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Evaluate clinical outcome of open reduction and internal fixation with volar locking plates for displaced unstable distal end radius fractures

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Abstract

Background: Fracture of distal radius usually occur as a result of high energy trauma in younger individual with good bone density and also reported in elderly osteoporotic bone. The management is done by cast immobilization to various operative modalities percutaneous K- wire fixation to provide good to excellent results. This study was done to determine the clinical outcome of displaced unstable distal end radius fracture treated with volar locking plates.

Objectives: 1. To study the demographic factors of patients with displaced unstable distal end radius fracture. 2. To determine the clinical outcome of patients who treated with volar locking plates.

Materials and Methods: This is a prospective observational study done on 33 patients with distal end of radius fracture. The detailed history of the patient was taken and radiographs were assessed. The data was quantified by Modified Gartland and Werley score in which outcome was evaluated. Patient was discharged on 12th postoperative day and followed up after 1st, 2nd, 3rd, 6th month and then yearly.

Results: In the present study, 63.63% cases from were from the age group 20-34 years, we had 29 cases (87.88%) males. Most common mode of injury was road traffic accident, in 18 cases (54.55%). In the present study, as per Frykman type VIII type of fracture was the commonest with 21 cases (63.64%). Ulnar was 25 degrees and radial were 15.60. An equal grip strength of the affected as the normal was noted in 27 cases (81.82%). At the final analysis of the outcome of our study excellent results were noted in 15 cases 45.45%.

Conclusions: Fracture of distal end of radius is one of the commonest fractures. This fracture is more common in males (87.8%) with predominance on right side. Road traffic accident is still the common mode of injury than fall. On follow up excellent functional outcome found in 45.45% cases with 81.82% patients achieved good grip strength.

Keywords: Open reduction, internal fixation, volar locking plates, distal end radius fractures

Introduction

Fracture of distal end of radius is one of the common fractures due to trauma and self-fall accounting for more than 20 % of all fractures seen in the casualty department.¹ Fracture of distal radius usually occur as a result of high energy trauma in younger individual with good bone density and are associated with substantial articular and periarticular tissue injury and also reported in elderly osteoporotic bone².

The management of distal end radius has been changed dramatically over the previous initial methods like cast immobilization to various operative modalities percutaneous K- wire fixation, External fixation (ligamentotaxis), K- wire fixation plus External fixation, Internal fixation with volar and dorsal plates. All above mentioned methods provide good to excellent results³⁻⁶.

This study was done to determine the clinical outcome of displaced unstable distal end radius fracture treated with volar locking plates.

Aims and Objectives

1. To study the demographic factors of patients with displaced unstable distal end radius fracture.
2. To determine the clinical outcome of patients who treated with volar locking plates.

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Materials and Methods

This is a prospective observational study. After obtaining approval from the Institutional ethics committee, 33 patients with distal end of radius fracture admitted in male and female orthopedic wards, in a tertiary care center were taken in the study. The detailed history of the patient was taken regarding personal data history, mode of injury, pre- injury ambulatory status, preexisting local and systemic condition that may affect recovery. Full clinical examination was done to assess the general condition of the neighboring joints and any associated injuries. Patients with open fractures, fractures due to malignancy, stable fractures were excluded. The radiographs were assessed in terms of loss of radial inclination, loss of palmar tilt, or presence of dorsal tilt, radial shortening fractures would be classified according to Frykman classification and AO classification of findings on dead lateral and anteroposterior radiographs.

The data was quantified by Modified Gartland and Werley score in which outcome was evaluated by clinical measures that included Flexion, Extension, Pronation, Supination, Percentage Grip and Power The dressing was done on

postoperative 12th day. Patient was discharged on 12th postoperative day and followed up after 1st, 2nd, 3rd, 6thmonth and then yearly. Functional evaluation of the patients was done according to the Demerit point system of Gartland and Werley with Sarmiento *et al.* modification. All the relevant data was entered in pre tested case record form. The data was analyzed by using Microsoft Excel. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number. (%)

Results

In the present study, 11 cases (33.33%) were from the age group 20-30 years, 10 cases (30.30%) cases were from the age group 31-40 years, in 41-50 years age group we had 6 cases (18.18%) and in 51-60 years age group, we had 5 cases (15.15%). Only 1 case (3.03%) was from > 60 years age group. In the study males outnumbered the females that male to female ratio was 6.75:1. we had 4 cases (12. 12%) females and 29 cases (87.88%) males.

