Effect of Global Postural Re-Education Method in the Improvement of Pulmonary Functions in Subjects with Chronic Obstructive Pulmonary Disease

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is the 5th cause of mortality and morbidity in the world and represents an economic and social burden. COPD is a chronic pulmonary disorder affecting 10% - 15% individuals over age of 45 years. Objective: This study sought to investigate the Effect of Global Postural Re-Education (GPR) method in the improvement of Lung Function capacity (LFC) in patients with COPD.

Methods and materials: A total of 20 patients with moderate COPD were selected from Department of Pulmonary, SIMS Erode by random sampling method and were divided into 2 groups namely Group-A and Group-B respectively. Experimental Group-A patients were involved in GPR programme (G.P.R) and Control Group-B patients performed conventional pulmonary rehabilitation 30 minutes 2 days per week for 6 months. Patient was assessed for Pulmonary Function Test (FEV₁/FVC) (PFT) and for Pulmonary Functions and Inch Tape for Thoracic Expansion (TE) in the Axillary area.

Results: Participation of two groups recorded significant improvement in PFT and TE following intervention (p<0.05). There was significant improvement in experimental group compared to control Group.

Conclusion: This study provides evidence that GPR is effective in improve the Pulmonary function in patients with COPD.

Keywords: Chronic Obstructive Pulmonary Disease, Global Postural Re-Education, Pulmonary functions

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**Introduction**: World health organization (WHO) estimates COPD as a simple cause of death, mainly affecting the middle aged and elderly people. Some of the risk factors for COPD include smoking, occupational exposures, air pollution, hyper responsiveness of airways, and certain genetic variations. The prevalence and death rate due to COPD are increasing proportionately in accordance with increase in smoking. Smoking cessation, disease education, early detection, and treatment will provide benefit against the cause of morbidity and mortality. COPD occurs among 4%-10% of adult male population in India and in other countries. The regional COPD working group for 12 Asia specific countries used a COPD prevalence model and estimated an overall prevalence rate of 3.5%-6.7%. By 2020 COPD, is expected to rise to 3rd position as a cause of death and to 5th position as a cause of loss of disability adjusted life years (DALYS), as per the baseline projections made in global burden of disease study. Factors like, increased visceral mass, improper posture, respiratory disease, muscle weakness and aging lead to compromise in the breathing mechanics that arise from shortening of the muscles of respiration, in turn affecting their ability to produce tension. This ultimately decreases the working ability of the respiratory musculature leading to reduction in the overall quality of life. COPD affects the mechanics of lungs and distal musculature. The maneuvers that are assigned for this condition are usually towards to an improvement on endurance. Programs that are focused towards the changes in thoracic mobility and its muscles are rare. Studies suggest that exercises aimed to the increasing mobility of chest wall, improve thoracic mobility and exercise capacity, reduce breathlessness and symptoms of depression in patients with COPD. The respiratory muscles are the most important in the maintenance of respiratory mechanics, and under diseased conditions, their muscle force is altered. Reduction in normal flexibility of muscle leads to alteration in the length-tension relationship, which in turn prevents the muscle from producing maximum tension, leading to muscle weakness and shortening. Changes in length, reduce excursions of thorax, thereby worsening the features of disease. Hyperinflation of lung reduces ability to carry out activities initially to a greater stress levels and then later reducing the ability at varying levels. Remodeling of inspiratory muscles consequently leads to reduction in their excursion. The adaptive changes that take place in chest wall and the surrounding muscles affects breathing in COPD patient. The elongation of respiratory musculature may improve thoracic mobility and reduce dyspnoea in patients with COPD. Improvements in expansion of thorax brings marked changes in tension generating capacity of muscles of respiration and reduces the stimulus for control of respiration, thereby reducing breathlessness. Besides the availability of techniques is also minimal. Muscle stretching will lengthen the muscles by producing an increase in number of sarcomeres, indirectly increasing the mobility of structures that have become tight due to disease. Though there are various methods for muscle stretching, the static method is the one that is used to lengthen and relax the musculature. The method includes single or group of exercises that target the respective muscle groups. Therefore, the production of tension in the muscles is of minimal intensity, which is more comfortable for the patient. GPR was first described in 1987. This method stretches the muscles that work against gravity mainly the internal rotators and muscles of respiration. Though there are various benefits, scientific evidence is fundamental for its use as a treatment alternative, because of the less availability of studies with regards to respiratory system. It is a method that includes exercises involving isometric muscular contraction. The GPR method was developed by Philippe Emmanuel Souchard in 1987. It is based on the theory of muscular chains. Based on transmission of tension from one group of muscles to another by means of aponeuroses. Five muscular chains constitute GPR method. They are dorsal chain, brachial chain,
anterior chain of the neck, antero-lumbar chain and respiratory chain. These postures are used to correct the retractions in the different muscular chains. Physical evaluation is essential for correction of the patient’s postural misalignments during treatment. Considering the patient’s ability to sustain a posture, different postures are incorporated. Isometric contractions in the increasingly eccentric positions of the shortened muscles, forms the basis of GPR method. In view of the muscle re-education, the GPR method has evidence on its effects in producing respiratory muscle stretching which invariably have an effect on thoracic excursion and a respiratory mechanics. Pulmonary rehabilitation uses multidisciplinary means to optimize physical and social functioning of patients with chronic respiratory impairment. They provide rehabilitation in inpatient, outpatient and home based settings. They include chest clearance techniques, upper extremity exercises and instruction on breathing techniques that are included in most rehabilitation programs. Increase in thoracic expansion, trunk mobility, improvement in chest wall function relieves dyspnoea by improving the breathing capacity. According to official statement of American thoracic society, ‘pulmonary rehabilitation is a multidisciplinary program for care of patients with chronic respiratory impairment that is individually tailored to optimize physical and social performance and autonomy.’ The goals of pulmonary rehabilitation are to decrease symptoms, restore functional capabilities, to reduce handicap, thus improving quality of life. Patients with COPD exhibit respiratory muscle weakness and decreased muscle endurance. It is essential to fill the gaps regarding the establishment of either pulmonary rehabilitation or GPR are essential to success and to bring largest benefit, and to sustain those benefits for a long term, forms the basis of management of patients with COPD.

