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Original Research Article

FUNCTIONAL OUTCOME OF K WIRE FIXATION USING LATERAL APPROACH IN CHILDREN IN SUPRACONDYLAR FRACTURE

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Abstract: *Pediatric supracondylar humerus fractures are common elbow injuries, often requiring surgical intervention. The K-wire fixation technique, which uses the lateral approach, is widely used for treating displaced fractures, though the outcomes and complication rates vary.* ***Objective:*** *This study aims to evaluate the functional outcomes of K-wire fixation using the lateral approach in pediatric supracondylar humerus fractures based on Flynn's criteria and to assess the associated complications.* ***Methods:*** *A prospective observational study was conducted involving 60 pediatric patients aged 2–14 years with displaced supracondylar humerus fractures (Gartland Type II and III). All patients underwent K-wire fixation using the lateral approach. Postoperative follow-up was performed for six months, and functional outcomes were assessed using Flynn's criteria, which evaluate cosmetic and functional results. Postoperative complications, including pin tract infection and wound infection, were documented. Descriptive statistics were applied, and a p-value < 0.05 was considered statistically significant.* ***Results:*** *The mean age of patients was 8.53 ± 4.75 years, with 63.3% male and 36.7% female. The average operative duration was 56.50 ± 8.32 minutes. Functional outcomes showed that 48 patients (80%) achieved excellent results, nine patients (15%) had good outcomes, and three patients (5%) had fair outcomes with no poor results. Complications were minimal, with one case each of pin tract infection and wound infection (1.7% each).* ***Conclusion:*** *K-wire fixation using the lateral approach for pediatric supracondylar humerus fractures is safe and highly effective, yielding excellent functional outcomes and a low complication rate. This approach offers a reliable treatment option for displaced fractures in children, providing a high rate of success with minimal complications.*

Keywords: Supracondylar fractures, K-wire fixation, Lateral approach, Pediatric fractures, Functional outcomes, Flynn's criteria

Introduction

Supracondylar humeral fractures, which are common in pediatric orthopedics, frequently occur when a person falls and lands on an outstretched hand. These fractures provide substantial difficulties since they can lead to problems and have long-term effects on functionality. (1, 2). These fractures occur proximal to the elbow joint and can disrupt the growth plate, resulting in concerns for both immediate and long-term joint function. Historically, the treatment of these fractures has ranged from non-surgical immobilization with a cast to more aggressive surgical procedures (3, 4). Supracondylar fractures affecting the humerus make up 18% of fractures in children and 60% in the elbow (5).

Among the available surgical techniques, using K-wire fixation with a lateral approach has become increasingly popular because of its high success rate in attaining and maintaining proper alignment of fractures while minimizing the occurrence of problems (6, 7). This method entails the insertion of K-wires through a lateral incision to stabilize the fracture using a percutaneous approach. The lateral approach is preferred because it provides direct access to the fractured site, enabling accurate alignment and stabilization with fewer chances of neurovascular damage compared to alternative techniques (7, 8).

The efficacy of K-wire fixation with the lateral technique is demonstrated by its ability to restore anatomical alignment, facilitate optimal healing, and maintain joint function. Nevertheless, the functional consequences of this approach, which include range of motion, strength, and general limb function, are vital signs of its effectiveness (9, 10). Functional outcomes are crucial because they directly affect the child's capacity to resume regular activities, including sports and daily routines, and prevent long-term issues such as joint stiffness or malalignment. The evaluation of these outcomes requires the assessment of both clinical measurements, such as the range of motion of the elbow and the strength of the grip, as well as patient-reported outcomes that represent the child's subjective perception of recovery and their quality of life (11, 12).

Although K-wire fixation is often used, thorough research is still needed to systematically assess its functional outcomes for children suffering from supracondylar humeral fractures. Gaining insight into the functional ramifications of K-wire fixation through the lateral approach would enhance clinical practices and guide orthopedic surgeons in improving treatment strategies for this prevalent pediatric injury. This study aims to determine the functional outcome of k-wire fixation using the lateral approach in children with supracondylar fractures.

Methodology

This prospective observational study was conducted at the Department of Orthopedic Surgery of Hayatabad Medical Complex, Peshawar, from April 2023 to April 2024, after obtaining ethical approval from the hospital. A total of 60

pediatric patients aged between 2 and 14 years with displaced supracondylar fractures (Gartland Type II and III) were included in this study. Patients treated with open fractures, neurovascular injuries, and other associated fractures or medical conditions affecting the outcome were excluded. Experienced orthopedic surgeons performed all surgeries. A standard lateral approach was used for the fracture's open reduction and internal fixation. Two crossed K-wires were inserted for fixation under fluoroscopic guidance. The wires were left protruding to allow easy removal after fracture union. After wound closure, the elbow was immobilized in a posterior plaster slab at 90° flexion. Postoperative antibiotics and analgesics were administered. The K-wires and plaster were removed after 3 to 4 weeks, depending on the radiological signs of fracture healing. Physiotherapy was initiated immediately after wire removal to restore the elbow's range of motion. Patients were followed up for a minimum of 6 months postoperatively. Clinical assessments were performed at regular intervals (2 weeks, one month, three months, and six months) post-surgery. The functional outcome was assessed using Flynn's criteria, which evaluates both cosmetic and functional outcomes based on the carrying angle and range of motion.

