

Research article

## Functional and radiological outcome of Colles fracture treated conservatively with plaster and cast

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### ABSTRACT

**Background and Objectives:** Fractures of distal radius are commonly encountered in orthopedic emergency. Various treatment methods are available including closed reduction and immobilization in cast, percutaneous pinning, pins and plaster, external fixation, open reduction and internal fixation with or without bone graft or substitute. There are no clear guidelines to follow. The aim of this study is to compare the radiological and functional outcome of distal radius fracture treated conservatively with cast alone.

**Material and Methods:** Sixty patients suffering from extra articular distal radius fracture were recruited for study. They were all treated conservatively with cast alone. They were followed up for 6 months. The radiological outcome in terms of dorsal angulation, radial length, radial angulation and ulnar variance and functional outcome in terms of Mayo wrist score was assessed.

**Results:** At 6 months follow up dorsal angulation, radial length, radial angulation and ulnar variance were -  $5\pm 3.20$  degrees,  $7.80\pm 0.77$ mm,  $20.47\pm 2.29$  degrees and  $1.27\pm 0.77$  respectively. Functionally 20 patients had good outcome, 32 patients had satisfactory outcome and 8 patients had poor outcome in terms of Mayo wrist scores.

**Conclusion:** Conservative management with cast is an effective treatment modality for Frykmans type I and II Colles fracture with satisfactory functional and radiological outcome.

**Key Words:** Cast. Colles Fracture, Functional and Radiological outcome.

### INTRODUCTION

Fractures of the distal radius are the most common of all skeletal injuries sustained by human beings.(1) Among distal radius fracture, the majority are extra articular fractures. Colles fracture is an extra articular distal radius fracture. There is no consensus regarding the appropriate treatment of this

condition or even the anticipated outcome. There is always a debate whether to treat these fractures conservatively or by operative means.

Fractures of the distal radius were considered uncomplicated injuries in the past. Initially, Colles treated these fractures when there was no radiography, aseptic surgery or

anaesthesia (1,2) and the amount of disability following malunion was accepted. Malunion results in pain, midcarpal instability and post-traumatic arthritis.(3) The degree of disability after a distal radius has been shown to correlate with the amount of residual deformity.(4) Permanent loss of the palmar angle and radial shortening of the distal radius are associated with persistent wrist pain.(5)

A variety of treatment modalities are available for distal radius fractures including close reduction and plaster cast application, close reduction and percutaneous pin application, external fixator using ligamentotaxis and open reduction and internal fixation with plate and screws.(6,7,8-10)

Many factors determine the choice of treatment such as the patient's age, life style, associated medical conditions, compliance, functional demands, limb dominance, type of fracture, severity and alignment of the fracture, condition of the soft tissue, including any open wound, and concomitant fractures.

Treatment by closed reduction and cast immobilization can be adopted at low cost without admission to hospital. Operative management is expensive and associated with typical surgical risk factors, radiation exposure, and financial expenses. The rationale of this study was to estimate the anatomical and functional outcome of conservative management of Colles fracture as there is dearth of local literature on this topic. This study provides evidence about anatomical and functional outcome of conservative management of Colles fracture.

## **MATERIAL AND METHODS**

This prospective study was conducted in the Department of Orthopaedics Janaki Medical

College and Teaching Hospital, Janakpur from December 2017 to June 2018.

Cases presenting to Emergency and outpatient department as fractures of distal radius and all cases that fulfill the following criteria were selected - unstable (dorsal angulation >20 degrees and radial shortening > 5 mm) extra articular distal radius fracture (Frykman type I and II) in all men and women between 40 to 70 years of age. Patients with open fractures, age below 40 years and above 70 years, stable fractures, volar angulated fracture, intra articular fracture, fractures associated with neurovascular and tendon injury, bilateral fractures of wrist, previous distal radius fracture in the contralateral side, inflammatory disease in the opposite wrist such as rheumatoid arthritis, fracture more than 2 weeks duration were excluded from the study.

The approval to conduct this study was obtained from the institutional review board. Informed consent was obtained from patients and confidentiality and anonymity of the data was maintained throughout the study.

Complete history was taken regarding mode of injury and associated comorbidities was identified and recorded. Thorough physical examination was done including all the systems. Injured wrist was examined to identify deformity, neurovascular status and tendon functions were assessed. Contralateral wrist was also examined to rule out previous fractures and involvement of inflammatory disease.

Patients were managed by closed reduction under hematoma block. With patient supine shoulder abducted and elbow flexed, traction was applied to the thumb with counter traction above the elbow by an assistant. If the traction alone was insufficient to correct then surgeon manipulated by compression. Reduction was confirmed clinically and

radiologically with the help of an image intensifier. When satisfactory reduction defined by radial shortening of <5mm compared with contralateral wrist, radial inclination  $\geq 15$  degrees, 15 degrees dorsal tilt to 20 degrees volar tilt) (11) was achieved then below elbow cast was applied with wrist in palmar flexion and ulnar deviation, and forearm in pronation. Check X-ray was taken immediately after reduction. Weekly follow up for first two weeks were done.

Posteroanterior and lateral X-rays were taken. Next follow up was done at 6<sup>th</sup> week and cast was removed at that time. Active ROM exercise and grip strengthening exercises were started and check X-ray posteroanterior and lateral view was done to assess radiological outcome. Subsequently patient was followed up at 12<sup>th</sup> week and at 6<sup>th</sup> month for functional and radiological evaluation.

**Radiological/Anatomical evaluation:** All measurements were done in X-rays as described by Vander Linden.(12) Values were compared with normal wrist as:

1. Dorsal angulation in degrees
2. Radial length (mm)

3. Radial Inclination in degrees
4. Ulnar variance (mm)

We followed the Mayo wrist scoring system as described by Cooney WP(13) for functional evaluation.

