

REVIEW ARTICLE

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EFFECT OF ACTIVE CYCLE OF BREATHING TECHNIQUE IN PATIENTS WITH PULMONARY CONDITIONS- LITERATURE REVIEW**¹Yashashree Thorat , ²Dr Arijit Kumar Das, ³Dr Abhijit D. Diwate**

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ABSTRACT:

Background: Active cycle of breathing technique is an airway clearance method that uses a cycle of techniques to loosen airway secretions, which includes breathing control, thoracic expansion exercises and forced expiration technique. The ACBT focus on normalizing the respiratory pattern, promoting airway clearance and reducing work of breathing. Along with this, it also helps in improving the Quality of life, reducing breathlessness and in turn improves the functional capacity of the individual. Therefore the main aim of this study was to find out the effect of ACBT in patients suffering from pulmonary conditions. **Materials and Methods:** Literature review were looked for at PEDRO, where ACBT was used as an intervention technique for the experimental group. Out of the total articles searched in PEDRO which showed ACBT as an intervention along with other techniques not under the control group, the statistical analysis was done which showed ACBT to be an effective intervention in various pulmonary conditions like Asthma, COPD, Bronchiectasis — thereby allowing us to comment on whether ACBT is effective or not as a treatment protocol. **Results:** Out of 9 articles searched in PeDro where ACBT was used as a treatment protocol in one group; it showed that eight articles proved the ACBT treatment to be effective and 1 article showed that ACBT is not that effective as a treatment protocol **Conclusion:** Thus this systematic review concludes that ACBT is an effective treatment protocol as eight reviewed articles out of 9 prove its effectiveness along with mentioning that it also helps in improving Quality of life and functional capacity by reducing the level of breathlessness.

Keywords: Active Cycle of Breathing Technique, Sputum production, Forced Expiratory Technique, Functional capacity, Quality of life.

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INTRODUCTION

Airway clearance therapies aim at improving the mucus clearance, by increasing the sputum production, which in turn improves the airway function. Active cycle of breathing technique is one such airway clearance method that uses a cycle of techniques to loosen airway secretions, which include breathing control, thoracic expansion exercises and forced expiratory technique.¹ Pulmonary conditions lead to the sub-optimal mucociliary escalator, which leads to a reduction of lung volume and capacities due to mucus retention and plugging in the lungs, causing increased work of breathing. The ACBT focus on normalizing the respiratory pattern, promoting airway clearance and reducing the work of breathing caused due to mucociliary dysfunction.² Abnormal secretion production can potentially lead to airway obstruction and sputum retention, thereby predisposing the airways to infection and inflammation. Treatment methods that aim to clear secretions may decrease the frequency of infections, therefore preventing further airway damage and deterioration of lung function, thereby potentially reducing the rate of progression of lung disease. The FET consists of one or two forced expirations or huffs, followed by breathing control (relaxed breathing). The FET is an integral part of the ACBT, in conjunction with thoracic expansion exercises and interspersed periods of breathing control. A typical ACBT cycle therefore consists of breathing control, thoracic expansion exercises, breathing control, and the forced expiratory technique (huffing). The number and frequency of each of the components of the ACBT can be altered, but all components of the cycle must be present and interspersed with breathing control.

A number of mechanisms have been proposed by means of which ACBT achieves enhanced secretion clearance. The forced expiratory manoeuvres (low- and high-volume huffing) are thought to promote secretion movement through changes in thoracic pressures and airway dynamics. Breathing control is reported to prevent bronchospasm and oxygen desaturation while the thoracic expansion exercises assist in the loosening and clearance of secretions via the improvement of collateral ventilation. It is possible that the physiological effects of ACBT may differ slightly across different patient populations, depending on the de-

gree of sputum production, stage of the disease, and whether the patient is medically stable, or in an exacerbated state.³

