Int. Res. Adv. 2018, 5(1),1-4 Article

Integrated
Research Advances

A literature review on physiotherapeutic interventions for airway clearance in COPD patients

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Received on: 15-July-2016, Revised on 18-05-2017, Accepted on: 12-Sept-2017, Published on: 30-Dec-2017

ABSTRACT

Chronic obstructive pulmonary disease (COPD) is internationally preferred term encompassing chronic bronchitis, asthma and emphysema. Chronic obstructive pulmonary disease (COPD) is characterized by airflow obstruction with breathing-related symptoms such as chronic cough, exertional dyspnea, expectoration, and wheeze. These symptoms may occur in conjunction with airway hyper responsiveness and may be partially reversible. Obstructive lung disease includes Chronic bronchitis, Emphysema, Asthma, Bronchiectasis and Cystic fibrosis. The result of the present narrative review concluded the effectiveness of Active cycle of breathing technique, Diaphragmatic breathing exercise along with Postural drainage in Chronic Obstructive lung disease in order to achieve the significant improvement and hasten the recovery of the patients.

Keywords: Postural Drainage, Diaphragmatic breathing exercises, Autogenic drainage technique, Lung function.

INTRODUCTION

Chronic bronchitis, which is defined in clinical terms, is the presence of a chronic productive cough for 3 months in each of 2 successive years. Airway obstruction is caused by inflammation and nonspecific bronchial hyper reactivity associated with chronic bronchitis. Chronic bronchitis is very common due to cigarette smoking and air pollution which leads to airway obstruction and causes weakness to the respiratory muscle. Emphysema, which is defined in anatomical terms, is the destruction of alveolar walls and permanent enlargement of the air spaces distal to the terminal bronchioles. The ensuing loss of lung elastic recoil and intraluminal pressure in the terminal airways causes small airways to lose their patency, especially during forced expiratory maneuvers. The collapse of these airways causes airflow limitation independent of exertion. Asthma, which is defined in physiologic terms, is reversible smooth muscle contraction that narrows the airway lumen, limiting expiratory airflow and resulting in symptoms, including wheeze, cough, and exertional dyspnea. Bronchiectasis is characterized by repeated pulmonary infections requiring antibiotics, disabling productive cough, shortness of breath and occasional hemoptysis. Impaired clearance of sputum results in a vicious cycle of colonization and infection of bronchi with pathogenic organisms, dilation of bronchi and further production of sputum.[1]

There are many techniques which have been used to improve work of breathing, lung compliance and to clear secretions. It has a great effect on health related quality of life on patients suffering from Chronic obstructive lung disease. The cardiovascular responses to physiotherapeuticintervention depend on exercise intensity i.e. percentage of maximum voluntary contraction (MVC) and muscle mass involved..[2] The physiotherapists have a generally positive regard and attitude for EBP and are interested in increasing their skills and the evidence used in their clinical practice.[3]

Narrative Review of Literature

Melam et al suggested that airway clearance is integral to the management of COPD. This study was conducted to compare the efficacy of two chest clearance techniques, autogenic drainage and active cycle breathing in COPD patients. Thirty subjects who were 40 - 60 years of age and had moderate chronic obstructive pulmonary disorder were allocated randomly into three groups, each consisting of 10 subjects.Group A received autogenic drainage, group B was given active cyclebreathing technique and group C receive medications The outcome measure used was computerized spirometer to evaluate pre& post-test values of forcedexpiratory volume (FEV1), forced vital capacity (FVC)

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Cite as: *Int. Res. Adv., 2018, 5(1), 1-4.*

and peak expiratory flow rate (PEFR). The results of this study revealed that both autogenic drainage and active cycle breathing technique are effective in clearance of secretions, which is one of the causes of airway obstruction in patients with COPD.[4]

Syed et al conducted a study to compare the efficacy of Active Cycles of Breathing Techniques (ACBT) with conventional chest physical therapy as a method of airway clearance in adults with productive bronchiectasis. Thirty-five adult patients of both genders with productive bronchiectasis were recruited. Patients underwent conventional chest physical therapy or ACBT following postural drainage as airway clearance techniques. Pulmonary function, wet weight and volume of sputum expectorated and visual analogue score (VAS) for comfort of either technique were measured. ACBT in postural drainage positions is found to be equally effective as conventional chest physical therapy in airway clearance of bronchiectasis and patients have rated ACBT to be more comfortable.[5]

Moiz et al conducted a study suggested the effect of a short term treatment of autogenic drainage (AD) and active cycle of breathing techniques (ACBT) were evaluated in patients with acute exacerbation of chronic obstructive pulmonary disease (COPD), in this study, Thirty male COPD patients with acute exacerbation were trained and randomly assigned into two groups and they performed each technique on successive days in a within subject randomized two day cross over design and after treatment and 30 minutes after treatment, sputum volume, SpO2, heart rate, PEFR, respiratory rate, VAS and patients preference. The results of this study indicates that ACBT is as effective as the AD in acutely clearing secretions and improving oxygen saturation without causing any undesirable effects on heart rate respiratory rate and breathlessness in patient with acute exacerbation of COPD. These techniques can be used in COPD exacerbations according to patients.[6]

Varekojis et al conducted a study, A Comparison of the Therapeutic Effectiveness of and Preference for Postural Drainage and Percussion, Intrapulmonary Percussive Ventilation, and High-Frequency Chest Wall Compression in Hospitalized Cystic Fibrosis Patients. In their study they compare the effectiveness of and patient preferences regarding 3 airway clearance methods: postural drainage and percussion (PD&P), intrapulmonary percussive ventilation. They concluded that IPV are at least as effective as vigorous, professionally administered PD&P for hospitalized CF patients.[7]

