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Proprioceptive neuromuscular facilitation (pnf) towards a typical case of glass cut injury provoking radial nerve palsy presenting as wrist drop

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Abstract
Introduction: Wrist drop are characteristic of injury to the radial nerve. When there is an injury to this nerve then the patient may experience quite a few symptoms which include numbness in the wrist, back of the hand, and forearm. The patient may also find it difficult to use the hand normally in day to day activities like gripping and grasping objects
Objective: The objectives of this work were to evaluate the results of physical therapy treatment – PNF Technique on enhancing the functional ability in individual affected with wrist drop by using Brief Michigan Hand Outcomes Questionnaire (MHQ)
Methods: The study was a clinical case study of the patient who is 34 years old male, admitted for glass cut injury, causing Radial Nerve Palsy and a procedure of nerve grafting is done. After discharge patient was put under post physiotherapy rehabilitation for his wrist drop. Intervention was tailored protocol i.e. proprioceptive neuromuscular facilitation for a period of 8 weeks, 5 sessions per week. The patient was assessed at the baseline using Goniometer for ROM and Brief Michigan Hand Outcomes Questionnaire (MHQ) for functional ability and reassessed after 8 weeks.
Results: The data showed that there was a significance difference in the outcome measure MHQ
Conclusion: The study concluded that PNF technique was effective in improving range and functional ability of a hand with Wrist Drop.

Keywords: PNF, MHQ, goniometry

Introduction

Wrist drop occurs as a consequence of radial nerve palsy. The incidence of injury to peripheral nerves, especially to radial nerve, is on the rise, largely due to increased road traffic accidents and increased violence in our society as a whole. The radial nerve function has been compromised would not be able to actively extend extensor muscles of the wrist and digits since the radial nerve innervates them. As a result, the hand hangs flaccidly in a flexed position when the patient attempts to move the arm to a horizontal position. Patients may also experience paraesthesia, hypoesthesia, numbness and other sensory disturbances. Simple, pain-free sensory deficits may be functionally less significant because they involve the anatomical snuffbox and the radial dorsum of the hand. Injury to radial nerve results in motor function impairment leading to weakness during extension of the wrist, and fingers. However, wrist extension may be relatively spared because common radial nerve innervates the extensor carpi radialis longus muscle proximal to its division. The inability of a person to extend his wrist and/or fingers due to the above mentioned causes is called "wrist drop" or "finger drop." Interventions for wrist drop include splinting, electrical stimulation, exercises for hand and fingers, surgery, and drug therapy. The present case is diagnosed with Wrist Drop caused due to the glass cut injury leading to the radial nerve palsy of left side.

AIM

The aim of the study is to find out the effectiveness of proprioceptive neuromuscular facilitation (PNF) technique for improving strength, ROM and functional ability of hand in patient with wrist drop.

Case Presentation

A unique case of Radial Nerve Palsy was reported in a 34yr male resulting as a consequence of glass cut injury of forearm leading to wrist drop. Surgical intervention – Nerve grafting was done to the patient. The symptoms include numbness, paraesthesia and other sensory disturbance and weakness while extending the wrist and fingers. After discharge the patient was put under post physiotherapy rehabilitation for his wrist drop Treatment included proper skin care, stretching, orthotic device (static & dynamic splint), and electrical stimulation for muscle re-education, and PNF Technique.

Clinical Findings

On examination, muscle power of left side fingers extensors are 0/5, left side wrist extensor are 0/5, elbow flexors are 4/5 and shoulder flexors and extensor are 5/5, 5/5 respectively according to medical research council.

Table 1

	Active ROM	Passive Rom
Shoulder flexion	0-170 degree	0-180 degree
Shoulder extension	0-40 degree	0-45 degree
Elbow Flexion/Extension	0-135 degree flexion/ 130 degree	0-140 degree flexion/ 0 degree
Forearm Pronation/ Supination	0-65 degree/ 0-75 degree	0-67 degree/ 0-79 degree
Wrist Extension/ flexion	0 degree/ 0-65 degree	0-65 degree/ 0-70 degree
Wrist Radial/ Ulnar	0 degree/ 0-30 degree	0-15 degree/ 0-35 degree
Assessment of Range of Motion of the Affected Side		

On neurological examination, impaired sensation in the C6-C7 and C8 dermatomal region of Left Hand was reported. His complete routine examination was normal. Patient underwent diagnostic test for radial nerve i.e. Nerve Conduction Velocity Test for the confirmation.

Materials and Methodology

Material used

- Couch
- Table & Chair
- Paper & pen
- Pillow
- Goniometer
- Brief Michigan Hand Outcomes Questionnaire (MHQ)

Assessment Tools

- Brief Michigan Hand Outcomes Questionnaire

Pnf Technique

Proprioceptive neuromuscular facilitation (PNF) is an exercise based on the principles of functional human anatomy and neurophysiology. PNF Techniques help develop muscular strength and endurance, joint stability, mobility, neuromuscular control and coordination– all of which are aimed at improving the overall functional ability of patients.

Dynamic Reversal (Slow Reversal)

Utilizes isotonic contractions of first agonists, then antagonists performed against resistance. Contraction of stronger pattern is selected first with progression to weaker pattern. The limb is moved through full range of motion.

