

Role of exercises and ACBT techniques incentive spirometry to Improving Breathing patterns, in COPD patients: A Review

Manoj¹, Prof. (Dr) Vinay Jagga²

Manoj, Research Scholar, College of Physiotherapy, Baba Mastnath University, Rohatk

Dean and Professor, Faculty of Physiotherapy, Baba Mastnath University, Rohtak

Email:manoj@saini@bmu.ac.in

Introduction:

ACBT consists of a cycle of breathing control, thoracic expansion exercises and the forced expiratory technique (FET). The FET, which includes one or two forced expirations or huffs followed by breathing control, is an essential part of the ACBT for the effectiveness of this specific technique in the respiratory tract secretions clearance. In addition, the diaphragmatic breathing technique is also an integral part of ACBT, as it results in the effective use and strengthening of the diaphragm and in the decrease of the work of breathing. 7 Postural drainage PD is based on a detailed anatomical topography of the bronchial tree. Such positioning allows the easiest outflow of mucus to the larger bronchus, located distally from individual segmental bronchi.

Smoking, aging, and other factors such as polypharmacy, medication interactions, lack of treatment of comorbidities, diagnosis coding accuracy, and lack of specific case definitions for comorbidities add to the complexity of studying comorbidities and outcomes in patients with COPD. β -Blockers may worsen lung function in a subset of patients with COPD, but their avoidance in many patients with COPD may contribute to increased cardiovascular events, especially in those at risk.

Aim and objective: In this study, we examine the role of ACBT technique to improve breathing patterns in COPD Patients. We want to motivate COPD Patients, to decrease the fear and minimize the symptoms of COPD.

Material and Method: Google Scholar, Pub Med, the Physiotherapy Evidence Database, and the Cochrane Database were used to search electronic databases for titles and abstracts. The review included only full-text papers, which were double-checked to determine the role of ACBT technique to improve breathing patterns in COPD Patients.

Result and Conclusion: This review also analyzed published literature from India to understand the role & effectiveness of ACBT technique to improve breathing patterns in

COPD patients. This exercise shows positive effects. The purpose of this study was that have been effective in reduce the symptoms of COPD. Expanding the availability and scope of these programs is a pressing concern for social support networks as well as global health and fitness providers.

Keywords: ACBT technique, Spirometry, Breathing exercises

Introduction

The symptoms of COPD might worsen rapidly. We refer to these as flare-ups, These typically last a few days and frequently call for further medication. Other health issues are also more likely to affect people with COPD. These consist of lung infections, such as pneumonia or the flu lung cancer; heart issues; brittle bones and weak muscles; anxiety and sadness.

Common COPD symptoms start to appear in midlife. People find it harder to perform their regular daily tasks when COPD worsens, frequently because they are out of breath. A significant financial burden could result from reduced productivity at work and at home as well as the expense of medical care.

Chronic bronchitis or emphysema are other names for COPD. The destruction of the little air sacs at the end of the lungs' airways is typically referred to as emphysema. A persistent cough that produces phlegm due to airway irritation is known as chronic bronchitis. People may have both COPD and asthma, which share symptoms include coughing, wheezing, and trouble breathing.

Causes

COPD can result from a number of factors that constrict the airways. The airway lining may be inflamed and swollen, mucus may obstruct the airways, and portions of the lung may be destroyed.

Over time, COPD develops gradually and is frequently caused by a combination of risk factors.

- indoor air pollution: in low- and middle-income nations with high levels of smoke exposure, biomass fuel (wood, animal dung, crop residue) or coal is commonly used for cooking and heating;
- occupational exposure to dusts, fumes, or chemicals;
- tobacco exposure from active smoking or passive exposure to secondhand smoke;

Alpha-1 antitrypsin deficiency is an uncommon genetic disorder that can induce COPD at a young age. Other early life events include asthma in childhood, preterm, poor growth in utero, and frequent or severe respiratory illnesses in childhood that restrict maximal lung growth.

If a person exhibits common symptoms, they should be suspected of having COPD. A breathing test called spirometry, which gauges lung function, can confirm the diagnosis. Since spirometry is frequently unavailable in low- and middle-income nations, the diagnosis may go unnoticed.

