

Effect of Combined Intervention of Physiotherapy Rehabilitation on Partial Clawing of Hand after Ulnar Nerve Repair: A Case Report

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ABSTRACT

Introduction: Claw hand is a condition in which fingers remain bent and unable to straighten up with hyperextension at metacarpophalangeal joint (MCP) and flexion at interphalangeal joint (IP). Partial clawing of hand is a condition that results due to damage of ulnar nerve leading to weakness of hand resulting in imbalance between lumbricals and dorsal interossei.

Patient concerns: A 31-year-old female noticed loss of sensation along with the medial border of wrist and last two fingers for 6 months after tendon repair and nerve repair surgery at the level of wrist due to trauma. right hand with difficulty in grasping and holding after her nerve repair.

Diagnosis: She was diagnosed with partial clawing of right hand due to damage of ulnar nerve at wrist joint.

Interventions: Physiotherapy sessions was given for five weeks and 6 days session per week. These interventions was included, lumbrical blockage splint, electrical muscle stimulation, passive range of motion, sensory reeducation, active assisted range of motions, mobilization of joints grade1 and 2, trans frictional massage, active ranges, ulnar nerve glides, strengthening exercises.

Outcomes: All combined intervention helped in early gain of sensation, ROM, hand strength and restored grasping activities. patient after rehabilitation was able to performs activities of daily life with right hand.

Conclusion: Combined physiotherapy interventions used in this case for partial clawing of right hand following ulnar nerve trauma at wrist and helped in early gain of sensation, ROM, hand strength and restore grasping

activities. Therefore, nerve repair followed by extensive physiotherapy after tendon injury should be the mainstay of treatment.

Keywords: Tendon repair; Claw hand; Physiotherapy interventions; Wrist trauma

List of Abbreviations

MCP	Metacarpophalangeal joint
DIP	Distal interphalangeal joint
IP	Interphalangeal joint
ROM	Range of motion

INTRODUCTION

Claw hand is a condition in which fingers remain bent and unable to straighten up with hyperextension at metacarpophalangeal joint (MCP) and flexion at interphalangeal joint (IP).^[1] Ulnar nerve damage can lead to loss of sensation at 4th and 5th digits, muscle weakness while fingers remain flexed.^[2] Partial clawing of hand is a condition that results due to damage of ulnar nerve leading to weakness of hand resulting in imbalance between lumbricals and dorsal interossei which reflects at level of MCP, IP and DIP joints.^[3] Loss of extension at interphalangeal joint and flexion at MCP joint is due to weakness of intrinsic and hyperactivity of extrinsic muscles made the MCP in terms of hyperextension.^[4] Ulnar nerve does not supply the Flexor digitorum superficialis and profundus and their hyperactivity leads to flexion at proximal interphalangeal and distal interphalangeal joint thus causing loss of grasp.^[3,4] Rehabilitation goal of this patient was to maintain the functional abilities and repair the damage caused by ulnar nerve and improve lifestyle by ameliorating her pain and functional ability. In this patient combined therapeutic interventions of partial clawing of right hand played an important role in regaining sensory functions and in maintaining ranges of motion (ROM) and muscles strength thus improving grip.

CASE PRESENTATION

A 31-year-old female noticed loss of sensation along with the medial border of wrist and last two fingers for 6 months after tendon repair and nerve repair surgery at the level of wrist due to trauma. She visited department of orthopedics with the complaints of aesthesia at medial border of wrist and finger of right hand and also complained of paresthesia and numbness in 4th and 5th digits of right hand with difficulty in grasping and holding after her nerve repair. She was diagnosed with partial clawing of right hand due to damage of ulnar nerve at wrist joint. Afterwards her rehabilitation was planned. Patient did not have any metabolic illness including diabetes, hypertension and arthritis. Prior written informed consent was obtained from the patient for the use of data for sake of publication.

Clinical findings

Patient was hemodynamically stable with surgery scar on her right hand. She had a partial clawing in right hand and her 4th and 5th digits with hyper extension at metacarpophalangeal joint and flexion at proximal

interphalangeal and distal interphalangeal joint of 4th and 5th digits as shown in **Figure 1**. There was muscles weakness and wasting of right hand with restricted movements at proximal interphalangeal and distal interphalangeal joint of 4th and 5th finger. Manual muscle testing was performed and recorded as explained in **Table 1**. On physical examination there was no sensation of pain and touch along the path of ulnar nerve. Loss of cold and hot sensation was also noticed on medial side of wrist and 4th and 5th digits of right hand. Special tests were performed i.e., Froment's, cross finger and card tests were positive. On patient –specific functional scale the outcome was 1 out of 10.



