

## Functional Outcome of Intraarticular Fracture Distal End Radius in Adult Treated by Variable Angle Volar Locking Plate

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Conflict of interest: Nil

### Abstract:

**Background:** INTRA-articular distal end radius fractures are difficult to manage and so various treatment modalities have been described. Variable angle locking plate is a novel development of LCP is the recent method to fix simple to complex fractures of distal end radius

**Objectives:** To evaluate functional outcome in fractures of distal radius fixed with variable angle volar locking plate.

**Methods:** In this study, 25 cases of intra-articular fractures of distal end radius were surgically managed by open reduction and internal fixation using variable angle volar locking plate in the Department of Orthopaedic Surgery Jhalawar Medical College Hospital The age of the patient in this study, ranged from 21 years to 80 years).

All patient were evaluated for radiological & functional outcome according "Sarmiento's modification of Lindstrom's criteria & Mayo Score" respectively.

**Results:** All the patients had good union. The mean time of union was 12 weeks. Stiffness was noted in 12% cases (3 patients), 4% (1 patient) show malunion, 8% cases (2 patients) had superficial infection which was controlled by dressing and antibiotics and 4% (1 patient) had broken screw. In our follow up, average mayo score in 1st week is 12, 2nd week is 60, 3rd week is 73, 4th week is 80, 5th follow up is 84.6

**Conclusions:** The results are evidence that Variable angle locking plates are good implant in the treatment of intra-articular unstable fractures of distal radius. It allows effective anatomic realignment and early wrist mobilization.

**Keywords:** Bone Plates, Radius, Volar Plate, Fracture Fixation, Internal, Injury.

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### Introduction

fractures of distal part of radius are one of the most commonly occurring fractures and encountering problems in selecting treatment option, accounting about 16% of all fractures in orthopaedic casualty and it has bimodal age distribution [1]. Distal radius fractures are mostly insufficiency fractures in osteoporotic bone of elderly and following high velocity injuries in young patients [2].

Until about 60 years ago, it was general notion that most distal radial fractures could be treated conservatively with satisfactory results. Only recently, it was clinically proved that intra-articular step-off and radial shortening corrected by surgery had improved patient outcome [3,4]. Non-displaced or reducible but stable extra and intra-articular fractures can also be treated with casting. Unstable reducible extra-articular fractures are commonly treated with reduction and often supplemented with extra- or intra-focal pinning. Extra-articular

fractures that are irreducible, intra articular fractures and fractures for demanding patients who require early mobilization, are commonly treated with plating (more often with palmar plating), intramedullary fixation, external fixation or pinning [5,6,7] Variable angle locking plate is a novel development of LCP is the recent method to fix simple to complex fractures of distal end radius. Variable angle provides angular stability with fracture fragment specific fixation. screws can be inserted into the plate at various desired angles to fix the fracture fragment.

### Objective

To evaluate functional outcome in intra-articular fractures of distal radius fixed with variable angle volar locking plate

### Patients and Methods

This study was conducted in the Department of Orthopaedic Surgery Jhalawar Medical College Hospital. The study period was from august 2020 to March 2022.

25 Patients with intra-articular distal radius fractures were included in this study. They were treated with variable angle volar locking plate through volar approach.

#### Inclusion Criteria:

1. Intra-articular fractures of distal end radius (ao type B, C1,C2)
2. Adult 21 - 80 yrs. age group
3. Close Fractures
4. Grade I open fractures as per Gustilo-Andersons Classification
5. Duration of injury -less then 10 days

#### Exclusion Criteria:

1. Patients less than 21 years of age and more than 80 years of age.
2. Extra-articular fracture distal end radius (AO TYPE A) & AO type C3
3. Open Grade II or Grade III Intra-articular fractures of distal end radius per Gustilo-Andersons Classification
4. Metabolic bone disorders or Pathological fractures
5. Underlying neuromuscular disorder
6. Patients unfit for surgery
7. Patient not willing to give Consent

In this study AO Type B pattern seen in 48% cases (12 patients) out of which 8% (2patients) type B1 followed by 28%(7 patients) type B2 and 12% (3 patients) type B3. Similarly AO Type C pattern seen in 52% cases C(13 patients) out of which 24%(6 patients) type C1 and 28% (7 patients) type C2 Operation done under supraclavicular block or general anaesthesia. After positioning painting and

draping, the distal radius exposed using volar Henry approach.

