

## A Case Report on Effectiveness of Early Physiotherapy Rehabilitation Approach for Colles' Fracture

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### ABSTRACT

Colles' fracture specifically is defined as metaphyseal injury of cortico-cancellous junction of distal radius. The incidence has been shown to follow bimodal distribution; in general those most affected are in first and seventh decade of life. Distal radius fracture have high incidence among the aging population. Comminuted fracture of distal end of the radius are caused by severe trauma and presents as shear and impacted fracture of articular surface. The type of fracture and localization, degree of displacement, patient's age and magnitude of soft tissue injury are the factors to be considered for treatment options. A 19 year old female reported to casualty with pain, swelling, tenderness and deformity over right wrist. Patient had history of fall from stairs 2 months back and sustained trauma to her to her right wrist. She was unable to perform her daily activities with right hand. X-ray findings confirmed displaced comminuted fracture of distal end of right radius. Medicinal and therapeutic intervention was given. Therapeutic intervention included thermotherapy, range of motion exercises, joint mobilization and progressive resistive exercise. Functional improvement was observed after 12 weeks of physiotherapy. Early start of physiotherapy after fixation of fracture can improve forearm functioning and quality of life.

**KEY WORDS:** COLLE'S FRACTURE, DISTAL END RADIUS, OPEN REDUCTION, INTERNAL FIXATION, PHYSIOTHERAPY REHABILITATION.

### INTRODUCTION

For high quality life of patient, forearm functioning is very important. Colles' described fractures of distal extremity of radius in 1814 (Belloti et al., 2017). Colles' fracture is defined as "metaphyseal injury of cortico-cancellous junction (within 2-3 cm of articular surface)

of distal radius with characteristic dorsal tilt, dorsal shift, radial tilt, radial shift, supination and impaction" (Meena et al., 2017). The incidence has been shown to follow bimodal distribution; in general those most affected are in first and seventh decade of life (Tosti et al., 2011). The incidence of distal radius fracture is higher among the older resulting in poor functional outcomes and impairments (Ikpeze et al. 2016). Strong trauma is the usual cause of comminuted fracture of distal end of the radius and there may be fracture of articular surface of distal radius with displacement of fragments (Mader et al., 2006). The type of fracture and localization, degree of displacement, patient's age and magnitude of soft tissue injury are the important factors to determine treatment

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options. Careful evaluation of distal radioulnar joint (DRUJ) is also important (Gurselsaka et al., 2013).

The mechanism of injury is normally a fall on outstretched hand with wrist in dorsiflexion. The form and severity depends upon position of wrist at the moment hitting the ground. There will be sudden pain with movement, bruising, swelling, tenderness on palpation of distal end radius. A displaced fracture will typically result in wrist disfigurement (dinner fork deformity) (Kvernmo et al., 2015). The X-ray of forearm and wrist is useful for diagnosis. Treatment modalities of fracture include cast immobilization or surgical treatment like internal or external fixation, pinning and bone substitute (Dudhamal et al., 2012).

To ensure an efficient and safe post-operative rehabilitation with protection of soft tissue during the operation, stable fracture fixation is advised (MericUgurlar et al., 2017). The rehabilitation aims at rapid functional restoration and prevention of chronic disability (Charls et al., 2001). A Colles' fracture usually heals completely in 8 weeks. X-ray can be taken time to time to assess the healing. After removal of the cast, the affected sides wrist, fingers, hand, elbow and shoulder are usually stiff for several weeks and needs exercise and physical therapy (Dudhamal et al., 2012). This is a case of young women with unstable, displaced distal radial fracture which was treated with open reduction internal fixation using locked volar plate. Initiation of early physiotherapy intervention helped to improve quality of life and forearm functioning.

**Patient Information:** A 19 year old female who live in Wardha town is a student of third year. Hand dominance right, experience pain, swelling, tenderness and deformity since trauma over right wrist which is gradually progressive. Patient presents with history of fall from stairs 2 months back and sustained trauma to her to her right wrist. She was brought to casualty by her relatives. After initial investigations in Wardha she was diagnosed with undisplaced comminuted fracture of distal end radius right side her parents were advised to take her to AVBRH Sawangi (M) Wardha by the physician. She came to AVBRH Orthopedic department on 10 January 2019 with complaint of severe pain, swelling and deformity since trauma. There is history of hair-line fracture of neck humerus of left shoulder and green stick fracture of distal inch radius right wrist.

