

Δ Vehicle Steering Errors and Reaction Time Following Distal Radius Fracture Surgical Fixation

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Purpose: The purpose of this study was to investigate the effects of an acute upper extremity injury on patients' steering ability (reaction time and steering accuracy) following distal radius fracture surgery.

Methods: 23 patients with at least 1 year of driving experience and an acute distal radius fracture treated with open reduction and volar locked plating were prospectively recruited. Steering accuracy and reaction time were tested in a high-fidelity driving simulator based on a production automatic transmission automobile at 3 time points, acute (<14 days), sub-acute (4-6 weeks), and final (3-4 months) after surgery. Steering accuracy was measured in number of errors, error time and magnitude. Reaction time was measured in seconds. The estimated marginal means and the 95% confidence interval (CI) were calculated. Repeated measures analysis of variance (rANOVA) was used to compare time points. $P < 0.05$ was considered significant.

Results: 21 patients completed the study. Two patients had incomplete data and were excluded, 1 was lost to follow-up, and 1 chose to discontinue due to baseline neuropathic pain. The mean age was 55 years (range, 18-83). 76% were female, and 57% of the injuries were to the dominant hand. All included fractures were classified per the AO/OTA as 23-A2 (2), 23-A3 (3), 23-C1 (7), 23-C2 (5), and 23-C3 (4) fractures. Mean steering reaction times were: acute 0.65 (CI 0.61-0.69), subacute 0.61 (CI 0.53-0.69), and final 0.60 (CI 0.57-0.64) seconds, which was not statistically significant ($P = 0.11$). Mean number of steering errors were: acute 7.9 (CI 5.1-10.8), subacute 5.0 (CI 3.1-7.0), and final 4.3 (CI 2.7-5.9), which were significantly different ($P = 0.002$). Mean steering error magnitude and error time were not significant. Average Disabilities of the Arm, Shoulder and Hand (DASH) score by final follow-up was 14, showing that at 3 months the overall upper extremity disability had normalized compared to published distal radius fracture outcomes.

Conclusion: In simulated steering of an automobile, patients had a higher number of steering errors acutely following distal radius fracture fixation; however, this improved significantly over time with the largest improvement between 2 and 6 weeks. While driving ability is complex and multifaceted and the threshold of errors that correlates with safe driving is unknown, the results of this study allow a surgeon to better counsel a patient following surgery.

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See pages 401 - 442 for financial disclosure information.