

Case Study - Post Operative Rehabilitation of Fracture of Distal End of Radius

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Abstract: ***Introduction:** Fracture in distal end of radius is one the most common injury experienced by orthopedic surgeon. They uses various techniques to manage such fractures mostly they consider closed reduction, open methods of reduction, per cutaneous fixation and stabilization techniques. Lately open reduction along with internal fixation of distal end of radius fracture has gained significant acclaim recently. **Methodology** Present case study was performed on Mr. D. S. Dahiya initiated during first week of November 2016 till end of February 2017 constituting four months of rehabilitation. Patient came post operatively with history of closed fracture of distal end of radius for physical therapy rehabilitation. **Therapy** initially started with pre rehabilitation kinesiological examination and accordingly short term and long term goals were identified. Hence physical therapy was focused on mobility, stability and functional training. For management of swelling and edema cryotherapy was used initially. Therapy focused on range of motion exercises, mobilization of wrist since patient came with primary complain of stiffness, weakness, and swelling. Regular pre and post examinations were recorded. Complete rehabilitation involves four months. Functional training also performed considering requirement of the patient focused on wrist flexors, extensors and wrist deviators. **Conclusion:** Complete rehabilitation of four months exhibits significant improvement in mobility of wrist joint, and interphalangeal joints. Improvement also observed in functional activities of wrist and hand.*

Keywords: distal radius fracture, rehabilitation, open reduction internal fixation

1. Introduction

Fracture in distal end of radius is one the most common injury experienced by orthopedic surgeon. They uses various techniques to manage such fractures mostly they consider closed reduction, open methods of reduction, per cutaneous fixation and stabilization techniques^{1,2}. Lately open reduction along with internal fixation of distal end of radius fracture has gained significant acclaim recently. Open reduction and internal fixation of distal radial fractures with an angular stable locking plate applied to the volar surface has gained vast popularity recently. It provides a stability in the osteoporotic bones which helps in restoration of articular surface and skeletal alignment. It also facilitates immediate free mobilization of the wrist joint. However, there are few systematic studies in the literature evaluating the efficacy of locking plate fixation using objective and subjective assessments^{3,4}. Since operative techniques utilized in present case involves latest techniques utilized by orthopedic surgeons for correction of displacement. Present study describes the rehabilitation post operatively of distal end of radius fracture.

2. Methodology

This case study was performed on Mr D. S. Dahiya which was initiated during the first week of November 2016 and last till end of February 2016 constituting a total of 4months. The patient came post operatively for rehabilitation and after detailed kinesiological examination rehabilitation for four months was performed. During the examinations and therapies we used the following equipment: Therapeutic Paraffin Wax Bath, hot water fomentation pads, treatment table, measurement tape, neurological hammer, goniometer, various sized pillows, grip exerciser. Name of the patient: Mr D. S. Dahiya

Age: 58 years **Diagnosis** fracture

Chief Complaint's patient complains of stiffness in wrist

and hand, pain while doing activities involving wrist hand, weakness in holding objects

History of present problem - Patient met a road traffic accident, where he was hit by a car and he fell down in outstretched position. Due to fall patient had fracture of distal end of left radius. After consulting orthopedic surgeon, investigations revealed close fracture of distal end of radius. Patient advised for surgical reconstruction which involves open reduction and internal fixation and was operated on 2nd November 2016. Bandage was worn until 09/011/2016 as pins were still present to secure stitches. After removal of stitches on 17th/03/2016, physical therapy was started from 20th November 2016

Problem - Patient complains of stiffness, swelling in and around left forearm, wrist and hand. Functional activities also compromised which involves gripping movement.

Present State Height: 5.10 ft

Weight: 82 kg

BMI: 24.9 kg/m²

Psychosocial History Work Living Conditions: Patient lives in a 2nd floor house with stairs and good accessibility to his house.

Family Has a wife and lives in a nuclear Family with his children

Personal and Medical History- Mr Dahiya was apparently alright until he met with an RTA 4 months back, when he fell on outstretched hand due to hit on left upper limb. Patient was immediately rushed to base hospital situated Delhi Cant. Patient underwent full body radiological examination where he was diagnosed with fracture of distal end radius of left upper limb. Temporary bandaging was done. Patient underwent surgery on 2nd November 2016

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Operations - The patient had open reduction internal fixation

Medications- patient took analgesics for one week post surgery

Abuses- Non-smoker, Non-Alcoholic, No Drug Abuse
 Differential considerations- Patient's complaint of lack of mobility, weakness and swelling in left wrist, it can be caused by due to immobilization and injury to soft tissues. Reduced power of muscle is due to muscle weakness

3. Initial Kinesiological Examination

Patient was having lot of swelling around left wrist, arm and forearm. Scar was healed well, non adherent in nature.