All of the surgeries were performed under tourniquet control. All of the patients underwent open reduction and internal fixation with a variable-angle locking plate Above elbow slab was given and patients were encouraged limb elevation and active & passive finger mobilization exercises in immediate post op period. Distal neuro-vascularity was assessed regularly and intravenous antibiotics were given for 3 days and after that changed to oral antibiotics till suture removal. The suture and slab removal done 10-14 post op day. The patient encouraged to active and passive exercise of wrist and fingers with compression bandage Resisted exercises were started about 6 weeks after surgery. Patients were advised for follow up at 4th, 8th,12th, 24th week interval and routine x-rays were taken to assess the fracture healing.

The quality of reduction was measured with a standard goniometer. The range of motion at the wrist joint was measured with the help of a goniometer. The grip strength was calculated using a digital hand dynamometer (Takei scientific instruments Co. Ltd., Japan). The patient was made to stand with his/her elbow at full extension and with the shoulder adducted and neutrally rotated. The grip strength was measured in kilograms and as a percentage of the normal strength of the other wrist. All the functional parameters were recorded at six weeks and at the final follow-up. The functional outcome was evaluated using the MAYO score.

#### Result

All patient were evaluated for radiological &functional outcome according "Sarmiento's modification of Lindstrom's criteria & Mayo Score" respectively.

**Table 1: Functional Outcome**

Results	No. of Patients	Percentage
Very Good	10	40%
Good	8	32%
Satisfactory	6	24%
Bad	1	4%

In our study, 40%cases (10 patients ) show very good functional outcome followed by 32%cases (8patients) with good, 24%cases (6patients) with satisfactory& 4%cases(1patients) bad outcome.

**Table 2: Radiological Outcome**

Results	No. of Patients	Percentage
Excellent	13	52%
Good	8	32%
Fair	3	12%
Poor	1	4%

In this study, 52% cases(13patients) showing excellent results followed by 32%cases (8patients) good, 12% cases (3patients) fair& 4% cases (1patients) poor outcome was seen.

**Union:** All the patients had good union. The mean time of union was 12 weeks with a range of 10 to 12

weeks with a 18 cases (72%) healing by 12 weeks. Rest of the 6 cases (24%) took a longer duration.

No case of delayed union was reported. Longer duration to union is noted in one due implant change done that need more duration for union.