Therapy

Although there is no cure for COPD, it can be improved by quitting smoking, reducing exposure to air pollutants, and receiving vaccinations. Treatment options include medication, oxygen, and pulmonary rehabilitation. COPD can be treated in a number of ways. The primary therapies are inhaled medications that widen and lessen airway edema. The most significant medications for treating COPD are bronchodilator inhalers. To keep the airways open, they relax them.

Short-acting bronchodilators can last four to six hours and begin to function in a matter of seconds. When flare-ups occur, these are frequently used. Although they take longer to start working, long-acting bronchodilators have a longer half-life. These can be used in conjunction with inhaled steroids and are taken every day.

Other therapies could be employed as well.

- Antibiotics and steroids are frequently used to treat flare-ups.
- People with severe COPD or those who have had the disease for a long time are treated with oxygen.
- Exercises to enhance breathing and exercise capacity are taught in pulmonary rehabilitation. For some patients with severe COPD, surgery may alleviate symptoms. Signs of PFTs Assessing the severity of the illness and tracking the effectiveness of treatment for individuals who report with dyspnea Assess surgical suitability for *lung resection or thoracic surgery.

Available measures

- Diffusing Capacity/DLCO

- Gas exchange (how efficient)
- Lung volumes (static)
- Spirometry
- Airflow (how much air, how fast)
- Volume (how much air)

Additional tests, such as those for respiratory muscle strength and airway responsiveness

- Lung compliance

Chest physical therapy (CPT) is a commonly used intervention. Enhancing mucus clearance, lowering the risk of lung infection, delaying the deterioration of pulmonary function, and enhancing quality of life are the primary objectives. Conventional CPT is utilized in certain critically ill patients, such as those on mechanical ventilation, as well as in stable patients with obstructive lung disease to avoid difficulties during the perioperative phase.

Mucociliary clearance is the primary defense mechanism of the smaller airways, and cough is the primary defense mechanism for clearance of secretions from the larger airways. Cough is also an important mucus-clearance mechanism in the smaller airways when mucociliary clearance is not functioning optimally (ie, when disease puts secretion production and clearance out of balance and/or causes abnormal mucus rheology). During a cough, the peak intrapulmonary pressure is normally about 200 cm H₂O before the glottis opens. When the glottis opens, the explosive decompression into the upper airways normally generates a flow of 6–20 L/s. During huff the flow and intrapulmonary pressure are much lower than during cough.⁶ Cough and huff can be started at low, medium, or high lung volume. Postural drainage is the use of various patient positions to orient secretion-filled bronchi with the expectation that gravity can assist secretion drainage. Postural drainage is probably most effective when there is a large quantity of mucus that has low adhesiveness. Nine postural positions have been described.⁷ Determining the locations of the secretion-filled bronchi is key to determining which patient positions to use. The time required in each patient position depends on the quantity, viscoelasticity, and adhesiveness of the mucus.

Methods

This study was ethically approved by ethical committee (BMU/FPT/2024/214). Google Scholar, Pub Med, the Physiotherapy Evidence Database, and the Cochrane Database were used to search electronic databases for titles and abstracts. The review included only full-text papers, which were double-checked to determine the role of ACBT technique incentive spirometry to improve breathing patterns in COPD patients.

A randomized assessment of the acute effectiveness, acceptability, and tolerability of Flutter and active breathing cycles with and without postural drainage in non-cystic fibrosis bronchiectasis was carried out by T Eaton et al. (2007). Although there is no proof of the best technique to treat bronchiectasis, airway clearing is essential. Assessing the acute effectiveness, acceptability, and tolerability of three airway clearance procedures in non-CF bronchiectasis was the goal of this randomized prospective trial. Over the course of a week, 36 patients with stable non-CF bronchiectasis (mean age 62 years, range 33–83) were randomly assigned to receive evaluations of Flutter, Active Cycle Breathing Technique (ACBT), and ACBT with Postural Drainage (ACBT-PD). ACBT-PD's total sputum wet weight was double that of Flutter or ACBT alone. There was no discernible variation in the length of treatment. Each of the three methods was well received and tolerated. Flutter was preferred by 16 patients (44%), ACBT by 8 patients (22%), and ACBT-PD by 12 patients (33%). Preference was not predicted by patient demographics, symptoms of reflux or upper airways, prior usage, or acute efficacy. This is the first randomized systematic assessment of Flutter, ACBT, and ACBT-PD's acute efficacy, acceptability, and tolerability in non-CF bronchiectasis. While all three methods were well accepted, ACBT-PD outperformed the others in terms of immediate effectiveness. However, it was unable to predict the patient's preferred treatment modality.

