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## A prospective study of clinical and radiological outcome of fractures of distal end radius treated using volar rim plate

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### Abstract

**Aim:** This study has been undertaken to study clinical and radiological outcome of fractures of distal end radius treated using volar rim plate.

**Materials and Methods:** This review the results of 25 cases of distal end radius fracture treated with volar rim plate from October 2019 to march 2021 in Bapuji hospital and Chigateri general hospital attached to J J M Medical College Davanagere.

**Results:** Results were evaluated using Modified Cooney green and O'Brien functional score. In present study we have 20 patients with excellent results 4 patients with good results and 1 patient as fair and 0 patients as poor. None of patients developed non union plate prominence tendon irritation and implant failure.

**Conclusion:** The implant provides anatomic reduction stable fixation preservation of blood supply early and active mobilization.

**Keywords:** distal end radius fractures, volar rim plate

### 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<sup>[1]</sup>. Fractures of the distal radius are extremely common. Incidence rates vary from 5.7 to 124.6 per 10,000 persons per year<sup>[2]</sup>.

This fracture shows bimodal distribution of age with the fracture more commonly seen in children and elderly. The objectives of management for a distal end radius fracture should be restoration of range of motion and grip strength while facilitating the patient's early reinstallation to normal daily activities and minimizing the chances of post traumatic arthritis<sup>[3]</sup>. Intra articular distal radius fracture's degree of anatomical reduction is directly related to the posttraumatic arthritis.

Conservative treatment is usually unsuccessful, and it is also fraught with complications, such as early osteoarthritis, deformity, subluxation, and instability<sup>[4, 5]</sup>. Surgical treatment with plates and screws has given promising results.

The Goal of management here is good reduction and immediate sturdiness to achieve anatomic fracture union, which will help to get the early mobilization of wrist and also to avoid the complications of fracture<sup>[6, 7]</sup>. Fracture healing depends on fracture gap, stability and blood supply<sup>[8]</sup>. The variable angle locking plate decreases the compressive forces exerted on the bone to achieve stability, which prevent associated impairment of blood supply<sup>[9]</sup> and periosteal compression and which is favoured for fracture healing and another advantage of variable angle Locking Compression Plate is that system holes combined with variable angle locking screws allow upto 15° of axis angulation in all direction.

Various surgical techniques have been reported such as percutaneous pinning, external fixators and internal fixation<sup>[5-10]</sup>.

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## Materials and Methodology

### Source of Data

The study was conducted on patients diagnosed with distal end radius fracture seen as out patients and in patients in Chigateri General Hospital and Bapuji Hospital attached to J.J.M Medical College, Davangere over a period of October 2019 to march 2021.

### Inclusion Criteria

1. Fracture of distal end radius of either side with or without ulnar styloid involvement.
2. AO Muller type 23 – C<sub>1</sub>, 23 – C<sub>2</sub>, 23 – C<sub>3</sub>
3. For fixation of complex intra and extra articular fractures
4. Patient willing to participate in study
5. Age between 18 to 70 years.

### Exclusion Criteria

1. Pathological fractures.
2. Skeletally immature patients.
3. Patients not willing for surgery.
4. Non union and delayed presentation of fractures.

### Surgical Techniques

Under general anaesthesia patient on supine position on table operative limb placed on side support, parts scrubbed painted and draped, reduction done under c arm guidance with traction and countertraction. Around 6 cm incision taken around volar aspect through modified henry approach in between brachioradialis and FCR tendon. Skin subcutaneous tissue fat separated then FCR identified volar sheath over it was split then FCR tendon retracted ulnarwards then dorsal sheath split with fingers. Pronator quadratus was visible it was cut more towards ulnar side Then howman retractor was used for retraction overlying fascia and periosteum was next divided Osseous ends were freed from surrounding tissue fracture fragments were reduced then volar rim plate mounted

over the bone and fixed with 2.4mm locking head and cortical screws. Reduction checked under c arm guidance then thorough wash given wound sutured in layers sterile dressing done.

