



Retrospective Study on the Analysis of Functional Outcome in Intraarticular Distal Radius Fractures Treated By Closed Reduction through Bridging External Fixator Compared to Volar Plating

Dr Mohd. Abdul Naser, Dr Amol Wagh, Dr Abrar Mapkar

Associate Professor Department of Orthopaedics Indian Institute of Medical Science & Research, Jalna-431202

Assistant Professor Department of Orthopaedics Indian Institute of Medical Science & Research, Jalna-431202

Junior Resident Department of Orthopaedics Indian Institute of Medical Science & Research, Jalna-431202

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ABSTRACT: **Introduction:** Conservative management remains main line of treatment in intraarticular distal radius fractures, mainly for stable fractures, but for unstable fractures, surgical treatment remains the mainstay. These include external fixation, percutaneous pinning, and internal fixation. The desire for anatomic restoration of the distal radial joint is the rationale for operative treatment.

Aim and Objective: TO ANALYSE FUNCTIONAL OUTCOME IN INTRAARTICULAR DISTAL RADIUS FRACTURES TREATED BY CLOSED REDUCTION THROUGH BRIDGING EXTERNAL FIXATOR COMPARED TO VOLAR PLATING

Materials and Methods: A retrospective clinical study was done on 30 patients with intraarticular distal radius fractures of which 15 were treated with bridging external fixator and 15 with volar plating by orthopaedic surgeons at a tertiary care centre in the Department of Orthopaedics, Indian Institute of Medical Science and Research, Noor hospital, Jalna between Jan 2020 to July 2020 (Mayo Wrist Score being calculated till Jan 2021). The Mayo Wrist score was assessed 6 months post day of Surgery.

Observation and Results: For all the operated patients Clinical, physiological and ortho-radiological assessment were performed to observe and evaluate fracture stabilization, reduction, fracture healing and callus formation, Functional evaluation done with Mayo Wrist score.

Conclusion: Both external fixation and distal radius plating are safe and reliable techniques to fix intraarticular distal radius fractures. Volar plating provides early fracture consolidation, with high union rate, with advantage of early mobilization and better functional outcome of the involved limb.

Keywords: Intraarticular Distal Radius fractures, Bridging External Fixator, Volar Plating, Mayo Wrist score

I. INTRODUCTION:

Fracture of distal radius, which accounts for > 8% of all bony injuries in emergency room, is more likely to occur in the paediatric and elderly populations¹. Good functional outcome requires restoration of the bony cartilaginous anatomy, the radio-carpal, ulno-carpal and intercarpal ligaments and the triangular fibro cartilaginous complex. Dysfunction of these structures can lead to bad outcome after a fracture of the distal radius². "One consolation only remains, that the limb will at some remote period again enjoy perfect freedom in all its motions, and be completely exempt from pain; The deformity, however, will remain undiminished throughout life." stated Dr. Abraham Colles⁵, in reference to fractures of the distal end radius. Over the past 20 years, more sophisticated internal techniques and external fixation techniques and devices for the treatment of displaced fractures of the distal end of the radius have been developed⁹. An External Fixator can be augmented with percutaneous pinning to add stability or to reduce intra-articular fractures¹⁰.

Over the past decade, there has been increasing interest in plate fixation, especially volar plate fixation, of distal radial fractures³.

A consensus prevails that vast majority of distal radius fractures (90%) are articular injuries resulting in disruption of both the radiocarpal and radioulnar joints¹². About 50% of the metaphyseal fractures have intraarticular extension to radiocarpal or distal radioulnar joint. Intraarticular fractures are inherent unstable, difficult to reduce anatomically and immobilize in close POP support and are associated with high rate of complications¹⁴.



Wrist function is dependent on integrity and alignment of the radius with its carpal and ulnar articulations¹⁵.

Epidemiology&Etiology

Distal radius fractures is the most common fracture of upper extremity with average incidence of 17.5% of fractures per year⁶. There is a bimodal distribution in children and the elderly⁴. Risk factors for fractures of the distal radius in the elderly include decreased bone mineral density, female sex, white race, family history, and early menopause. Females are more liable to distal radius fractures when compared with males¹¹ mainly because of more severe osteoporosis and a higher liability of elderly women to falls¹³ compared to the age - matched men.