The aim of the study was to see the effect of ACBT by evaluating health-related Quality of life and functional capacity of adult asthmatic patients. There are several methods to measure functional capacity in these patients, and the six-minute walk test is commonly used among them. Six-minute walk test has three main outcomes walking distance, O₂ saturation, and perceived exertion, assessed by Borg scale to measure the functional capacity of disease. The basic interventions to assess functional lung capacity and treat patients with asthma were an active cycle of breathing (ACBT) along with six-minute walk test and airway questionnaire (AQ). Reported data suggest that active cycle of breathing technique is basically used to clear airways and mobilize excess bronchial secretions from the lungs. The treatment included a session of about twenty-five minutes that consisted of chest expansion exercises, breathing control techniques and forced expiratory technique. Each patient received multiple sessions (3 times/week for one month) of the active cycle of breathing technique. To determine the effect of the intervention (ACBT); functional capacity of lungs and health-related Quality of life were measured.⁴ The questionnaire consisted of a total of 20 items with a scoring range from 0-20 where high scores indicated poor Quality of life. The patient filled the questionnaire on the day during their first session, and on the last day of their last session after four weeks.⁴

So in this study, the main aim was to find the effect of ACBT in patients with pulmonary conditions.

There is a rising number of population suffering from pulmonary dysfunction either due to bed immobility, age, allergens or sedentary lifestyle. All these conditions lead to increased mucus production and increased work of breathing.

In physiotherapy with new advances, we have come across various ways of airway clearance

Therefore this study was conducted to find out whether or not ACBT is effective according to the previous studies done in PEDRO which use ACBT an experimental group. This study will help us find the effectiveness of the intervention for easy application in future.

MATERIALS AND METHODOLOGY

The study was conducted in DVVPF'S College of Physiotherapy; Ahmednagar. It was a systematic review using purposive sampling. In total, nine articles were reviewed. The inclusion criteria for the study was studies which used ACBT as a treatment component. The study which includes experimental study. Studies included in PeDro with ACBT as an experimental group.

The studies which were excluded were those not included in PeDro , which did not use ACBT as a treatment component and studies which did not use an experimental study design. The outcome measures used were Six-minute walk test, rate of perceived exertion and airway questionnaire. The systematic review was carried out and articles were reviewed in PeDRO where ACBT was used as an interventional technique in the experimental group.

Out of the total articles searched in PeDro which showed ACBT as an intervention along with other techniques not under control group.

The statistical analysis was done, which showed ACBT to be effective in various pulmonary conditions like asthma, COPD, Bronchiectasis etc.

The aim of the study was to study the effect of the active cycle of breathing technique in patients with a pulmonary condition. The objective of the study was to determine the effect of the intervention. The research question was is the active cycle of breathing technique an effective way of reducing symptoms associated with pulmonary conditions.

RESULT

Studies with 17 different outcome measures and 9 different interventions were found. These studies showed an improvement in the arterial blood gas analysis values, wet sputum volume, functional capacity and Quality of life values. Out of the nine articles searched eight articles stated that ACBT is an effective method in treating patients with pulmonary conditions in comparison to other intervention technique. [Fig. 1]

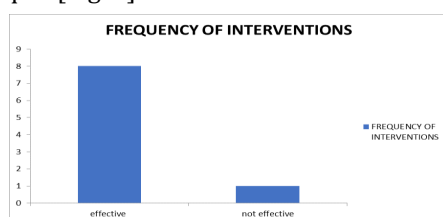


Fig 1: Effective and Non effective interventions

DISCUSSION

This study shows that ACBT is effective in treating patients with pulmonary conditions. Patients who were treated with ACBT showed improvement in arterial blood gas analysis values and changes were noted in FEV1/FVC and FVC values. Patients treated with ACBT showed improvement in Quality of life and endurance as well.

In this systematic review, nine articles were referred from Pedro in which eight articles showed significant improvement, whereas one article showed no significant effect in comparison to other treatment protocols.

