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Treatment of supracondylar humerus fracture and ipsilateral distal forearm fracture in children with K-Wire fixation

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Abstract

Background: Treatment of ipsilateral supracondylar fractures of humerus and distal fractures of forearm bones in children with closed reduction and k-wire fixation along with management of two Gustilo-Anderson 2 open supracondylar fractures with wound debridement and subsequent open reduction. For this reason, percutaneous pinning technique is the treatment of choice for ipsilateral supracondylar humerus with distal forearm fractures. By this procedure even displaced fractures can be treated successfully with minimal incidence of complications. The purpose of study is to determine the efficacy of management of ipsilateral supracondylar fractures with distal forearm fractures, imaging of forearm bones with fractures of supracondylar humerus.

Methods: 20 cases of supracondylar humerus fractures with distal forearm fractures in children aged between 5-12 years treated with closed reduction and percutaneous pinning except in cases with open fracture of supracondylar humerus treated with wound debridement and open reduction and were studied prospectively for functional outcome.

Results: 90% of patients observed excellent results, while 10% have fair outcome. Pin site infection was seen in patients with open fractures which resolved with k-wire removal and antibiotic coverage. While 2 cases were seen with recovering radial nerve palsy at 6 months follow up.

Conclusion: The results obtained in study shows anatomic reduction by closed method and stabilization with k-wire fixation hence is treatment of choice for Ipsilateral supracondylar humerus and forearm distal fractures.

Keywords: Children, supracondylar humerus, distal forearm, k-wire fixation

Introduction

Fractures of supracondylar humerus and distal fractures of forearm isolate are common but as combined are rare injuries. In children, fractures of supracondylar humerus isolate compromises around 50 -70% of elbow injury and distal fractures of forearm constitutes around 65 - 75% of all forearm fractures. Similar mechanism of injury is seen with both fractures, involving hyper-extension injury of upper limb. Children who sustain a supracondylar fracture have a greater range of elbow hyperextension than those associated with a distal forearm fractures is hypothesized by an article ^[1]. Hyperextension injury involves hyper-extension at wrist and elbow leading to fractures at carpal bones, radius, ulna, and humerus especially distal humerus. Few articles reported supracondylar and ipsilateral forearm fracture with varying incidence ranging from 3 to 13% ^[2, 3, 5, 6]. One article has reported 9 cases of isolated distal radius fracture out of 31 cases with ipsilateral supra-condylar humerus and forearm fracture studied retrospectively over a period of 5 years ^[2]. Other article reported 4 distal radius fracture out of 8 (11.1%) patients with ipsilateral forearm with supracondylar humerus fracture ^[3]. Another article reported 22 patients with ipsilateral supracondylar and forearm fracture with 6 patients having radius fracture ^[5]. Most of the cases reported have been treated with K-wire fixation for both radius and supracondylar humerus if the fracture is displaced (gartland type II and Type III) ^[8-11]. One article has reported 1 case out of 10 cases of supracondylar humerus with ipsilateral lower end radius fracture with Pin tract site infection ^[12].

We have reported 20 cases with supracondylar humerus fracture with ipsilateral distal forearm fracture over a period of 5 years between June 2015 and June 2020 treated at Adichunchunagiri Institute of Health and Research Centre and the functional outcome assessed for these injuries.

Patients and Methods

Between June 2018 and March 2020, we came across 20 cases with ipsilateral supracondylar humerus and distal radius fracture, all between 5-12 years of age. All patients presented within 24 hours of injury. Three patients had (Gustilo-Anderson type 2 open Supracondylar humerus fracture with lacerated wound over of distal humerus. Out of these 3 patients 2 of them had a 1 cm puncture wound over the distal forearm with wrist drop. Ultrasound examination did not show any nerve discontinuity. Of the twenty patients, fifteen had history of fall on outstretched hand, two had history of road traffic accident (hit by two-wheeler) and three with grade 2 open fracture had history of fall from tree. No comorbidities were found in all these patients, and all patients were operated in within 24 hours of arrival at hospital. We did closed reduction and K-wire fixation for supracondylar humerus fracture from lateral side. Medial wire was used only if two lateral pins were insufficient in providing stability at fracture site. Closed reduction was achieved by milking manoeuvre as described by Peter, Scott and Stevens [8]. Patients with the open fractures underwent thorough wound debridement and open reduction with K-wire fixation. All the displaced distal radius fractures underwent closed reduction and K-wire fixation using 2 crossed wires [2, 3, 9].

Postoperatively, limb immobilization with A/E cast and forearm in supination except in cases with open fractures where elbow spanning external fixator was applied. Single dose of broad-spectrum I.V antibiotic (Cephalosporin) given after calculated weight basis in patients with closed fractures requiring pinning. Children with open fractures received two days of post-operative I.V antibiotic consisting of Gram positive and Gram-negative coverage (Cephalosporin and aminoglycoside) with daily dressing to look for signs of infection. X-rays were taken immediate post-operatively and

then repeated at 4th, 6th, 8th and 12th week and then once in 6 months with a total follow-up of 6-months of all patients available. All patients were assessed by Flynn's criteria modified by Templeton and Graham at 6-month follow-up.