Most of the fractures are caused by a fall on the outstretched hand with the wrist in dorsiflexion. Distal Radius Fracture with dorsal

angulation is by far the commonest pattern and is often described as the Colles' fracture⁷. Along with sex, age group, ethnicity, family history, and early menopause, decreased bone mineral density also accounts as one of the risk factors for fractures of the distal end of the radius⁸

Materials and Methods: This retrospective clinical study was conducted on 30 patients with intraarticular distal radius fracture, with 15 patients each treated with external fixation and volar plating by orthopaedic surgeons at a tertiary trauma care centre in the Department of Orthopaedics, Indian Institute of Medical Science and Research, Noor hospital, Jalna 431202 between Jan 2020 to July 2020 (MayoWrist Score being calculated till Jan 2021). Fracture patterns were classified on basis of Frykmans^[17] classification of distal radius fractures.

Table 1:Mayo Wrist Score.

Item	Points	Definition
Pain	25	No pain
	20	Mild, occasional
	15	Moderate (tolerable)
	0	Severe, intolerable
Return to sport (work) at 6 months	25	Return without protection
	20	Return with protection
	15	Restricted return to sport, only exercises
	0	Unable to return to sport
Range of motion	25	90-100% (normal)
	20	80-89%
	15	70-70%
	0	50-69%
Grip strength	25	90-100% (normal)
	15	80-89%
	10	70-70%
	0	50-69%

INCLUSION CRITERIA

1. Patients > 18 years of age.
2. Distal end of radius intraarticular fracture.
3. Closed fractures.
4. Frykmann classification^[17] – Type 3,5,7

EXCLUSION CRITERIA

1. Neurovascular compromise.
2. Compound fractures.
3. Non united fractures.
4. Polytrauma patients.

SURGICAL METHODOLOGY

Preoperative planning : Pre-Operative Investigations. And A dose of IV antibiotics (Inj. Cefuroxime) was given 30 mins before the surgery^[18]

Operative Procedure

Bridging External Fixation or Volar plating.

Post-Operative: Active finger, wrist, elbow and shoulder movements was encouraged from 2nd day postop.

Suture removal was done after 10-12 days. Radiographs were taken in both Anteroposterior and Lateral views and Signs of union looked for.



Union of fracture was defined as formation of bridging callus on two radiographic antero-posterior and lateral views and clinically defined as no pain at fracture site. We used Mayo Score^[16] for clinical and functional assessment 6 months post-operatively. The collected data were coded then entered and analysed using the SPSS version 22 (Statistical package for social science). Simple graphs were used to illustrate some information.

30 patients with intraarticular distal radius fractures presenting within 3 weeks of clinical injury who were operated between Jan 2020 and July 2020 qualifying the inclusion and exclusion criteria were included in this retrospective study. All the Surgeries were done by operating surgeons of our department in IIMSR medical college. The Functional Assessment was done with the help of Mayo score.

II. OBSERVATIONS & RESULTS

1. Distribution according to Age

The mean age of patients was 37.35 years (range 18–60 years).

Table 2: Age Distribution

	Minimum	Maximum	Mean	S.D.
Age	18	70	37.35	14.34

2. Distribution according to Sex

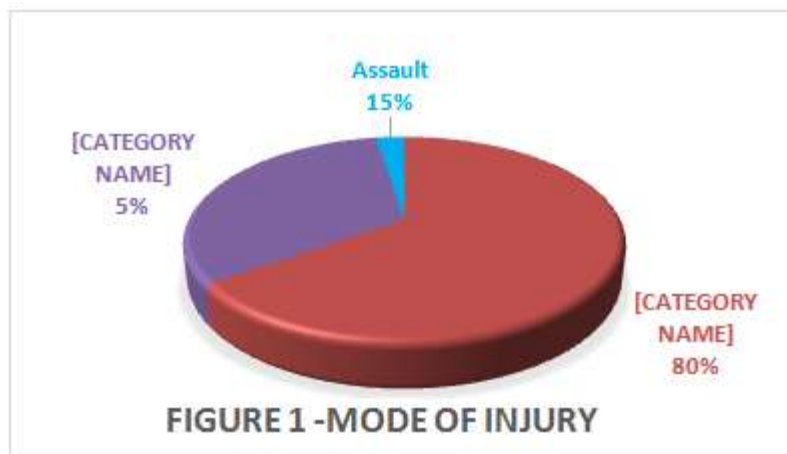
There were 21 males and 9 females. Males were dominant in this case study .

