Are 2.7-mm Recon Plates Stable Enough for Anteroinferior Plating of Displaced Midshaft Clavicle Fractures?

Alex Glide, MD[1]; Martin Hoffmann, MD[2]; Clifford Jones, MD, FACS[3]; Debra Sietsema, PhD[3];
[1]Grand Rapids Medical Education Partners, Grand Rapids, Michigan, USA;
[2]BG-University Hospital Bergmannsheil, Ruhr University, GERMANY;
[3]Orthopaedic Associates of Michigan, Grand Rapids, Michigan, USA

Purpose: Clavicular fractures comprise about 5% to 10% of all fractures, with 69% to 76% occurring in the middle third. Recent studies have shown that anteroinferior plating results in efficient healing, few complications, and excellent return to function. Because the anteroinferior plate is perpendicular to the primary force vector and has greater resistance to axial compression of the clavicle during motion, smaller plates (2.7 mm) could be used. The purpose of this study was to elucidate the rate of implant failure comparing 2.7-mm DC (dynamic compression) plates compared to 2.7 mm recon (reconstruction) plates for anteroinferior plating in midshaft clavicle fractures.

Methods: Between 2002 and 2010, 180 consecutive skeletally mature patients with 181 midshaft clavicle fractures underwent open reduction and internal plate fixation in one Level I trauma center, were followed in a single private practice, and retrospectively evaluated. Excluded patients were related to pathological fracture (1), death (1), initial nonoperative treatment (1), superior plating (8), and incomplete data (20). Therefore, the final study group consisted of 150 clavicle fractures in 149 patients. The distribution between the two plate types was almost equal: 80 DC plates (53.3%) and 70 recon plates (46.7%). Fractures were classified according to the AO/OTA classification. Patients were evaluated clinically and radiographically at regular intervals of 2, 6, and 12 weeks.

Results: The majority (67.1%) of the patients were male. Mean age was 41 years. The body mass index (BMI) averaged 26.3 kg/m2. Mean follow-up was 9.5 months (range, 3-54). Fractures were classified as 15B1 70 (46.7%), 15B2 62 (41.3%), and 15B3 17 (11.3%). Median plate length was 12 holes (range, 5-16). Median number of screws inserted was 8 (range, 4-12). Lag screws were used in 80 (53.3%). Average working length was 1.5 holes. Fractures healed in 97.3%. No infections were recorded. Four patients developed a nonunion (2.7%) and 3 fractures (2.0%) healed as malunions. Malunion formation was related to higher BMI ($P = 0.008$). No differences were found for nonunion or malunion regarding plate type, plate length, or working length. Hardware failure occurred in 6 fractures (4.0%). Failure rate was 7.1% in recon plate constructs (5 of 70) and 1.3% in DC plates (1 of 80) ($P = 0.066$).

Conclusion: Hardware failure in anteroinferior plating is low. Nonunion and hardware failure rates are low when following modern surgical techniques with longer plates. The increased rate of hardware failure led us to a recent change in surgical technique avoiding recon plates for clavicle osteosynthesis. Further biomechanical studies are warranted.

POSTER ABSTRACTS