

## “The Patient Knows Best”- Evaluation Of Distal Radial Fracture Locking Plate Fixations Using The Patient Rated Wrist Evaluation.

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**Abstract:** Fractures of distal end radius account for one sixth of all fractures that are seen and treated by orthopaedic surgeons. Although most of them were managed conservatively in the past, recently they have become the focus of an intense resurgence in interest regarding optimal management. We analysed the results of 26 patients with distal radial fractures fixed with locked volar plating using the PRWE score at the time of final follow-up (minimum six months) for this study. Routine standard preoperative, intraoperative and postoperative protocols were followed. 14 male and 12 female patients with the average age of 46 (range 20-72) were operated and followed up for a period of six to twelve months. In our study 18 of cases were of type C of AO classification and 4 cases were of B2 and 4 cases were of B3 type. The mean time to union was eight weeks (range 6-12 weeks). In our series out of 26 patients, function was excellent in 15, good in 6, fair in 4 and poor in 1 patient. Open reduction and internal fixation of distal radius fractures with plating provide good functional results for the patients with satisfying and predictable outcomes, both for the patient as well as the Surgeon.

**Keywords-** distal radius fracture, locking plate, Patient Rated Wrist Evaluation, DASH score, Brigham and Women's questionnaire, Gartland and Werley score

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### I. Introduction

Fractures of distal end radius account for one sixth of all fractures that are seen and treated by orthopaedic surgeons. These fractures are characterized by varying degree of comminution with volar and dorsal displacement, articular spread & depression and involvement of major fragment with or without involvement of radio carpal radio ulnar joint. Having been recognized for nearly two centuries, fractures of the distal radius recently have become the focus of an intense resurgence in interest regarding optimal management

Although most of distal radius fractures were managed conservatively in the past, the necessity of excellent functional results which requires maintenance of fracture alignment, length, rotations & early mobilization of the neighbouring joints is achieved better by surgical intervention. Open reduction & internal fixation with variable angle locking compression plate is advantageous as the reduction is done under direct vision, a method of achieving a stable fixation with almost perfect reduction, good reduction is achieved & maintained. Cost effectiveness, clean & sterile operation theatres with good antibiotics have decreased the chances of infections, there is no or less need for C- arm thus the medical staff has no or insignificant radiation hazards, the limb can be mobilized early & joint stiffness as well as muscle contractures can be minimized.

**Aim-** to evaluate the results of distal radial fractures fixation with locking volar plate using the PRWE.

### II. Material and Methods

We analysed the results of 26 patients with distal radial fractures fixed with locked volar plating who met the inclusion criteria for this study.

Inclusion Criteria 1. Pt. age -18 years and above 2. Fracture age - <3 weeks 3. with or without ulnar styloid fracture. 4. Closed fractures.

Exclusion Criteria 1. comorbid conditions preventing surgical intervention 2. Patients with local tissue condition making the surgery inadvisable 3. Pathological fractures other than primary osteoporosis. 4. open fractures 5. Multiple fractures in the same limb 6. pretreated with closed reduction and cast application 7. Skeletally immature patients 8. Neurological deficit.

Routine standard preoperative, intraoperative and postoperative protocols were followed. Anteroposterior and lateral views radiographs were taken and classified as per AO classification. Due medical fitness was obtained and skin condition assessed before posting the patient for surgery. Patient was operated under block or general anaesthesia with fluoroscopy assistance as per need. For surgery, standard Henry volar approach was used utilizing the plane between brachioradialis and flexor carpi radialis longus. Intraoperatively reduction was assessed under fluoroscopy. A volar splint was applied for two weeks, followed by which regular wrist physiotherapy was initiated. The patients were followed up for minimum of 6 months. Clinical, functional and radiological reviews were performed at periodic intervals. At the time of final follow-up (minimum six months) the evaluation of the procedure was done using the PRWE score.

Outcome assessment:

Outcome assessment has become important in evaluating the efficacy of surgical procedures. In accordance with this, most orthopaedic surgeons are now of the opinion that a proper outcome assessment should be performed after any form of surgery. Such an assessment facilitates surgeons in distinguishing between various treatment methods and helps to identify effective treatment options which, in turn, improves patient care.

A wide variety of outcome measures have been proposed for upper limb extremity disorders, including those for the evaluation of wrist and hand function. Some of these are generic instruments, such as the Short Form (SF)-36 and sickness impact profile. These generic measures assess the impact of musculoskeletal problems on the overall health and well being of patients, and they were designed for broad use in a variety of disorders. However, more specific outcome instruments have been designed for specific use in musculoskeletal problems, including those specific for anatomical regions, such as the patient-rated wrist evaluation score (PRWE), and those for outcome measures for specific diseases, such as carpal tunnel syndrome.