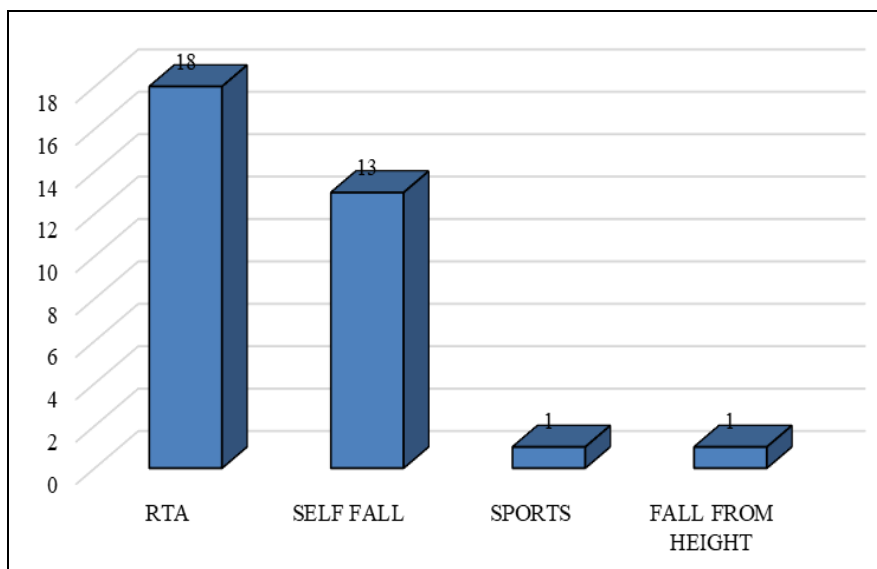


Fig 1: Distribution of study subjects according to the cause of injury

In the study as per the mode of injury evaluated, we had 18 cases (54.55%) were as a result of road traffic accident, 13

cases (39.39%) were due to self-fall, sports and fall from tree were responsible for 3.03 cases each (Figure 1)

Table 1: Type of Fracture - According to Frykman and AO Classification

Type of Fracture	Frequency	Percent	A-O Type	Frequency	Percent
III	1	3.03%	B3	9	27.27%
IV	1	3.03%	C1	1	3.03%
VI	7	21.21%	C2	8	24.24%
VII	3	9.09%	C3	13	39.39%
VIII	21	63.64%			

In the present study, as per Frykman type VIII type of fracture was the commonest with 21 cases (63.64%) followed by VI type of fracture 7 cases (21.21%), VII type of fracture 3 cases

(9.09%) , III and IV with 1 case (3.03%). As per AO type , C3 type of fracture was the commonest with 13 cases (39.39%). (Table 1)

Table 2: Assessment of range of Movements

Parameters	Radial	Ulnar	Pronation	Supination	Palmar	Dorsal
Mean	15.60	25	70.75	77.42	60.15	60.45
Standard Deviation	3.98	6.37	14.09	12.63	15.63	16.02

It was found that while assessing the range of movements, ulnar was 25 degrees, radial was 15.60,pronation was 70.75

degrees, supination was 77.42 degrees, palmar flexion was 60.15 degrees and dorsal was 60.45 degrees. (Table 2)

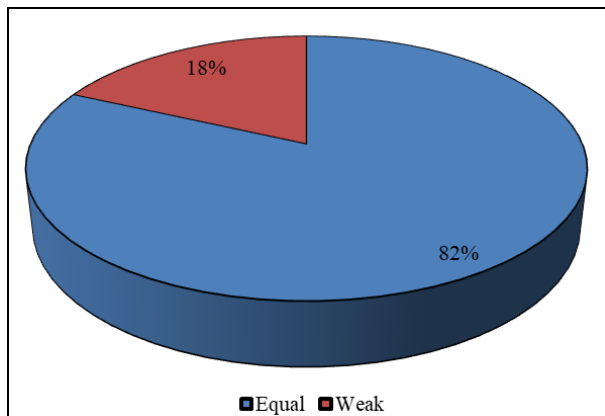


Fig 2: Assessment of the grip strength of affected and non-affected side:

