

Intervention of Biofeedback Training for Acute Spinal Cord Injury

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ABSTRACT

The aim of the study is to improve proprioceptive awareness of muscle and shape the levels of low muscle tension to maximal muscle relaxation. This case report is about a 24 year paraplegic male who reported with acute spinal cord injury. Pelvic stabilization and strengthening of the pelvic is focused for the quality of life and performing the daily activities independently with ambulation. Biofeedback along with isometric exercises have been introduced for the voluntary motor activity facilitation.

Keywords: BIOFEEDBACK, ISOMETRICS

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INTRODUCTION

Spinal cord injury to neural elements of the spine which can lead in different degrees of deficits of sensorimotor, autonomic and sphincter dysfunction, where the neurologic deficit or dysfunction can be either temporary or permanent, complete or incomplete[1].

The rehabilitation of people with SCI must involve several health care professionals initiated in acute phase and continue with special interventions and different therapeutic approaches. The rehabilitation of patients with spinal cord injury is greatly important for the main focus make patient independent and promote longer survival, less morbidity and higher quality of life. The higher occurrence of incomplete lesion is due to early treatment in rescue and surgery and not to rehabilitation[2].

Respiratory complications are the major mortality and morbidity in the first six months to one year after lesion. The impairment in respiratory musculature strength and in pulmonary function can significantly limit the rehabilitation of the patient[3].

The main drawback of patient with SCI is he gets psychologically depressed and thinks it is hardest to live with dependency as their inability to walk and use arms and hand[4].



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CASE STUDY

A 24 year old male paraplegic in wheelchair with Jewett brace reported into the neurologic rehabilitation department with a set of radiological evidences showing an obstruction between L1-L2 vertebrae; the initial diagnosis suggested as incomplete injury, motor paraplegia at the T12 neurological level on the right and L3 neurological level at the left.

The patient reported that he had met with a motor-bike accident an year back and was transferred to spinal cord injury centre where he underwent surgery. The surgical procedure included a laminectomy at L2-L3 and insertion of Harrington rods, because of the vertebral damage caused by the accident. After the surgery the patient was immobilized by a frame, later the patient was plaster casted and transferred to the bed. Episodes of thrombophlebitis occurred and he was not rehabilitated till 2 months post surgery.

METHODOLOGY

Before the treatment started manual muscle test was performed and following results were extracted showing lower extremity muscle groups with activity which were graded as:-

Left side:- iliopsoas (poor), sartorius (poor), adductor (poor), quadriceps femoris (poor plus); hamstring group (poor).
Right side:- sartorius itself showed voluntary involvement.

Sensory testing performed at the same time showed, intact sensation at L3 dermatome and intact or absent at L2 level on the left side, on the right L2 level was intact and absent below the level.

Biofeedback training was chosen because it could easily be involved with an exercise program that would not stress an unstable spine and also could provide the staff and patient with immediate information about the involuntary activity of muscles from below the level of injury.

Short-term goals: The short term goals for treatment were subjected to strengthen and facilitate muscle groups below the level of injury.

Long-term goals: The long term goals for the treatment were to ambulate with appropriate bracing.

PLACEMENTS OF ELECTRODES

EMG biofeedback was mainly placed to the proximal hip muscles that are important for the stabilization of the pelvis during ambulation.,electrodes were firstly place on gluteus maximus and medius.

Treatment

All exercises were initially performed in supine lying because the post surgical pain limited the amount of time the patient could be placed in the prone position.The initial training session consists of gluteal muscle emg biofeedback training followed by manually resisted isometric hip abduction. Due to spinal instability only voluntary isometric exercises were considered and rotations and back extensors were contraindicated in the treatment as the electrodes were showing fluctuations.The treatment session was for 5 min followed by 3 minute rest as per the convinence of the patient due to complain of pain and fatigue which may limit the treatment session but however this pattern is well known to expose the muscle fibres to oxidative metabolism [5].All contractions were performed to the maximum.Fatigue was determined by reduction of emg activity during contractions.This was followed upto 3 weeks with each week having 3 sessions. After 9 sessions the treatment was modified to back extensors involved in with prone position as per the stability of the spine and isotonic exercises were subjected tog-luteal muscles, followed by electrical stimulation which was added to the treatment sessions[6-8].After 27 sessions and 9 weeks of treatment the patient responded towards the pelvic stabilization,and voluntary movements.

RESULT

Pre test and Post test values were drawn for every session and the means were calculated.Pre test values and Post test values were taken with mean of Pre test A which was 33.3 and Post test mean value being 2 .Simultaneously Pre B value and after treatment Post B value was taken and Pre B value mean was 164 and mean of post B value was 364.64.Applying t- test we got P-value of Pre A as 0.013428 and Post A as 0.011554(ideally p value<0.05).Therefore there is significant statistical difference between Pre and Post.

DISCUSSION

Functional restoration of the patient after spinal cord damage has not yet been resolved.Medical and other health professionals must seek new methods to improve such injured patient's neuromuscular status and his ability to perform daily activities with functional independency.

EMG Biofeedback has direct application for use in a patient of incomplete spinal cord injury.Many studies have been reported in the past of use of biofeedback in chronic spinal cord injury[9-11],for relaxation or strengthening programs,but as an adjunct to the chronic spinal injury it can be also used in the acute spinal cord injuries.This device can monitor voluntary

motor activity and provide information.

EMG biofeedback can be introduced into the therapy atleast from a psychological perspective as the patient is able to participate actively in the rehabilitation.EMG biofeedback device can be used to re-evaluate and assist in detection of motor activity return through out the rehabilitation process.

CONCLUSION

This study evidently proves and suggests that biofeedback training has great impact in intervention of spinal cord therapy for pelvic stabilisation and motor-reduction comparatively with any alternative interventions.

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