Patient was managed conservatively both times. Consultant orthopedic surgeon advised X-ray and laboratory test. X-ray of right forearm interpreted displaced comminuted fracture of distal end radius. For this she was operated on 14 January 2019. Post-operation patient was treated with analgesics and below elbow slab was given. Active finger movement, limb elevation on pillow was advised. After 2 days she was discharge and was called for follow-up after 14 days. Patient came for follow-up on 29 Jan 2019, sutures were removed and Slab was given for 1 month.

After 1 month on 28 Feb 2019, slab was removed and check radiograph was done. Crepe bandage was given. Later physiotherapy consultation accompanied 2 months later post-surgery that is on 1 March 2019. Post-operatively patient had chief complaints of pain in right wrist which patient describe as dull aching type with intensity of 6/10 at rest and 8/10 on activity on NPRS which aggravated on activities, swelling, stiffness, also unable to perform range of motion (ROM) at wrist due to prolong immobilization in plaster slab and difficulty in performing activities of daily living such as self-hygiene.

**Clinical Findings:** After taking informed consent from patient, she was examined in sitting position with both shoulders at level. On physical examination, vital signs including temperature were normal, pulse rate 76 beats/min, RR- 24 breaths/min, and BP-120/80 mmHg. On inspection patient kept right shoulder adducted and elbow flexed to approx 90°, forearm mid pronated, wrist in neutral and interphalangeal joints in mid flexion position. Presence of scar was over anterior aspect distal forearm with visible swelling at wrist. On palpation local temperature was not raise, diffuse tenderness grade 2 and scar length was 9 cm. Neurological assessment was normal. Myotome assessment, it was limited due to injury however grossly impaired from C5, C6 and C7 in right upper extremity and deep tendon reflexes were found intact. X-ray and clinical photograph are shown in figure below.

#### Clinical Photograph:

**Therapeutic Intervention:** Patient was given physiotherapy for 12 weeks (5 days a week) which included sessions on patient's education and thermotherapy. Also range of motion exercises, joint mobilization and progressive resistive exercise were conducted.



#### Radiological Images



Fig a: X-ray of comminuted distal radius fracture

Fig b: X-ray immediate Post-OP

Fig c: Check X-ray before removal of slab

### Description

**During immobilization:** Full range of strong forceful active finger movements were followed. Active Range of Motion exercises to digits, thumb, elbow and shoulder were given to prevent stiffness. Wrist movement, supination and pronation were not encouraged. Dependent edema was treated by limb elevation on pillow above elbow and elbow above the shoulder. Care of plaster slab and

checking it to see that it is not hampering the full range of MCP joints of finger and thumb. Intermittent use of sling with elbow in at least 70° of flexion. It should be checked for slackness and padding under neck.

### On removing the plaster:

#### Week 1

Thermotherapy for 10-15 minutes to induce relaxation, improve circulation and reduce pain, stiffness around the joint and puts joint in an ideal position for exercise. Scar mobilization using deep friction massage by applying pressure of varying intensities with ball of thumb and fingers performed for 30 seconds to 1 min. Exercises to improve Flexion – extension includes Wrist mobilization is initiated Stabilizing the forearm just above the wrist joint and small range of relaxed passive movement flexion-extension in midprone position is performed.

#### Timeline

Diagnosed with undisplaced comminuted fracture	8/1/2019
Admitted at Hospital (diagnosed with displaced fracture)	10/1/2019
Operated (open reduction internal fixation)	14/1/2019
Discharge	16/1/2019
Follow up 1 (sutures removed & plaster slab re-applied)	29/1/2019
Follow up 2 (plaster slab removed)	28/2/2019
Physiotherapy Rehabilitation	1/3/2019

Table 1. Range of motion Pre and Post treatment.

