Section: Orthopaedics

Original Research Article

A STUDY ON THE EPIDEMIOLOGICAL PROFILE OF SUPRACONDYLAR FRACTURES IN CHILDREN IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: Supracondylar humerus fractures are common pediatric injuries requiring effective management to ensure optimal cosmetic and functional outcomes. This study examines the effectiveness of K-wire fixation, combined with open or closed reduction, in treating Type II and Type III supracondylar fractures.

Materials and Methods: A prospective study was conducted on 20 patients, aged 6 to 12 years, with supracondylar humerus fractures treated with open or closed reduction and K-wire fixation at Govt Medical College/ Govt General Hospital, Siddipet, from February 2024 to January 2025. Patients were followed up for a minimum of six months. Data collected included demographic characteristics, fracture type, surgical methods, and post-operative complications.

Results: Of the 20 cases, 12 were male, and 80% involved the left elbow. Falls were the primary cause of injury (90%). Type III fractures predominated (70%), and open reduction was used in 65% of cases. Complications were minimal, with only one pin tract infection and two cases of cubitus varus deformity. Cosmetic outcomes were excellent in 75% of cases, and functional results were excellent in 80%.

Conclusion: K-wire fixation, combined with open or closed reduction, is effective in managing supracondylar humerus fractures in children, achieving high cosmetic and functional success with minimal complications.

Keywords: Supracondylar humerus fracture, K-wire fixation, pediatric fractures, open reduction, closed reduction, cosmetic outcome, functional outcome.

INTRODUCTION

Supracondylar fractures of the humerus are the most common type of elbow fractures in children, accounting for approximately 60-75% of all pediatric elbow fractures.[1,2] These fractures typically occur as a result of falls on an outstretched hand, leading to hyperextension of the elbow and subsequent fracture at the supracondylar region of the distal humerus. They are most commonly observed in children aged 5 to 7 years, with boys being slightly more affected than girls.[3] Supracondylar fractures are clinically significant due to their potential for complications, including neurovascular injury, compartment syndrome, and long-term deformity if not managed appropriately.[4]

The classification of supracondylar fractures, as proposed by Gartland, divides them into three main types based on displacement: Type I (undisplaced), Type II (displaced with an intact posterior cortex), and Type III (completely displaced).[5] The management approach varies depending on the type and severity of the fracture, as well as the presence of any associated neurovascular compromise. Non-operative treatment, typically involving immobilization in a cast, is generally reserved for Type I fractures. Displaced fractures (Type II and Type III), however, frequently require surgical

intervention to achieve adequate alignment and stability.[6]

Closed reduction and percutaneous pinning, or K-wiring, is the standard of care for displaced supracondylar fractures in children.[7] K-wire fixation provides stability to the fracture and allows for proper alignment while minimizing soft tissue damage. The procedure involves inserting Kirschner wires (K-wires) through the distal fragment to maintain the reduction achieved by closed manipulation.[8] Two or more K-wires are typically used, inserted either in a parallel or crossed configuration, to provide stable fixation. The outcomes of K-wire fixation for supracondylar fractures are generally favorable, with a high rate of bone healing and good functional recovery.

The purpose of this study was to evaluate clinical and functional outcome of closed reduction and percutaneous K-wire fixation in displaced supracondylar humerus fracture in children.

MATERIALS AND METHODS

This prospective study was conducted at Govt Medical College/ Govt General Hospital, Siddipet, from February 2024 to January 2025, examining clinical and functional outcomes of displaced supracondylar humerus fractures in children managed through closed reduction and percutaneous K-wire fixation. The study included 20 consecutive cases of displaced supracondylar fractures, selecting participants based on specific inclusion and exclusion criteria. Eligible participants were children aged 3 to 12 with Gartland Grade II and Grade III fractures who were medically fit for surgery, and whose parents consented to the procedure. Fractures older than one week were excluded. Patients presented to either the emergency department or regular outpatient services with suspected elbow injuries, where they underwent detailed history-taking, thorough examination, and initial clinical assessments to rule out any associated injuries. Radiographic imaging, including standard anteroposterior and lateral view X-rays, was used to assess fracture patterns, after which patients were counseled, consented, and scheduled for surgery.

The surgical procedure was standardized and performed under general anesthesia. The fracture was reduced through controlled traction with the elbow in extension and the forearm in supination. Varus or valgus force was applied to correct displacement, while flexion of the elbow was used to align angulation, with continuous monitoring of the radial pulse to ensure vascular integrity. Reduction was assessed via C-arm imaging, particularly focusing on Baumann's angle. If deemed acceptable, K-wires (2-2.5mm) were introduced through the lateral epicondyle in an angled manner, ensuring they crossed 1.5–2 cm above the fracture line for stability. A medial K-wire was inserted in a similar fashion, taking care to avoid the ulnar nerve in its groove. Final wire placement and fracture alignment were confirmed through A-P and lateral views on the C-arm, with K-wires trimmed subcutaneously.

Postoperatively, an above-elbow plaster slab was applied, maintaining the elbow at 80-100 degrees of flexion. Patients were discharged within 24-48 hours and followed up weekly. After three weeks, the slab was removed, and X-rays were taken. If adequate callus formation was observed, K-wires were removed, and active range-of-motion exercises were initiated. In cases with insufficient callus formation, the K-wires were retained, and intermittent movement was encouraged. Patients were advised against massage or passive stretching and followed up regularly for clinical and radiographic assessments of fracture union and elbow range of motion. Statistical analysis was descriptive, with outcomes reported as percentages to illustrate treatment efficacy and complication rates.