**RESULTS**

Sixty patients with extra articular Colles fracture underwent closed manipulation and cast application. Among the 60 patients, there were 40 female and 20 male patients. Their ages ranged from 45 to 65 years. The average age was 54.27 years. The right wrist was involved in 20 patients, whereas the left wrist was involved in 40 patients. There were 32 Frykmann type 1 and 28 Frykmann type 2 distal radius fractures. Falling on an outstretched hand was the commonest mode of injury. The mean pre-reduction dorsal angulation, radial length, radial angulation and ulnar variance were  $28.13 \pm 8.40$  degrees,  $4.53 \pm 2.03$  mm,  $14.47 \pm 4.01$  degrees,  $3.67 \pm 1.54$  mm respectively. After closed reduction and cast application, the mean dorsal angulation, radial length, radial angulation and ulnar variance were -

Parameters	Mean	SD	Range
Pre reduction dorsal angulation	28.13	8.40	19.73-36.53
Pre reduction radial inclination	4.53	2.03	2.5-6.56
Pre reduction radial inclination	14.47	4.01	10.46-18.48
Pre reduction ulnar variance	3.67	1.54	2.13-5.21
Post reduction dorsal angulation	-11.07	4.69	-15.76-6.38
Post reduction radial length	9.93	0.88	9.05-10.81
Post reduction radial inclination	22.13	1.88	20.25-24.01
Post reduction ulnar variance	-0.2	1.26	-1.46-1.24
Dorsal angulation at 6 months	-5	3.20	-8.2 - 1.8
Radial inclination at 6 months	7.8	0.77	7.03- 8.57
Radial inclination at 6 months	20.47	2.29	18.18-22.76
Ulnar variance at 6 months	1.27	0.77	0.5-2.04

11.07±4.69 degrees, 9.93±0.88 mm, 22.13±1.88 degrees, -0.20±1.26 mm respectively. At six months follow up, the mean dorsal angulation, radial length, radial angulation and ulnar variance were -5±3.20 degrees, 7.80±0.77 mm, 20.47±2.29 degrees, 1.27±0.77 mm respectively. At 6 month, Mayo wrist score grading was good in 20, satisfactory in 32 and poor in 8 cases. There were 8 cases of Reflex Sympathetic Dystrophy (RSD).

**Table 2: Mayo wrist score evaluation at different times**

Evaluation at	Sex	Good	Satisfactory	Poor
6 weeks	Male		8	12
	Female		10	30
6 months	Male	6	12	2
	female	14	20	6

**DISCUSSION**

Fractures of the distal radius are commonly encountered in orthopaedics practice with increasing numbers of low energy fractures in the elderly population.(14) While anatomical reduction can usually be achieved by closed manipulation, there is still no agreement as to the most appropriate way of maintaining reduction in these fractures. Various methods of internal and external stabilization devices have come in to practice over the years to prevent displacement in unstable fractures such as external fixation, percutaneous pinning, intrafocal pinning, pins and plaster, limited open reduction with or without bone grafting or bone substitutes and extensive open reduction and internal fixation.(15)

Our prospective study estimated radiological and functional outcomes of closed reduction and cast immobilization in Frykman type I

and type II fractures. The radiological parameters were within the acceptable range. In our study we used Mayo wrist score to assess the functional outcome. Our data showed that 18 patients (30%) had satisfactory and 42 patients (70%) had poor results at 6 weeks follow up. At 12 weeks follow up the results improved with 20 patients (33.3%) good results, 32 patients (53.3%) satisfactory results and only 8 patients (13.3%) showing poor results. This showed that as duration passes the long term functional outcome became better. Eight patients showing poor results could be attributed to RSD.

The reported incidence of RSD varies considerably from 1.4% to 42%.(16,17) In a comparative study on 40 patients between plaster group and external fixator group no significant difference was found in symptoms like pain, swelling, deformity and inability to move in both groups.(18) Roumen et al demonstrated that treating distal radius fracture with external fixator had better radiological outcome, but the functional outcome were no better than the control group.(19)

Grle et al in their prospective study on 122 patients showed excellent early results with conservative management of distal radius fractures.(20) In contrast some studies showed better results with operative treatment of distal radius fracture but they included intraarticular fractures as well.(21)

A meta-analysis of seven studies was done to compare the results between operative and conservative treatment of distal radius fractures. Overall, the radiologic outcome was better in surgically treated cases, however no remarkable difference was found in terms of

functional results and number of complications.(22)

Young and Rayan demonstrated a satisfactory functional outcome in 88% of their patients. They treated 25 patients older than 60 years, for distal radius fracture conservatively. There was no significant difference between radiological outcome and the final functional outcome.(23)

The mean age of these fractures in our study was 54.27 years and high occurrence in 50 to 59 years. Study done at Malmo and Bergen(24) showed high occurrence in 60 to 69 years. In the current study 66.6% of patients were females which is similar to study done at Malmo Sweden (1953) and Bergen (1998).(22)

No case suggestive of median nerve compression was observed in our study. Compressive neuropathy of the median, ulnar or radial nerve is reported to occur in 8 to 17% of distal radius fractures among which median nerve compression is most common.(25)

We did not find any case suggestive of carpal instability or ulnocarpal impingement. We followed our cases only for 6 months but these complications generally appear late. Thus we cannot comment on these due to short follow up duration. No cases of tendon rupture was observed in our study as these are uncommon complications and take place after 6 to 9 months of fracture.(26)

## CONCLUSION

Extraarticular Colles fracture Frykman type I and II can be treated conservatively with satisfactory functional and radiological

outcome. These fractures are more common in elderly female population.

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