SCIENTIFIC ARTICLE

Prospective Evaluation of Pronator Quadratus Repair Following Volar Plate Fixation of Distal Radius Fractures

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Purpose To evaluate the efficacy of pronator quadratus (PQ) repair after volar plating of distal radius fractures.

Methods All consecutive distal radius fractures treated operatively with a volar plate during a 1-year period were assigned to receive a repair of the PQ versus no repair. Surgical exposure, reduction, and postoperative rehabilitation were equivalent in both groups. Clinical outcomes with a minimum follow-up of 12 months were assessed via range of motion; grip strength; Disabilities of the Arm, Shoulder, and Hand (DASH) scores; and visual analog scale (VAS) scores.

Results A total of 60 consecutive distal radius fractures were treated operatively with a locking volar plate. Full follow-up data were available for 33 patients in the PQ repair group and 24 patients in the control group. At 12 months, the mean DASH score was 8 for the repair group and 5 for the control group. Range of motion at the wrist, grip strength, and VAS scores were also not significantly different between groups. In addition, we found no significant differences in any of the parameters at the 2-, 6-, or 12-week intervals, although we observed greater grip strength and wrist flexion in the repair group at 6 weeks. Reoperation was required for 4 patients in the repair group and 1 in the control group.

Conclusions Pronator quadratus repair after volar plating of a distal radius fractures did not significantly improve postoperative range of motion, grip strength, or DASH and VAS scores at 1 year. The rates of reoperation between groups were not significantly different. *(J Hand Surg 2013;38A:1678–1684. Copyright © 2013 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic II.

Key words Distal radius, fracture, outcome, pronator quadratus, volar plate.

Distal radius fractures are among the most common fractures of the skeleton and are estimated to account for 2.5% of all visits presenting to the emergency room.[1] As the treatment of this common injury has evolved, internal fixation with the volar locking plate has gained popularity as a method of contemporary surgical management.[2] Volar plate fixation has the advantages of obtaining articular

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fragment stability, a relatively low risk of tendon rupture, and early return to motion and functional strength.[3–16] However, to gain access to the fracture site through the volar approach, the pronator quadratus (PQ) muscle must be released and elevated. Controversy surrounds the merits of its subsequent repair, which theoretically augments postoperative clinical function, stability of the distal radioulnar joint, and soft tissue coverage over the hardware. Opponents of the PQ repair claim that the quality of the tissue often precludes a durable repair, and outcomes studies are universally good regardless. Although PQ repair was included in the initial technical descriptions of volar plating, at least 1 retrospective study has formally challenged this assertion.[9]

The purpose of this prospective trial was to evaluate the outcomes after volar plate fixation for distal radius fractures as a function of PQ repair. We assessed outcomes primarily through range of motion; grip strength; Disabilities of the Arm, Shoulder, and Hand (DASH) scores; and visual analog scale (VAS) scores. We secondarily compared the incidence of reoperation and postoperative complications such as tendon rupture, tendonitis, neuritis, malunion, and nonunion.

MATERIALS AND METHODS

We conducted a double-blinded, prospective, clinical trial from January 2011 to December 2011. Institutional review board permission was obtained, and all patients signed an informed consent. We assigned 60 consecutive distal radius fractures treated operatively with a volar plate into 1 of 2 groups. Repair of the PQ was performed in the study group, and no repair of the PQ was performed in the control group. The patients were blinded to their respective study group. For ease of facilitation, patients born in an odd birth year were assigned to the repair group, whereas those born in an even birth year were assigned to the control group. Patient demographics such as age, hand dominance, comorbidities, fracture severity, and presence of concurrent ulnar styloid fracture were recorded. The senior author (A.I.) classified all fractures in a blinded manner using the AO/ASIF classification system. Surgical exposure, reduction, and postoperative rehabilitation were similar in both groups. Two patients were lost to follow-up before 1 year and were excluded from the final analysis. One patient with an ipsilateral elbow fracture-dislocation was also excluded.

Surgical technique

A single orthopedic hand surgeon performed all surgical procedures. Either regional or general anesthesia was used in all cases with tourniquet control. The volar distal radius was exposed through a flexor carpi radialis approach. The PQ was released along its distal and radial borders and elevated in a subperiosteal fashion ulnarly, with care being taken not to violate the muscle or compromise its neurovascular pedicle inserting on the ulnar side from the interosseous membrane. All fractures were repaired with 1 of 2 variable-angle volar locking plates: a Medartis APTUS plate (Kennett Square, PA) or a Synthes 2.4 Variable-Angle LCP 2-column plate (Paoli, PA). In the repair group, repair of the PQ was performed over the plate with 4 to 5 interrupted figure-of-8 2-0 absorbable, synthetic, braided sutures to return the released edges of the PQ to the radial and distal borders of the radius. Repair of the muscle was achieved in all attempted cases, although we observed varying degrees of muscle injury. In the control group, the PQ was placed back to its anatomic position but was not repaired with sutures.

Postoperative management

Immediately after surgery, the patient was encouraged to elevate the hand and begin early and unrestricted finger motion. The postoperative soft dressing was maintained for 10 to 14 days until the first follow-up visit. At that visit, the dressings and sutures were removed, radiographs were taken, and therapy was started under the supervision of a certified hand therapist. A prefabricated orthosis was also applied for comfort and protection, but its use was optional. During weeks 2 through 6, an aggressive anti-edema protocol was initiated along with tendon gliding and range of motion exercises. At 6 weeks postoperatively, patients were reevaluated and advanced to progressive strengthening and resistance exercises upon evidence of sufficient interval healing by radiographs and clinical exam. In addition, use of the orthosis was discontinued. During reevaluation at 12 weeks postoperatively, patients were advanced to a work hardening program or discharged from therapy depending on occupational needs, and orthosis use was terminated. A final visit was performed 12 months postoperatively. An equivalent postoperative protocol was used for all patients irrespective of the study arm.

Assessment of outcomes

The primary outcome measure was the DASH score. Secondary outcome assessments included measurements of the VAS score, range of motion, and grip strength. An orthopedic nurse who was blinded to the study protocol obtained all of the outcome measurements during the follow-up visits. Wrist flexion, exten-