Figure 1: Depiction of Patient’s Hand before and after rehabilitation of Partial Ulnar Claw Hand.

Table 1: Assessment of MMT Grading Before Treatment and After Treatment.

Muscles	Before Treatment		After Treatment	
	Affected hand	Non affected hand	Affected hand	Non affected hand
Interossei	1	5	4	5
Lumbricals of 4 th and 5 th digits	1	5	4	5
Flexor digitorum profundus of 4 th and 5 th digits	1	5	4	5
Flexor carpi ulnaris	1`	5	5	5
Abductor digiti minimi	1	5	5	5

Therapeutic intervention

Patient had physiotherapy session for five weeks and 6 days session per week. Patient was told about the session before starting of intervention. She was given with lumbrical blockage splint to regain ROM of 4th and 5th digits. In first 14 days, Electrical stimulation of muscle was applied for interossei, lumbricals, flexor digitorum profundus and Abductor digiti minimi. Electric pulse at frequency of less than 1/s was applied.^[3] Passive ranges was performed to fingers in abduction, adduction and pronation that helped in strengthening of muscles, ligament and joint for 2 sets of 10 repetitions. Sensory re-education for 20 minutes with touch stimulation of different types of shapes and textures like cotton, plastic, silk and towel. After that active assisted exercises were performed. Maitland’s grade 1-2 mobilization was given 2 oscillation per sec for 60 seconds to improve ranges

and relieve pain. Trans frictional massage technique was applied for 45 second 3 sets of 5 repetitions and 60 seconds rest was given to reduce tightness shortened muscle.

In next 15-21st days active ranges was performed at MCP and fingers. Home plan guidelines of self-ulnar nerve glides were taught to patient which help to stimulate the nerve. From next 22-30th days 4 patient's plan progressed to strengthening program with the help of mechanical and manual resistance with 10 sets of 3 repetitions of lumbricals and interossei muscles. In this report combined therapeutic rehabilitation program helped the patient to gain early improvement in ranges, sensation, muscle strength and to be functionally independent in daily activities. After 5 weeks of physiotherapy session strength of right hand improves and functional grasp improved.

DISCUSSION

Palsy of ulnar nerve results into motor and sensory function loss. When any portion of the ulnar nerve is damaged this condition can results.^[5] whereas in Partial clawing of hand there is damage to ulnar nerve that leads to weakness of muscles which are supplied by ulnar nerve that ultimately leads to improper functioning between lumbricals and interossei^[3] combined therapeutic interventions used in this case for regaining wrist and fingers range of motion, muscle strength, sensory re-education and improvement in hand grasping and functional activities. Splinting plays an important role in the recovery of patients with hand injuries.^[6] So, in this case report lumbrical blocking splint has been used for partial claw hand deformity because this splint reverse the functional impairment and helps in restoring normal range of motion without compromising day to day activities.^[3] Maitland joint mobilization used as a therapeutic technique for increasing ranges and pain so that function of upper extremity improve.^[7] Maitland mobilization technique has significant role in decreasing pain and improving ranges.^[3] Similarly in this case report mobilization of wrist,mcp,ip joint and IP joint has been performed followed by trans frictional massage to break adhesions and to improve flexibility.^[6,7] mirror therapy with sensory re-education had a greater effect in sensory relearning. Different types of touch stimulations like cotton, plastic, silk, towel has been proved useful in this rehabilitation.^[6] also, desensitization technique has been used in this case report .in this case report ulnar nerve glides has been performed 10-15 reps twice a day. strengthening of hand muscles was performed mechanically and manually to gain grasp functions.^[7] Hand grip strength has been improved with Thera putty, therapeutic ball and hand gripper in this case. All these combined physiotherapy interventions aid in regaining the normal functioning of hand and early regain in sensation and strength within one month of physiotherapy session.

CONCLUSION

Combined physiotherapy interventions used in this case for partial clawing of right hand following ulnar nerve trauma at wrist and helped in early gain of sensation, ROM, hand strength and restore grasping activities. Therefore, nerve repair followed by extensive physiotherapy after tendon injury should be the mainstay of treatment.

Conflict of Interest: Authors declare no conflict of interest.

Animal and Human Rights Statement: No animal and human right has been violated in this case study as per Helsinki Declaration.

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