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Original Research Article.

Randomized Study of Functional Outcome of Patients with Lower End Radius Fracture Treated with Distal Locking Radius Plate

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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.

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. All the patients were subjected to clinical examination. Radiographic evaluation of the affected & the normal side was done at the time of injury with the anterio-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. Follow up of six months with an average age of 40 yr.

Results: 20 out of 20 fracture united following osteosynthesis. Average time to union was 16 weeks. 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 appears to provide 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, Treatment, Early Mobilization.

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INTRODUCTION

Fractures of lower end radius are most common fractures of the upper extremity, encountered in practice and constitute 17 % of all fractures and 75% of all forearm fractures.[1] Close reduction and cast immobilization has been the mainstay of treatment of these fractures but malunion 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 may cause 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.[2-5] Locking compression plate in distal radial fractures owes advantage to avoid possible deprivation of blood supply to the distal metaphyseal fragments. This study evaluates the anatomical and functional outcome of open reduction and plate fixation with early mobilization in the management of fracture distal end radius.

MATERIALS & METHODS

All the patients were subjected to clinical examination. Radiographic evaluation of the affected & the normal side was done at the time of injury with the anterio-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 as according to the AO Classification into type A (extra-articular), type B (partial articular) or type C (complete articular).[6] After pre-anesthetic evaluation patients were taken up for surgery. Volar approach taken, fracture site identified and according to fracture 3 or 4 hole volar locking plate inserted, all screw tighten and reduction checked under IITV and closer done layer by layer.

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

Table 1: Distribution of age group

Age (yrs)	No. of Patients
20-30 yrs	3
31-40 yrs	5
41-50 yrs	7
51-60 yrs	5
Total	20
Mean age	48.9 yrs

Table 2: Distribution of patients: AO Classification

AO Classification	No. of patients
Type A	40%
Type B	10%
Type C	50%

Table 3: Functional outcome

Outcome	Injured site	Contralateral side	P-value
Mean grip strength	18kg	21kg	<0.01
Mean Pinch strength	8.7 kg	8.9 kg	0.27
Mean flexion of wrist	86%	100%	

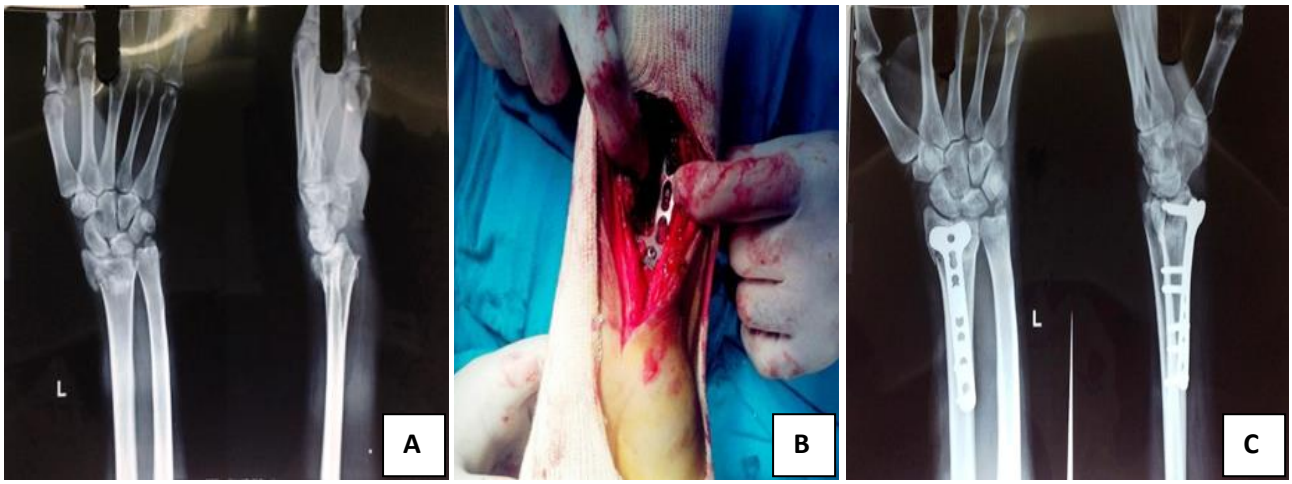

Figure 1 A,B,C: Pre-operative x-rays, Intra-operative & Post-operative

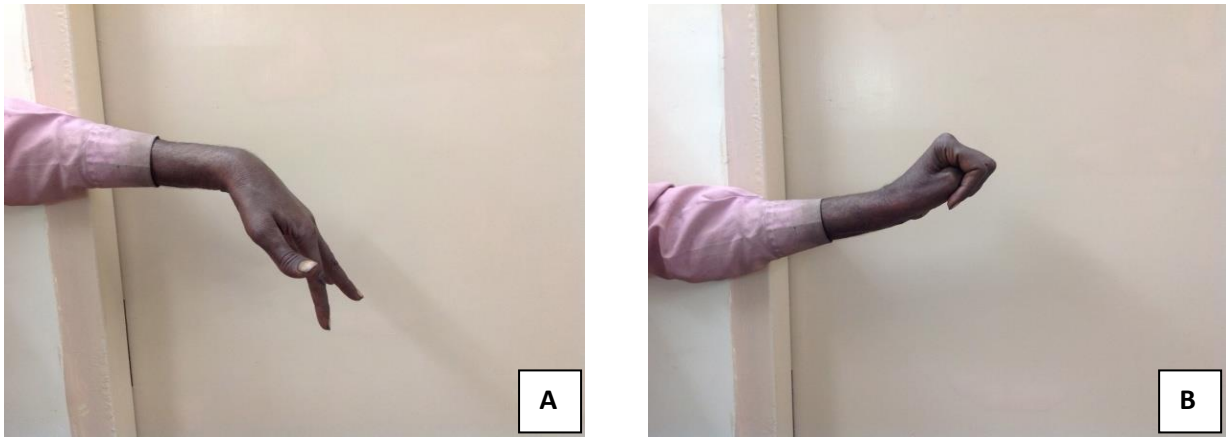

Figure 2: Follow-up six months (2A-palmer flexion, 2B- Dorsiflexion)

RESULTS

Twenty patients with a distal radial fracture were enrolled. The mean age at the time of enrollment was 48.9 years (table 1). 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 (table 2). 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 (table 3). All Michigan Hand Outcomes Questionnaire domains approached normal scores at four months, with small continued improvement to six months.

DISCUSSION

The importance of restoring the anatomical alignment and articular congruity is well-recognized in the fixation of distal radial fractures. Intra-articular incongruity has been shown to correlate with post-traumatic arthritis , whilst malalignment 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 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. This was reflected in the Garland and Werley and the modified Green and O'Brien scores, which were scoring systems done by mainly objective evaluations. This age-related effect, however, was not seen in the patient self-assessment of the upper extremity disability using the DASH questionnaire.[7] The strength of our study is that all procedures were performed in a single centre by or under the supervision of two experienced surgeons; thus, the principle and concept of fixation were consistent. The follow-up evaluations were also conducted with the same group of surgeons. we believe this study has demonstrated a good clinical outcome with no loss of radiographic reduction using the 2.4-mm locking plate system in the fixation of distal radial fractures. It can be concluded that the volar locking plating system appears to provide effective fixation when used for the treatment of initially inadequately reduced distal radial fractures.

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