A study by Faisal et al. (2012) examined the effectiveness of postural drainage and the active cycle of breathing approach in bronchiectasis patients. With a mean age group of 44 years, 30 participants who met the inclusion criteria participated in the randomized experimental investigation. The goal and procedures of the study were explained to each participant. Fifteen subjects were randomly assigned to the ACBT group, while fifteen more were assigned to the Postural Drainage group. The Pulmonary Function Test and Pulse Oxymetry were used to measure FVC, FEV1, PEFr, and SPO₂ before and after. The paired "t" test was used to evaluate the data. It was found that postural drainage and ACBT had extremely high significant effects on increasing FVC, FEV1, PEFr, and SPO₂. With a P-value of less than 0.05, ACBT

was found to be considerably more effective than postural drainage in treating individuals with bronchiectasis, even though both treatments dramatically improved pulmonary function and cleared airways.

The study by V. Kiran et al. (2014) compared the effects of postural drainage and autogenic drainage on oxygen saturation in patients with chronic bronchitis 15 minutes after treatment. Sixty COPD patients participated in this trial. Two groups of patients were created, and each group received either autogenic drainage or postural drainage treatment. The treatment's efficacy was assessed for a maximum of six days. Sputum was taken both immediately after treatment and fifteen minutes after each session, and pulse oximetry was tracked. The study found that the amount of sputum recovered with Autogenic Drainage (14.0 ± 3.5 g) and Postural Drainage (24.4 ± 3.0 g) differed significantly, as did the oxygen saturation, which decreased during Postural Drainage from $93.3 \pm 0.7\%$ to $91.2 \pm 0.8\%$ ($p < 0.01$) and took 15 minutes after treatment to reach baseline. Following full treatment days, oxygen saturation improved progressively and did not decrease during autogenic drainage (baseline, $93.3 \pm 0.8\%$; $p < 0.01$). Accordingly, this study found that autogenic drainage is more effective at increasing Spo₂ in patients with COPD, does not result in a sharp decline in Spo₂ as happens with postural drainage right after therapy, and is more tolerable for COPD patients while having less of an impact on sputum clearance. Postural Drainage is proven to be more effective in terms of the average amount of secretion clearance.

A study by Hesham A. Abdel Halim et al. (2015) compared active breathing cycles with postural drainage to traditional chest physical therapy for individuals with bronchiectasis. The trial, which was conducted on October 6 at the University Hospital, involved 30 participants—20 men and 10 women—all of whom had bronchiectasis. Following postural drainage as the airway clearance approach, the participating subjects received either ACBT or conventional chest physical therapy in random order over the course of 14 days at a frequency of twice daily. The study's findings indicate that there was a significant difference in mMRC before and after both ACBT and traditional physiotherapy. Additionally, FEV₁ and MMEF significantly improved following conventional physiotherapy, while FVC and MMEF significantly improved following ACBT. When comparing arterial blood gas data, there were notable improvements in PaCO₂, PaO₂, and PAO₂, but no discernible change in P (A-a) O₂ following any of the physiotherapy approaches. Prior to beginning physiotherapy, there was no significant difference between the two groups' mMRC dyspnea score, spirometry, arterial

blood gas data, Leicester cough questionnaire (LCQ), and sputum wet volume; however, there were significant differences between the two groups' PaO₂, P (A-a) O₂ gradient, LCQ (physical domain score and total score), and sputum wet volume before and after ACBT physiotherapy sessions. According to the study's findings, treating bronchiectasis during an infectious exacerbation with ACBT combined with postural drainage is more successful than traditional chest physical therapy.