On evaluation of the grip strength of the affected and not affected sides, an equal grip strength of the affected as the normal was noted in 27 cases (81.82%) but grip strength of the affected was weaker than normal in 6 cases (18.18%). (Figure 3)

Table 3: Score Inherence

Score Inference	Frequency	Percent
Excellent	15	45.45%
Fair	5	15.15%
Good	11	33.33%
Poor	2	6.06%

At the final analysis of the outcome of our study excellent results were noted in 15 cases 45.45%, good results were noted in 11 cases 33.33%, fair results were noted in 5 cases 15.15%, poor results were noted in 2 cases 6.06%. (Table 3)

Table 4: Result comparison

Series	Flexion	Extension	Pronation	Supination
Kavin khatri <i>et al.</i> (2016) ^[13]	80	77	78	76
Paritosh Gogna <i>et al.</i> (2013) ^[11]	54	58	80	84
Ahyan kilc <i>et al.</i> (2009) ^[14]	75.1	75.2	77.8	78.3
Present Study	60.15	60.45	70.75	77.43

At the final analysis of the outcome of our study excellent results were noted in 15 cases 45.45%, good results were noted in 11 cases 33.33%, fair results were noted in 5 cases 15.15%, poor results were noted in 2 cases 6.06%. Murakami *et al.* ^[15] reported 83% excellent and 17% good outcome in their series of 24 patients of unstable distal radius fractures fixed with volar locking plate. Kavin Khatri *et al.* ^[13] (2016) stated at the end of 6 weeks following treatment found that to Gartland and Werley scores excellent results in 65.2% cases and good results in 35% cases. Figl *et al.* ^[16] reported excellent results in 37.5% of patients, good results in 57%, and fair results in 5.5%. Paritosh Gogna *et al.* (2013) ^[11] had excellent results in 79% (n=26), good in 18% (n=6), and fair in 3% (n=1) patients. In study conducted by Ahyan kilc *et al.* (2009) ^[14], out of 27 patients, 12 (44.4%) patient having excellent result and 12 (44.4%) patient achieved good result and 3(11.1%) patient achieved fair result.

Conclusions

Fracture of distal end of radius is one of the commonest fractures. This fracture is more common in males (87.8%) with predominance on right side. Road traffic accident is still the common mode of injury than fall. On follow up excellent

Discussion

There is a recent rise in high energy fractures of the distal radius in young adults, because of motor vehicle accidents and recreational activities, which invariably require surgical management Restoration of normal alignment and articular congruity in a displaced fracture can be difficult but is essential for a good functional outcome in terms of early wrist motion, improvement in range of motion and grip strength ^[7, 8]. It has been shown in the laboratory and clinical studies that extra and intra-articular malunion alters the function of wrist ^[7, 9, 10].

In this study males outnumbered the females that male to female ratio was 6.75:1. we had 4 cases 12.12% females, and 29 cases 87.88% males. Paritosh Gogna *et al.* study 23 males and 10 females with an average age of 44.12 ± 18.63 years (18–61 years) ^[11] Sohael M. Khan on 60 patients of distal radius fractures found that Male patients predominated female patients (36 males to 24 females) ^[12] Kavin Khatri *et al.* ^[13] on 23 patients found that 16 were males and 7 were female. In our study In the study as per the mode of injury evaluated we had commonest 54.55% were as a result of road traffic accident followed by 13 cases 39.39% were due to self fall, sports and fall from height were responsible for 3.03 cases. Sohael M. Khan *et al.* ^[12] reported road traffic accident was the commonest cause of the trauma . Paritosh Gogna *et al.* ^[11] reported road traffic accidents was the commonest with 78.78% (26) cases followed by fall with 21.21% (7). Kavin khatri *et al.* reported commonest cause is road traffic accidents with 18 cases followed by fall with 5 cases ^[13]. It was found that while assessing the range of movements, ulnar was 25 degrees, radial was 15.60, pronation was 70.75 degrees, supination was 77.42 degrees, palmar flexion was 60.15 degrees and dorsal was 60.45 degrees.

functional outcome found in 45.45.% cases with 81.82% patients achieved good grip strength.

Limitations: The sample size was small in study and follow up period was insufficient. As of many patients was managed by cast and k wire only due to patient non-compliance to give proper follow up and unwillingness for surgery. Thus, further prospective study with large population and longer follow up time were required to evaluate the clinical outcome.

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