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## Prospective study of low profile plates in management of distal radius fractures

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### Abstract

**Introduction:** Unstable distal radius fractures requiring surgery have long been treated with diverse techniques including pinning, external fixation, nailing, and plating.

**Aim:** To evaluate the clinical, functional and radiological outcome in fragment specific fracture fixation of unstable and intra articular distal radius fracture using low profile plates.

**Methods:** This is a prospective study of 20 cases of unstable & intra articular distal radius fractures treated by fragment specific fracture fixation. The wrist function was assessed according to Mayo wrist score, and postoperative complications were recorded.

**Results:** Results are analysed using Mayo scoring system. Out of 20 patients, 11 achieved excellent results, 6 got good result and 3 got satisfactory results.

**Conclusion:** Low profile plates in management of intra articular distal radius fracture provides stable fixation, allows early joints mobilization, provides better clinical, radiological and functional outcome.

**Keywords:** Distal radius fracture, minimally invasive plate fixation, palmar locking plate

### Introduction

Distal radius fracture is a common injury in all age groups. However, there are several controversies in the operative indication, surgical approach and the best treatment method. The gold standard in the treatment of distal radius fracture remains uncertain [1]. Cast treatment with or without closed reduction has long been considered a viable option for treatment of distal radius fractures. However, the results are often unsatisfactory with restricted function and disabilities [2, 3]. Several studies have reported good anatomical and functional results of distal radius fractures treated with external fixation but also described high incidence of pin tract infection, cosmetic deformity, and nerve injury [4]. Traditional open reduction and internal fixation often results in extensive soft tissue dissection and periosteal injury and may be associated with high rates of infection, delayed union and nonunion [4, 5]. However, controversy still exists regarding the complications associated with current implants and fracture patterns that are not amenable to those surgical techniques [6, 7, 8]. Low-profile dorsal plates were developed to address these problems by providing bicolumnar fixation and minimizing extensor tendon complications [9, 10]. To date, few studies have described the effectiveness of or the complications associated with minimally invasive plate osteosynthesis (MIPO) techniques using these new implants [11].

### Aim

To evaluate the clinical, functional and radiological outcome in fragment specific fracture fixation of unstable and intra articular fractures of distal radius.

### Materials and methods

This is a prospective study of 20 cases of unstable & intra articular distal radius fractures treated by fragment specific fracture fixation. Twenty patients were randomly selected from the admissions in the accident and emergency ward in Department of Orthopaedics in Tirunelveli Medical College Hospital, Tirunelveli. Inclusion criteria: age above 20 years, closed unstable distal radius fractures, closed intra articular distal radius fractures. Exclusion criteria: age less than 20 years, compound fractures, old fracture more than 14 days, infection

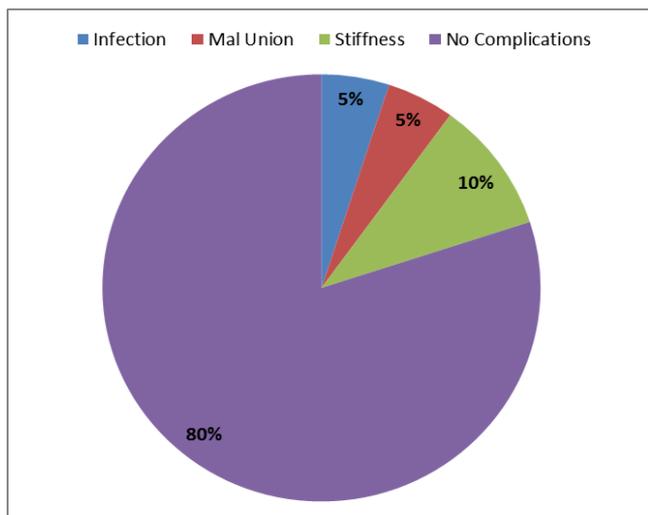
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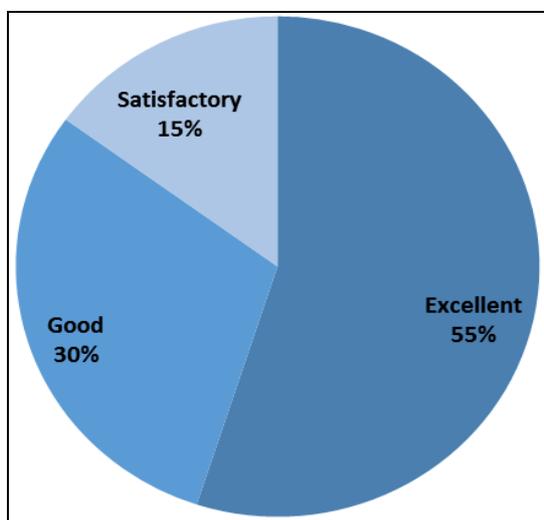
of fracture site, fracture on the other side of wrist, other fracture associated with same limb, patients with co-morbid medical conditions, poor skin condition. All the cases were analysed as per the following criteria; classification of fractures, time interval between injury and surgery, associated injuries.