Methods: Patients who visited the Department of Pulmonology, SIMS were assessed. Patients who met the inclusion and exclusion criteria were selected for this study. A clear explanation of the study was given to the selected patients and those who agreed for participate were given with an informed consent. After obtaining consent form, all patients then completed a through physical examination by senior therapist. Following the examination, a self-report questionnaire was given to the patient to collect data about participant’s details, work details, PFT and TE. 20 patients with COPD age group of 45-50 years both the gender, FEV1: FVC ranging from 68 – 69 % with predicted FEV1 of less than 70% were selected and all the patients were divided into two groups, the patients randomly assigned into two equal groups, 10 patients in each group. Regardless of treatment group, all patients were scheduled for the first treatment session within 7 days of the baseline examination. All patients attended one week of educational sessions by a senior physiotherapist in the first 2 weeks. 10 patients in this group A underwent GPR for duration of 30 minutes. 10 patients in this group B underwent Conventional Pulmonary rehabilitation for duration of 30 minutes. All these exercises are demonstrated to the patients individually and brochures were given. G.P.R method includes a series of gentle movements that stretches and strengthens the thoracic cage musculature that have become tight or weak from under use. The protocol consists of respiratory muscle stretching in open-arm, open-hip joint angle. Prior to this the subjects were positioned in supine lying and were given diaphragmatic relaxation manoeuvre, which consisted of applying gentle sliding pressure with finger tips working bilaterally from xiphocostal angle to the ribs. They were positioned with arms at an angle of 45 degrees to the body, palms facing ceiling, legs apart, hips and knees flexed and soles of feet facing each other. They were then instructed to spread their hips from initial position, maintaining soles of feet together. Following this, they were instructed to inhale and exhale slowly and to lower the rib cage and to extend the abdomen. Then the legs were extended, with the spine in contact with couch. Conventional
Pulmonary rehabilitation includes instruction on breathing techniques, upper extremity exercise, chest clearance techniques. Following treatment, the patient was advised to continue the home programme and thanked for their co-operation. The data were noted separately and was taken for analysis.

**Results:** The data were analyzed by paired and unpaired ‘t’ test. Both the groups indicated significant difference between the pre test and post test values which shown in Table I & II. The unpaired ‘t’ test analyzed for the Post test variables for Both groups of PFT(FEV1/FVC) for measuring Lung function shown in the table III and TE(axillary) in the Table IV. There was significant difference shown between the Groups. Group A patients show superior to Group B. Based on the statistical analysis using unpaired ‘t’ test, the ‘t’ value for FEV1/FVC was 7.313, TE was 11.90 (axillary), at 5% level of significance, ‘p’ value <0.05. Therefore it showed that there is a significant difference in improvement of FEV1/FVC ratio and TE in Group -A who underwent Global postural re-education method than Group-B who underwent conventional pulmonary rehabilitation. Thus GPR method can be used in the improvement of pulmonary function, TE in patients with moderate COPD.

