. Of them, 7 (70%) were boys and 3 (30%) were girls. Mean age was 6 years (range 4-11 years). Right side was involved in 6 (60%) and left side was involved in 4 (40%) of the patients. The mean delay in presentation was 8 days (range 2 to 14 days). The mean period of hospitalization was 7

days (range 5 to 10 days). Puckering of skin was seen in 3(30%) of cases.

All fractures united in a mean duration of 7.1 weeks (Range 5–10 weeks). Analysis of the results showed that younger the patient the faster the union. Carrying angle of the normal side was 11.8°. The mean change in carrying angles in the 7 patients who were graded as “excellent and good” was 6.5° (range 5-10°). Two patients had superficial pin infection, which subsided with antibiotic treatment. None had myositis ossificans, gross limitation of motion, iatrogenic nerve injury, cubitus varus deformity needing surgical correction, trochlear necrosis or surgical site infection.

At last follow-up after 6 months on average the outcome was excellent in 3 (30%) patients, good in 4 (40%), fair in 2 (20%), and poor in 1 (10%). Thus, 9 (90%) patients had satisfactory outcomes.

Restricted range of motion was noted in 1 patient, who had severely displaced malunited fracture and underwent very late open reduction and resulted in loss of more than 25^o of extension and more than 20^o of flexion. No case of compartment syndrome was recorded.

Fig 1(a).Preop of 6 weeks delayed supracondylar humerus fracture



Fig 1(b)Immediate post op xray



Fig 1 (c) Intraop image

Discussion : Extension-type supracondylar humerus fractures are the most common elbow fractures in children. Classically, prompt reduction and percutaneous pinning is the method of choice.^{4,15} According to the literature, neglected supracondylar humeral fractures are those who are more than 14 days old and have already started the biological process of healing with early callus formation. Late presentation is one of the most important causes for failure of closed reduction.¹⁶ Late presentation is common in developing countries. Operation may be further delayed due to non-availability of OT timing or shortage of manpower or equipments. Yildirim et al., had reported that closed reduction is not feasible after 3 days.¹⁷

Tiwari et al. in India.⁶ and Abdullah et al. in Turkey.⁵ reported mean treatment delays of 4 and 6 days, respectively. A study by Lal and Bhan.¹⁸ included 20 children with delayed open reduction by means of a posterior approach for supracondylar humeral fractures. The delay time ranged from 11 to 17 days. In another study by Abdullah et al.,⁵ the average delay time was 6 days (Range 2–19 days) compared to our study which was 8 days. The rate of conversion to open reduction has been reported as ranging from less than 3% to about 46%.¹⁹ The average time for complete union in the current study was 7.1 weeks (Range 5–10 weeks) that is comparable to a study by Dehao et al.²⁰

In our study, the time to regain the near normal ROM ranged from 12 to 22 weeks with a mean

duration of 16 weeks with faster recovery in patients with faster union and less immobilization. In the study by Eren et al.⁸ full functional recovery was achieved within 3 months in 29 patients (93.5%). Explanation for inferior functional result could be very late presentation (After 1 month) and extensive soft tissue dissection (Tricepsplasty)

Conclusion : V-Y tricepsplasty approach allows to do a circumferential callus osteoclasts, which helps in reducing and fixing the fracture under direct visual control. However, It leads to more pain after surgery and an extension deficit. Recovery is slow and requires patients to be highly motivated to complete the required rehabilitation.

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