

## Operative Treatment of Displaced Midshaft Clavicle Fractures: Have Evidence-Based Recommendations Changed Practice Patterns?

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**Background/Purpose:** In 2007, members of the Canadian Orthopaedic Trauma Society (COTS) conducted a randomized controlled trial (RCT) comparing open reduction and internal fixation (ORIF) with nonoperative management of displaced midshaft clavicle fractures. The findings were improved functional outcome scores, decreased malunion rates, and decreased nonunion rates with ORIF for displaced midshaft clavicle fractures compared with nonoperative treatment. A recent meta-analysis of 6 RCTs comparing ORIF versus nonoperative treatment of midshaft clavicle fractures concluded a significantly lower nonunion rate, significantly lower symptomatic malunion rate, and earlier return of function with ORIF. A survey was completed by members of the Canadian Orthopaedic Association to examine the influence of major fracture clinical trials on the practice of individual orthopaedic surgeons. This survey found that the 2007 COTS clavicle fixation study was perceived by most surgeons to be influential in improving patient care and 73% of respondents stated that this RCT changed their practice pattern. However, to date, this perceived change in practice pattern has not been quantified. This study aims to quantify practice pattern changes for management of displaced midshaft clavicle fractures.

**Methods:** This study is a dual-center retrospective radiographic review comparing treatment patterns prior to and following the RCT published by COTS in January 2007. Following institutional approval, eligible patients were identified through data registries as being aged 16 to 60-years of age with displaced midshaft clavicle fractures (AO/OTA 15B-1, 15B-2, 15B-3) between January 2001 and December 2014 at each of the 2 participating Level I trauma centers. Exclusion criteria were open fractures, pathological fractures, or patients previously enrolled in the COTS trial. Two groups were identified: pre-trial cohort (injury date between January 2001 and January 30, 2003, prior to COTS study enrollment) and post-trial cohort (January 2007 to December 2014). Statistical analysis used independent samples t tests for comparing groups, with significance established at  $P < 0.05$ . Odds ratios (ORs) were calculated for subgroup analysis of gender, age ( $< 40$  years vs  $> 40$  years), and pre- and post-trial.

**Results:** A total of 686 patients met inclusion criteria. The pre-trial cohort ( $n = 108$ ) was comprised of 76.1% males, with a mean age of 37.7 ( $\pm 13.9$ ) years. The post-trial cohort ( $n = 578$ ) was comprised of 68.5% males, with a mean age of 41.9 ( $\pm 12.7$ ) years. The mean ISS for the pre-trial group was 21.3 ( $\pm 13.8$ ), compared to the post-trial cohort mean ISS of 25.1 ( $\pm 13.7$ ) ( $P = 0.01$ ). There was no significant difference between groups for gender ( $P = 0.117$ ); however, the pre-trial cohort was younger ( $P = 0.005$ ) compared with the post-trial cohort. There were no differences between the participating sites for age or gender. There was nearly a 10-fold significant increase in the patients treated with ORIF for displaced midshaft clavicle fractures from the pre-trial cohort (3.7%) to the post-trial cohort (34.1%) ( $P < 0.001$ ). Patients

were more likely to undergo ORIF if their age was <40 years (OR = 2.0), or if their ISS was greater than 9 (OR = 1.2), indicating an injury in addition to the clavicle fracture; however, there was no increased likelihood of surgical treatment based on gender.

**Conclusion:** Quantifying changes in practice pattern following publication of evidence-based recommendations is important to further our understanding of the impact large RCTs are having on clinical practice, duration of time required for practice patterns to change, and the longevity of practice pattern changes. Although we did not measure union rates or functional outcomes, this study demonstrated a significant practice pattern shift towards more frequent ORIF for displaced midshaft clavicle fractures following the COTS trial.