**Table I. PFT (FEV1/FVC) Pre test and Post test comparison of Group A and Group B**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ Value</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pre test</td>
<td>69.12</td>
<td>0.61</td>
<td>26.11</td>
<td>68.55</td>
<td>0.47</td>
<td>12.45</td>
</tr>
<tr>
<td>2.</td>
<td>Post test</td>
<td>78.05</td>
<td>0.99</td>
<td>p&lt;0.05</td>
<td>73.82</td>
<td>1.19</td>
<td>p&lt;0.05</td>
</tr>
</tbody>
</table>

**Table II. TE(Axillary) Pre test and Post test comparison of Group A and Group B**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ Value</th>
<th>Mean</th>
<th>SD</th>
<th>‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pre test</td>
<td>1.75</td>
<td>0.10</td>
<td>25.29</td>
<td>1.56</td>
<td>0.23</td>
<td>10.58</td>
</tr>
<tr>
<td>2.</td>
<td>Post test</td>
<td>2.82</td>
<td>0.132</td>
<td>p&lt;0.05</td>
<td>2.07</td>
<td>1.47</td>
<td>p&lt;0.05</td>
</tr>
</tbody>
</table>

**Table III. PFT (FEV1/FVC) Post-test comparison of both group**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Groups</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Group-A</td>
<td>73.82</td>
<td>1.37</td>
<td>7.313</td>
</tr>
<tr>
<td>2.</td>
<td>Group-B</td>
<td>78.05</td>
<td>0.993</td>
<td>p&lt;0.05</td>
</tr>
</tbody>
</table>

**Table IV. TE (Axillary) Post test comparison of both group**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Groups</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Group –A</td>
<td>2.07</td>
<td>0.14</td>
<td>11.90</td>
</tr>
<tr>
<td>2.</td>
<td>Group -B</td>
<td>2.82</td>
<td>0.13</td>
<td>p&lt;0.05</td>
</tr>
</tbody>
</table>

**Discussion:** This study was aimed to determine the effectiveness of conventional pulmonary rehabilitation and GPR method (G.P.R) on the pulmonary function and TE in patients with moderate COPD. The study’s functional parameters were FEV1/FVC ratio and TE (axillary). A total of 20 patients with moderate COPD (FEV1/FVC ratio of 68% to69% with a predicted FEV1of less than 80%), who fulfilled the selection criteria were randomly selected and divided into two groups containing 10 in each. Group - B received conventional pulmonary rehabilitation and Group-A received GPR method. Results obtained from statistical interpretation.
between Group A & B at 5% level of significance showed that there is a significant difference in the improvement of pulmonary function and TE in patients with moderate COPD, increase in lung volume in COPD results in severe shortening of respiratory muscles. When a muscle loses its normal flexibility, there is alteration in length-tension relationship, which in turn reduces the ability of muscle to produce maximum tension, thereby leading to muscle weakness. The causes for such shortening can be due to various factors like incorrect postural alignment, immobilization of muscle, muscle weakness and aging. The exercises aimed to increasing mobility of chest wall, improve thoracic mobility and exercise capacity reduce breathlessness and symptoms of depression in patients with COPD. GPR method resulted in greater improvements than the conventional exercise program in specific pulmonary function parameters like forced vital capacity, forced volume in 1 sec and peak expiratory flow parameters. This supports the study in the improvements in pulmonary function, TE in Group-A patients who underwent GPR method which includes stretching and mobilization. Therefore in patients with COPD, adequate muscle length would increase the efficiency of respiratory muscles, promoting better mechanics of muscles of thoracic wall. Maintenance of muscles in lengthened state for a long duration forms the basis of GPR method. In addition, it facilitates adaptations that promote improvements in extensibility, flexibility and strength. GPR method was effective in promoting an increase in TE, respiratory muscle strength. Based upon the recommendation suggested by Rosanna et al., the above study was done and results obtained. GPR uses active muscle stretching postures in which the stretching is made possible by the patient’s participation in isometric contractions in the increasingly eccentric positions of the shortened muscles. Improvements in expansion of thorax brings marked changes in the tension generating capacity of muscles of respiration and reduce the stimulus for control of respiration, thereby reducing breathlessness. There is an increase in length of muscles of respiration improves expansion of thorax and reduce dyspnoea in patients with Chronic obstructive pulmonary disease. From the above, this study gives a strong data support that patients with moderate COPD can improve their pulmonary function & TE using GPR method, which includes stretching and mobilization of thoracic muscles whereby there is an increase in extensibility, flexibility and strength of major thoracic musculature for easy and better pulmonary function.

**Conclusion:** There is a significant improvement in Pulmonary functions on both the groups. When compared with Group A (Experimental group), the Group A shows a marked improvement on Pulmonary functions as measured with PFT (FEV₁/FVC) and TE (Axillary). So this study concludes that the Lung Function following COPD were significantly improved through application of GPR than conventional Pulmonary Rehabilitation.

**References:**