**Results**

The age group varied from 20 to 56 years, with mean age of 37 years. Incidence of fracture was observed maximum between 41 to 50 years of age. Males are affected more in our study compared to females. Injury to right side was common in our study. We use mayo wrist score to assess the functional outcome. In our study predominantly excellent results obtained. In our study one patient had malunion found on the fourth week radiograph. Despite malunion, one of the patient had good functional outcome owing to the rehabilitation measures. In our study, 2 patients had stiffness of wrist joint because of poor co-operation with rehabilitation exercise. They were treated with mobilization after heat therapy and they showed progressive improvement with rehabilitation. In our study, one patient had minimal serous discharge from the incision site. The infection was treated according to pus culture and sensitivity report with intravenous antibiotics for a week, followed by oral antibiotics for another week. The infection subsided without any complication. Union was also not affected in this patient.



**Fig 1:** Distribution of Complications



**Fig 2:** Distribution of Mayo Score



**Fig 3:** a. dorsal buttress plate b. mini plate c. extra articular lag screw, c. mini plate extra articular lag screw 1, d. volar plating and K wire, e. volar T plate, f. union

**Discussion**

The goal of surgery for unstable distal radius fracture is to obtain and maintain an acceptable reduction, and for intra articular fractures is to maintain the articular congruity and to allow early restoration of Function. Achieving fracture stability is a prerequisite for attaining a satisfactory outcome for distal radius fractures. Unstable fractures are at increased risk for loss of reduction and subsequent malunion. Malunion can potentially lead to a poor functional outcome with residual pain, loss of motion, decreased endurance and grip strength, midcarpal instability. In case of intra articular fractures, many observations makes linking the residual articular incongruency directly with the early onset of degenerative changes. Thus in patients with any degree of residual articular incongruity documented 91% rate of degenerative arthritis, showed by Knirk and Jupiter [12], in their long term follow-up study. Numerous prospective studies to evaluate the functional outcome of various treatment options including plaster immobilization, external fixation and open reduction with internal fixation. Good or excellent results were achieved in 43%, 80% and 63% in each group. Recent studies show further improvement in functional outcome of ORIF owing to advances in implants and surgical techniques. Wright, Horodyski and Smith [13] reported retrospective study of 21 patients treated with plating and external fixation. In this study, there was no functional difference between the two groups. Egol K *et al.* [14] conducted a prospective randomized study involving 88 cases. Although the patients treated by plating had significant early improvement in the range of movement of wrist, in absolute terms the difference in range of movement was clinically unimportant. At one year radiological, clinical and functional outcome were similar in two groups. In an attempt to minimize the morbidity of extensive surgical dissections associated with conventional dorsal plate fixation of distal radius fractures, Medoff RJ [15] devised a hybrid technique of percutaneous wire and plate fixation designed to fix individual fracture fragments through several small incisions. This technique involves the use of ultra thin low profile implants, that can be shaped to customize fixation for

different fragment configurations and builds on the work of Rikli and Regazzoni <sup>[16]</sup>, by placing these implants strategically along the radial and intermediate columns to maximize construct rigidity. Mechanical studies using an unstable and intra articular distal radius fracture model have demonstrated that dual low profile plates, when placed at 50-90 degree angles to each other in the axial plane, provide fixation that is statistically superior. Thus the term “Fragment – specific fixation” does not refer to a particular implant type, but to the concept of two or more low profile implants placed strategically along the columns of the distal radius to fix individual fracture fragments. Benson *et al.* <sup>[17]</sup> reported an 85 intra articular fractures stabilized with fragment specific fixation with 32 months follow up documented 85% flexion, 91% extension, 64 excellent, 24 good results and no cases of symptomatic arthritis. Also in the same way, Schnall *et al.* <sup>[18]</sup> reported in a group sustained high energy trauma, averaged return to work in 6 weeks, with all fractures united without loss of position or deformity. Patient function was assessed using MAYO score, shows 12% of excellent and 8% of good results. The most common combination of fixation was radial plate with an ulnar plate. Further, in our study only one patient developed mild infection which is much lower compared to the external fixator. Nerve injury, commonly median nerve injury has been reported with incidence of 0-17% in conventional plating technique. In our study no neurovascular injuries had occurred, since the incision were made on safety zones considering the neurovascular anatomy. In our study malunion was reported in one case. The limitation of this study includes small study group, short follow up period and absence of control group.

### Conclusion

The distal radius fracture is a common fracture encountered in orthopaedic trauma centre. Due to increased incidence of the road traffic accidents (high velocity injury) distal radius fracture in young patient is increasing. The technique of minimally invasive plate osteosynthesis can be utilised in extra articular and minimally comminuted intra articular fractures. An adequate surgical technique will minimize complications and a personalized rehabilitation regime will ensure the best possible result. The surgeon’s familiarity with the approaches, technique and instruments also plays an important role. Accurate anatomical reduction of the articular surface and stable fixation are mandatory for better functional outcome.

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