Taniya Singh et al. (2019) looked into the efficacy of postural drainage in conjunction with the active cycle breathing technique against autogenic drainage in individuals with chronic bronchitis. The purpose of this study is to compare the effects of postural drainage and the active cycle of breathing technique to autogenic drainage. In this study, thirty subjects were randomly assigned to two groups, experimental group A and control group B, each of which had fifteen subjects. Prior to the training session, both groups underwent evaluations to rule out any pulmonary or cardiac issues. For four weeks, Group B received only autogenic drainage, whereas Group A received treatment using the Active Cycle Breathing Technique with Postural Drainage. According to this study, the active cycle breathing technique with postural drainage and autogenic drainage are both successful on their own, however there isn't a significant difference between the two groups when compared.

Discussion:

This study assessed the information currently available to support the use of incentive spirometry and the ACBT technique to help patients with COPD modify their breathing patterns. This program therapy improves lung capacity, breathing patterns, and performance. It also lowers the risk of COPD symptoms. The purpose of this review was to examine how exercise improves the function and quality of life of patients with COPD and how breathing exercises can strengthen the chest muscles. Each trial included in this review examined the potential benefits of exercise treatment in reducing the likelihood of symptoms while improving respiratory of symptoms while improving respiratory patterns, muscle strength, and performance.

Rotua Elvina Pakpahan et al. (2021) looked into how the Active Cycle Breathing Technique and chest physical therapy together affected the respiratory rate and sputum-expanding capacity in patients with chronic exacerbation obstructive lung disease. Currently the fourth most common cause of mortality worldwide, chronic obstructive pulmonary disease (COPD)

is expected to rise to the third position in 2020. The purpose of this study was to investigate how oxygen saturation and respiratory rate were affected by the combination of Active Cycle Breathing Technique (ACBT) and chest physical therapy. A quasi-experimental design with pre-test and post-test control groups was the research methodology employed. Using purposive sampling, the researcher selected 60 respondents and split them into 30 intervention groups and 30 control groups. Following treatment, there were notable variations in the respiratory rates of the control and intervention groups, with a value of $p=0.001$ ($p < 0.05$). The intervention group was seven times more productive than the control group in terms of the percentage of sputum excretion capacity.

The efficiency of autogenic drainage and the active cycle of breathing approach in patients who had undergone laprotomy was examined by Vinal Charpot et al. in their study from 2021. 43 individuals who had undergone laparotomic surgery were chosen as a convenient sample for this study based on inclusion and exclusion criteria. FVC, FEVI, PEFR measured using a P.F.T. machine, chest expansion or excursion measured with a measuring tape, and P.F. were the outcome measures for this study. Medicare Systems Pvt. Ltd., the testing machine RMS (Medspiror) Recorder, and a 150-centimeter-long measuring tape with markings in both centimeters and inches. According to the study's findings, patients in both groups experienced a notable improvement in their parameters following treatment in the surgical wards using autogenic drainage and the active cycle of breathing approach. The results of autogenic drainage and active cycle breathing strategies did not differ significantly, according to this study. Additionally, it was noted that active cycle breathing and autogenic drainage are both highly beneficial on their own.

Conclusion:

.According to current evidence, Exercise is a low-cost, non-invasive alternative treatment that has been shown to reduce the risk of COPD symptoms by improving respiratory patterns, strengthening muscles, and improving performance.

Regular exercise raises muscle strength, improves breathing patterns, improves performance, and is a safe and effective strategy to reduce the risk of COPD symptoms. Consistent practice will also have long-term good effects that will improve everyday activities and further lessen these symptoms. Regular exercise appears to be the most effective preventative training method. Another important factor is that there are no adverse physiological effects from this workout.

Acknowledgement:

All thanks and appreciation to the prof. Dr. Vinay Jagga Dean college of physiotherapy, BMU Rohtak, Haryana and my family members who contributed to the completion of this study.

