

# Functional Outcomes Following Bridge Plate Fixation for Distal Radius Fractures

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**Purpose** To determine the functional outcomes of patients treated with dorsal spanning distraction bridge plate fixation for distal radius fractures.

**Methods** All adult patients at our institution who underwent treatment of a unilateral distal radius fracture using a dorsal bridge plate from 2008 to 2012 were identified retrospectively. Patients were enrolled in clinical follow-up to assess function. Wrist range of motion, grip strength, and extension torque were measured systematically and compared with the contralateral, uninjured wrist. Patients also completed *Quick-Disabilities of the Arm, Shoulder, and Hand* and *Patient-Rated Wrist Evaluation* outcomes questionnaires.

**Results** Eighteen of 100 eligible patients, with a minimum of 1 year from the time of implant removal, were available for follow-up (mean, 2.7 y). All fracture patterns were comminuted and intra-articular (AO 23.C3). There were significant decreases in wrist flexion (43° vs 58°), extension (46° vs 56°), and ulnar deviation (23° vs 29°) compared with the contralateral uninjured wrist. Grip strength was 86% and extension torque was 78% of the contralateral wrist. Comparison of dominant and nondominant wrist injuries identified nearly complete recovery of grip (95%) and extension (96%) strength of dominant-sided wrist injuries, compared with grip (79%) and extension (65%) strength in those with an injured nondominant wrist. Mean *Quick-Disabilities of the Arm, Shoulder, and Hand* and *Patient-Rated Wrist Evaluation* scores were 16 and 14, respectively. There were 2 cases of postoperative surgical site pain and no cases of infection, tendonitis, or tendon rupture.

**Conclusions** Distraction bridge plate fixation for distal radius fractures is safe with minimal complications. Functional outcomes are similar to those published for other treatment methods. (*J Hand Surg Am.* 2015;40(8):1554–1562. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)

**Type of study/level of evidence** Therapeutic IV.

**Key words** Distal radius fracture, bridge plating, distraction plate, functional outcome.

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**F**RACTURES OF THE DISTAL RADIUS account for approximately 17% of all fractures treated in emergency rooms.<sup>1,2</sup> There are numerous surgical techniques to treat these fractures, including percutaneous pinning, external fixation, and plate fixation.<sup>3–7</sup> The goals of surgical treatment are anatomic reduction of the distal radius, placement of a stable construct to enable fracture healing, and restoration of normal wrist kinematics.<sup>8–12</sup>

Dorsal spanning plate fixation has been described as an effective treatment option for unstable comminuted

distal radius fractures, bilateral wrist fractures with metaphyseal bone loss or diaphyseal extension, and complex injuries requiring extensive soft tissue and bony reconstruction.<sup>13–15</sup> In addition, this method allows for early weight bearing and transfer in polytrauma patients with pelvic and lower extremity fractures.<sup>13–15</sup> The plate is temporarily fixed to the second or third metacarpal under the extensor tendons. After fracture healing is confirmed at approximately 12 weeks, the plate is removed and therapy is initiated for wrist motion and strengthening.<sup>4,5,13,16</sup>

Functional results and complications have been previously reported with percutaneous fixation, volar plating, dorsal plating, and external fixation of distal radius fractures.<sup>12,17–25</sup> The literature on outcomes after dorsal spanning plate fixation for distal radius fractures has been limited to retrospective reviews<sup>14,26</sup> except for one prospective series by Ruch et al<sup>27</sup> in 2005.

We hypothesized that patients treated with dorsal spanning bridge plate fixation for unilateral distal radius fractures would have functional kinematics that were not significantly different from their unaffected wrist and not have significant functional impairment in their activities of daily living or work related activities greater than 1 year after plate removal. The purpose of this study was to systematically analyze the functional and kinematic outcomes of the wrist in patients after dorsal spanning bridge plate removal for the treatment of distal radius fractures.

## MATERIALS AND METHODS

This functional outcomes analysis was approved by our institutional review board and adhered to the Strengthening and Reporting of Observational Studies in Epidemiology guidelines, and was conducted at a large level 1 trauma center. A data inquiry was completed for all patients who underwent surgical treatment of intra-articular distal radius fractures with Current Procedural Terminology codes 25608 or 25609 treated for at our tertiary care center from January 1, 2008 to December 31, 2012. Patient medical record numbers were retrieved from this query to create a research database on a secured password-protected file. We performed a medical chart review to verify that patients met inclusion criteria for the study. Patients who met criteria were contacted via telephone and asked to participate in the study. We made up to 5 attempts to contact each patient. Included participants returned for a clinic visit when outcomes data were collected. Neither patients nor their insurance were billed for the visit because patients were

considered research subjects. Consent was completed at the time of the clinical follow-up visit.

## Study population and inclusion

All available patients over age 18 years who underwent surgical treatment of a unilateral distal radius fracture at our institution with dorsal spanning bridge plate fixation during the study period with greater than 1 year of follow-up from removal of the dorsal bridge plate were included in the study and enrolled at the time of follow-up. Exclusion criteria were patients with bilateral injuries, multiple methods of fixation of the radius (ie, volar plating, dorsal plating, other methods of surgical fixation), concomitant ipsilateral elbow or hand fractures, additional injuries to the affected wrist or contralateral wrist, additional surgery on the affected wrist after removal of bridge plate for unrelated injuries, and any surgical intervention on the contralateral wrist. Patients with K-wire fixation of the radial styloid in addition to dorsal bridge plate fixation were included. All ancillary hardware was removed before or at the time of the plate removal.

## Surgical indications and technique

Indications for use of this technique included unstable comminuted distal radius fractures, open fractures with metadiaphyseal extension and bone loss, and polytrauma patients who were thought to benefit from early weight bearing and transfer. A standardized surgical technique was used in all patients as described previously using the second metacarpal for fixation of a dorsal spanning bridge plate.<sup>13</sup> All patients received surgical treatment from 1 of 2 authors (C.A. or D.H.).

## Data collection

Data were collected from the patients at the study follow-up visit by 2 of the authors, an orthopedic surgical resident, and a hand fellow. Wrist motion, grip strength, and wrist extension strength were collected for both the injured wrist and the contralateral, uninjured wrist. We measured wrist range of motion using a goniometer and made strength measurements using a Baltimore Therapeutic Equipment machine (PrimusRS, Hanover, MD). Subjects completed questionnaires at the time of follow-up. These included the short Disabilities of the Arm, Shoulder, and Hand (*QuickDASH*) form, the Patient-Related Wrist Evaluation (PRWE) questionnaire, and the 12-item Short Form Health Survey (SF12). We collected the following information for each patient: patient demographics (age, sex, comorbidities, date of injury, date of surgery, additional injuries at the time of the

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