Range of motion (ROM) Measurement

S.no	Motion	Active ROM	Passive ROM
1	Wrist flexion	40	45
2	Wrist extension	35	40
3	Radial deviation	10	13
4	Ulnar deviation	15	18
5	Finger PIP flexion	50	55
6	Finger PIP extension	0	0
7	Finger DIP flexion	45	50
8	Finger DIP extension	0	0

Strength measurement

S.no	Muscle	Muscle strength
1	Wrist flexors	3 ⁺
2	Wrist extensors	3
3	Radial deviators	3
4	Ulnar deviators	3 ⁺
5	Finger PIP flexors	3 ⁺
6	Finger PIP extensors	3 ⁺
7	Finger DIP flexors	3 ⁺
8	Finger DIP extensors	3 ⁺

Neurological Examinations: Romberg's Test - Negative (Only done as orientational) Subjective Light Touch - Normal sensation Deep tendon reflexes normal : biceps reflex 2+, brachioradialis reflex 2+ and triceps reflex 2+

4. Conclusion of examination

The initial kinesiological examination shows the patient has both muscular and structural restrictions. Tightness of muscles surrounding the wrist joint, mainly wrist flexors - Flexor Digitorum Superficialis and Flexor Digitorum Profundus was shown by muscle length test. The structural restrictions around the wrist joint, mainly restriction of wrist movement, was shown by joint play examination as well as strength testing showed lot of muscle weakness, wrist flexors and wrist extensors were significantly affected, Flexor Digitorum Superficialis and Flexor Digitorum Profundus being main muscle group. wrist extensors were weaker as compared to flexors. Muscle strength test shows loss of strength of muscles around wrist, main muscle group being Extensor Carpi Radialis Longus, Extensor Carpi Radialis Brevis, Flexor Carpi

Radialis as radial deviation is more affected

Short and long term Rehabilitation

Short-term rehabilitation plan: Short term plan was to stretch shortened muscles and gain muscle strength and ROM in wrist joint as well as remove the blockage on radius.

Long-term rehabilitation plan: long term plan of rehabilitation was to restore strength and mobility in wrist joint

5. Therapy Process

The patient got a treatment with passive interventions to improve circulation and prevent immobilization adhesion formation. These treatments included application of an ice pack to reduce edema followed by application of a wax bath on the affected wrist. Gentle range of motion mobilizations were then introduced that could only be performed in flexion and extension to the patient's pain tolerance. Three sets of 5 flexion/extension repetitions were performed on the affected wrist. The joint was also mobilized in circumduction, ulnar flexion and radial flexion to the patient's level of tolerance. Early mobilization resulted in rapid recovery of both movement and strength without causing more discomfort or adversely influencing the progression of the deformity. Early mobilization would ensure rapid recovery of wrist and hand function while avoiding the complications of a conventional plaster cast^{5,6}.

Supervised Active rehabilitation program

Pain management - Rehabilitation started with management of pain which was controlled by cryotherapy followed by heat/ thermal therapy. Electrotherapy modalities also used to control swelling and pain.

Isometric Exercise

- Wrist flexors and extensors

Active, active assisted and passive Range of Motion Exercise

- Rehabilitation started with assisted stretch of forearm flexors and extensor musculature and radial/ulnar deviation
- Weight bearing wrist extension exercise(hand on the table with the patient leaning forward on them) to patient tolerance
- Active stretch to shoulder girdle and rotator cuff musculature
- Active stretch to elbow flexor and extensor musculature

Intrinsic Hand Muscle Exercise

- Thumb/digit opposition
- Repetitive squeezing of therapy putty
- Repetitive towel wringing exercise

Strengthening Routine

- Biceps curl with weights bilaterally
- Strengthening of Shoulder abductors, flexors and extension with reps with 2 pound weights bilaterally performed
- Performed squeezing exercises of left wrist
- Flexion and extension of wrist using weights as per tolerance

Functional Activities

- Patient was advised to practice activities at home also which involve the affected extremity (e.g. writing, typing, cooking, etc.)

In addition the patient in this case study was encouraged to resume functional activities that involve the wrist and hand such as writing, cooking and sewing.⁷

6. Final Kinesiological Examination Conclusion

Pre rehabilitation readings of range of motion, muscle strength, and functional status were recorded which were later compared to analyze the effect of physical therapy rehabilitation in February 2011. Results exhibit significant improvement among all domains. Mobility was improved drastically which includes wrist flexors, extensors, and deviators. Wrist flexion has achieved complete range of motion along with radial deviation. Strengthening domain also exhibits drastic improvement which was performed using static exercises, theraband resisted movements, and weights cuffs.

7. Conclusion

During complete physical therapy session of four months significant improvement was achieved in wrist joint flexion, extension, and radial deviation. Functional training also improved ADL activities performed by patient. Hence physical therapy plays pivotal role in rehabilitation post operatively in distal fracture.

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