The traditional methods for evaluating wrist and hand function following an intervention consist of measuring grip strength and assessing the range of motion, both which provide a good, objective analysis of outcome. However, these methods do not take into account other aspects related to an analysis of outcome, such as the patient's ability to carry out activities of daily living, the ability to return to previous occupations and pain. Hudak et al. emphasised that to evaluate outcome following hand surgery, appropriate, reliable and validated outcome measures are required that take into account all aspects of patient life that may be affected.

The most commonly used outcome measures described in literature were the DASH score (disability of shoulder, arm and hand questionnaire), the PRWE score (patient-rated wrist evaluation questionnaire), the Brigham and Women's carpal tunnel questionnaire and the Gartland and Werley score. There are very useful evidences in literature to suggest that the PRWE score is the most responsive instrument for evaluating the outcome in patients with distal radius fractures, while the DASH score is the best instrument for evaluating patients with disorders involving multiple joints of the upper limb. The Brigham and Women's score is a disease-specific outcome instrument for carpal tunnel syndrome; it has been validated and demonstrated to show good responsiveness and reliability in evaluating outcome in patients with carpal tunnel release. The Gartland and Werley score, although the most commonly described instrument in the literature for evaluating outcome after wrist surgery, has not been validated so to date.

PRWE is the Patient-Rated Wrist Evaluation, a 15-item questionnaire was originally described by MacDermid et al. in 1998. The aim of the questionnaire is to provide a reliable and valid tool for quantifying patient-rated wrist pain and disability in order to assess outcome in patients with distal radius fractures. It allows patients to rate their levels of wrist pain and disability from 0 to 10, and consists of 2 subscales: Pain subscale - contains 5 items each of which is further rated from 1-10. The maximum score in this section is 50 and minimum 0 and Function subscale - contains total 10 items which are further divided into 2 sections i.e. specific activities (having 6 items) and usual activities (having 4 items). The maximum score in this section is 50 and minimum 0.

Development, item generation and reduction - The questionnaire was developed by surveying wrist experts, reviewing the biomechanical literature and carrying out patient interviews. This resulted in the identification of the domains of pain and function as priorities for the evaluation of wrist function. The items in both these essential domains were further reduced by expert and patient review as well as pilot testing. Pain items were modified to incorporate the whole spectrum of severity, both in intensity and frequency. Functional items were modified to include items that were commonly performed by either hand, performed by most of the patients and easy to understand. The intention was that the questionnaire be simple and brief.

Scoring - It is self administered by the patient. The score consists of two domains - pain and function - both of which carry equal weight. There are five items in the pain domain and ten items in the function domain. The response to each item is scored on a scale of 0-10. The pain score is the sum of five items, a worse score of 50; the disability (function) score is the sum of ten items, divided by 2. Thus, the total function on the PRWE scale ranges from 0 (normal wrist) to 150 (worst possible score).

Construct validity- As per literature ,the change in the disability over time when evaluated in 101 patients with wrist fractures showed a statistically significant improvement was found ( $p < 0.0001$ ), with the amount of improvement being 74% as compared to the SF-36 score, which reported an improvement of 14% ( $p < 0.0001$ ).

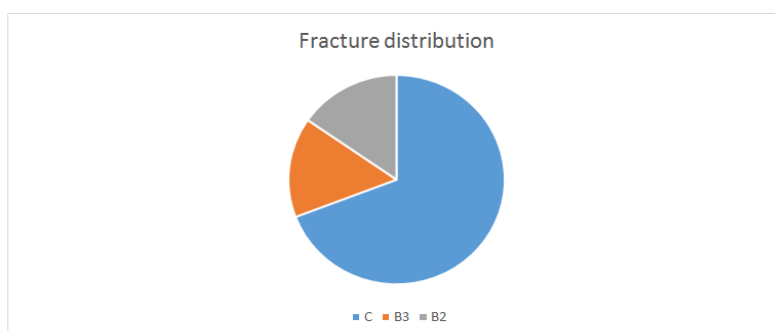
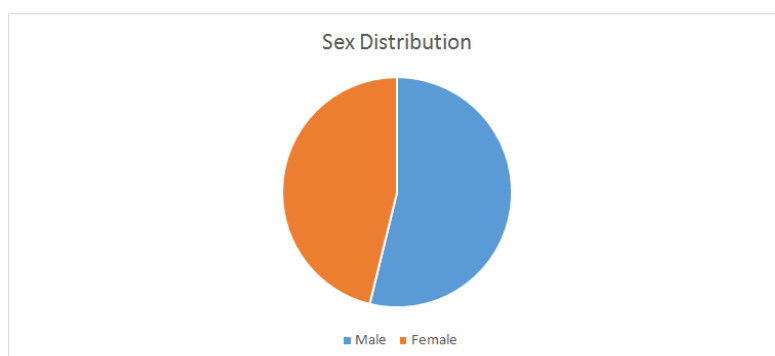
Criterion validity- As per literature, the PRWE score was correlated with the SF-36 score and with an impairment score that was based on an assessment of physical functions, such as range of movement of wrist joint, grip strength and dexterity. The PRWE score showed a correlation with the SF-36 score of between 0.33 and 0.73. There was a low correlation with the SF-36 mental summary score and a high correlation with bodily pain score and physical function score. The PRWE score correlated poorly – 0.52 (weak to moderate correlation) – with an impairment score (score for the measurement of function impairment in patients, which raises questions over the validity of this score, as an impairment score is the aspect which corresponds to the function of the PRWE scale, an important aspect when evaluating outcome in patients with distal radius fractures).

