Can physiological parameters determine the optimal method of airway clearance for the individual patient with cystic fibrosis?

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Introduction: CF patients frequently express preferences for one airway clearance technique (ACT) over another and may be able to clear more secretions with that technique. Expiratory airflow is utilized by modern ACT’s to mobilize secretions, yet only one study has examined the effect of various ACTs on Peak expiratory flow rates (PEFR).

Aim: The purpose of this study was to determine whether there exists different individual responses to ACTs as measured by PEFR which are dependent on the individual’s underlying lung pathology.

Method: Maximum expiratory flow volume maneuvers were obtained from CF patients and categorized according to type and severity of lung disease. In addition to measuring FVC, FEV1, and FEF25–75, PEFR, PIFR, FIV1 were examined to determine the degree of airway compression and flow rates. Patients then repeated their flow volume loops while performing a component of an ACT. The ACT components used were a forceful huff, a gentle huff, and autogenic drainage breathing.

Results: Results varied greatly among patients. In patients whose PFTs suggested compressible large airways PEFR was greatest with AD > gentle huff > forceful huff. Only AD had a PEFR/PFR greater than 1.1 which is needed for secretion clearance by annular flow. AD produced the greatest amount of sputum in these patients. In patients with mild lung disease, PEFR was greatest with a forceful huff > gentle huff > AD.

Conclusions: No one ACT produced consistently greater PEFRs, instead they were dependent on the underlying lung pathology. In prescribing an ACT, it may be useful to use pulmonary function flow volume maneuvers to assist in determining the most effective technique for the individual patient.

High frequency chest wall oscillation: an adjunct to other airway clearance techniques in CF adults?

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Aim: To audit the use of high frequency chest wall oscillation (HFCWO) in addition to usual airway clearance techniques (ACT), heighten awareness, promote discussion and enhance its consideration as a Rx adjunct.

Method: Audit was undertaken of 11 Rx episodes in 10 CF adults (7M:3F, age 19–46yrs). Data collected included demographics, lung disease severity, ACT utilised, O2 saturation (SPO2), heart rate (HR) and adverse events. Outcomes included FEV1% predicted, sputum wet weight and patient satisfaction. HFCWO was utilised in addition to the usual ACT of ACBT (5/10) and AD with/without Acapella/Flutter/PEP/IPPB (5/10).

Results: 9/11 Rx episodes (range 7–36 days, mean 19 days) of HFCWO and usual ACT were completed. 2 adults discontinued HFCWO due to nausea/didn’t like it. No adverse effect or change in SpO2 (range 91–99%, mean 95%) or HR (range 66–123bpm, mean 85 bpm) was noted. FEV1% predicted increased (start range 11–91%, mean 37%) to (range 12–102%, mean 46%) at end of Rx episode. This represented an increased FEV1%/patient of 1–20%, mean increase 8%, comparable to ACT alone. Sputum weight voided/day was greater than with ACT alone, during Rx sessions (range 0–102g, mean 23g), outside Rx (range 0–174g, mean 51g) and total/day (range 8–276g, mean 106g). 8/10 adults reported ‘improved mucus clearance’ ‘more effective than ACT alone’ and ‘wish to use again’.

Conclusion: HFCWO in addition to usual ACT was well tolerated and patient satisfaction high. FEV1 and sputum weight outcomes were not significantly increased compared to ACT alone. This audit heightened awareness, promoted discussion and enhanced consideration of HFCWO in addition to usual ACT. Further study is being undertaken to evaluate benefit.

A retrospective analysis of various airways clearance techniques on FEV1 decline over one year in cystic fibrosis patients


Background: The Cochrane review (van der Schans, 2000) has been unable to demonstrate the efficacy of any airways clearance technique (ACT) in the long-term treatment of Cystic Fibrosis (CF).

Aim: To retrospectively evaluate the effect various ACTs on FEV1 decline of over 1 year.

Method: A retrospective analysis of 124 CF patients (Male = 68, Female = 56, mean age = 27.8 years) was conducted. Patients were grouped according to ACT performed with greater than 40% compliance (self-reported). Data was also collected in those patients with poor compliance. FEV1 decline over one year was the primary outcome measure. Groups were also analysed regarding baseline demographics including; diabetic and infection status, age, gender, baseline FEV1 and Body mass index (BMI).

Results: Baseline demographic data revealed no statistically significant differences between any group including the non-compliant group (p>0.05). No statistically significant difference was seen between any ACT including the non-compliant group after one year (p>0.05). However, a trend was suggestive of a lower decline in FEV1 in the Positive Expiratory Pressure (PEP) group (−0.4% ± 45) compared with the non-compliant group (−2.2% ± 38), the percussion and vibration group (−3.3% ± 20), ACBT group (−3.3% ± 15) and the exercise alone group (−0.75% ± 6). Conclusion: These findings concur with those of the Cochrane review (van der Schans, 2000) that suggest there is no evidence supporting one ACT over another in the long-term treatment of CF patients.

Fibroscopy

A prospective randomized trial comparing airway clearance strategies following lung transplant

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Little is known about the efficacy of airway clearance (ACT) techniques following lung transplant (LT). This study aimed to compare the effects of two ACT strategies (proactive vs reactive) on a range of clinical outcomes following LT.

Methods: A prospective randomized trial design with stratification for supportive pre-LT disease was used. Consecutive patients at 1 month post LT were eligible for inclusion. Subjects were excluded if medically unstable, ventilator dependent or had a contraindication to performing positive expiratory pressure (PEP) therapy. Patients performed AC using PEP either twice daily (proactive strategy) or only in the presence chest infection (reactive strategy). Lung function (FEV1 and FVC), chest radiography (Brasfield score), exercise capacity (6 minute walk) and bronchoscopic airway characteristics (anatomotic healing, patency and secretions) were assessed at 1, 2 and 3 months post LT. Adherence and satisfaction were measured.

Results: Of 60 consecutive patients, 36 (18 in each group) were recruited and completed the study. Both groups improved lung function (FEV1 72.4±4% to 81.4±4% p<0.0001; FVC 69.3±3% to 81.3±3% p<0.0001), Brasfield scores (17.8±0.5 to 19.8±0.5 p<0.002) and 6 minute walk (451±16m to 545±16m p<0.0001) over the study period. No significant differences between groups for any outcome were found. Adherence to both strategies was high (>84%). The reactive strategy was preferred.

Conclusion: In the absence of significant differences in outcomes, it is recommended that AC only be performed in the presence of chest infection. Supported by: Alfred Trusts Grant.