Clinical Summaries Supporting PEP and Oscillatory PEP Devices for Airway Clearance

STUDIES USING THE AEROBIKA* OSCILLATING POSITIVE EXPIRATORY PRESSURE THERAPY SYSTEM

COMBINING OSCILLATING POSITIVE EXPIRATORY PRESSURE THERAPY WITH INHALATION OF BRONCHODILATOR VIA A BREATH-ACTUATED NEBULIZER: INITIAL EVALUATION OF IN VITRO DATA TO DETERMINE NEBULIZER PERFORMANCE


Conclusions: “The delivery of medication as fine particles from the AeroEclipse* II BAN [Breath Actuated Nebulizer] is comparable by combining the BAN with the Aerobika* OPEP [Oscillating Positive Expiratory Pressure] device, offering the patient the opportunity for combined aerosol/OPEP therapy. Substitution by OPEP devices that do not allow incoming aerosol to be transported directly to the patient, are likely to result in substantial loss of aerosol from this nebulizer that may be clinically significant.”

HYPERPOLARIZED 3HE MAGNETIC RESONANCE IMAGING FOLLOWING OSCILLATORY POSITIVE EXPIRATORY PRESSURE TREATMENT IN GOLD STAGE II & III COPD


Conclusions: “In this pilot, proof-of-concept study, self-administered oPEP therapy over 4 weeks variably affected lung volumes, VDP and symptoms in two cases with stable advanced COPD. One COPD ex-smoker case exhibited clear improvements in Spirometry and plethysmography measurements, mucus clearance and SGRQ, whereas the other case showed no or little change during the treatment period. Future work will involve careful patient phenotyping using MRI and CT to help stratify subjects to oPEP therapy and to better understand therapy responses. Results in all subjects are currently being evaluated to determine the effect of 4 weeks oPEP in 14 COPD ex-smokers who completed therapy. For two COPD ex-smokers, one a self-reported non-responder and the other a self-reported responder to oPEP, there were changes in PFTs, 3HE MRI, SGRQ and ease in bringing up sputum that were in agreement with self-reported response.”
GENERAL IN VITRO AND IN VIVO STUDIES OF PEP AND OPEP

LONG-TERM MULTICENTRE RANDOMISED CONTROLLED STUDY OF HIGH FREQUENCY CHEST WALL OSCILLATION VERSUS POSITIVE EXPIRATORY PRESSURE MASK IN CYSTIC FIBROSIS
Conclusions: “The results of this study favour PEP and do not support the use of HFCWO as the primary form of AC in patients with CF.”
- “Treatment time was significantly shorter in the PEP group.”
- “There were significantly more adverse events related to the lower airways in the HFCWO group than in the PEP group (mean 2.46 vs 1.72, p=0.023). These included increased cough, chest infection, haemoptysis, decreased lung function and chest pain”.
- “The number of hospitalisations for PE in this study was three times more in the HFCWO group than in the PEP group (19 vs 6). The cost of hospitalisation is significant for our health economy and also causes a significant burden for the family of people with CF. Thus, at a time when we are looking to reduce health costs, unless there is strong evidence to support the use of more expensive equipment we cannot justify the cost.”
- “The relatively lower PE rates and their later onset in patients performing PEP therapy compared with HFCWO supports the use of PEP as the primary ACT in patients with CF aged > 6 years.”

ADHERENCE TO AIRWAY CLEARANCE THERAPIES BY ADULT CYSTIC FIBROSIS PATIENTS
Conclusions: “Treatment recommendations and self-reported subject adherence were in best agreement when positive expiratory pressure and flutter devices were used. Healthcare professionals should consider these outcomes as potentially applicable to their own clinical practices.”

INFLUENCE THAT OSCILLATING POSITIVE EXPIRATORY PRESSURE USING PREDETERMINED EXPIRATORY PRESSURES HAS ON THE VISCOSITY AND TRANSPORTABILITY OF SPUTUM IN PATIENTS WITH BRONCHIECTASIS
Conclusions: “The fact that sputum viscosity decreased whether OPEP was performed at P15 or P25 suggests that there is no need to generate high expiratory pressure to achieve the desired result.”
- “...mechanisms that promote the displacement and removal of secretions are essential to maintain the respiratory tract defenses against infections and the proliferation of bacteria.”
- “...the decreased sputum viscosity after the sessions at P15 and P25 suggests a better rheological profile and greater sputum thinning after the use of the [OPEP] device.”

AIRWAY CLEARANCE DEVICES IN CYSTIC FIBROSIS
Marks Jh. Paediatric Respiratory Reviews 2007;8:17-23.
- “Airway clearance devices as alternatives to CCPT [Conventional Chest Physiotherapy] allow CF patients to choose the therapy that best fits their lifestyle and allows greatest independence
- “Airway clearance devices are preferred by many patients compared to CCPT and may result in better adherence.”
- “PEP may be more effective for airway clearance than CCPT.”
- “Oscillating positive expiratory pressure devices and HFCWO [High Frequency Chest Wall Oscillation] appear to be at least as effective as CCPT.”
POSITIVE EXPIRATORY PRESSURE AND OSCILLATORY POSITIVE EXPIRATORY PRESSURE THERAPIES

Myers TR. Respiratory Care 2007;52(10):1308-1327.