The first article which was reviewed was that of Hesham A. AbdelHalim , Heba H. AboElNaga , Karim A. Fathy which concluded that significant difference in MRC before and after both ACBT and conventional physiotherapy showed a significant improvement in values of FVC after ACBT while there was a significant improvement of FEV1 after conventional physiotherapy where arterial blood gas values showed significant improvements in PaCO₂, PaO₂ and PAO₂ values while there was no significant difference P (A-a)O₂ after both types of physiotherapy techniques. Comparison between the two groups regarding before starting physiotherapy showed no significant difference while there were significant differences in advances to post ACBT physiotherapy sessions. This study demonstrated significant differences in FVC and MMEF of the subject group who had undergone ACBT-PD where this technique clears and mobilizes excess secretions from small airways at the periphery thus an alteration of thoracic expansion with breathing control followed by forced expiration.^[1] There was also a significant improvement in wet sputum volume with increased sputum wet volume and clear airways as it improved the alveolar ventilation and ventilation-perfusion matching thus improving tissue oxygenation by decreasing the perception of dyspnoea leading to an improvement in Quality of life. Thus it is concluded that ACBT shows significant improvement. In the 2nd , J.A. Pryor , E. Tannenbaum , S.F. Scott , J. Burgess , D. Cramer , K. Gyi , M.E. Hodson from their study concluded that there was no significant difference among the regimens in the primary outcome measure of FEV1, no significant differences in the modified shuttle walk test also no significant differences in the physical domains of SF-36 were obtained.

Dyspnoea, fatigue, emotion and mastery of chronic respiratory questionnaire also subjected no significant changes, thereby concluded that ACBT shows no significant improvement and is not an effective treatment method.²

In the 3rd article by Sundus S, Memoona S, Muhammad IN, Rashid HN showed a significant improvement in post-treatment health-related quality of life. The result also showed improvement in the distances walked by the patients. The analysis of their results depicted that there is a significant improvement in the score of airway questionnaire and six-minute walk test. Many studies agreed with the results of this study and reported improvement in six-minute walk and functional capacity. Another comparative study done on patients with cystic fibrosis found active cycle of breathing technique to be as effective as postural drainage.

The efficacy of ACBT has been reported in comparative studies. Another study compared the efficacy of conventional treatment with the active cycle of breathing technique in patients with bronchiectasis with variable ethology.

Besides the active cycle of breathing technique, many other physiotherapy interventions are reported and used for pulmonary rehabilitation. To expectorate excess pulmonary secretions, and improve the pulmonary functional capacity, devices and coughing techniques are majorly used. A device called Accapella is also an effective method to expectorate sputum and to provide airway clearance and was found to be as efficient as ACBT in patients with bronchiectasis and COPD. There are other studies that compared active cycle of breathing technique with autogenic drainage, but there are very few evidences which prefer ACBT over any other airway clearance technique. Similarly, the results of this study also have found out strong evidence from another study that included a comparison of active cycle of breathing technique and diaphragmatic breathing in patients with chronic obstructive pulmonary disease (COPD). This study also showed that there was an equal level of improvement in FEV1, FVC and modified Borg scale values. But FEV1/FVC levels have shown more improvement in a group of patients receiving active cycle of breathing technique than those who were performing the diaphragmatic technique with postural technique. A systematic review

found the evidence for the effectiveness of the active cycle of breathing technique in patients with chronic obstructive pulmonary disease and cystic fibrosis. Most comparators were conventional chest physiotherapy, positive expiratory pressure, and control.³ Sputum net weight and forced expiratory volume were assessed. The results showed increased sputum production during and up to one-hour post-ACBT in comparison with conventional therapy. Thus according to the study reviewed it shows significant improvement.

In the 4th by Richa, Rajeev Aggarwal, Md.Abu Shaphe, Chacko George Anurag Vats stated that there is no significant difference in improvement of PEF, SPO2 and RR in both the groups using ACBT and flutter as a treatment protocol. The results of the study showed that treatment with ACBT and flutter techniques during acute exacerbation of COPD has a significant effect on PEF, RR and SpO2 whereas there was no such effect of routine breathing exercise on these variables. This change in PEF and SpO2 might be due to gentle, relaxed breathing at tidal volume, which minimizes any potential increase in airflow obstruction and has improved oxygen saturation during breathing control while performing ACBT. Improvement in SpO2 after ACBT is thought to be due to thoracic expansion exercises used in the ACBT which provides communication among the alveoli, improve ventilation, and allow air to flow behind the bronchial secretions. Improved lung function by ensuring collateral ventilation in segments of lung not previously involved in ventilation.^[4] The increase in PEF could be the result of a larger airflow without an airway collapse. So according to the study reviewed it shows significant improvement with the use of ACBT as a treatment protocol.

