

## Randomized study of functional outcome of patients with lower end radius fracture treated with distal locking radius plate

Jakhar R ,Kalla R

### ABSTRACT

**Background:** The best treatment for an inadequately reduced fracture of the distal part of the radius is not well established. We collected prospective outcomes data for patients undergoing open reduction and internal fixation of an inadequately reduced distal radial fracture with use of the volar locking plating system.

**Aim:** To evaluate the anatomical, functional outcome and complications of open reduction and plate fixation in the management of fracture distal end radius.

**Methods:** Over a six month period, 20 patients underwent open reduction and internal fixation of an inadequately reduced distal radial fracture with use of the volar locking plating system. All the patients were subjected to clinical examination and radiographic evaluation of the affected & the normal side at the time of injury. The radiographs were assessed in terms of loss of palmar tilt or presence of dorsal tilt, radial shortening and loss of radial inclination. Follow up of six months with an average age of 40 yr was done.

**Results:** All fractures united following osteosynthesis in an average of 16 weeks time of union. All Michigan Hand Outcomes Questionnaire domains approached normal scores at four months, with small continued improvement to six months.

**Conclusion:** The volar locking plating system provides effective fixation when used for the treatment of initially inadequately reduced distal radial fractures.

**Keywords:** open reduction and internal fixation, volar locking plate, radiological assessment

### INTRODUCTION

Fractures of lower end radius are most common fractures of the upper extremity constituting 17 % of all fractures and 75% of all forearm fractures.

Close reduction and cast immobilization has been the mainstay of treatment of these fractures but mal-union of fracture and subluxation /dislocation of distal radioulnar joint resulting in poor functional and cosmetic results is the usual outcome. The residual deformity of wrist adversely affects wrist motion and hand function by interfering with the mechanical advantage of the extrinsic hand musculature causing pain, limitation of forearm motion and decreased grip strength as a result of arthrosis of the radiocarpal and distal radioulnar joints.

As open reduction and volar plating ensures more consistent correction of displacement and maintenance of reduction, this study evaluates the anatomical, functional outcome and complications of open reduction and plate fixation in the

management of fracture distal end radius.

### MATERIALS AND METHODS

Over a six month period, 20 patients underwent open reduction and internal fixation of an inadequately reduced distal radial fracture with use of the volar locking plating system. Patients were enrolled in the present study on the basis of strict entry criteria and were evaluated second, fourth, and sixth months after surgery. Informed written consent was obtained from patients. All the patients were subjected to clinical examination, radiographic evaluation of the affected and normal side at the time of injury with the antero-posterior and lateral views. The radiographs were assessed in terms of loss of palmar tilt or presence of dorsal tilt, radial shortening and loss of radial inclination. Fractures were classified according to the AO Classification into type A (extra-articular), type B (partial articular) and type C (complete articular). With Volar approach fracture site was identified and according to fracture 3 or 4 hole volar locking plate

inserted, all screw tighten and reduction checked under IITV.

Outcome measures included radiographic parameters, grip strength, lateral pinch strength, the Jebsen-Taylor test, wrist range of motion, and the Michigan Hand Outcomes Questionnaire.

## RESULTS

The mean age of the patients at the time of enrolment was 48.9 years. Forty percent (eight) of the twenty fractures were classified as AO type A, 10% (1) were classified as type B, and 50% (10) were classified as type C. Radiographic assessment showed that the plating system maintained anatomic reduction at the follow-up periods. At the time of the six month follow-up, the mean grip strength on the injured side was worse than that on the contralateral side (18 compared with 21 kg;  $p < 0.01$ ), the mean pinch strength on the injured side was not significantly different from that on the contralateral side (8.7 compared with 8.9 kg;  $p = 0.27$ ), and the mean flexion of the wrist on the injured side was 86% of that on the contralateral side. All Michigan Hand Outcomes Questionnaire domains approached normal scores at four months, with small continued improvement to six months.

### Case no.1



Pre op X-ray



Post op X-ray

### Case no.2



Pre op X-ray



Post op X-ray

## DISCUSSION

The importance of restoring the anatomical alignment and articular congruity is well-recognised in the fixation of distal radial fractures. Intra-articular

incongruity has been shown to correlate with post-traumatic arthritis whilst mal alignment can lead to decreased grip strength, reduced range of motion and instability internal fixation results in a better restoration and preservation of radial length and volar tilt compared with external fixation. The advent of the locking plate system provides a more secure and reliable fixation for osteoporotic bones. The plates and locking-head screws are smaller than the traditional 3.5-mm system, so fracture fragments can be addressed individually. The smaller profile plates allow a more distal placement, hence a more subchondral fixation, with less tendon and soft tissue irritation. The smaller T- and straight plates permit a fragment-specific approach in accordance with the three-column theory in distal radius fracture fixation. Our series demonstrated that there was no significant difference in the radial length and volar tilt comparing radiographs immediately following operation with those at final follow-up. Hence the radiographic reduction achieved post-operatively can be effectively maintained over time with this method of fixation. These results are comparable with other published studies using volar plating of distal radial fractures. When the range of motion was analysed according to age, there was a trend that the elderly patients seemed to regain less motion. It was reflected in the Garland and Werley and the modified Green and O'Brien scores. Age-related effect, however, was not seen in the patient self-assessment of the upper extremity disability using the DASH questionnaire.

## CONCLUSION

The volar locking plating system appears to provide effective fixation when used for the treatment of initially inadequately reduced distal radial fractures.

## AUTHOR NOTE

Rohan Jakhar, P.G. Resident 3rd year

**(Corresponding Author);**

email: rohanjakhar05@yahoo.co.in

Rajeshwar Kalla, Professor and Head

Dept. of Orthopaedics, Mahatma Gandhi Medical College and Hospital, Sitapura, JAIPUR

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