### Post-Op Protocol

- Wound inspected dressing done on post op day 2 and 5 iv antibiotics given and sutures removed on post op day 10.
- Limb elevation was given for 1 week gentle wrist rom exercise was started after 2 weeks 6 -8weeks full rom of wrist was allowed.
- Regular follow up was done 6 weeks 12 weeks 6months and 1year interval.
- Local examination of wrist joint for tenderness movements assessed and fracture union was assessed radiographically by taking serial radiographs.
- Functional outcome was assessed by Modified Cooney Green O'Brien functional score for wrist.

### Results

In our study 25 patients were included. The age group included were between 18 to 42 years with mean age of 30 yrs. The male to female ratio in our study was 4:1 with left wrist involving in 6 patient and 19 patient involving right side. In our study the most common mode of injury was road traffic accident and others being simple fall on outstretched hand. The present study consists of fresh fractures of distal end radius which were treated using volar rim plate A minimum follow up period was 6 months with each follow up clinical and radiological evaluation was done.

Results were evaluated using Modified Cooney and O' Brien functional score for wrist. In present study we have 20 patients with excellent results, 4 patients with good results, 1 patient as fair and 0 patient as poor. None of patient developed non union, plate prominence, tendon irritation and implant failure.

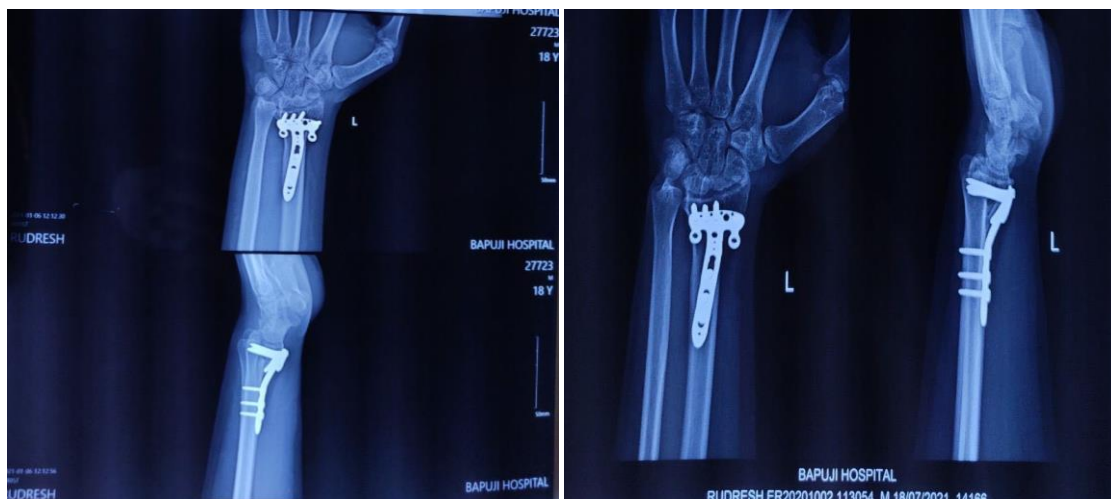


Pre-OP

Immediate Post OP

1 Month Post OP

3 Month Post OP



6 Months Post OP

1 Year Post OP

**Case 1: Rudresh 18 years Male**

### Discussion

Distal end radius fracture is one of the most commonly encountered fractures in present day scenario of trauma care. As the lifestyle changes requirement and needs towards medical condition also changes. In this era if patient immobilised for longer duration will have to face economic distress the conservative means of treating distal end radius has become obsolete. Moreover there have been few studies which have reported poor outcome higher rates of malunion stiffness and early arthritis of fractures managed conservatively.

