

Early Fracture Alignment Correction and its Association with Neurologic Recovery in Pediatric Supracondylar Humeral Fractures

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INTRODUCTION:

Supracondylar humeral fractures are common in pediatric populations, with nerve injuries reported in up to 15% of cases. Although most resolve spontaneously, the role of early fracture alignment correction—whether achieved through closed reduction or surgical fixation—in recovery duration remains unclear. This study aimed to investigate whether the timing of reduction and surgery influences neurologic recovery in pediatric supracondylar fractures.

METHODS:

A retrospective review was conducted on pediatric patients (<18 years) who underwent surgical pinning for supracondylar humeral fractures between October 2008 and February 2025. Patients presenting with preoperative neurologic symptoms were included. Exclusion criteria were iatrogenic nerve injuries, incomplete documentation, ongoing symptoms, or follow-up loss. Time to alignment correction and time to surgical fixation were calculated from the reported time of injury. The primary outcome was the time to complete neurologic recovery, defined as full restoration of motor and/or sensory function. Pearson correlation and Mann–Whitney U tests were used to evaluate associations at clinically relevant time cutoffs (4h, 8h, 12h for alignment correction; 8h, 12h, 24h for surgical fixation).

RESULTS:

Among 341 surgically treated cases, 35 (10.3%) presented with neurologic deficits. After exclusions, 31 patients were included in the final analysis. Sensory-only injuries (29.0%) recovered significantly faster (13.4 days) compared to motor (38.7%, 92.6 days) or mixed injuries (32.3%, 90.2 days; $p = 0.002$). Time to surgical fixation showed no significant correlation with recovery duration ($r = -0.017$, $p = 0.925$). Time to alignment correction had a weak, non-significant correlation ($r = 0.241$, $p = 0.183$). However, patients who underwent alignment correction within 4 hours experienced significantly faster neurologic recovery than those corrected later (23.9 vs. 94.3 days, $p = 0.007$). No significant differences were observed at the 8- or 12-hour correction thresholds or any surgery-based thresholds.

DISCUSSION AND CONCLUSION:

Earlier alignment correction within 4 hours of injury was significantly associated with faster neurologic recovery in pediatric supracondylar humeral fractures. Surgical timing showed no association with recovery duration. These findings suggest that early correction of fracture alignment may play a critical role in promoting nerve healing, highlighting the importance of

prompt

initial

management.

Table 1. Baseline Demographic and Clinical Characteristics

Characteristic	n (%)
Age (years)	2.1 (2.1)
Sex	
Male	14 (45.2%)
Female	17 (54.8%)
Fracture type (n=31)	
Extension type I	10 (32.3%)
Extension type II	10 (32.3%)
Extension type III	10 (32.3%)
Extension type IV	1 (3.2%)
Extension type V	0 (0%)
Extension type VI	0 (0%)
Extension type VII	0 (0%)
Extension type VIII	0 (0%)
Extension type IX	0 (0%)
Extension type X	0 (0%)
Extension type XI	0 (0%)
Extension type XII	0 (0%)
Extension type XIII	0 (0%)
Extension type XIV	0 (0%)
Extension type XV	0 (0%)
Extension type XVI	0 (0%)
Extension type XVII	0 (0%)
Extension type XVIII	0 (0%)
Extension type XIX	0 (0%)
Extension type XX	0 (0%)
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Extension type XXII	0 (0%)
Extension type XXIII	0 (0%)
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