Table 3: Sex Distribution

Sex	Frequency	Percentage
Male	21	70 %
Female	9	30 %
Total	30	100 %

3. Side of Injury (Fracture): Right side being more common than Left Side. Right side being affected in 18(60%) patients and left side being affected in 12(40%) patients.

4. The mechanisms of injury included Road traffic accident in 24(80%), fall when walking and from height in 5(15%), assault in 1(5%). Road traffic accident was the most common cause of injury.



5. The Frykman classification was used.

Type 3-18(60%)

Type 5-0

Type 7-12(40%)

6. The average time for radiological healing was 13 weeks

7. The Mayo score was calculated at the end of full functional recovery.

Scores were as follows :

External Fixator group :Excellent : 4

Good : 4

Fair : 5

Poor : 2

Volar plating group :Excellent : 5

Good : 5

Fair : 4

Poor : 1



Mayo wrist score of 90-100 was taken as excellent, 80-89 as good, 65-79 as fair, and below

65 was taken as poor. The average Mayo Wrist score of the external fixator group was 86.8 and of volar plating group was 90.6.

Table 4: Functional outcome according to Mayo wrist score

Treatment	Excellent	Good	Fair	Poor
External Fixation	4	4	5	2
Volar Plating	5	5	4	1

III. DISCUSSION:

Our study's male predisposition of 70 % is comparable to Louis Catalano et al which was 67%. The higher incidence among the males could

be attributed to a highly active work group with a higher involvement in high energy trauma and high velocity injuries of RTA

Table 5: Comparison of sex ratio

	Males(%)	Females(%)
Jupiter et al	60	40
Louis catalano et al	67	33
John k Bradway et al	56	44
Our study	70	30

In our study RTA formed the reason of trauma in 24 of the 30 study cases. Our study's RTA trauma predisposition is 55 %. The reason for this nearly same incidence could be an older mean

age of case study where a low-energy trauma is more frequent is causing a fracture on the outset of an osteoporotic bone.

Table 6: Comparison of mode of trauma

	RTA(%)	Fall(%)	Others(%)
Jupiter et al	67	33	0
Louis catalano et al	10	67	24
F Fitousi and SP Chow	79	9	12
Anakwe et al	10	90	0
Our study	80	15	5

In our study, we got excellent functional results according to the Mayo Wrist Functional scoring system in 5(33%) patients treated with Plating as compared to 4(26%) patients in the external fixator group, good results in 5(33%) patients in the plating group as compared to 04(26%) patients in the external fixator group. We got fair result in 5(33%) patients in the external fixator group as compared to 4(26%) patients in the Plating group. We got poor result in 2(13%) patients of the external fixator group and 1(6%) in the plating group.

Zamzuri et al (2004) in their short term study comparing external fixation versus internal fixation for closed unstable intra-articular fractures of distal radius reported that the anatomical results were better in the internal fixation group compared to the external fixation group.

Antonio Abramo et al (2009) in their study comparing ORIF with plating to closed reduction external fixator, found that internal fixation gives better results as compared to external fixator in

terms of early mobilisation, better grip Strength and better subjective evaluation.

Wright, Horodyski and Smith retrospectively reported 21 Patients who had been treated by a Volar locked plate and compared them With 11 patients who had been treated by External fixation. In this study, there was no functional difference between the two groups, but good radiological outcome were reported with volar locking plated group.

Egol, Walsh, Tejwani et al conducted a prospective randomized study in 88 cases¹⁹. Although the patients treated by volar plating had statistically significant early improvement in the range of movement of wrist, this advantage diminished with time and in absolute terms the 55 difference in range of movement was clinically unimportant. At one year radiological, clinical and functional outcome were similar in two groups. No clear advantage could be demonstrated with either treatment, but fewer reoperations were required in external fixator group, according to their study.



IV. CONCLUSION:

External fixation or Internal fixation with volar locking plate yield better radiological and clinical outcome in unstable distal radius fracture in a short term follow up of 10 months. The movements in conventional External fixation

improves with intense physiotherapy after period of 6-8 weeks (early immobilization period) in our cases. Use of locked volar plate predictably yields better patient reported outcome as per Mayo Wrist score and allows earlier range of wrist motion which yields accelerated return of function.



Fig. 2(Volar plating Post op Xray)



Fig. 3(6 months post Volar plating)



Fig. 4 (External Fixation Post-op Xray)Fig. 5 (6 months post External Fixation)



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