

Effects of Anxiety and Depression Measured by the Center for Epidemiological Studies-Depression Scale (CES-D) on Postoperative Finger Stiffness and Clinical Outcomes after Volar Locking Plate Fixation of Distal Radius Fracture

Jin Hyung Kim¹, Jong Hun Baik², JAEHOON LEE, Jinsung Park³, Kihyeok Ku⁴

¹Orthopaedic surgery, ²Orthopaedic surgery, Kyung Hee University Hospital, ³Gyeongsang National University Hospital, ⁴Orthopaedic Surgery, Kyung Hee University Hospital At Gangdong

INTRODUCTION:

Distal radius fracture is a common injury, particularly in older adults. Volar locking plate fixation has become the main treatment for surgical treatment for distal radius fracture and allow to patients early return to normal activity via stable fixation and early range motion exercise. Early restoring the range of motion of the hand following distal radius fracture surgery can contribute to the functional outcomes including time to return to normal activities of daily living and work. Despite the apparent clinical effect of psychological factors on finger stiffness, few studies have evaluated the correlation between psychological factors and clinical outcomes including finger stiffness and pain, after distal radius fracture surgery. Therefore, this study was aimed to evaluate the effect of anxiety and depression, measured using the the center for epidemiological studies-depression scale (CES-D), on postoperative finger stiffness after volar locking plate fixation of distal radius fracture, and identify risk factors associated with postoperative finger stiffness.

METHODS:

Participants were consecutive patients who underwent open reduction and internal fixation for distal radius fracture between January 2019 and January 2020. A total of 76 consecutive patients who underwent volar locking plate fixation for distal radius fracture were enrolled and divided into 2 groups according to CES-D scores: a psychological distress group (Group A, n=29, CES-D \geq 16), and a healthy group (Group B, n=47, CES-D <16).

The CES-D consist a 20-item self-report questionnaire. Scores can range from 0 to 60 with higher scores reflecting greater severity. Scores of 16 and above are traditionally recommended cut-off value for detecting depression.

Finger stiffness was defined as the finger tip did not touch the distal palmar crease when patients make a fist. Also we measured active flexion range of motion (ROM) at metacarpophalangeal, proximal interphalangeal, and distal interphalangeal joints.

Clinical outcomes were assessed using the visual analog scale for pain (VAS), ROM of finger, grip strength, and the Disability of the Arm, Shoulder, and Hand (DASH) score at 4, 6, 12, 24 weeks, and 1 year postoperatively.

RESULTS:

The patients' mean age was 63.3 ± 12.8 years (range, 20 to 86 years), and the mean follow-up period was 13.7 ± 1.8 months (range, 12.0 to 19.2 months). The mean time from injury to surgery was 3.3 ± 2.3 days (range: 1 to 10 days). C1-type fractures were the most common (29 patients, 38.2%), followed by A2 (17, 22.4%), C3 (14, 18.4%), and C2 (12, 15.8%). Only 2 B3 (2.6%), 1 B2 (1.3%), and 1 B1 (1.3%) cases were identified. There were no significant differences in preoperative sex, age, hand dominance, BMI, presence of osteoporosis, fracture type, mechanism of injury (low energy vs. high energy), postoperative radiologic parameters except ulnar variation, and follow-up period between the two groups.

At 4 weeks postoperatively, finger stiffness was observed in 8 patients (27.6%) in the Group A and 4 patients (8.5%) in the Group B. Group A showed significantly higher mean VAS-R and VAS-A scores and distance to palmar crease, and significantly lower mean range of motion of fingers and grip power, and significantly worse DASH score than Group B. At 6 weeks postoperatively, finger stiffness was decreased in the two groups (6 in the Group A, 2 in the Group B). However, mean VAS-R and -A, distance to palmar crease were still significantly higher in Group A, and mean range of motion of fingers and grip power were significantly lower in Group A. Also, mean DASH score was still significantly worse in the Group A than the Group B. At 12 weeks postoperatively, finger stiffness was not observed in the two groups. However, mean VAS-A scores were still significantly higher in Group A than the Group B. Also, mean grip power was significantly lower in Group A than Group B, and mean DASH score was significantly worse in Group A than Group B (Table 1). At 6 months postoperatively and last follow up, mean VAS-R and -A score, grip power, and DASH score did not differ between the two groups (Table 2).

