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Dr. V Ritesh Gupta
Resident, Department of
Orthopaedics, BRDMC,
Gorakhpur, Haryana, India

Dr. Ashok Yadav
Associate Professor, Department
of Orthopaedics, BRDMC,
Gorakhpur, Haryana, India

Dr. Pavan Pradhan
Professor, Department of
Orthopaedics, BRDMC,
Gorakhpur, Haryana, India

Dr. Surendra Kumar Gaur
Assistant Professor, Department
of Orthopaedics, BRDMC,
Gorakhpur, Haryana, India

Dr. Amit Mishra
Associate Professor, Department
of Orthopaedics, BRDMC,
Gorakhpur, Haryana, India

Corresponding Author:
Dr. V Ritesh Gupta
Resident, Department of
Orthopaedics, BRDMC,
Gorakhpur, Haryana, India

A prospective study on clinical and functional outcome of fracture distal end radius managed by volar plate

Dr. V Ritesh Gupta, Dr. Ashok Yadav, Dr. Pavan Pradhan, Dr. Surendra Kumar Gaur and Dr. Amit Mishra

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Abstract

Introduction: Fracture of distal end radius are one of the most common skeletal injuries encountered in the orthopaedic practice. There are various modalities of treatment but plating allows secure internal fixation with resultant early return of wrist function by directly restoring the anatomy. The purpose of this study was to evaluate the clinical and functional outcome of the surgical management of intra-articular fractures of distal radius by ORIF with volar plate.

Materials and Methods: It was a prospective study in which 25 patients with intra-articular distal radius fracture were managed primarily by ORIF with volar plate whose screws were multidirectional. The clinical and functional outcome was assessed using Gartland and Werley score, and Mayo Wrist score respectively.

Results: The study included 25 patients, 19 males and 6 females aged from 21 to 70 years with mean of 38 years. Ulnar styloid fracture was present in 6 patients and DRUJ instability was present in 4 patients. The average duration of follow-up was 7 months ranged from 1-15 months. Using Gartland and Werley 92% had excellent to good result while 79% had excellent to good functional outcome according to Mayo score.

Conclusions: Early Primary fixation of the distal radius fractures is important for good functional outcome and to avoid complication of prolonged immobilization, which facilitates early return to regular activities.

Keywords: Distal end radius fracture, orif with volar plating, gartland and werley score, mayo score

Introduction

Fracture of distal end radius are one of the most common skeletal injuries encountered in the orthopaedic practice ^[1]. It occurs most frequently in adult patients after the fourth decade of life and comprises around 10% to 20% of all the fractures attended as emergencies ^[2].

Distal radius fracture however have a bimodal age distribution ^[3], among these one with younger age group results due to high-energy trauma and another group of elderly patients resulting with low energy trauma. The causes of the injury are fall on outstretched hand/work related accidents/car accidents/sports injuries.

The importance of fixation of distal radius fractures have evolved over the past two decades. It was the century old treatment of cast immobilization initially, moving on to Kirschner wire fixation and then finally to internal fixation with various plates. A tremendous improvement in functional outcome of wrist have been observed following fixation of intra-articular fractures with diverse available volar locking plates. Apart from functional outcome, there is also improvement in surgical technique leading to less disfigurement.

Most of the distal radius fractures will also fall into its anatomical position, if good anatomical reduction of distal radius is achieved by definitive internal fixation ^[4]. Plating allows secure internal fixation with resultant early return of wrist function by directly restoring the anatomy ^[5]. The antiglide effect of buttress plate help to reduce and stabilize intra-articular fractures, however there is a need for protection of fracture till it consolidates and there are still chances of loss of reduction ^[6].

The purpose of this study was to evaluate the clinical and functional outcome of the surgical management of intra-articular fractures of distal radius by open reduction and internal fixation

With volar plate and to follow prospectively the rate of return of wrist motion and function in patients.

Materials and Methods

This was a prospective study, done in BRD medical college to study the clinical and functional outcomes of the surgical management of intra-articular distal radius fracture with volar plate. Twenty five consecutive fractures of intra-articular distal radius in skeletally matured patients were included in the study in the time period of January 2017 to July 2018. The patients were managed primarily by ORIF with volar plate whose screws were multidirectional. Patients included in this study were sorted based on following preset inclusion and exclusion criteria. Patients of both sexes were recruited in the study.

Inclusion Criteria

1. Age more than 18 years.
2. AO type B and type C distal radius intra-articular fracture associated with or without ulnar styloid fracture.
3. Patients who were medically fit and willing for surgery.

