Clinical and radiological outcomes and patient experience following orthogonal dual plating for displaced midshaft clavicle fractures at minimum two-year follow-up

Jelle P. Van Der List[1], Camden Tissue, Kathryn Barth, Craig Klinger[2], David Wellman, David Leonard Helfet[3]
[1]Orthopaedic Surgery, Hospital For Special Surgery, [2]Hospital for Special Surgery, [3]Hosp for Special Surgery

INTRODUCTION:
Recent high-level evidence comparing operative and conservative treatment of displaced midshaft clavicle fractures has suggested beneficial outcomes of surgical treatment. Displaced midshaft clavicle fractures are commonly treated with superior plating, but orthogonal dual mini-fragment plating has increasingly been used. The proposed advantages include increased multi-planar bending stiffness, decreased implant prominence and hardware irritation. The purpose of this study was to assess clinical outcomes and patient satisfaction following orthogonal dual mini-fragment plating with minimum 2 years follow-up in patients with acute midshaft fractures and non-unions of midshaft fractures.
METHODS:
All patients undergoing orthogonal dual mini-fragment plating for both acute displaced midshaft clavicle fractures and non-unions of displaced midshaft clavicle fractures (AO/OTA type 15.2) between 2008 and 2020 and with minimum two-year follow-up were included. Medical records were examined for patient characteristics and union, and patients were sent a general questionnaire, QuickDASH and SF-12 questionnaires. Data were reported in mean with standard deviation (mean ± SD) or median with interquartile range (IQR) depending on normal distribution of data, and statistical tests were used accordingly (independent-t-test, and chi-square tests, respectively).
RESULTS:
A total of 108 patients were included with a mean of 5±2 year follow-up, of which 78 patients had surgical treatment for acute fractures and 30 patients underwent nonunion surgery (initial treatment in the nonunion cohort consisted of nonoperative treatment in 15 and surgical treatment in 15). Mean age was 43±18 years, 66% were male, BMI was 25±4 kg/m^2, and most patients sustained their midshaft clavicle fractures from sports activity, a fall from ground level, a bicycle accident or a motor vehicle accident (see Table 1 for baseline characteristics and Figure 1 for case example).
In the acute fracture cohort, union was achieved in 77 patients (99%) with mean time to union of 10±3 weeks. Three patients (4%) underwent revision surgery; one for nonunion, and two for refracture after new trauma. Four patients (5%) underwent hardware removal due to symptomatic hardware. Patients were highly satisfied with the overall treatment (92%), shoulder appearance (90%), and scar appearance (88%). Median reported Visual Analog Scale for Pain (VAS pain) score was 0 (0–0), Quick Disabilities of the Arm Shoulder and Hand (QuickDASH) score was 0 (0–0), physical Short Form 12 (SF-12) score was 57 (55–57) and mental SF-12 score was 56 (51–58).
In the non-union cohort, similar rates of union were found (29 patients, 97%) with mean time to union of 12±3 weeks. One patient (3%) underwent revision surgery for recalcitrant non-union. Five patients (17%) underwent hardware removal due to symptomatic hardware, and four for routine removal as part of treatment for initial low-grade infection. Patients were similarly satisfied with the overall treatment (84%), shoulder appearance (88%), and scar appearance (92%). Median VAS pain score was 0 (0–27), QuickDASH score was 1 (0–2), physical SF-12 score was 53 (49–55) and mental SF-12 score was 56 (52–60).
Comparing both groups, patients with acute fractures had earlier time to union (p=0.002), better QuickDASH scores (p=0.019) and QuickDASH Work scores, and higher physical SF-12 scores (p=0.035). See Table 2.
DISCUSSION AND CONCLUSION: Orthogonal dual mini-fragment plating of both acute fractures and non-unions of displaced midshaft clavicle fractures was found to consistently lead to osseous union (98%), patient satisfaction (84-92%), excellent patient reported outcomes, and low rates of secondary surgery for hardware irritation (7% for acute fractures, 17% for non-unions). The small, low-profile plates decrease rates of hardware irritation while allowing excellent multiplanar stability for healing and are suitable for both treating acute fractures and non-unions of the clavicle.