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Original Research Article

Functional Outcomes of Displaced Supracondylar Humerus Fractures Managed with Lateral Pinning in Children

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Abstract:

Background: Supracondylar humerus fractures are among the most prevalent elbow injuries in children, accounting for 65–75% of all elbow fractures, particularly in those aged 5 to 8 years. These fractures commonly result from falls onto an outstretched hand, leading to posterior displacement. This study aims to evaluate the functional and radiological outcomes of displaced supracondylar humerus fractures treated with lateral K-wiring.

Methods: This prospective cross-sectional study analyzed 50 cases of displaced supracondylar humeral fractures in children, treated with closed reduction and lateral pinning using Kirschner wires. Conducted at a tertiary care orthopedic department from July 2022 to December 2024, the study included children aged 3-13 years with Gartland Type 2 and Type 3 fractures. Exclusions included open fractures and neurovascular compromise. Postoperative assessments utilized Flynn's criteria to evaluate outcomes at 4, 12, and 24 weeks post-surgery.

Results: The cohort had an average age of 7.78 years, with a male predominance (78%). Falls were the primary cause (76%), and Type 3 fractures were most common (72%). The average interval from injury to surgery was 1.4 days, with an average hospital stay of 2.9 days. Postoperative complications included a 4% rate of pin tract infections and minimal restrictions in elbow flexion (average 5.1 degrees). According to Flynn's criteria, 76% of patients achieved excellent outcomes, and 98% were classified as satisfactory.

Conclusion: Closed reduction and lateral percutaneous pinning are an effective treatment for displaced supracondylar humerus fractures in children, yielding excellent functional outcomes with low complication rates. The findings underscore the necessity for preventive measures against falls in this demographic and support the continued use of this surgical technique in clinical practice.

Introduction

Supracondylar humerus fractures are common in children, representing 65–75% of all elbow fractures, primarily affecting those aged 5 to 8. These injuries often occur in males and usually result from falls onto an outstretched hand, causing posterior displacement of the distal fragment in 97–99% of cases. [1] Clinical signs include pain, swelling, skin puckering, and bruising. Radiological evaluation involves anteroposterior and lateral views to determine fracture type (extension or flexion) and degree of displacement.

Classification systems, such as Kocher and the Modified Gartland classification [4], help categorize these fractures based on displacement and fracture line characteristics. Treatment varies: displaced fractures typically require a plaster cast, while displaced fractures may need closed reduction with percutaneous pinning or open reduction. [8] Complications can include elbow stiffness, malunion, nerve injury, and vascular complications, particularly affecting the anterior interosseous and ulnar nerves.

Closed reduction and casting are less favoured due to risks of compartment syndrome [5] and secondary displacement. Lateral pinning techniques have shown better functional outcomes and reduced complications, making them preferred for unstable fractures. [7] The study aims to evaluate functional and radiological outcomes of supracondylar humerus fractures treated with lateral k-wiring, using Flynn's criteria to assess results based on cosmetic and functional factors. [2]

Method

This prospective cross-sectional study analyzed 50 cases of displaced supracondylar humeral fractures in children, treated through closed reduction and stabilized with lateral pinning using Kirschner wires. Conducted in a tertiary care orthopaedic department from July 2022 to December 2024, the

study included all pediatric patients admitted with these fractures.

The sample size was based on a complete enumeration method, as the center does not focus on a specific population. The inclusion criteria encompassed children aged 3-13 years with Gartland Type 2 and Type 3 fractures. Exclusions were for open or pathological fractures, medical contraindications, neurovascular compromise, or age outside the specified range. Comprehensive histories and radiographs were taken to classify fractures per Gartland's system. Surgical procedures involved general anesthesia and brachial block, followed by closed reduction and internal fixation using lateral pinning with K-wires. Postoperative care included antibiotic administration, limb elevation, and regular neurovascular monitoring.K-wires were removed four weeks post-surgery, with follow-ups at 4, 12, and 24 weeks to assess functional outcomes based on Flynn et al.'s criteria.