Mannino et al conducted a study on Chronic obstructive pulmonary disease (COPD) continues to cause a heavy health and economic burden in the United States and around the world. Some of the risk factors for COPD are well known and include smoking, occupational exposures, air pollution, airway hyper responsiveness, asthma, and certain genetic variations, although many questions remain, such as why < 20% of smokers develop substantial airway obstruction. There are several different definitions of COPD and the definitions depend on accurate diagnosis. Small differences in the definition can have large effects on the estimates of COPD in the population.[8]

Cahalin et al conducted a study, it was shown that the evidence based for diaphragmatic breathing as an adjunctive treatment modality for persons with COPD. This article reviewed the literature regarding the efficacy of diaphragmatic breathing in persons with COPD and reported on beneficial and detrimental effect of diaphragmatic breathing in patients with COPD with elevated respiratory rate, lung tidal volume that increased during diaphragmatic breathing.[9]

Lapid conducted a study suggested airways clearance techniques are used to aid in mucus clearance in variety of disease states such as COPD. Autogenic drainage and Active cycle of breathing technique are two new modalities that rely heavily on basic airway physiology to enhance clearance. He concluded that both techniques have same effect on mucus clearance in COPD.[10]

Jones et al conducted a study on comparison of oxygen cost of breathing exercise and spontaneous breathing in patients with stable COPD. 30 subjects with stable moderately severe COPD were participated. Oxygen consumption and respiratory rate during spontaneous breathing at rest were recorded for 10 minutes and then they performed three breathing exercises, diaphragmatic breathing, pursed lip breathing and combination of both in a random order with a rest period in between them. The results suggested that the determinants of breathing pattern other than metabolic demand warrant being a primary focus in patient with COPD and confirmed that diaphragmatic breathing, pursed lip breathing and combined training resulted in lower oxygen cost which can be explained by a commensurate reduction in respiratory rate.[11]

Thompson et al conducted a study, Randomized crossover study of the Flutter device and the active cycle of breathing technique in non-cystic fibrosis bronchiectasis randomized crossover study was performed in 17 stable patients with non-cystic fibrosis bronchiectasis at home, in which 4 weeks of daily active cycle of breathing technique (ACBT) were compared with 4 weeks of daily physiotherapy with the Flutter device. No significant differences between the two techniques were found. They concluded that Daily use of the Flutter device in the home is as effective as ACBT in patients with non-cystic fibrosis bronchiectasis and has a high level of patient acceptability.[12]

Savci et al conducted a study with 30 stable COPD patients treated with Active cycle of breathing technique and Autogenic drainage for 20 days and found that there was increased vital capacity, peak expiratory flow rate, arterial oxygenation and exercise performance. They concluded that autogenic drainage is as effective as Active cycle of breathing technique in clearing secretions and improving lung functions.[13]

Vitaccam et al conducted a study, This study investigated the impact of deep diaphragmatic breathing (DB) on blood gases, breathing pattern, pulmonary mechanics and dyspnea in severe hypercapnic chronic obstructive pulmonary disease (COPD) patients recovering from an acute exacerbation. He did a study on 25 COPD patients during natural breathing and diaphragmatic breathing. They concluded that in severe chronic obstructive pulmonary disease patients with chronic hypercapnia, deep diaphragmatic breathing is associated with improvement of blood gases at the expense of a greater inspiratory muscle loading.[14]

Bestall et al conducted a study suggested classifying COPD depends largely upon spirometric measurements but disability is only weakly related to measurements of lung function. In this study they examined the validity of MRC Dyspnea scale for COPD. This study was done on 100 patients, assessment included to MRC Dyspnea scale, Spirometry tests, and blood gas analysis, shuttle walking test and Borg score for percieved breathlessness before and after exercise. Health was assessed using chronic respiratory questionnaire. St.George respiratory questionnaire concluded that MRC Dyspnea scale is a simple and valid method of categorizing patients with COPD in terms of their disability that could be used in complement FEV1 in the classification of COPD severity.[15]

Miller et al conducted a study in the comparative study of autogenic drainage and the active cycle of breathing techniques with postural drainage. Eighteen patients with cystic fibrosis took part in a randomized two-day crossover trial. There were two sessions of one method of physiotherapy on each day, either autogenic drainage or ACBT. The study days were one week apart. On each day the patients were monitored for six hours. They concluded the Autogenic drainage was found to be as good as ACBT at clearing mucus in patients with cystic fibrosis and is therefore an effective method of home physiotherapy.[16]

Christensen et al conducted a study on COPD with chest PT with or without positive expiratory pressure by mask selected 43 patients and randomly allocated 20 to PEP treatment group and the remaining 20 to conventional chest physiotherapy (control) group. Patients were treated twice daily for 12 months. The PEP group had significantly less cough and less mucous production and finally they concluded that treatment with simple PEP device can reduce morbidity in patients with chronic bronchitis and may preserve lung function a more rapid decline.[17]

May et al conducted a study on Physiologic Effects of Chest Percussion and Postural Drainage in Patients with Stable Chronic Bronchitis. In their study they compare the effect of 30-minute period of chest percussion and postural drainage was compared to a Sham treatment in 35 patients with stable chronic bronchitis. Then were no differences in the subjective responses or arterial blood gas levels following therapy. Spirometric studies showed small improvement over baseline They had concluded that chest percussion and postural drainage are effective in augmenting the volume of expectorated sputum.[18]

CONCLUSION

The narrative review concluded that physiotherapeutic interventions whether it is Active cycle of breathing technique, autogenic drainage, diaphragmatic breathing exercise, postural drainage etc, all are effective and plays a vital role in clearing secretions and improving the lung function.

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