In my 5th article which I have reviewed conducted by Monisha R and TS Muthukumar it concluded that it showed a significant reduction in pain (VAS Score) the chest expansion improved significantly. The 6MWT showed a reduction in the rate of perceived exertion using Borg scale.^[5] Thus, according to the study reviewed it is concluded that ACBT can be an effective treatment protocol and helps in reducing dyspnoea, improves Quality of life and functional capacity along with improved chest expansion.

In the 6th by Ganeswara Rao Melam, A.R. Zakaria, Syamala Buragadda, Deepesh Sharma and Mohammed Abdulrahman Alghamdiit stated that there was no significant difference in baseline measurements of FEV1, FVC and PEFr between the groups. The groups receiving AD and ACBT showed significant improvement as compared to those receiving medications. The study showed that there is an improvement in ventilation-perfusion matching because of the collateral ventilation, which allowed the air to get behind the secretions, thus relieving the patients of dyspnea and improving the Quality of life also.⁶ Thus, according to this study reviewed it can be concluded that ACBT is an effective treatment method.

The 7th article by Bipin Puneeth, Mohamed Faisal, C.K, Renuka Devi.M, Ajith S it concluded that ACBT showed high efficacy in improvement compared to postural drainage. This study also mentioned that oxygen saturation, which is lowered due to chest percussion, could be avoided with ACBT. There is an improvement in lung functions after conventional PT and ACBT. ACBT showed significant changes.⁷ Thus, it can be concluded as ACBT is an effective treatment protocol compared to other technique used.

In the 8th article by Bilge Üzmezöglü, Gündeniz Altıay, Levent Özdemir, Hakan Tuna, Necdet Süt concluded that both the methods were associated with a reduced number of patients complaining of cough and fatigue and increased sputum production significant reductions were determined by the Medical Research Council and Borg Dyspnoea scores there was an improvement in the physical subscale of the Short Form (SF)-36.⁸ During the physiotherapy period, changes in pulmonary functions were observed. Thus it can be concluded that the group using ACBT as an intervention technique shows a significant change in Quality of life, functional capacity and rate of perceived exertion.

The 9th article by Kanika Jain Krupali Mistry concluded that Group 1 showed significant improvement in RR BHT and PaCO₂ group 2 showed significant improvement in SPO₂ and PaO₂. This study stated that a decrease in SPO₂ could be avoided with the use of incentive spirometry and manual chest PT with incentive spirometry shows much significant result as compared to ACBT with incentive spirometry. ACBT shows a more significant difference in RR and

PaCO₂ because of thoracic expansion exercises which include breath-holding thus allowing the air to reach the obstructed areas of lung thus helping in removal of secretions and the forced expiration allows the secretions to reach the central airway thus stimulating the cough reflex and helping in expectoration of the sputum.⁹

It also shows improved functional capacity and relieves from dyspnoea. Thus according to the study reviewed, it can be concluded that ACBT is an effective treatment method for patients with pulmonary conditions.

These all articles where ACBT component of 1 group was compared to other treatment method showed improvement in functional capacity in terms of six-minute walk test, reduced breathlessness & in terms of Rate of Perceived Exertion using Borg scale leading to an improved quality of life in terms of Airway Questionnaires. And thus it clearly signifies that ACBT is the most effective treatment of choice for reducing breathlessness & improving functional capacity and Quality of life.

CONCLUSION

In this study out of 9 articles eight articles where ACBT was used as a component of 1 group in comparison to other intervention technique shows improvement in functional capacity, Quality of life and reduced breathlessness thereby clearly signifying that ACBT can be used as an effective treatment intervention for pulmonary conditions.

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