Positioniing

Position of the Patient: Patient in sitting on the chair with the affected hand support on the pillow in the end of the couch

Position of the Therapist: The therapist in Walk stand position facing the patient

Procedure

- The patient is instructed to sit on the chair and arm is placed on the end of the couch with pillow support.
- The therapist resists the desired (stronger) pattern wrist flexion. As the end of the desired range of motion approaches, the therapist reverse the grip on the distal portion of the moving segment and gives a command to prepare for the change of direction.
- At the end of the desired movement the therapist gives the command to reverse direction without relaxation, and gives resistance to the new motion with distal part.
- Normally, starts with contraction of stronger pattern and finish with contraction of the weaker pattern.
- Number of repetitions- 10 REPEATITION/SET
- Number of sets/session – 5 SETS

Repeated Contraction, (Repeated Stretch)

Repeated isotonic contractions from the lengthened range induced by quick stretches and enhanced by resistance; performed through the range or part of range at a point of weakness. Technique is repeated (i.e., three or four stretches) during one pattern or until contraction weakens.

Positioning

Position of the Patient: Patient in sitting on the chair with affected hand support on the couch with a pillow.

Position of the Therapist: The therapist in Walk stand position facing the patient.

Procedure

- The patient is instructed to sit on the chair and the forearm is placed pronated on the end of the couch with pillow support.
- The therapist one hand is placed on the elbow and the other hand is placed above the wrist and gives quick stretch to the extensor muscle group.
- The therapist gives a preparatory command while fully elongating the muscle group.
- Immediately after the stretch give the command "Pull up and out".
- When the patient's muscle is contract, give resistance to the entire pattern.
- The technique may be repeated, without stoping, from the beginning of the range as soon as the contraction weakens or stops.
- Number of repetitions- 10 Repetitions/Set
- Number of sets/session – 5 SETS

Intervention Procedure

Therapeutic interventions were started from the first day of patient visit. Initially, cock-up splint was prescribed to maintain the wrist in extended position. Full passive range of motion exercises were initiated for the wrist and hand joints. Patient was educated about the assisted active exercises for extension of wrist, fingers and thumb, elbow flexion in supination and forearm supination. Stretches were taught for finger joints, wrist joint and elbow joint of the left side and were performed in 2 sets where in 5 repetitions were performed with 15 seconds hold in between simultaneous repetitions. Proper care of the limb was advised to the patient in order to prevent the skin from infection along with proper inspection to look for any bruises. As the skin type is dry, patient was informed to apply moisturizing ointment over the dry region. Electrical muscle stimulation was given to the affected muscles. Visual Feedback exercises were advised to the patient in

order to improve the position of hand.

Data Analysis and Interpretation

Table 1: Represents Pre & Post Test Values of Brief Michigan Hand Outcomes Questionnaire

Tool	Pre Score	Post Score	Difference
MHQ	29	45	16

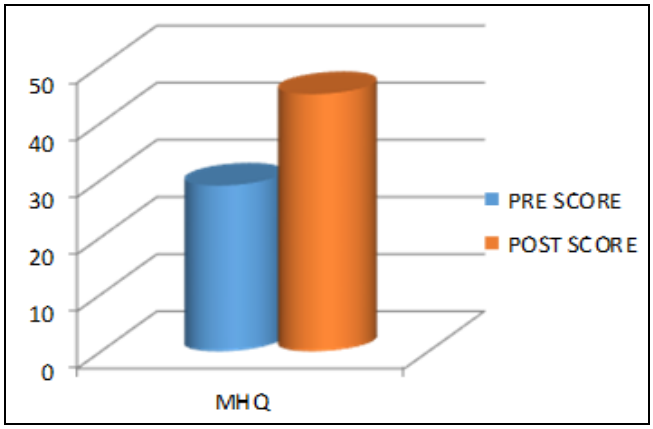

Fig 1: Represents Pre & Post Test Values of Brief Michigan Hand Outcomes Questionnaire

Discussion

Some patients recover spontaneously with the traditional treatment, others may require PNF technique in addition to the regular treatment for better prognosis. Since patient was highly motivated, he performed the exercises with enthusiasm. He was proactive in performing the exercises prescribed at the Rehabilitation program. He also carried out the home exercise programme sincerely. The limitation to the rehabilitation included long duration of treatment and patient's inability to pay the medical expenses for the treatment. Post treatment NCV was not performed due to financial limitation of the patient but treatment continued for the management of the radial nerve palsy.

On the 8th week of rehabilitation, patient reported voluntary movement of left side fingers and wrist along with an increase in the sensation as compared to day 1. Muscle power of left side fingers extensor was 4/5, left side wrist extensor was 4/5, elbow flexors was 5/5 and shoulder flexors and extensor was 5/5 and 5/5 respectively according to medical research council. The pre and post score of Brief Michigan Hand Outcomes Questionnaire (MHQ) was 29 and 45 respectively. Thus the data showed the significant difference of 16 between pre and post test score

Result

Result showed that Proprioceptive neuromuscular facilitation (PNF) technique was effective in improving range of motion (ROM), Functional ability in patient with wrist drop. It is observed that pre and post test showed the significant difference in values before and after the treatment protocol.

Conclusion

The study concluded that the Proprioceptive neuromuscular facilitation (PNF) technique is effective in improving the extensor muscle group strength, ROM and Functional Ability of hand on patient with wrist drop.

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