Predictors of finger stiffness

At 4 weeks postoperatively, finger stiffness significantly correlated with psychologic patients ($p = 0.049$, odd ratio = 4.10). However, sex ($p=0.449$), DM ($p=0.265$), injury mechanism ($p=1.000$), osteoporosis (0.524), and fracture type ($p=0.861$) did not correlate with finger stiffness. The distance to palmar crease at 4 weeks after surgery significantly correlated with age ($P < .001$, correlation coefficient of Spearman; 0.529), but did not correlate with the time to surgery ($p = 0.611$), BMI ($p = 0.629$), and radiologic parameter such as RI, RL, VT, and UV ($p = 0.266, 0.614, 0.442, \text{ and } 0.462$, respectively).

Older age ($\beta, 0.056$; 95% CI, 0.991 to 1.128; Exp(B) 1.057; $p = 0.092$) and psychologic patient ($\beta, 1.140$; 95% CI, 1.106 to 15.159; Exp(B) 4.095; $p = 0.035$) were associated with finger stiffness in univariable logistic regression analysis. However,

finally, in the multivariable logistic regression analysis, psychologic patients was the only factor associated with postoperative finger stiffness (β , 1.516; 95% CI, 1.121 to 18.509; Exp(B) 4.556; $p = 0.034$).

DISCUSSION AND CONCLUSION: Anxiety and depression was a consistent and major determinant of postoperative finger stiffness and negatively affected clinical outcomes until 3 months after volar locking plate fixation for distal radius fracture. Recovery from pain and of ROM and return to normal activities of daily living after volar locking plate fixation occurred more quickly in patients with healthy psychological status. Therefore, evaluations of psychological status should be emphasized to prevent early finger stiffness and to improve early clinical outcomes after volar locking plate fixation.

Table 1. Clinical and functional outcomes at 4 weeks and 3 months after surgery between the groups

	Group A (n=20)	Group B (n=47)	p-value
4 weeks			
Finger stiffness (%)	8 (27.0%)	4 (8.7%)	0.05
VAS-R score	1.69 ± 1.19	0.64 ± 0.76	0.004
VAS-A score	4.14 ± 2.15	3.21 ± 1.37	0.054
Distance to poster corner (cm)	2.46 ± 0.68	1.64 ± 0.75	0.003
Range of finger ROM (°)	62.44 ± 13.58	91.13 ± 6.05	0.043
Grip power (%)	29.71 ± 12.44	29.94 ± 10.79	0.921
DASH score	62.16 ± 18.12	42.76 ± 21.78	0.061
3 months			
Finger stiffness (%)	4 (20.7%)	2 (4.7%)	0.003
VAS-R score	1.17 ± 1.17	0.47 ± 0.63	0.003
VAS-A score	4.07 ± 1.89	2.32 ± 1.32	0.004

Table 2. Clinical outcomes at 6 and 12 months after surgery between the groups

	Group A (n=20)	Group B (n=47)	p-value
12 weeks			
VAS-R score	0.24 ± 0.64	0.11 ± 0.31	0.355
VAS-A score	3.83 ± 1.56	0.93 ± 1.070	0.004
Grip power (%)	54.57 ± 24.49	68.88 ± 20.38	0.009
DASH score	25.46 ± 30.01	13.46 ± 14.89	0.008
6 months			
VAS-R score	0.07 ± 0.26	0.04 ± 0.20	0.442
VAS-A score	0.99 ± 0.71	0.33 ± 0.64	0.164
Grip power (%)	34.42 ± 23.223	39.65 ± 19.73	0.261
DASH score	17.83 ± 14.37	12.09 ± 14.46	0.189
12 months			
VAS-R score	0.03 ± 0.19	0.04 ± 0.20	0.880
VAS-A score	0.98 ± 0.68	0.17 ± 0.48	0.120
Grip power (%)	85.24 ± 36.21	91.75 ± 12.23	0.689
DASH score	10.33 ± 11.48	7.42 ± 11.12	0.275

*Group A, a depression group (Group A, CES-D ≥ 10); Group B, a healthy group (Group B, CES-D < 10)

*Statistically significant ($P < 0.05$)