

EFFECT OF HIGH FREQUENCY (HF) NEURO MUSCULAR ELECTRICAL STIMULATION OF LOWER LIMB MUSCLES ON PULMONARY FUNCTIONS AMONG COPD SUBJECTS

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ABSTRACT:

AIM: To determine the effectiveness of High frequency (HF) Neuromuscular electrical stimulation (NMES) along with conventional therapy on pulmonary functions among severe COPD subjects.

METHODOLOGY: 20 individuals with COPD were selected based on inclusion and exclusion criteria. Detailed procedure were explained in patient's words and those who are interested, informed consent will be obtained from those participants. Subjects will be assessed for pulmonary function - FVC, FEV1 through computerized spirometry. Before and after the intervention as pre-test and post-test values. Participants will be collected through consecutive manner and assigned into two groups 5 in each according through odd even method. The treatment duration for both the groups comprised of 30 minutes per session.

CONCLUSION : From the study, it has been observed that both HF- NMES along with conventional physiotherapy and conventional physiotherapy alone shows significant effect on FVC and FEV1 among COPD subjects, anyhow while comparing the mean values of Group B receiving HF-NMES along with conventional physiotherapy shows more significant than Group A receiving conventional physiotherapy alone. Hence, it has been concluded that HF- NMES of lower limb muscles proved to be more effective on FVC and FEV1 among COPD subjects.

Key Point : Chronic Obstructive Pulmonary Disease,

INTRODUCTION:

Chronic obstructive pulmonary disease is characterized by a persistent blockage of air flow from the lungs. Although COPD affect the lungs, it also produces significant systemic consequence. Skeletal muscle dysfunction in COPD patients is characterized by significant reduction in muscle strength and endurance, it is structurally characterized by loss of muscle mass, cross-sectional area and fiber type distribution. The physiotherapist plays a very important role in management of COPD. NMES is a physiotherapeutic intervention with positive effects on skeletal muscle function, exercise capacity and health status. NMES is a method of augmenting muscle performance. It has also been shown to improve oxidative potential of the muscles and Hence the effects of HF- NMES on lower limb dysfunction in severely disabled patients with COPD is done.

METHODOLOGY

Study design: Quasi Experimental study.

Study setting : Saveetha Medical College and Hospital, Saveetha Physiotherapy outpatient department.

Sampling method: Consecutive sampling technique.

Sample size: 20 (Group-A n=10 and Group-B n=10)

Inclusion criteria:

Age: 35 to 55 years, **Gender:** Male and Female, Patients with COPD who are referred through physician.

Exclusion criteria:

Patient with any systemic illness, patients with other obstructive lung disease, patients with recent thoracic surgeries, patients with recent chest trauma, patients with any musculoskeletal disorders, Patients with any neurological disorders, Patients with any cardiovascular disorders.

MATERIAL REQUIRED: Computerized Spirometry, NMES unit, Electrodes, cables, gel, cotton. Pillows. Chair with arm rest.

OUTCOME MEASURES:

Pulmonary functions-FVC, FEV1 using computerized spirometry:

PROCEDURE:

20 individuals with COPD were selected based on inclusion and exclusion criteria. Detailed procedure was explained in patients words and those who are interested, informed consent will be obtained from those participants. Subjects were assessed for pulmonary function - FVC, FEV1 through computerized spirometry, before and after the intervention as pre-test and post-test values. Participants were collected through consecutive manner and assigned into two groups 10 in each according through odd even method. The treatment duration for both the groups comprised of 30 minutes per session

Group A: (n=10)

- Conventional physiotherapy alone

Group B: (n=10)

- High frequency NMES along with Conventional physiotherapy.

NMES PROTOCOL

- Neuromuscular electrical stimulation was given;
- **ELECTRODE PLACEMENT:** In preparation for the electrode placement, the skin over the stimulation site was scrubbed with a spirit pad.
- Constant voltage stimulator
- Symmetrical biphasic square pulsed current at 50Hz.
- [Pulse; 300 us Wider.
- Intensity: intensity was set to create visible contraction of muscles under the tolerance of patient .
- This training protocol was applied simultaneously on both quadriceps , (hamstring, calves (10minutes × 3 in the first week and 15 minutes × 3 thereafter) in sequence , five days/ week for 4weeks (a total of 20 sessions).

CONVENTIONAL PHYSIOTHERAPY PROTOCOL**Postural drainage**

Postural drainage positioning is given if secretions are present and depending on the lobe in which secretions are present. A 3 to 5 minutes positioning is sufficient if given along with vibration. Patients breathed by diaphragmatic and pursed lip breathing during the drainage period. This is followed by forced expiratory technique in form of huffing and coughing which is taught prior to the treatment to the patient.

Pursed-lip Breathing

Patient will be made to sit in a comfortable position and relax his shoulders. Ask the patient to breathe in slowly and deeply through the nose with mouth closed and then breathe out gently lightly pursed lips. Patient is instructed to keep a steady stream of air flowing through the centre of lips.