Results

Of 20 patients, 18 patients had excellent functional outcome at 6 months with two having fair outcome due to the presence of wrist drop which has recovered partially. These two patients even had superficial pin tract infection which healed after k-wire removal at 6 weeks and antibiotic coverage. The other eighteen patients had no pin tract infection. Signs of fracture union were seen in all patients following which k-wires were removed. None of these patients had mal-union or non-union. No incidence of loss of reduction was seen. No vascular injury was seen in any of the cases.

Discussion

The reported incidence of varying range from 3-13% of ipsilateral supracondylar humerus fracture with forearm fracture. Among them, fracture of distal radius/ulna are less common. In our cases, all supracondylar fracture of humerus were of extension type with the displaced fractures having a posteromedial displacement (Gartland type 2 or 3). All radius fractures were of extension type with dorsal displacement and dorsal angulation.

This study an imaging of the forearm and wrist in patients with supracondylar humerus fractures to rule out any associated forearm or wrist injury. This study recommends closed reduction and K-wire fixation for both supracondylar humerus (Type III) and distal radius fracture. We also recommend conservative management of nerve injury which usually recovers on observation and surgical exploration is required only if ultrasound examination shows any discontinuity in nerve. We had only one fair result at 6-month follow-up due to recovering radial nerve palsy restricting active wrist dorsiflexion up to 45 degrees. In all our patients, the supracondylar humerus fracture was operated first followed by distal radius fracture as recommended by Templeton and Graham [11].

Table 1.

Flynn <i>et al.</i> criteria modified by Templeton and Graham				
	Loss of elbow flexion/Extension	Loss of forearm pronation/supination	Loss of wrist Flexion/Extension	Change in carrying angle
Excellent	0-5	0-15	0-15	0-5
Good	6-10	16-30	16-30	6-10
Fair	11-15	31-45	31-45	11-15



Fig 1: Radiograph of supracondylar humerus fracture (A & B) and distal radius fracture (C & D)

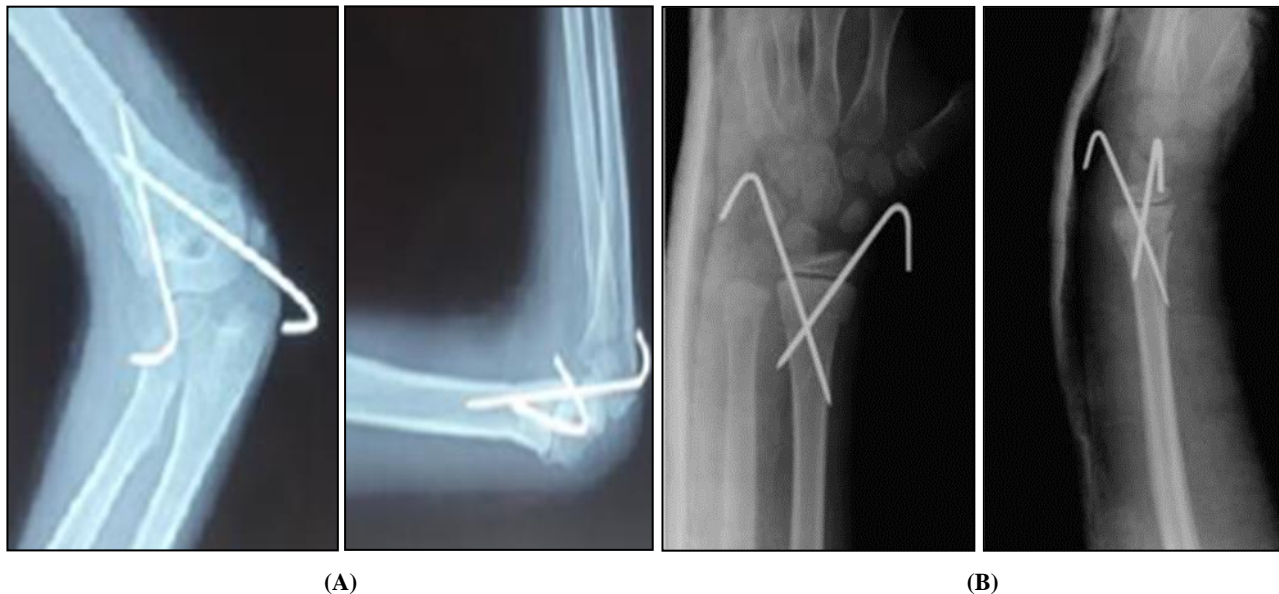


Fig 2: Immediate postoperative radiographs of supracondylar humerus (E & F) and distal radius fracture (G & H) with K-wire fixation

Conclusion

This study recommends imaging of forearm and wrist in patients with supracondylar humerus fracture to rule out forearm and wrist injury. This study also recommends closed reduction with k-wire fixation of displaced supracondylar humerus fracture as well as distal forearm fractures in children. This study also recommends of observation and conservative management for atleast 6 weeks if any nerve palsy is seen before considering for surgical exploration.

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