

Positional Change in Displacement of Midshaft Clavicle Fractures: An Aid to Preoperative Evaluation

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Background/Purpose: The majority of midshaft clavicle fractures are treated nonsurgically; however, shortening or horizontal displacement greater than 20 mm has been shown to be associated with worse functional outcomes and is considered a potential surgical indication. It has been suggested that the upright position may result in a dynamic increase in fracture displacement during the healing process. Since an upright radiograph mimics the position of the limb during nonsurgical treatment, it is important to determine if it is associated with increased fracture displacement, which may alter treatment decision making. We sought to evaluate whether there is a change in fracture displacement based on patient position.

Methods: A retrospective review of 80 consecutive patients with displaced midshaft clavicle fractures between December 2006 and June 2013 was performed at a Level I trauma center. Vertical and horizontal displacements of each fracture were measured by four reviewers on supine, semi-upright, and/or upright chest radiographs. The effect of patient position (supine, semi-upright, upright) on fracture displacement was calculated using a mixed effects linear regression model. Patients were coded as categorical variables and included as random effects in the model. The proportion of patients that have a horizontal displacement greater than 20 mm in supine versus upright was compared using a Fisher's exact test.

Results: Four observers completed measurements with interclass correlation coefficients of 0.957 (95% CI: 0.946-0.966) and 0.926 (95% CI: 0.909-0.941) for vertical and horizontal displacements, respectively. Mean vertical displacement was 9.42 mm (95% CI: 8.07-10.77 mm) in the supine position, 11.78 mm (95% CI: 10.25-13.32 mm) in the semi-upright position, and 15.72 mm (95% CI: 13.71-17.72 mm) in the upright position. Horizontal displacement was -0.41 mm (95% CI: -2.53 to 1.70 mm) in the supine position, 2.11 mm (95% CI: -0.84 to 5.07) in the semi-upright position, and 4.86 mm (95% CI: 1.66-8.06 mm) in the upright position. Using a mixed effects linear regression model, we determined that change in position from supine to upright significantly increases both vertical and horizontal fracture displacements ($P < 0.001$). When placed in the upright position, the proportion of patients that met surgical indications (horizontal displacement >20 mm) was three times greater when compared to the supine position: upright 17.65% versus supine 5.88% ($P = 0.06$). Positional changes in fracture displacement were not associated with body mass index, age, or gender.

Conclusion: Our results demonstrate that patient position is associated with significant

changes in fracture displacement. Over three times more patients meet surgical indications (horizontal displacement >20 mm) when placed in the upright position compared to the supine position. We recommend upright chest radiographs be obtained to evaluate midshaft clavicle fracture displacement as this represents the physiologic stress across the fracture when considering nonsurgical management.