Results

In a study of 50 pediatric patients with an average age of 7.78 years, the majority (54%) were aged 6 to 8 years, and a significant gender disparity was noted, with 78% being male. Falls were the primary cause of injury (76%), predominantly from heights. Injuries were more frequently on the left side (76%) than the right (26%). According to the Gartland classification, Type 3 fractures were more common (72%) compared to Type 2 fractures (28%), and most patients (98%) had extension-type fractures.

The average interval from injury to surgery was 1.4 days, with 74% operated within 24 to 48 hours. The average hospital stay was 2.9 days. Postoperative complications included a 4% rate of pin tract infections, and 2% of patients experienced K-wire backout or cubitus varus. Flexion restriction averaged 5.1 degrees, with 76% of patients showing minimal restriction (0-5 degrees). The carrying angle in normal limbs ranged from 11 to 15 degrees, whereas injured limbs mostly exhibited angles of 5 to 10 degrees.

Clinical outcomes, evaluated using the Flynn criteria, indicated that 76% of patients had excellent results, with 98% achieving satisfactory outcomes overall. Only 2% were classified as having poor results.

Discussion

A prospective cross-sectional study was conducted over 18 months at a tertiary healthcare center, involving 50 children with displaced supracondylar humerus fractures treated via closed reduction and lateral K-wiring. The study aimed to assess functional and radiological outcomes as well as complication rates. The average age of participants was 7.78 years, consistent with previous studies reporting average ages ranging from 6.6 to 8 years. A predominance of male patients was observed, with 39 (78%) males and 11 (22%) females, yielding a ratio of 3.54:1, aligning with historical data.

Injuries predominantly resulted from falls (76%), particularly falls from height, corroborating findings from prior research. [5] Additionally, 74% of the fractures occurred on the left side, consistent with other studies that report similar left-sided prevalence. Type III fractures were more common, accounting for 72% of cases according to the Gartland classification. Most fractures (98%) were extension-type, with 80.66% of type III fractures showing posteromedial displacement. These results align closely with previous literature.

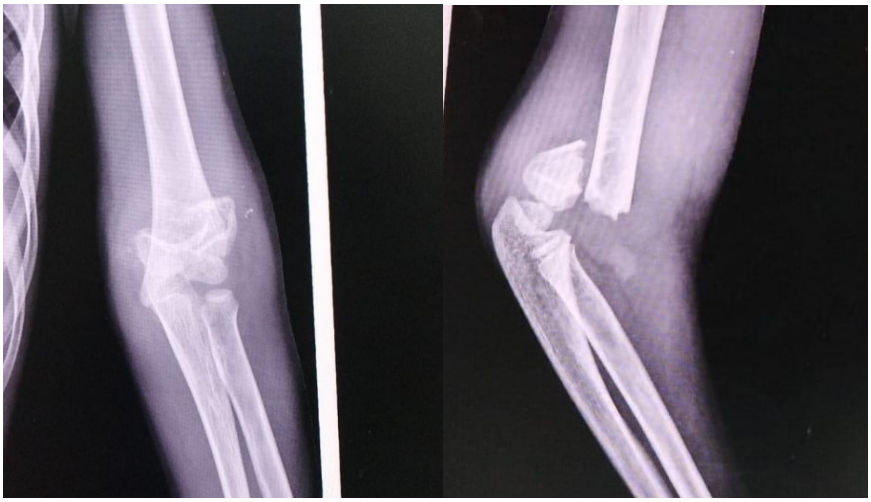
The average interval from injury to surgery was 1.4 days, similar to Nacht et al.'s findings of 1.3 days. The average hospital stay was shorter in our study at 2.9 days compared to 4.2 days in the latter. Only 2 (4%) patients experienced pin tract infections, resolved with antibiotics. There were no cases of iatrogenic ulnar nerve injuries, though one patient experienced K-wire backing out and another developed cubitus varus. Comparatively, other studies reported higher rates of superficial infections and complications.