- **Excellent**: No loss of motion and less than 5° of carrying angle change.
- **Good**: Loss of motion up to 5–10° and 6–10° carrying angle change.
- **Fair**: Loss of motion 10–15° and 11–15° carrying angle change.
- **Poor**: Loss of motion greater than 15° and carrying angle change greater than 15°.

Data were collected and analyzed using Microsoft Excel and SPSS 24, respectively.

Results

Our series consisted of 60 patients having a mean age of 8.53±4.75 years. Male patients had a frequency of 38 (63.3%), while females had a frequency of 22 (36.7%) (Figure 1). Twenty-seven (45%) parents of the patients were educated, while 33 (55%) were uneducated. Seventeen patients (28.3%) belonged to a low socioeconomic background, 30 (50%) belonged to the middle class, and 13 (21.7%) belonged to a high socioeconomic background. The mean operative duration recorded in our series was 56.50±8.32 minutes.

We assessed the functional outcome using Flynn's criteria; the excellent outcome was seen in 48 (80%) patients, suitable in 9 (15%), while the fair outcome was seen in 3 (5%) patients. None of our patients had experienced poor outcomes (Table 2). Regarding the complications, one patient developed a pin tract infection, while one patient developed a wound infection (Table 3)

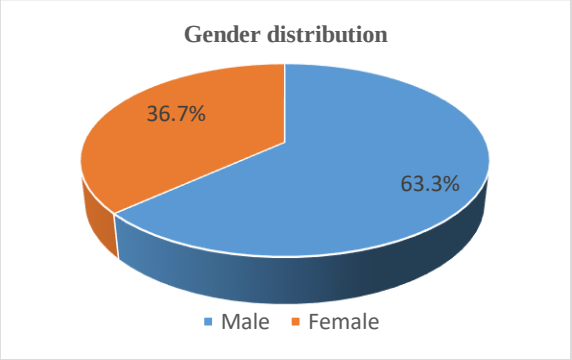

Figure 1 Gender distribution

Table 1 Functional outcome

Functional outcome	Frequency	Percent
Excellent	48	80.0
Good	9	15.0
Fair	3	5.0
Total	60	100.0

Table 2 Complications

Complications		N	%
Pin tract infection	Yes	1	1.7%
	No	59	98.3%
Wound infection	Yes	1	1.7%
	No	59	98.3%

Discussion

Our study's mean age of patients was 8.53 years, with a male predominance (63.3%) and most cases (80%) showing excellent outcomes according to Flynn's criteria. The operative duration was around 56.50 ± 8.32 minutes, with minimal complications such as pin tract and wound infections occurring in just 1.7% of cases. Hussain S et al. emphasize that the lateral approach offers a clear view of the lateral column, allowing for effective anatomical reduction and preventing complications such as cubitus varus. Their study of 52 children with displaced supracondylar fractures found that 90.4% of patients showed satisfactory results using Flynn's criteria. The authors argue that the lateral approach is familiar to most orthopedic surgeons and minimizes the risk of nerve injuries, which are more common in medial or posterior approaches (13).

This aligns with Kashyap A et al. (14), who also found that the lateral approach yields better functional outcomes than the posterior approach, with fewer complications such as infection and a shorter operative time. They concluded the lateral approach is safer due to less soft tissue damage and a lower likelihood of ulnar nerve injuries. When comparing

our results to these studies, our findings of 80% excellent outcomes and minimal complications resonate with those reported by both Hussain S et al. (13) and Kashyap A et al.(14). The mean operative time of 56.50 minutes in our study is consistent with Kashyap A et al. observation of shorter operative times with the lateral approach (54.06 minutes), suggesting a procedural advantage in terms of efficiency.

One significant aspect of our study was the low incidence of complications, particularly the minimal pin tract infection and wound infection rates, each at 1.7%. This compares favorably with the literature. Kashyap A et al. reported a higher incidence of pin tract infections, at 6.7%, with no significant difference between the lateral and posterior approaches. Similarly, Hussain S et al. reported superficial pin tract infections in 5 of 52 patients (9.6%) treated using the lateral approach. This suggests that our study's relatively low complication rates could be due to stringent post-operative care or differences in surgical technique, particularly in managing pin insertion sites and infection control protocols.

In the study by Hussain S et al.(13), the authors observed that the lateral approach for open reduction and internal fixation of supracondylar fractures using crossed K-wires provided excellent functional outcomes. They emphasized the safety of the lateral approach, particularly in avoiding complications such as cubitus varus, a common deformity following supracondylar fractures. Additionally, the study found that the lateral approach offered better visualization of the fracture site and facilitated an anatomical reduction, contributing to improved clinical outcomes, with 90.4% of patients achieving satisfactory results based on Flynn's criteria.

The incidence of postoperative complications was minimal, with superficial pin tract infections resolving with appropriate treatment, and no cases of deep infections or vascular complications were reported.

Conclusion

The lateral approach for K-wire fixation in pediatric supracondylar fractures provides excellent functional outcomes, as evidenced by the high percentage of patients achieving excellent and good results based on Flynn's criteria. This technique minimizes complications such as pin tract infections and wound infections, reduces operative time, and enhances recovery. The lateral approach is thus a safe, efficient, and effective method for treating displaced supracondylar fractures in children, with minimal risk of postoperative complications and a high functional success rate.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-HMCI-9823/23)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Coordination of collaborative efforts Study Design, Review of Literature, Coordination of collaborative efforts.

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Conception of Study, Development of Research Methodology Design, manuscript Review, and final approval of manuscript.

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Data acquisition and analysis.

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