Thoracic mobility exercise

To Mobilize the upper chest while sitting in a chair ask the patient reach with both arm overhead (180 degree bilateral shoulder flexion and slight abduction) during inspiration and then bend forward at the hips and reach for the floor during expiration.

RESULT

The result analysis shows that post-test mean values of FEV1 for Group-A is 1.44 and Group-B is 1.89. and also post-test mean values of FVC for Group-A is 1.96 and Group-B is 2.88. This shows that there is improvement in FEV1 and FVC levels.

DISCUSSION:

Isabelle Vivodtzev PhD et al in his study on Functional and Muscular Effects of Neuromuscular Electrical Stimulation in Patients With Severe COPD: A Randomized Clinical Trial In this patients with severe COPD, NMES was given which improved muscle CSA. This was associated with a more favorable muscle anabolic to catabolic balance. Improvement in walking distance after NMES training was associated with gains in muscle strength, reduced ventilation during walking, and the ability to tolerate higher stimulation intensity. The study involves Twenty of 22 patients with COPD were randomly assigned to NMES (n = 12) or sham (n = 8) training in a double-blind controlled study. NMES was performed on quadriceps and calf muscles, at home, 5 days per week for 6 weeks. Quadriceps and calf muscle cross-sectional area (CSA), quadriceps force and endurance, and the shuttle-walking distance with cardiorespiratory measurements were assessed before and after training. Vivodtzev Isabelle MSc in his study of Improvement in Quadriceps Strength and Dyspnea in Daily Tasks After 1 Month of

Electrical Stimulation in Severely Deconditioned and Malnourished COPD states that The combination of ES and UR was associated with greater improvement in quadriceps strength and dyspnea during the performance of daily tasks than UR alone in severely disabled COPD patients with low BMI. In this population, ES has been revealed as a useful procedure, complementing the usual pulmonary rehabilitation, the study consists of Seventeen patients with severe COPD (mean [\pm SD] FEV₁, 30 \pm 3% predicted) and low body mass index (BMI) [18 \pm 2.5 kg/m²]. Patients were randomly assigned either to usual rehabilitation (UR) alone or to a UR-plus-ES program for 4 weeks. Quadriceps muscle strength, total muscle mass (MM), exercise capacity, and health-related quality of life were measured before and after rehabilitation.

The results of the previous studies on Effects of Neuromuscular Electrical Stimulation in Patients With Severe COPD were compared with the current study of High frequency (HF) Neuromuscular electrical stimulation (NMES) Along with conventional therapy shows improvement in Pulmonary Functions FVC and FEV1 and provides that there was both clinically and statistically significant difference found among the groups.

CONCLUSION:

From the study, it has been concluded that Neuromuscular electrical stimulation (NMES) has an beneficial effect on FVC and FEV1. And also there was significant difference found between the Group-A and B. Group-B receiving Neuromuscular electrical stimulation (NMES) along with conventional therapy shows more improvement than Group-A receiving conventional therapy alone on Pulmonary Function on patients with severe COPD.

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TABLE-1: Comparison between FVC of Group-A & Group-B