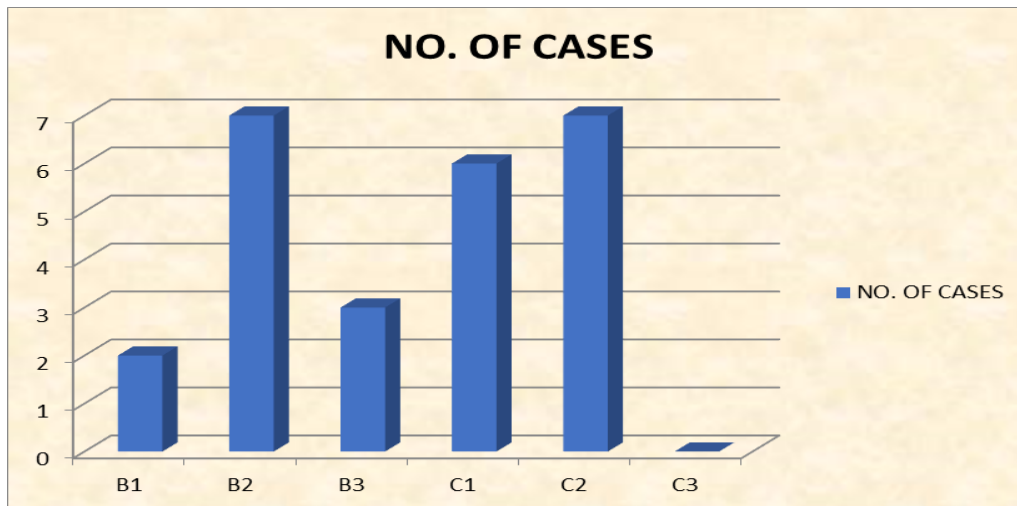
**Table 3: Union Time**

Union Time	No. of Patients	Percentage
10-12 Week	18	72%
12-16 Week	6	24%
>16 Week	1	4%

Stiffness was noted in 12%cases (3 patients) at 3rd follow-up, 4% (1 patient) show malunion at 4th follow-up, 8% cases (2 patients) had superficial infection, noted at 2nd follow up, which was controlled by dressing and antibiotics. and 4%(1patient) had broken screw noted at 3rd follow up. This case re operated and change implant. None of the patients in the present study presented with iatrogenic neurovascular injury or implant expose during the period of follow-up.

**Table 4: Complications**

Complications	No. of Patients	Percentage
Stiffness of Wrist	3	12%
Malunion	1	4%
Superficial Infection	2	8%
Broken Implant	1	4%



**Figure 1: No. of Cases**

**Discussion**

A fall on a outstretched hand is the common mode of injury causing distal radius fractures. Distal radial fractures which occur due to road traffic accidents (high energy trauma) are mostly intra- articular, displaced and unstable Gartland and Werley group II and III and AO type B2, B3, C1,C2[8] Amazingly two hundred years before itself, Abraham Colle’s (1814) [9] described extra articular distal radius fractures are having good outcome from his statement —The nature of the injury once ascertained, it will be a very easy matter to explain the different phenomena attendant on it and to point out a method of treatment which will prove completely successfull. But this is not applicable to all the fractures of distal end of radius as stated by Colle’s. Once the fracture geometry becomes complicated, the treatment of the distal radius becomes a challenging one.

Females are more liable to distal radius fractures when compared with males mainly because of more severe osteoporosis and a higher liability of elderly women to falls compared to the age – matched men. Restoration of radial length, radial tilt and congruity of articular surfaces is important for good functional results. Failure to achieve and maintain near anatomic restoration can lead to various deformities and disabilities. The residual deformity of wrist adversely affects wrist motion and hand function[10] Closed reduction and cast immobilization have been one of the modalities and mainstay of treatment of these fractures leading to complications like malunion, subluxation /dislocation of distal radioulnar joint resulting in poor functional and cosmetic outcome. The residual deformity of wrist adversely affects wrist motion and hand function. Later studies have advised operative treatment with open reduction and internal

fixation with conventional T buttress plates, and more recently locking compression plates which

have been used widely because of mechanical advantage.[11,12,13]



**Figure 2:**

A combination of an improved understanding of distal radial anatomy, patient demands and the new fixation devices have changed the management of distal radial fractures. Locking plates are preferred in osteoporotic and in multiple complex fractures[14]. Variable angle locking plate is a novel development of LCP is the recent method to fix simple to complex fractures of distal end radius. Variable angle provides angular stability with fracture fragment specific fixation. screws can be inserted into the plate at various desired angles to fix the fracture fragment

The results are evidence that Variable angle locking plates are good implant in the treatment of intra-articular unstable fractures of distal radius. It allows effective anatomic realignment and early wrist mobilization. It is biomechanically superior due to closer joint interface placement and better-screwing capability in different directions[15]. A successful anatomic alignment was made possible regardless of the direction of fracture angulation with Variable angle volar locking plate[16]. 90% the patients went back to their daily activities with good recovery.

Use of variable angle locking compression plates in distal radius fractures provide good to excellent results and are effective in the correction and maintenance of distal radius anatomy. By using these plates, joint motions and daily functioning is recovered in a shorter time(17,18). Hence Variable angle locking compression plate is a useful implant

in fixing unstable and comminuted intraarticular distal radius fractures.

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