

## Reliability of Unilateral Clavicle Radiographs versus Panoramic Shoulder Girdle Radiographs in Evaluating Midshaft Clavicle Fracture Shortening

Ryan Ponton, MD; Andrew Johnson, MD; Patrick Morrissey, MD; Dean Asher, MD;  
David Dromsky, MD; Kevin Kuhn, MD  
Naval Medical Center San Diego, San Diego, California, USA

**Background/Purpose:** A relative indication for surgical treatment of midshaft clavicle fractures is shortening of the fracture greater than 1.5-2.0 cm. Previous studies suggest that this degree of shortening impairs shoulder function by decreasing muscular strength and endurance; however the optimal radiographic projection for measuring clavicle shortening has not been established. The purpose of this study was to compare the interobserver and intraobserver reliability of measuring clavicle shortening on a standard unilateral clavicle series versus a panoramic shoulder girdle series (bilateral clavicles on the same cassette).

**Methods:** After IRB approval, a single institution PACS (Picture Archiving and Communication System) was queried from 1 June 2014 and searched back in time until the sample size was reached. Statistical power analysis demonstrated a sample size of 30 would be sufficient for comparison. Inclusion criteria were patients with a midshaft clavicle fracture that were older than 18 years, had no prior clavicle trauma or surgery, and had both unilateral and panoramic shoulder girdle series performed within 1 week of injury. Two musculoskeletal radiologists, 2 fellowship-trained orthopaedic trauma surgeons, and 2 senior orthopaedic residents evaluated both a unilateral clavicle series and a panoramic shoulder girdle series for fracture shortening. Two weeks after initial evaluation, the same individuals reviewed the same films again to measure clavicle shortening. An intraclass correlation coefficient (ICC) and its confidence interval (CI) were calculated to determine interobserver reliability. The average difference between the 2 time points with 95% CI was calculated to determine intraobserver reliability for each of the unilateral clavicle films and the panoramic shoulder girdle films. The imaging methods were tested statistically by a test of correlation of the two correlation coefficients' data.

**Results:** The average age of the patients in this study was 28.8 years old. 20 of the 30 (67%) fractures were comminuted. Overall, intraobserver reliability for measuring clavicle shortening was higher with the panoramic shoulder girdle films compared to the unilateral clavicle films ( $P = 0.02$ ). Reliability for each observer was higher with use of the panoramic shoulder girdle film, with 4 of the 6 (67%) observers demonstrating a statistically significant difference. Similarly, interobserver reliability for measuring clavicle shortening was significantly higher with the panoramic shoulder girdle film ( $P < 0.01$ ). Significantly higher inter- and intraobserver reliability was observed in comminuted fracture patterns ( $P < 0.01$ ) compared to simple fracture patterns.

**Conclusion:** To our knowledge, no prior study has compared the reliability of measuring clavicle shortening in the acute setting on unilateral versus panoramic shoulder girdle films. Our study demonstrated a more reliable measure of shortening using the panoramic shoulder girdle films. This reliability was demonstrated in both inter- and intraobserver measurements. When evaluating midshaft clavicle fracture shortening, clinicians should consider obtaining panoramic shoulder girdle films.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.