RESULTS

This prospective study was conducted on 20 cases of supracondylar humerus fractures (Type II and Type III) managed with open or closed reduction and K-wire fixation at Govt Medical College/ Govt General Hospital, Siddipet, from February 2024 to January 2025. The patients were followed up for a minimum of six months. The ages of the patients ranged from 6 to 12 years, with an average age of 7.2 years.

Among the patients, the majority (60%) were male, and the left elbow was predominantly affected (80%).

Table 1: Demographic characteristics

Demographic characteristics		frequency
Age	1-5 years	6 (30%)
	6-10 years	10 (50%)
	>10 years	4 (20%)
Gender	Males	12 (60%)
	Females	8 (40%)
Side of involvement	Left elbow	16 (80%)
	Right elbow	4 (20%)

Falls were the leading cause of injury (90%), with road traffic accidents accounting for the remaining 10%. The fractures were classified as Type II in 30% of cases and Type III in 70%. Nerve injuries were rare, with a single incidence each of median and radial or ulnar nerve injuries (5%).

Table 2: Characteristics of fracture

characteristics of fracture		Frequency
Injury mechanism	Falls	18 (90%)
	Road traffic accident	2 (10%)
Type of fracture	Type II	6 (30%)
	Type III	14 (70%)
Collateral nerve injuries	Median nerve	1 (5%)
	Radial and ulnar nerve injury	1 (5%)
Collateral fractures	Distal radius fracture	2 (10%)

Open reduction was performed in 65% of cases, while closed reduction was applied exclusively to Type III fractures (35%). K-wire fixation involved two cross wires, two lateral pins, or three K-wires in varying cases. Post-operative complications were minimal, with only one case of pin tract infection (5%) and two cases of cubitus varus deformity (10%). Most patients achieved excellent cosmetic (75%) and functional results (80%), indicating the effectiveness of the treatment approach.

Table 3: Surgery characteristics

Open reduction	Type II	6 (30%)
	Type III	7 (35%)
Closed reduction	Type III	7 (35%)
Pinning	2-cross wire pinning	8 (40%)
	2 lateral pinning	1 (5%)
	3 K-wire pinning	11 (55%)
Post-operative complications	Pin tract infection	1 (5%)
	Cubitus varus deformity	2 (10%)

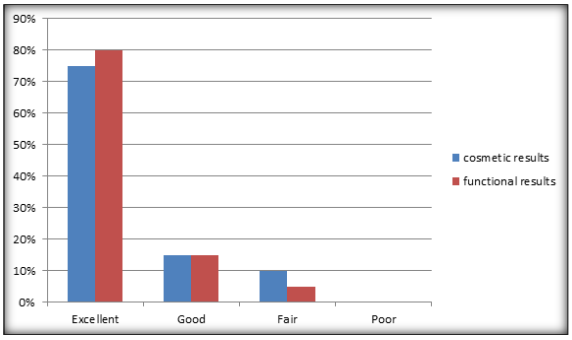

Figure 1: Outcomes

Patient 1

Patient 1

Figure 2 and 3: Pre-op and post–op images of supracondylar fracture in 2 patients

DISCUSSIONS

The findings of this study align with and expand upon the results of similar studies regarding the management of supracondylar humerus fractures in pediatric patients. The high success rate observed in terms of both cosmetic and functional outcomes, with 75% and 80% of patients respectively achieving excellent results, is consistent with studies by Burianov et al,[9] who noted that K-wire fixation

effectively maintains alignment and stability, thus facilitating optimal recovery. The choice between open and closed reduction, as applied in our study, also mirrors the findings of Flynn et al,[10] who suggested that closed reduction with percutaneous pinning is preferred for Type III fractures due to its minimally invasive nature and reduced complication rates. In our study, however, a substantial proportion of Type III fractures required open reduction, likely reflecting the severity and complexity of these fractures and corroborating the findings of Mehlman et al,[11] who observed similar patterns in severe fractures.

Our study also documented minimal postoperative complications, with only one case of pin tract infection (5%) and two cases of cubitus varus deformity (10%). This is in line with the findings of Cake et al,[12] who reported a low rate of complications associated with K-wire fixation, particularly when stringent postoperative care protocols were followed. However, unlike some studies that have reported higher rates of cubitus varus deformity, our lower incidence may be attributed to meticulous surgical technique and precise pin placement, which, as observed by Skaggs et al,[13] plays a crucial role in preventing deformity.

The demographic distribution in our study, where the left elbow was more commonly involved (80%), aligns with findings by Eismann et al,[14] who also noted a higher frequency of left-sided injuries in pediatric elbow fractures, possibly due to the natural tendency of children to use their dominant hand to break falls. Additionally, falls were the primary mechanism of injury (90%), a finding consistent with previous literature indicating that falls are the leading cause of supracondylar fractures in children.[15]

Although our study demonstrates the efficacy of K-wire fixation in achieving favorable outcomes, it is worth noting that a longer follow-up period could provide further insights into the long-term functional and cosmetic outcomes, as highlighted by studies such as that of Cheng et al,[16] which emphasize the value of extended monitoring in identifying late-onset complications. Overall, the findings underscore that K-wire fixation, when combined with appropriate reduction methods, is a reliable approach in managing supracondylar humerus fractures, yielding satisfactory cosmetic and functional results with minimal complications.

CONCLUSION

In conclusion, this study demonstrates that K-wire fixation, combined with open or closed reduction, is an effective treatment for Type II and Type III supracondylar humerus fractures in children, yielding excellent cosmetic and functional outcomes with minimal complications. The results align with previous research, reinforcing that precise surgical technique and postoperative care are crucial in minimizing deformities and ensuring optimal recovery in pediatric patients.

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Conflicts of Interest: Nil.

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