Patient seeks for faster and better functional outcome and are ready to risk for surgery with better surgical techniques sterile maintenance and better post op protocols the results of surgical management are superior to conservative means

Management of distal end radius have many options as conservatively managed with closed reduction and cast/splint application and operative such as Percutaneous pinning Ex-fix, plating, T butters VA LCP Volar rim plate. The main purpose of this surgical treatment is anatomical reduction, maintenance of radial height, radial inclination, volar tilt and normal ulnar variance. In order to prevent stress to the implant, it should be strong in comparison to bone strength. Therefore volar rim plate are preferred, as they are anatomically pre-contoured. It has bevelled distal edge rounded and polished surface, countersunk screws for reduced soft tissue irritation. Additionally distal screws provide option for fixation of radial styloid, lunate faecet and DRUJ. It has variable angle combi hole which allows accurate plate positioning and radial length adjustments. It also provides locking in nominal angle and 15° off axis angulation in all the directions to address individual fracture pattern. This 2.4 mm volar rim distal radius plates are intended for fixation of complex intra and extra articular fractures of distal radius.

In this study we prospectively analysed outcome of distal end radius fracture treated with volar rim plate. We have taken into account age, Sex distribution, mode of injury, time taken for union, range of motion at the end of study.

In our study the age group included were between 18 to 42 years with mean age of 30 years. Similar to study conducted by Gupta R.K *et al* <sup>[11]</sup> were more than 18 years of age with mean age of 36.39 years. In the study conducted by H. C. Lee *et al* <sup>[12]</sup> there were 11 males and females with age ranging from 20 to 70 (mean 44.6) years old.

In our study the male to female ratio was 4:1. Similarly the

study conducted by H. C. Lee *et al* <sup>[12]</sup> there were 11 males and females with ration of 1:1. In the study conducted by Gupta R.K *et al* <sup>[11]</sup> there were 13 male and 7 female with ratio of 13:7.

In our study left wrist involving in 6 patient and 19 patient involving right side. In the study conducted by Gupta R.K *et al* <sup>[11]</sup> there were 16 patients had involvement of left side while 4 patients had involvement of right side. There were 11 right and 11 left wrist fractures with 50% occurring on the dominant limb in a study conducted by H. C. Lee *et al* <sup>[12]</sup>.

In our study the most common mode of injury was road traffic accident (80%) and others being simple fall on outstretched hand. In the study conducted by Gupta R.K *et al* <sup>[11]</sup> road traffic accident was observed to be the most common mode of injury accounting for 71.42% of the cases & fall on outstretched hand accounting for rest. In study conducted by H. C. Lee *et al* <sup>[12]</sup> 10 fractures occurred as a result of a fall, 2 fell from substantial height, and 6 were sustained in road traffic accidents. The remaining cases included 2 industrial accidents, a fall from a bicycle and another from a golf cart.

In our study none of patient developed non union, plate prominence, tendon irritation and implant failure. In study conducted by H. C. Lee <sup>[12]</sup> One patient developed deep wound infection resolved with ten days of intravenous antibiotics and the implants were not removed. Three other patients complained of numbness over the distribution of the superficial radial nerve. They recovered after conservative treatment. One patient developed rupture of the extensor tendons of the middle and ring fingers after two months. He underwent early removal of implants and a palmaris longus graft tendon repair at 14 weeks. At the final review, he was noted to have recovered full function. In study conducted by GUPTA R.K *et al* <sup>[11]</sup> two patients (10%) developed complications in the present study. one of the patients complained of screw impingement for which implant removal was done after 12 months of surgery while other patient developed Sudeck's Osteodystrophy which was managed conservatively.

All the patients were assessed with Modified Cooney Green and O'Brien score for final outcome and performance in daily activities. Results were excellent in 20 cases, good in 4 cases, fair in 1 case, poor in none. In the study conducted by Gupta R.K *et al* <sup>[11]</sup> excellent to good results were obtained in 85% of the patients. One of the patients had a fair outcome while the other patient had poor outcome due to decreased range of

motion and persistent pain in the distal radio-ulnar joint. Final results as reported by Kilic *et al.* [13] in their study were excellent to good in 89.9% patients and moderate to poor in 11.1% patients according to Gartland and Werley system.

### Conclusion

The implant distal radius volar rim plate has been provided with anatomic reduction stable fixation preservation of blood supply early and active mobilization.

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