Joint	Movements	Pre treatment		Post treatment	
		Active	Passive	Active	Passive
Elbow	Flexion	120°	125°	140°	140°
	Extension	0°	0°	0°	0°
Forearm	Pronation	40°	45°	87°	90°
	Supination	30°	40°	85°	90°
Wrist	Flexion	35°	40°	75°	75°
	Extension	35°	42°	70°	72°
	Radial deviation	10°	12°	20°	20°
	Ulnar deviation	15	20°	30°	35°

Table 2. Manual Muscle Testing Pre and Post Treatment

		Pre treatment	Post treatment
Elbow	Flexors	4	5
	Extensor	NT	NT
Wrist	Flexors	3 -	4
	Extensors	3 -	4

#### Week 2-4

Thermotherapy and range of motion exercises are continued. Graded joint mobilization was started with II-III (Maitland) dose at 3 bouts of 30 seconds interval,

followed by cryotherapy for 7-8 minutes. Alternately Indian salutation and Reverse salutation were done. As the range improves isometrics, isotonic self-resistive exercises and strengthening using therapy balls to improve grip strength were done.

#### Week 5-8

Thermotherapy and range of motion exercises are continued. Graded joint mobilization progressed to III-IV (Maitland) dose at 3 bouts of 30 seconds interval, followed by cryotherapy for 7-8 minutes. Muscle Energy Technique was started at end range of motion. Patient was asked to initiate flexion, extension, supination and pronation. Reciprocal inhibition followed by post isometric relaxation (3-5 repetition) was done.

### Week 8-12

Static stretching to elbow and wrist along with active range of motion exercises were done. Functional task oriented exercises such as turning keys, door knobs, scooping beans and putting in box were started for reducing difficulty in daily living. Functional use of whole upper extremity especially forearm wrist and hand was encouraged and progressed right from initial stage.

**Follow up and outcome:** Table shows initial and final evaluation of range of motion and strength evaluation. After 12 weeks, improvement was reported. Remarkable decrease in pain on NPRS from 6/10 to 1/10 at rest and 8/10 to 2/10 during activity was seen.

#### PSFS (Patient Specific Functional Scale)

Patient capacity increased in activities like grooming, eating, and writing .

Pre score – 1/10

Post score – 6/10

#### NPRS (Numerical Pain Rating Scale)

Pre score – 8/10

Post score – 2/10.

## DISCUSSION

In this case, patient reported with complain of pain and stiffness along with reduced strength, decreased range of motion and difficulty in doing activities of daily living. A plan of care was made after careful clinical evaluation. Intervention included thermotherapy, range of motion exercises, stretching, graded joint mobilization and muscle energy techniques. Starting early physiotherapy post cast removal regularly shows significant increase in wrist extension and grip strength. Active range of motion exercises are beneficial to facilitate the pumping action of hand muscles and to reduce the swelling and oedema. Heating benefits in both active range of motion gain and persistent ROM gain (Nakano et al., 2012). Initial therapy of ice, paraffin wax bath application and gentle range of motion mobilization helps in improvement of both range of motion and grip strength. ROM exercises were initially initiated to advance passively towards active assisted exercises and then free exercises. Graded joint mobilization (Maitland) was given in grades II-III and progressed to III-IV, 3 bouts at interval of 30 second. After mobilization an Ice pack for 7-10 minutes were added.

Application of Ice pack helps to reduce inflammation result from tissue tension of joint mobilization, reduces any discomfort after treatment- induce micro trauma, reduces any secondary ischemic injury and it improved plastic tissue elongation (Draper et al., 2010). Manipulative management show significant increase in range of motion. Muscle energy technique for biceps and triceps was integrated, from reciprocal inhibition to post isometric relaxation (Sakina et al., 2017). Mundada et al. (2017) reported a case of Type-I Monteggia with ipsilateral fracture of distal radius epiphyseal injury 14.

Similar articles are reported in GBD studies (James et al., 2017; Spencer et al., 2020; Murray et al., 2020; Murray et al., 2017). Studies on different types of fracture were also reported by Dhankar and Bele (2019), Reddy and Dhaniwala (2019). Related articles and cases were reported by Bawiskar et al. (2020) , Phansopkar et al. (2020), Reddy et al. (2020) and Saoji et al.(2020).

## CONCLUSION

The above study concludes that definitive surgical approach and early physiotherapy rehabilitation lead to enhancement in functional goals of patient which stands a major understanding towards a successful recovery.

**Conflict of interest:** None

**Funding support:** None

**Patient consent:** Proper consent was taken from the patient for writing case report.

#### List of abbreviation

DRUJ – Distal Radio-ulnar Joint

ORIF – Open Reduction Internal Fixation

ROM – Range Of Motion

MET – Muscle Energy Technique

NPRS – Numerical Pain Rating Scale

PSFS – Patient Specific Outcome Measure

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