REFERNCES

1. Ganeswara Rao Melam, A.R. Zakaria, Syamala Buragadda, Deepesh Sharma and Mohammed Abdulrahman Alghamdi. Comparison of Autogenic Drainage & Active Cycle Breathing Techniques on FEV1, FVC & PEFr in Chronic Obstructive Pulmonary Disease. *World Applied Sciences Journal*.2012; 20 (6): 818-822.
2. Angshu Bhowmik, Kamaljeet Chahal, Gillian Austin, Indranil Chakravorty. Improving mucociliary clearance in chronic obstructive pulmonary disease. *Respiratory Medicine* (2009) 103, 496-502.
3. Hillas G, Perlikos F, Tsiligianni I, Tzanakis N. Managing comorbidities in COPD. *International journal of chronic obstructive pulmonary disease*. 2015; 10:95.
4. Ailsa J McKaya, P A Maheshb, Julia Z Fordhama, AzeemMajeedc. Prevalence of COPD in India: a systematic review. *Prim Care Respir J*2012; 21(3): 313-321.
5. Subin Solomen. Guidelines for the physiotherapy management of chronic obstructive pulmonary disease. *The Journal of Indian Association of Physiotherapists*.2019; 13: 66-72.
6. Ada Clarice Gastaldi, Paolo Paredi, Anjana Talwar, Sally Meah, et al. Oscillating Positive Expiratory Pressure on Respiratory Resistance in Chronic Obstructive Pulmonary Disease with a Small Amount of Secretion. *Medicine journal* 94 (42): e 1845.
7. Dimitra Zisi, Costas Chryssanthopoulos, Serafim Nanas, Anastassios Philippou. The effectiveness of the active cycle of breathing technique in patients with chronic respiratory diseases: A systematic review. *Heart & Lung*. 2022; 53: 89-98.
8. Roman Nowobilski, Tomasz Włoch, Maciej Płaszewski, Andrzej Szczeklik. Efficacy of physical therapy methods in airway clearance in patients with chronic obstructive pulmonary disease. *Polskie archiwum medycyny wewnetrznej*2010; 120 (11): 468-478.
9. Ozen Kacmaz Basoglu, Alevatasever and FezaBacakoglu. The efficacy of incentive spirometry in patients with COPD. *Respirology* (2005) 10, 349–353.

10. J.A.Pryor, B.A.Webber, M.E.Hodson, J.C.Batten. Evaluation of the forced expiration technique as an adjunct to postural drainage in treatment of cystic fibrosis. *British Medical Journal*. 1979; 2: 417-418.
11. T Eaton, P Young, I Zeng and J Kolbe. A randomized evaluation of the acute efficacy, acceptability and tolerability of Flutter and active cycle of breathing with and without postural drainage in non-cystic fibrosis bronchiectasis. *Chronic Respiratory Disease* 2007; 4: 23–30.
12. Bipin Puneeth, Mohamed Faisal, C.K, Renuka Devi.M, Ajith S. Efficacy of active cycle of breathing technique and postural drainage in patients with bronchiectasis - a comparative study. *Innovative journal of medical and health science*. 2012; 2(6):129 – 132.
13. V. Kiran, Dr. Bhimasen. S, E. Mastanaiah, A. Thirupathi. Effectiveness of postural drainage versus autogenic drainage on oxygen saturation in patients with chronic bronchitis with 15 minutes post therapy. *International Journal of Physiotherapy*. 2014; 1(5):299-303.
14. Hesham A. Abdel Halim, Heba H. Aboel Naga, Karim A. Fathy. Comparison between active cycles of breathing with postural drainage versus conventional chest physiotherapy in subjects with bronchiectasis. *Egyptian Journal of Chest Diseases and Tuberculosis*. 2016; 65: 157–165.
15. Taniya Singh, Niraj Kumar, Nishu Sharma, Anirban Patra. Effectiveness of Active Cycle of Breathing Technique along with Postural Drainage versus Autogenic Drainage in Patients with Chronic Bronchitis. *Physiotherapy and Occupational Therapy Journal*. 2019; 12(1):47-58.