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EVIDENCE-BASED ORTHOPAEDICS

Volar Locking-Plate and Kirschner-Wire Fixation Did Not Differ in Terms of Functional Outcomes After Dorsally Displaced Distal Radial Fracture

Costa ML, Achten J, Parsons NR, Rangan A, Griffin D, Tubeuf S, Lamb SE; DRAFFT Study Group. Percutaneous Fixation with Kirschner Wires Versus Volar Locking Plate Fixation in Adults with Dorsally Displaced Fracture of Distal Radius: Randomised Controlled Trial. *BMJ*. 2014 Aug 5;349:g4807.

Question: In patients with a dorsally displaced fracture of the distal part of the radius, how does volar locking-plate fixation compare with Kirschner-wire fixation?

Design: Randomized (allocation concealed), blinded (data collectors and outcome assessors), controlled trial with twelve months of follow-up (Distal Radius Acute Fracture Fixation Trial [DRAFFT]).

Setting: 18 centers in the United Kingdom.

Patients: 461 patients ≥ 18 years of age (mean age, 59 years; 84% women) who had a dorsally displaced fracture of the distal part of the radius within 3 cm of the radiocarpal joint in the past 2 weeks. Exclusion criteria were a fracture extending > 3 cm from the radiocarpal joint, open fracture, inability of the fracture to be reduced with indirect techniques, or

contraindication to anesthesia. 416 patients (90%) completed follow-up.

Intervention: Patients were allocated to volar locking-plate fixation ($n = 231$) or Kirschner-wire fixation ($n = 230$). Locking-plate fixation involved an incision over the volar aspect of the wrist. The screws in the distal portion of the bone were screwed into the plate at a fixed angle. The surgical approach, type of plate, and number and configuration of screws were decided by the surgeon. During Kirschner-wire fixation, the wires were passed through the skin over the dorsal aspect of the distal part of the radius and into the bone. The size, number, and configuration of wires and the insertion technique were decided by the surgeon. All patients received the same postoperative advice.

Main outcome measures: The primary outcome measure was the Patient Rated Wrist Evaluation (PRWE) (100 points,

with higher scores indicating worse outcome). Secondary outcomes were the Disabilities of the Arm, Shoulder and Hand (DASH) score (100 points, with higher scores indicating more disability) and health-related quality of life measured with the EuroQol questionnaire (EQ-5D) (ranging from 1 [perfect health] to 0 [death]). Complications included refracture, neurological injury, vascular injury, tendon injury, superficial wound infection, and deep wound infection.

Main results: The study had $\geq 80\%$ power to detect a 6-point difference between groups. Analysis was by intention to treat. No difference was seen between the groups in terms of the PRWE score at twelve months (Table). A borderline difference between groups was seen for the DASH score, favoring the locking-plate group; no differences were seen for the EQ-5D (Table). The locking-plate and Kirschner-wire groups had similar rates of complications, including refracture (1% vs. 1%), neurological injury (6% vs. 9%), vascular injury (0% vs. 0%), tendon injury (2% vs. 3%), superficial infection (8% vs. 5%), and deep infection ($< 1\%$ vs. $< 1\%$).

Conclusion: In patients with a dorsally displaced fracture of the distal part of the radius, no differences were seen in functional outcomes between treatment with volar locking-plate and Kirschner-wire fixation.

Source of funding: Health Technology Assessment scheme of the National Institute for Health Research.

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Volar locking plate vs. Kirschner wires for dorsally displaced distal radial fracture at twelve months*			
Outcomes	Volar locking plate	Kirschner wire	Treatment effect (95% CI)†
PRWE	13.9	15.3	-1.3 (-4.5 to 1.8)
DASH	13.0	16.2	-3.2 (-6.5 to 0.0)
EQ-5D	0.85	0.83	0.02 (-0.02 to 0.06)

*PRWE = Patient Rated Wrist Evaluation (100 points, with higher scores indicating worse outcome); DASH = Disabilities of the Arm, Shoulder and Hand (100 points, with higher scores indicating more disability); EQ-5D = EuroQol questionnaire (ranging from 1 [perfect health] to 0 [death]); CI = confidence interval. †Adjusted for treatment group, age, sex, intra-articular extension, and recruiting center.

Commentary

Many questions remain unanswered by this randomized, blinded, controlled trial by Costa and colleagues. Most notably, why were the postoperative results in the first six weeks, when the benefits of internal plate fixation might reasonably be expected to be most obvious, not reported? In addition, the absence of any sort of radiographic follow-up or estimation of articular or extra-articular reduction in the two groups leaves the following question unanswered: Given that the two groups were not statistically different at one year, is there a reasonable expectation of either equality or non-difference after additional follow-up? If one recalls the data of Goldfarb et al. demonstrating the total absence of a correlation between radiocarpal osteoarthritis and disability at fifteen years of follow-up¹, this may not matter; however, the data gathered during this study could be useful in this regard.

Other difficulties with the study are that a substantial number of the operative procedures were done by "trainees" and that some of the complications and neurological injuries were reported in a selective manner. Because of this, questions remain. How does one refracture a distal part of the radius that was treated operatively with internal fixation? Were

plates removed? Were these pin injuries to the lateral antebrachial cutaneous nerve and internal fixation injuries to the median and ulnar nerves?

These concerns notwithstanding, the authors showed that if the surgeon is facile at either percutaneous pinning or internal fixation of these fractures, similar functional results might be reasonably expected at one year of follow-up. What this study does *not* tell us is whether early postoperative function is improved in either group or whether either method is better in terms of obtaining and maintaining operative reduction. The long-term functional sequelae of these issues remain unknown.

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Reference

- Goldfarb CA, Rudzki JR, Catalano LW, Hughes M, Borrelli J Jr. Fifteen-year outcome of displaced intra-articular fractures of the distal radius. *J Hand Surg Am*. 2006 Apr;31(4):633-9.

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