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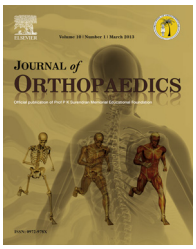

Original Article

# Volar locking plate fixation for distal radius fractures: Does age affect outcome?

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ABSTRACT

*Background:* The AAOS guidelines are unable to recommend for or against operative treatment of distal radius fractures in older patients.
*Aims:* This study compares the outcomes of older patients (≥60 years) against a cohort of younger patients treated with volar locking plate (VLP) fixation.
*Methods:* We assessed 78 patients, comparing range of movement (ROM), grip and pinch strength, subjective Visual Analogue Score (VAS) for pain and function and composite outcome scores.
*Results:* There was no difference in clinical outcomes between the two groups at six months.
*Conclusion:* Open reduction and VLP for distal radius fractures gives comparable outcomes in the older population.



## 1. Introduction

Distal radius fractures are common injuries that have extensive literature describing treatment options and the respective outcome.[1–4] One increasingly popular treatment option is open reduction through a volar approach and fixation using a volar locking plate (VLP).

VLP fixation has been shown by numerous studies to have good radiological and clinical outcomes.[5–8] The advantage of VLPs compared to standard volar fixation is that they offer stable fixation even in comminuted fractures of osteoporotic bone. Therefore, the benefit should be seen particularly in the older population. In the older patient, that would involve a shorter time to an independent living and return to daily activities.

The principles of 'stable anatomic reduction and early mobilisation' that are well established and universally accepted have been slow to develop for the management of wrist fractures in the older population. This is perhaps partly because of the traditional view that a good result was inevitable regardless of the appearance of the reduction,[9] and partly that despite the plethora of evidence, there is little consensus. The AAOS guidelines are unable to recommend for or against operative treatment or the use of VLP in the management of distal radius fractures in older patients.[10]

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## 2. Aim

This study investigates the clinical outcomes of older patients (≥60 years) that are treated with VLP fixation for the treatment of unstable distal radius fractures. We aim to compare these to a matched cohort of younger patients (≤59 years) undergoing the same procedure.

We aimed to compare the two cohorts for range of movement (ROM), grip and pinch grip strength, Visual Analogue Score (VAS) in pain and function. In addition to this, we compared composite outcome scores at six months post injury.

## 3. Patients and methods

We prospectively selected and followed 78 consecutive patients who had sustained a displaced unstable distal radius fracture that underwent open reduction and internal fixation with a VLP. All procedures were performed in our trauma unit in a 12-month period by either a consultant orthopaedic surgeon or a trainee under consultant supervision.

Statistical analysis was performed using IBM SPSS Statistics 21 software.

All 78 procedures were done with an above elbow tourniquet. The radius was approached via a volar approach through the bed of flexor carpi radialis. The carpal tunnel was opened if indicated for nerve compression or to improve exposure. The median nerve and flexor tendon were retracted ulnarwards. The pronator quadratus was opened as a flap, being raised from the radial border of the distal radius; this was reflected ulnarward.

The fracture was then reduced and held temporarily with Kirshner wires. Adequate articular surface reduction and restoration of radial height and volar tilt were confirmed using fluoroscopy. Following this, a VLP was applied. Closure was performed in the standard manner.

Post-operatively, the wrist was placed in a bulky wool and crepe bandage or Plaster of Paris for 10–14 days. After this, the patients were allowed to mobilise their wrist, pain permitting, under physiotherapeutic guidance.

We documented standard demographics as well as the fracture type according to the AO/OTA[11] classification from the initial radiograph. Patients were reviewed clinically at 6 months in the outpatient department. Objective measurements of ROM, grip and pinch-grip strength were made and measured with a dynamometer (Jamar; Therapeutic Equipment, Clifton, NJ) and when possible compared with the uninjured contralateral side. Patient Rated Wrist Evaluation (PRWE), modified Gartland and Werley score (mGWS), and the quick Disability of Arm Shoulder and Hand (qDASH) questionnaire were carried out by patient questionnaires on the day of clinic review.[12–14] Clinical assessment and compilation of data was done by assessor blinded to the study.

Statistical analyses were performed as follows:

Outcome measures were statistically analysed at 6 months post-VLP using the Student's *t*-test and Mann–Whitney *U* test. Results were grouped in age groups as *the ≤59 group and the ≥60 group*. Data which followed a normal distribution was considered as parametric and analysed using a Student's *t*-test at 95% confidence interval (95% CI). Data with a positive skew meaning they did not have a normal 95% distribution curve was considered non-parametric and a Mann–Whitney *U* test generated.[15]

For analyses of all outcome measures including ROM, grip strength and composite scores, the Mann–Whitney *U* test (for independent samples and related samples, respectively) hypothesised that *the distribution of the outcome measures is the same across categories of age* where the *≤59 group was compared to the ≥60 group. Pinch grip strength was analysed using Student's t test.*

When comparison of treated limb against normal (untreated) contralateral limbs was made, the Mann–Whitney *U* test hypothesised that *the median of differences between each treated limb movement and normal limb movement is equal.*

## 4. Results

There were 43 patients in the *≤59 years group and 35 in the ≥60 years group*. In total, there were 62 females and 16 males, the ages ranging from 17 to 83. According to the AO/OTA classification, there were 22 type A fractures, 14 type B and 42 type C (Table 1).

### 4.1. *Objective ROM*

Grip strength was significantly better for the <59 group (mean 57 N) compared to the ≥60 group (mean 40 N), $p$ value = 0.001. Pinch movements were also significantly better in the ≤59 group (mean 9.1 N) compared to the over ≥60 (mean 7.2 N) (95% CI 0.63, 3.2; $p = 0.004$). In contrast, ulnar flexion was better in the ≥60 group (mean 28.1°) compared to a mean = 23.6° in the younger group ($p = 0.022$) (Table 2). The remaining measures of movement were statistically insignificant between the two groups

**Table 1 – Demographics of the study.**

| Age group | Number of patients | Age range (years) | Mean age | Male:Female (M:F) | AO/OTA classification | | |
|---|---|---|---|---|---|---|---|
| | | | | | A | B | C |
| ≤59 | 43 | 17–59 | 45.5 | 11:32 | 11 | 8 | 24 |
| ≥60 | 35 | 60–83 | 70 | 5:30 | 11 | 6 | 18 |
| Total | 78 | 17–83 | 56.6 | 16:62 | 22 | 14 | 42 |