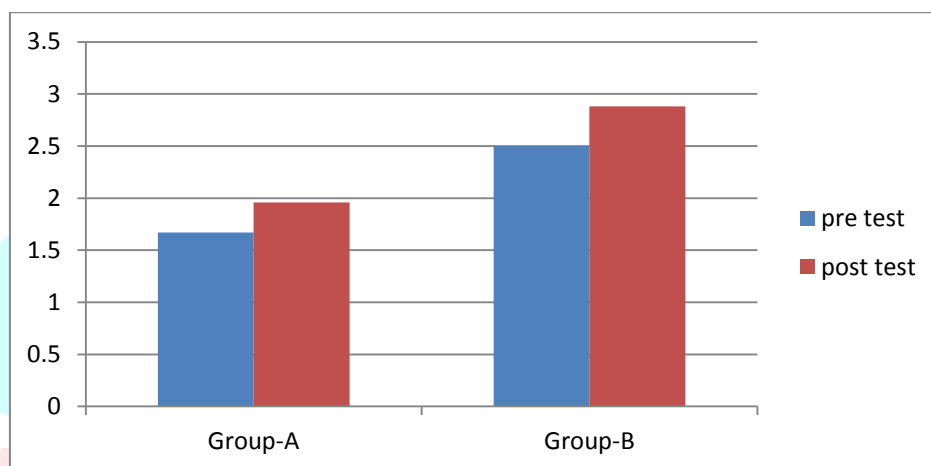


TABLE-2: Comparison between FEV1 of Group-A & Group-B

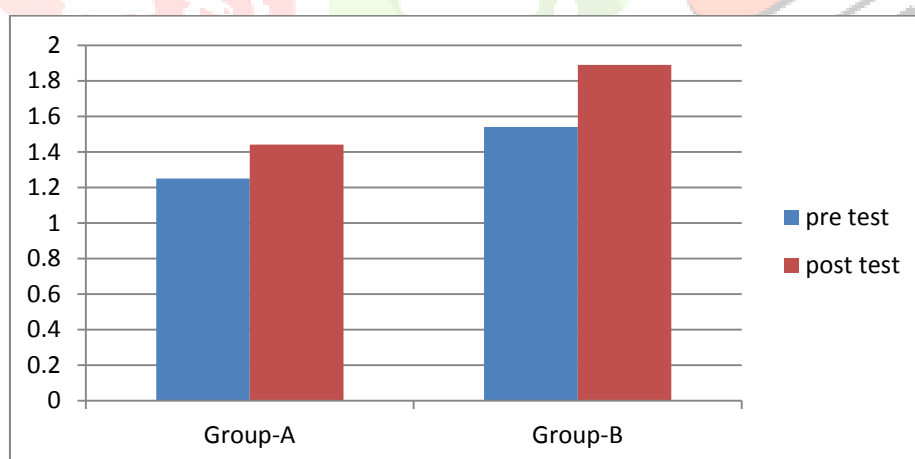


TABLE-3: comparison between post-test values of FVC

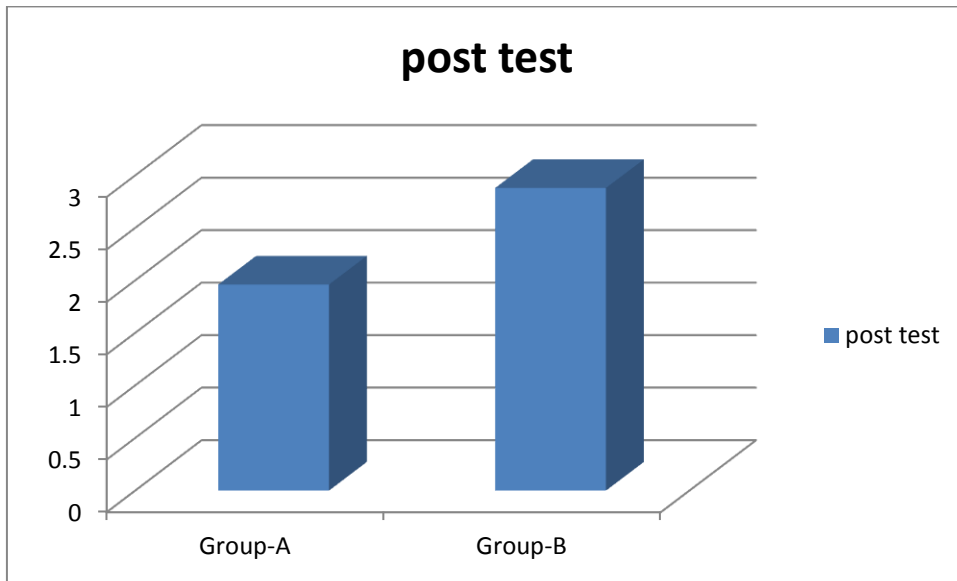
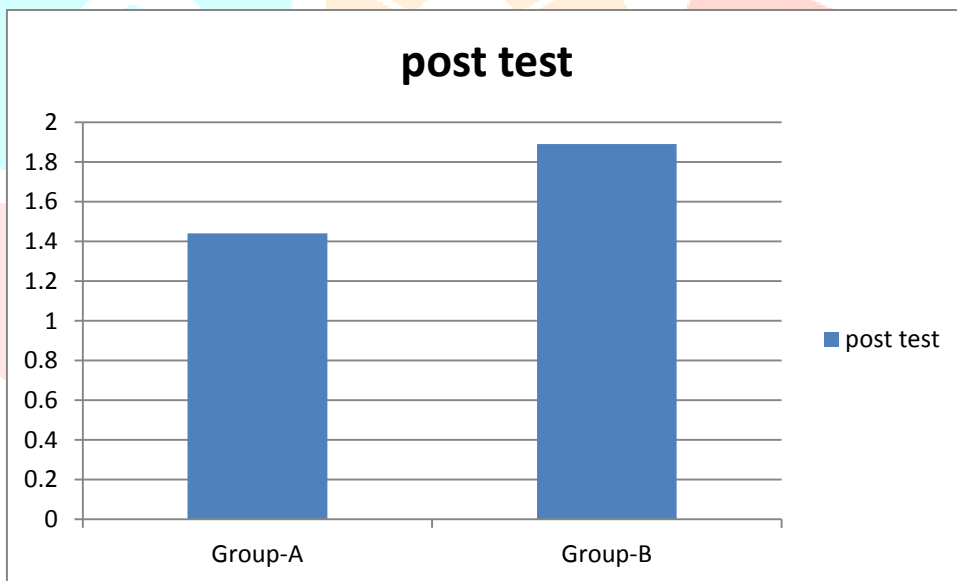


TABLE-4: comparison between post-test values of FEV1



PATIENTS RECIVING ON NEUROMUSCULAR ELECTRICAL STIMULATION

