

Changes in Superior Displacement, Angulation, and Shortening in the Early Phase of Healing for Completely Displaced Midshaft Clavicle Fractures in Adolescents: Results from a Prospective, Multicenter Study

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Purpose: Progressive displacement of diaphyseal clavicle fractures has been observed in adult patients, at times necessitating a change from nonoperative to operative treatment. Whether this occurs in adolescent patients has not been well investigated. The purpose of this study was to assess the rate and extent of progressive clavicle fracture displacement in adolescent patients following injury and during the early stages of healing.

Methods: This was an IRB-approved multicenter study evaluating prospective data that had previously been collected as part of a larger study evaluating the functional outcomes of adolescent clavicle fractures. A consecutive series of completely displaced diaphyseal clavicle fractures in patients age 10-18 years treated at one of three tertiary care pediatric trauma centers were included; all of them had standardized imaging within 2 weeks of the date of injury and throughout the course of healing (5-20 weeks post-injury). Measurements of clavicle shortening, superior displacement, and angulation were performed using validated techniques. Progressive displacement and/or interval improvement in fracture alignment were noted, as well as the subsequent need for surgical intervention. Patient demographic and radiographic parameters were assessed as possible risk factors for interval displacement.

Results: 100 patients met the inclusion criteria. The mean shortening, superior displacement, and angulation at the time of injury were 24 mm, 15 mm, and 7°, respectively. At a mean of 10 weeks post-injury, the fracture alignment improved across all three measurements for the overall cohort, with mean improvements in shortening of 15%, superior displacement of 15%, and angulation of 21%. Using a clinical threshold of a change in shortening or displacement of 10 mm or angulation of 10°, 21% of fractures improved, 4% worsened, and 75% remain unchanged. Patients with more severe fractures were more likely to have improved alignment than less displaced fractures ($P < 0.001$). No patient underwent surgical intervention for progressive displacement.

Conclusion: Significant improvements in fracture alignment were observed in a substantial percentage of adolescent patients with completely displaced clavicle fractures in the first 10 weeks of healing. Among the most severely displaced fractures, a 20% improvement in shortening and 50% improvement in angulation was identified. In 4% of cases, increased displacement was observed, but this tended to be mild, and in no cases did it prompt surgical intervention.