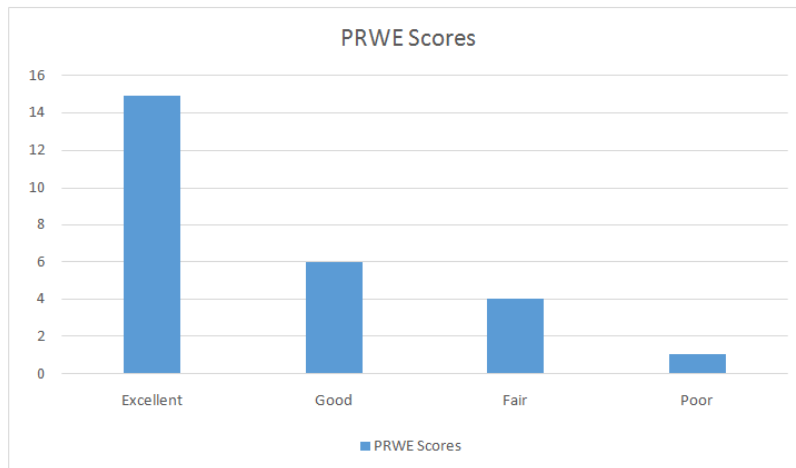
Test retest reliability -As per literature, this was tested on three groups of patients. Groups 1 and 2 comprised patients with distal radius fractures currently undergoing physiotherapy and having completed physiotherapy, respectively, while Group 3 patients had scaphoid fracture non-union and were tested for long-term retest reliability. A short-term retest reliability testing was performed on the first two groups. An excellent intra-class correlation (ICC;  $>0.90$ ) was found for pain subscales for all three groups. The function subscales showed an excellent reliability in the distal radius fracture group (ICC  $> 0.85$ ) but only moderate reliability over the long-term in Group 3 (ICC  $> 0.61$ ). No appropriate testing for internal consistency and responsiveness was performed, which makes the PRWE score rather weak in terms of overall reliability.

In our study we used PRWE scoring system to assess the functional outcomes. PRWE score is very simple and specific to the wrist, it reduces questionnaire fatigue. PRWE scores have excellent correlation with DASH scores thus making PRWE scores a good scoring system for assessing functional outcome in our study

### III. Results

Total 26, (14 male and 12 female) patients with the average age of 46 (range 20-72) were operated and followed up for a period of six to twelve months (minimum six months).In our study 18 of cases were of type C of AO classification and 4 cases were of B2 and 4 cases were of B3 type.The mean time to union was eight weeks (range 6-12 weeks). In our series out of 26 patients, function was excellent in 15, good in 6, fair in 4 and poor in 1 patient. (That one patient was not able to follow the standard rehabilitation protocol). One patient had superficial infection which responded well to a course of antibiotics and had good a PRWE score at 10 months. Transient tingling and numbness was observed in one patient who was given 75mg of Pregabalin once a day and recovered within 8 weeks and had fair a PRWE score at final followup at 1 year.





PRWE scores: Functional outcome  
Case Illustrations-



**CASE 1**



**CASE 2**



**CASE 3**



**CASE 4**

Limitations of the study- This study is limited by less number of cases and no control group or other modes of fixation for comparison. Further analysis and work will help to delineate the strategy in distal radius plating to avoid complications and adverse outcomes.

Conclusion- Open reduction and internal fixation of distal radius fractures with plating provide good functional results for the patients with satisfying and predictable outcomes, both for the patient as well as the Surgeon.

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