Physical therapy

Active cycle of breathing technique in cystic fibrosis

Code: 054 **Updated:** June 21, 2020

Background

Several techniques for airway clearance are an important component of treatment in CF.

Chest physiotherapy is beneficial for mucus transport in people with CF. However, there is no agreement upon a definitive method of treatment, thus both conventional and alternative treatments are widely used. Generally the choice of therapy is based on most familiarity to some methods, neglecting others. Either one or several airway clearance regimens are quite different in each country: conventional chest physiotherapy is more promoted in the USA, while ACBT is the most commonly used in the United Kingdom; positive expiratory pressure (PEP), flutter and AD are mainly used in the rest of Europe, and exercise is the favorite treatment in the Scandinavian countries.

People with CF and caregivers encounter every day mainly on the question of which technique is as efficacious as the other, what time length it requires, whether it can be performed independently.

Airway clearance therapies in people with CF aim to improve mucus clearance, to increase sputum production, and ultimately to improve airway function. The active cycle of breathing technique (ACBT) is a safe administered method for airway clearance that uses a cycle of techniques to loosen airway secretions including breathing control, thoracic expansion exercises, and forced expiration technique (FET).

In particular:

- in breathing control, the individual performs tidal breathing (gentle relaxed breathing) using the lower chest, related to rate and depth of the individuals that are encouraged to relax their shoulders and upper chest. Breathing control is the resting period between the active parts of ACBT;
- FET consists of deep breathing with inspiration and passive relaxed expiration. The FET combines huffing and breathing control, where one or two forced expirations (huffs) are interspersed with periods of breathing control. Huffing is a type of cough which includes inhaling and active exhaling. Huffing helps to mobilize and clear peripherally situated secretions.

Issues

To compare the clinical effectiveness of ACBT with other airway clearance therapies in people with CF.

What is known

A CDSR (McIlwaine M, 2019) evaluated the PEP technique for aiways clearance in CF patients. A total of 28 studies (involving 788 children and adults) were included in the review; 18 studies involving 296 participants were cross?over in design. The evidence provided by this review is of variable quality, but suggests that all techniques and devices described may have a place in the clinical treatment of people with CF. Following meta?analyses of the effects of PEP versus other airway clearance techniques on lung function and patient preference, this Cochrane Review demonstrated that there was a high?quality evidence that showed a significant reduction in pulmonary exacerbations when PEP using a mask was compared with HFCWO. Airway clearance techniques should be individualised throughout life according to developmental stages, patient preferences, pulmonary symptoms and lung function. This also applies as conditions vary between baseline function and pulmonary exacerbations.

A CDSR protocol (Patterson KD, 2019) that will compare exercise versus different airway clearance techniques in children and adults with cystic fibrosis is under review. Outcomes as lung function tests, exercise capacity and QoL will be evaluated.

1 CDSR (Wilson LM, 2018) including six Cochrane Reviews that compared airway clearance techniques either as a single technique or as a combination of techniques with no intervention, with coughing, or with another airway clearance technique was performed. The quality of the body of evidence comparing different airway clearance techniques on other outcomes was either low or very low. The authors concluded that patients with CF should choose the airway clearance technique that best meets their needs, after considering comfort, convenience, flexibility, practicality, cost, or some other factor. More long?term, high?quality RCTs comparing airway clearance techniques among people with CF are needed.

1 CDSR (Freitas DA, 2018) comparing standard postural drainage (greater (30° to 45° head down tilt) and lesser (15° to 20° head down tilt) vs modified postural drainage (without head down tilt) in infants and young children with CF included review of two studies, involving 40 participants. The included studies were different in terms of the age of participants, the angle of tilt, the reported outcomes, the number of sessions and the study duration. Among selected outcomes one study reported that postural drainage with a 20° head-down position did not appear to exacerbate gastroesophageal reflux. However, in this study the majority of the reflux episodes reached the upper oesophagus. The second study reported that modified postural drainage (30° head-up tilt) was associated with fewer number of

gastroesophageal reflux episodes and fewer respiratory complications than standard postural drainage (30° head-down tilt).

1 CDSR (Mckoy Naomi A. 2016) on active cycle of breathing technique (ACBT), identified sixty-two studies, of which 19 (440 participants) met the inclusion criteria. Five were randomised controlled studies including 192 participants (two with a follow-up of one to three years), while three were completed cross-over studies. The study size ranged from seven to 65 participants. The age of the participants ranged from six to 63 years (mean age 22.33 years). Studies compared ACBT to autogenic drainage, airway oscillating devices, high frequency chest compression devices, conventional chest physiotherapy and physical exercise.

Patient preference, lung function, sputum weight, oxygen saturation, and number of pulmonary exacerbations were evaluated as primary and secondary outcomes during the studies. Patient preference varied as more patients preferred autogenic drainage (AD) over ACBT, more preferred ACBT over airway oscillating devices, and more were comfortable with ACBT versus high frequency chest compression. No significant difference was seen in sputum weight between ACBT and autogenic drainage or between ACBT and airway oscillating devices. Again no significant difference in lung function and number of pulmonary exacerbations was seen between ACBT and ACBT plus conventional chest physiotherapy. All other outcomes were either not measured or had insufficient data for analysis, as quality of life and mortality rate. Five studies, including 106 participants, compared ACBT to other therapies as non-invasive ventilation (NIV), pressure support ventilation (PSV), test of incremental respiratory endurance (TIRE), coughing, resistive inspiratory maneuvers (RIM), with no conclusive data.

One RCT (Dwyer TJ. 2019) investigated the effects of treadmill exercise vs resting breathing and PEP therapy on mucus clearance in 14 adults with mild to severe CF lung disease. Mucus clearance was measured using the radioaerosol technique and gamma camera imaging. Treadmill exercise alone was less effective than PEP therapy (mean difference -7%, 95% CI -6- -8). There were no significant differences in mucus clearance from the intermediate and peripheral lung regions, but significantly less clearance from the central lung region.

A non randomized clinical trial (NCT03534986) evaluate the effect of High Frequency Chest Wall Oscillation Vests on spirometry measurements in 32 adults with CF and bronchiectasis. Results are not available.

Unresolved questions

There is insufficient evidence to support or reject the use of ACBT over any other airway clearance therapy. In order to suit the needs of patients, families and caregivers, ACTs need to be individually and continuously adapted.

Keywords

Airway clearance technique; Chest physiotherapy - Devices; Drainage;