- “In addition to enhanced secretion mobilization and elimination, the secondary objective of these airway-clearance devices is to prevent recurring infection, atelectasis, and disease progression, or to improve pulmonary mechanics and facilitate gas exchange.”
- “Oscillations reportedly decrease the viscoelastic properties of mucus, which makes it easier to mobilize mucus up the airways, and create short bursts of increased expiratory airflow that assist in mobilizing secretions up the airways.”

PHYSIOTHERAPY AND AIRWAY CLEARANCE TECHNIQUES AND DEVICES

McIlwaine M. Paediatric Respiratory Reviews 2006;7S:S220-S222.

- “Oscillation has been shown to decrease the viscoelastic properties of mucus hence making it easier to mobilize up the airways. The second effect of the oscillations is to cause short bursts of increased acceleration of the expiratory airflow which assist in mobilizing the secretions up the airways.”

THE FLUTTER DEVICE VERSUS THE PEP MASK IN THE TREATMENT OF ADULTS WITH CYSTIC FIBROSIS


Conclusions: “When comparing the Flutter device and the PEP Mask in the treatment of adults with CF over a 13-month period, there were no significant differences in pulmonary function or health-related quality of life. A much larger sample would be needed to conclude with confidence that there were no between-group differences. Therefore, additional research is needed to further examine the effectiveness of the Flutter device and the PEP Mask.”

EVIDENCE FOR PHYSICAL THERAPIES (AIRWAY CLEARANCE AND PHYSICAL TRAINING) IN CYSTIC FIBROSIS: AN OVERVIEW OF FIVE COCHRANE SYSTEMATIC REVIEWS


- “Patients tended to prefer techniques that promoted independence to CCPT”
- “Single, short and longer term trials show that PEP is at least as effective as other forms of airway clearance”
- “Evidence from the Cochrane systematic reviews support current expert opinion that no one airway clearance regimen is better than another.”
- “Data are consistent that treatment factors (the duration and the complexity of the treatment) or trait factors (worry and confidence in medical practitioners) are important determinants of adherence.”
- “As current evidence suggests that physical therapy interventions are equally beneficial, treatment duration, patient preference and patient adherence may be important primary outcomes.”

EFFECT OF HIGH-FREQUENCY ORAL AIRWAY AND CHEST WALL OSCILLATION AND CONVENTIONAL CHEST PHYSICAL THERAPY ON EXPECTORATION IN PATIENTS WITH STABLE CYSTIC FIBROSIS


- “It is conceivable that compliance can be improved by the availability of simple, effective, and easy-to-use devices that allow independent treatment at home. Devices to apply oral airway and chest wall oscillation fit these criteria. Considering their effectiveness and their potential to reduce health-care costs by permitting self-administration, they appear to represent a useful alternative to conventional CPT.”
GUIDELINES FOR THE PHYSIOTHERAPY MANAGEMENT OF THE ADULT, MEDICAL, SPONTANEOUSLY BREATHING PATIENT

British Thoracic Society Physiotherapy Guideline Development Group

- “Consider the active cycle of breathing techniques (which includes the forced expiration technique), autogenic drainage and plain or oscillating positive expiratory pressure for patients with stable COPD who need an airway clearance technique to assist in the removal of secretions.”
- “Consider oscillating positive expiratory pressure devices when recommending an airway clearance technique for adults with cystic fibrosis.”
- “Consider oscillating positive expiratory pressure when recommending an airway clearance technique for adults with noncystic fibrosis related bronchiectasis.”
- “PEP and oscillating PEP devices have been shown to be equally effective as traditional chest physiotherapy in sputum clearance, and are recognised as useful techniques in the NICE guidelines on COPD. There may be a patient preference for PEP devices, with or without an oscillatory function, over traditional methods of postural drainage and manual techniques, due to the convenience they offer to the patient. No difference in benefit has been shown between devices in aiding sputum clearance.”

BRITISH THORACIC SOCIETY GUIDELINE FOR NON-CF BRONCHIECTASIS – A QUICK REFERENCE GUIDE

Pastor MC, Bilton D, Hill AT. British Thoracic Society Reports 2010;2(2)

- “The active cycle of breathing techniques (plus postural drainage) and oscillating positive expiratory devices (plus postural drainage and the forced expiration technique) should be considered when offering individuals with non-CF bronchiectasis effective airway clearance techniques.”

CYSTIC FIBROSIS PULMONARY GUIDELINES: AIRWAY CLEARANCE THERAPIES

American Association of Respiratory Care (AARC)

- “There are no ACTs [Airway Clearance Therapies] demonstrated to be superior to others, so the prescription of ACTs should be individualized.”
- “There are advantages and disadvantages of each of the therapeutic options...and decisions regarding prescription of airway clearance may include age of the patient, patient preference, severity of disease, availability of a partner, and observed efficacy based on patient reporting (subjective measures) and objective measures (eg, lung function).”