Exclusion Criteria

1. Age less than 18 years.
2. Patients with compound grade 2 and
3. Patients with pathological fractures.

Patients were admitted both in emergencies and regular outpatient department of those suspected wrist injury. After detailed history, thorough examination and initial clinical assessment of all the patients were done to rule out any other associated injuries and splinting of affected limb was done. Standard posteroanterior and lateral view x-rays were taken to assess fracture pattern. On the posteroanterior film radial height, radial inclination, articular step-off and gap were noted. On lateral film palmar tilt angle noted. Union of fracture was defined as trabecular bridging across the fracture site. Fractures were classified according to AO classification. Patients operated after proper counselling and informed consent. All surgeries were performed under regional anaesthesia (supraclavicular or axillary block) and were approached by volar FCR approach & fixed with 2.7mm fixed angle Volar locking plate with screws in different direction that are specially designed to buttress the distal radius. The ulnar styloid was found to be fractured in six of our study patients. Once the radius and intermediate column is fixed with angle stable volar LCP, the ulnar component align to its original position if there is no DRUJ disruption. If DRUJ disruption warrants fixation, then it was stabilized with 2mm kirschner wire which transfixes radius & ulna. A period of four weeks of immobilization in above elbow cast was followed as post-operative protocol. Transfixation wires were removed after four weeks and intermittent wrist mobilization started.



Fig 1: Intra operative picture of Distal Radius with volar plate

Postoperatively, 3rd generation injectable cephalosporins were continued for 3 days followed by oral antibiotics. Sutures were removed on the 12th post-operative day. Clinical assessment was done based on Demerit point system of Gartland and werley. Mayo wrist score was used for functional outcome assessment. The average duration of follow-up was 7 months and ranged from 1-15 months. Clinical and functional reviews were performed at periodic intervals.

Statistical Analysis

The data obtained in the present study was reported as percentages.

Results

Mean age of our series of patients was 38 years. Most of the patients were in younger age group. Among 25 patients, there were 16 patients of less than 40 years of age. 19 patients were male and 9 were females. There were 11 patients who had injury to right side, rest of 14 patient's having injury to left side. All the patients were having right hand predominant. Incidence of road traffic accident predominated and was the cause of injury in 20 patients. This may be due to physically active young patients are more in our study. Ulnar styloid

fracture was present in 6 patients and DRUJ instability was present in 4 patients. Among the various classification of distal radius fracture, we choose to consider AO classification for our study (Table 1). According to AO classification, there were 9 patients having type B fracture and 16 patients with type C fracture. The average delay in surgery in our study was 7.6 days and the range was 1 day to 30 days. Most of the patients (68%) were operated within 7 days from the time of injury.

Table 1: Classification (AO)

Type	Number	Percentage
B1	1	4%
B2	6	24%
B3	2	8%
C1	3	12%
C2	6	24%
C3	7	28%
Total	25	100%

The average duration of follow-up was 7 months ranged from 1-15 months. The mean time of union was 12 weeks with a range of 10 to 18 weeks, with majority of patients i.e. 19 out of 24 (79%) healed by 12 weeks. There were 2 instances of

loss of reduction with fracture collapse, which resulted in intra-articular violation of screws. Functionally 79% of the

patients had excellent to good outcome (table 2). Patients evaluation done as per Mayo score (Table 2).

Table 2: Functional outcome of patients

Functional status	Number of patients	Percentage
Excellent	14	58%
Good	5	21%
Satisfactory	3	13%
Poor	2	8%

Table 3: Patient evaluation with mayo score.

Pain		Range of movement (%of normal side)	
No pain	25	100%	25
Mild, occasional pain	20	75-99%	15
Moderate, tolerable	15	55-74%	10
Severe, intolerable	0	25-54%	5
		0-24%	0
Functional status		Grip strength (%of normal side)	
Regular job	25	90-100%	25
Restricted employment	20	75-89%	15
Able to work but unemployed	15	50-74%	10
Unable to work due to pain	0	25-49%	5
		0-24%	0

Table 4: Clinical outcome of the patients.

Result	Number of patients	Percentage
Excellent	17	71%
Good	5	21%
Fair	2	8%
Poor	0	0%

Clinical outcome was assessed by Gartland and Werley scoring. At final follow up the mean range of wrist motion consisted of 58° palmar flexion, 60° dorsiflexion, 64° pronation, 70° supination, 20° radial deviation and 30° ulnar

deviation. All patients were able to return to domestic duties or to their occupations when examined at the one year follow-up. Clinically 92% had excellent to good results (Table 4).

Complications

Two of our patients had screws trespassing the articular surface into the wrist joint results in erosion of distal fragment and two of our patients had prominent wires that were felt subcutaneously on the radial side. Stiffness of the wrist joint and the hand was noted in two patients who presented late to our hospital and one patient had deep infection.