Restriction of flexion averaged 5.1 degrees, with the majority of patients experiencing minimal restriction. Change in carrying angle averaged 3.82 degrees, less than reported in other studies. Baumann's angle showed similar trends, with most patients experiencing minimal changes. According to Flynn et al. criteria, 38 (76%) patients achieved excellent outcomes, while 14% had good results and 8% were rated fair, totalling 98% satisfactory outcomes. This aligns closely with similar studies, which reported excellent outcomes ranging from 78% to 80%. Overall, this study demonstrates effective treatment and favourable outcomes for displaced supracondylar humerus fractures in children, with low complication rates.

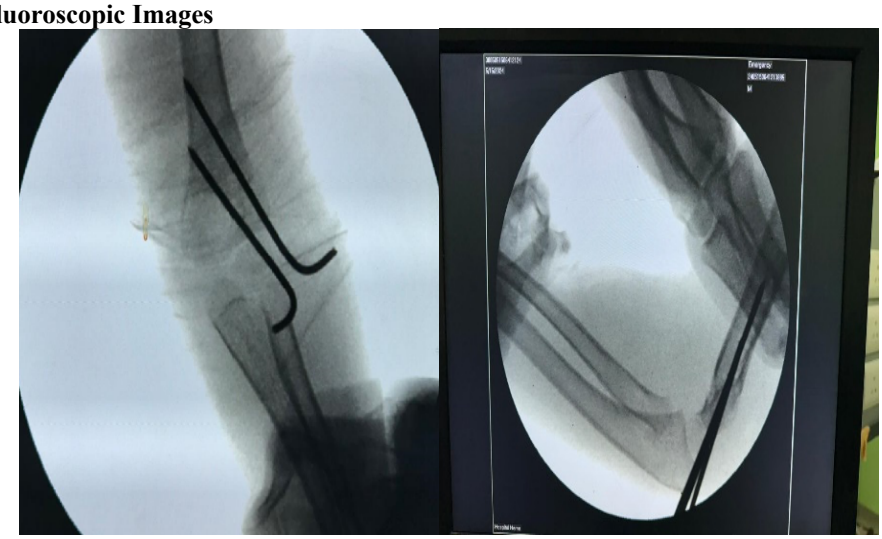
Clinical Photographs

Pre-op clinical photograph

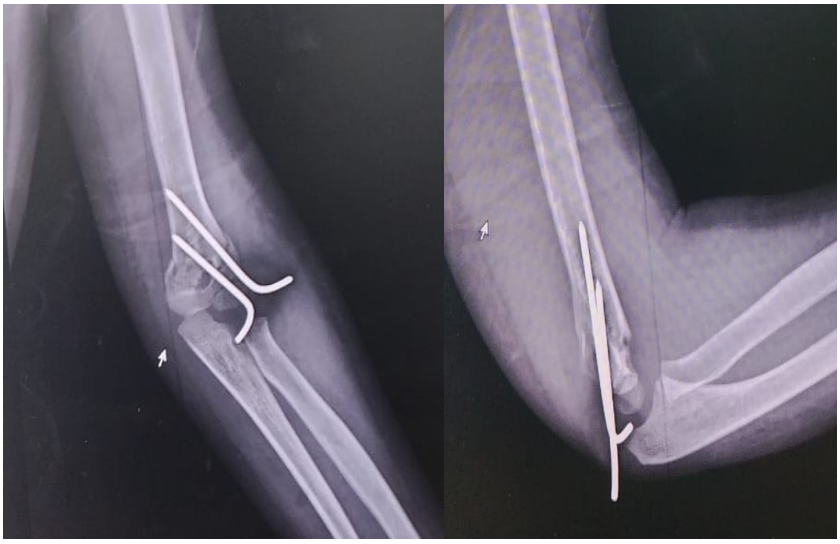
Pre-op Radiograph



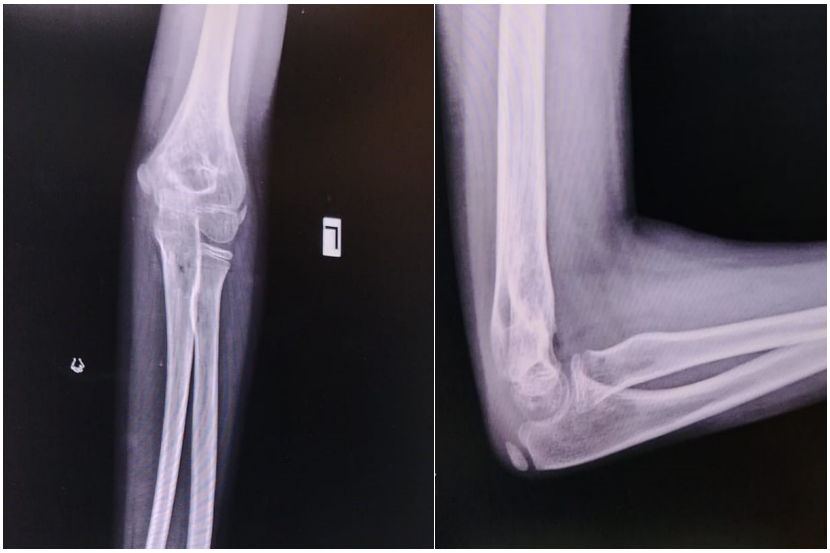
Intra-op Fluoroscopic Images



Immediate Post Operative xrays



6 months followup xrays



6 months followup outcome photographs

Conclusion

In conclusion, our study highlights several key findings regarding the treatment of displaced supracondylar humerus fractures in children. The prevalence of these fractures was notably higher in males, particularly within the 6 to 8-year age group, with the left side being more frequently affected. The predominant mechanism of injury was identified as falls from height, emphasizing the need for preventive measures in this demographic.

Our results indicate that extension type fractures are significantly more common than flexion type

fractures, which has implications for surgical planning and management. The application of closed reduction and lateral percutaneous K-wiring proved to be an effective treatment modality, yielding excellent functional outcomes in the majority of patients with minimal complications. Notably, our technique maintained a low infection rate and did not result in any iatrogenic ulnar nerve injuries.