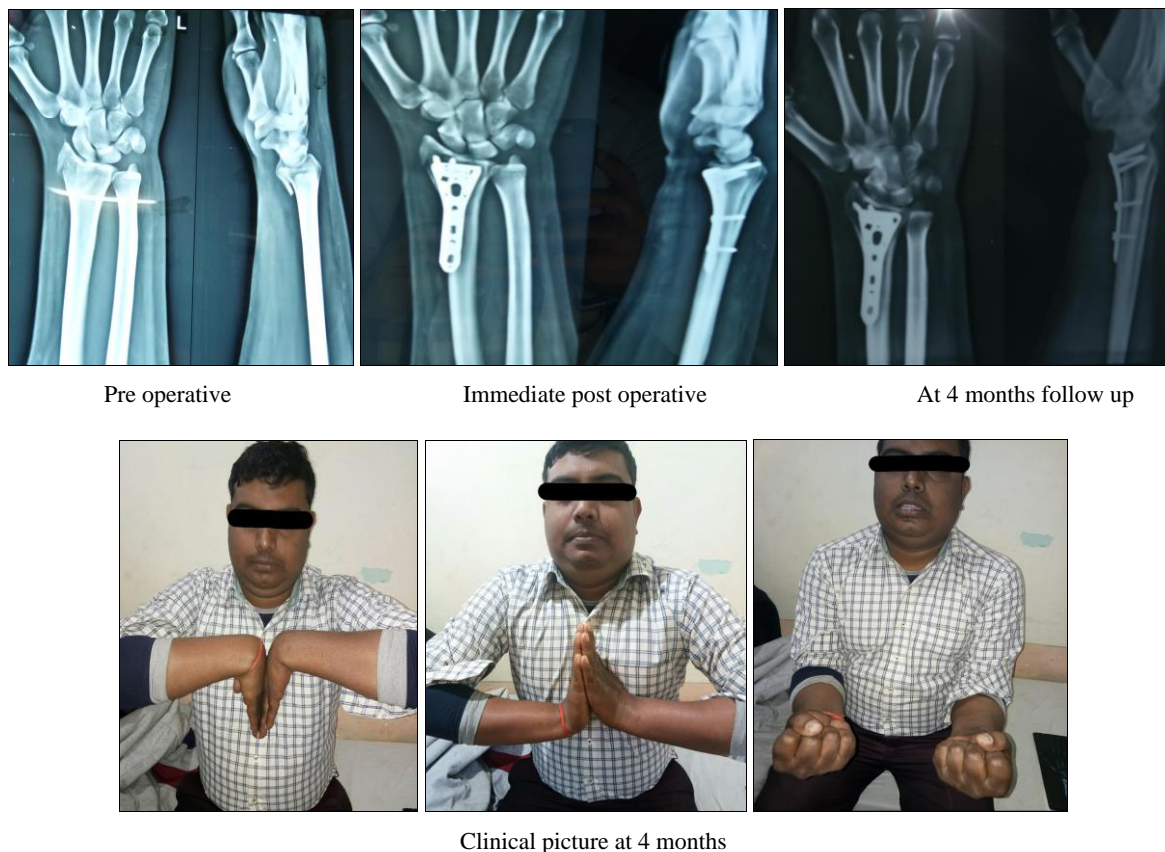


Fig 2: Case radiographic and clinical picture

Discussion

The distal end intra articular fractures need anatomical reduction restoring the angles for optimum results functionally, there are variety of surgical management options, but we choose open reduction and internal fixation with volar plate as the the modality of treatment. The incidence of intra-articular distal radius fractures and its complex nature is in increasing trend due to rising road traffic accidents. In our series around 80% of patients were due to RTA and presents with polytrauma, which was comparable to F Fitoussi & SP Chow [7]. This increased nature of RTA injury and involvement of younger age group in our study is a new trend. In our study 16 of 25 cases (64%) are type C distal

radius fractures, which explains the more and more complex presentation of these fracture patterns. The average age of 38 years in our study is comparable to Jupiter *et al.* [8] and Louis Catalano III [9] who had an average age of 43 & 30 respectively. Our study had a male preponderance with 19 cases of 25 cases [76%] and is comparable to F Fitoussi & SP Chow *et al.* [7] and Orbay J *et al.* [10] which were 92%, 90% and 89% respectively. The fixed angled 2.7mm volar locking plates was used in all our patients, with maximum number of screws in the metaphyseal region in the desired direction of anchorage.

The average range of functional outcome of various studies was comparable with our study (Table 5).

Table 5: Comparison of clinical outcome

Studies	PF in degrees	DF in degrees	PR in degrees	SUP in degrees	RD in degrees	UD in degrees
F.Fitoussi <i>et al.</i> [7]	52	52	68	88	14	26
Jupiter <i>et al.</i> [8]	66	58	72	78	22	42
OrbayJ <i>et al.</i> [10]	47	44	77	76	22	32
R E Anakwe <i>et al.</i> [11]	64	62	62	78	20	34
Our study	58	60	64	70	20	30

Table 5: Comparison of functional outcome.

Studies	Excellent	Good	Satisfactory
Jupiter <i>et al.</i> [8]	52	52	68
RE Anakwe <i>et al.</i> [11]	47	44	77
John K Bradway <i>et al.</i> [12]	66	58	72
Dennison <i>et al.</i> [13]	64	62	62
Our study	58	60	64

In our study we had 58% of patients had excellent results based on Mayo wrist score and were comparable to other studies (Table 6).

Conclusion

From our study, we conclude that early primary fixation of the distal radius fractures is important for good functional outcome and to avoid complication of prolonged immobilization, which facilitates early return to regular activities. Overall, we believe this study has demonstrated a good clinical and functional outcome, with minimal complication and good patient satisfaction using the locking plate system in the fixation of distal radial fractures. However, a prospective randomized controlled trial and long term follow-up is needed to further validate our findings.

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