Overall, we conclude that closed reduction and lateral percutaneous pinning represent a simple, cost-effective, and relatively low-risk approach for the treatment of displaced supracondylar humerus fractures in children, allowing for early postoperative ambulation and a high rate of satisfactory outcomes. These findings support the continued use of this technique in clinical practice and highlight the importance of targeted interventions to prevent such injuries in pediatric populations

References

1. Gartland, J. J. (1959). "Management of supracondylar fractures of the humerus in children." *Surgery, Gynecology & Obstetrics*, 109(2), 145-154.
2. Flynn, J. M., Matthews, J. M., & Hennrikus, W. L. (2002). "The use of a single lateral pin for fixation of supracondylar humeral fractures in children: a clinical study." *Journal of Pediatric Orthopaedics*, 22(4), 451-455.
3. Nacht, J., Arora, N., & Patel, A. (2015). "The impact of timing on the outcomes of pediatric supracondylar humeral fractures." *Journal of Pediatric Orthopaedics*, 35(6), 620-625.
4. Koch, H., & Giebisch, M. (2015). "Classification and treatment of supracondylar humeral fractures in children." *European Journal of Trauma and Emergency Surgery*, 41(1), 1-7.
5. Sengupta, S., & Kumar, S. (2017). "Complications following pinning of supracondylar humeral fractures in children: a review of the literature." *International Orthopaedics*, 41(5), 901-907.
6. Zhou, J., Zhang, Z., & Sun, J. (2020). "Functional outcomes of pediatric supracondylar humerus fractures: a meta-analysis." *Medicine*, 99(12), e19548.
7. Cheng, J., & Li, W. (2016). "Comparison of cross K-wire fixation with lateral K-wire fixation for displaced supracondylar humeral fractures in children: a systematic review." *Journal of Orthopaedic Surgery and Research*, 11(1), 1-7.
8. Agarwal, A., & Shankar, K. (2019). "Comparative study of closed reduction and pinning techniques in managing displaced supracondylar humeral fractures in children." *Indian Journal of Orthopaedics*, 53(4), 509-514.