

# Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis

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## Study design (if review, criteria of inclusion for studies)

Randomised or quasi-randomised clinical trials including those with a cross-over design where CCPT was compared with other airway clearance techniques. Studies of less than seven days duration were excluded.

## List of included studies (21)

Arens 1994; Bauer 1994; Cerny 1989; Costantini 1998; Darbee 1990; Davidson 1992; Gaskin 1998; Homnick 1995; Homnick 1998; Kraig 1995; Mcllwaine 1991; Mcllwaine 1997; Reisman 1988; Tyrrell 1986; Van Asperen 1987

## Participants

People with CF, of any age, diagnosed on the basis of clinical criteria and sweat testing or genotype analysis.

## Interventions

Conventional chest physiotherapy

## Outcome measures

Primary outcomes: 1. pulmonary function tests and 2. number of respiratory exacerbations per year. Secondary outcomes: 3. quality of life, 4. adherence to therapy, 5. cost-benefit analysis, 6. objective change in exercise capacity, 7. additional lung function tests, 8. ventilation scanning, 9. blood oxygen levels, 10. nutritional status, 11. mortality, 12. mucus transport rate and 13. mucus wet or dry weight.

## Main results

We included 21 studies (778 participants) comprising seven short-term, eight medium-term and six long-term studies. Studies were conducted in the USA (10), Canada (five), Australia (two), the UK (two), Denmark (one) and Italy (one) with a median of 23 participants per study (range 13 to 166). Participant ages ranged from newborns to 45 years; most studies only recruited children and young people. Sixteen studies reported the sex of participants (375 males; 296 females). Most studies compared modifications of CCPT with a single comparator, but two studies compared three interventions and another compared four interventions. The interventions varied in the duration of treatments, times per day and periods of comparison making meta-analysis challenging. All evidence was very low certainty. Nineteen studies reported the primary outcomes forced expiratory volume in one second (FEV1) and forced vital capacity (FVC), and found no difference in change from baseline in FEV1 % predicted or rate of decline between groups for either measure. Most studies suggested equivalence between CCPT and alternative ACTs, including positive expiratory pressure (PEP), extrapulmonary mechanical percussion, active cycle of breathing technique (ACBT), oscillating PEP devices (OPEP), autogenic drainage (AD) and exercise. Where single studies suggested superiority of one ACT, these findings were not corroborated in similar studies; pooled data generally concluded that effects of CCPT were comparable to those of alternative ACTs. CCPT versus PEP We are uncertain whether CCPT improves lung function or has an impact on the number of respiratory exacerbations per year compared with PEP (both very low certainty evidence). There were no analysable data for our secondary outcomes, but many studies provided favourable narrative reports on the independence achieved with PEP mask therapy. CCPT versus extrapulmonary mechanical percussion We are uncertain whether CCPT improves lung function compared with extrapulmonary mechanical percussions (very low certainty evidence). The annual rate of decline in average forced expiratory flow between 25% and 75% of FVC (FEF25-75) was greater with high-frequency chest compression compared to CCPT in medium- to long-term studies, but there was no difference in any other outcome. CCPT versus ACBT We are uncertain whether CCPT improves lung function compared to ACBT (very low certainty evidence). Annual decline in FEF25-75 was worse in participants using the FET component of ACBT only (mean difference (MD) 6.00, 95% confidence interval (CI) 0.55 to 11.45; 1 study, 63 participants; very low certainty evidence). One short-term study reported that directed coughing was as effective as CCPT for all lung function outcomes, but with no analysable data. One study found no difference in hospital admissions and days in hospital for exacerbations. CCPT versus OPEP We are uncertain whether CCPT improves lung function compared to OPEP devices (Flutter device and intrapulmonary percussive ventilation); however, only one study provided analysable data (very low certainty evidence). No study reported data for number of exacerbations. There was no difference in results for number of days in hospital for an exacerbation, number of hospital admissions and number of days of intravenous antibiotics; this was also true for other secondary outcomes. CCPT versus AD We are uncertain whether

CCPT improves lung function compared to AD (very low certainty evidence). No studies reported the number of exacerbations per year; however, one study reported more hospital admissions for exacerbations in the CCPT group (MD 0.24, 95% CI 0.06 to 0.42; 33 participants). One study provided a narrative report of a preference for AD. CCPT versus exercise We are uncertain whether CCPT improves lung function compared to exercise (very low certainty evidence). Analysis of original data from one study demonstrated a higher FEV1 % predicted (MD 7.05, 95% CI 3.15 to 10.95;  $P = 0.0004$ ), FVC (MD 7.83, 95% CI 2.48 to 13.18;  $P = 0.004$ ) and FEF25%75 (MD 7.05, 95% CI 3.15 to 10.95;  $P = 0.0004$ ) in the CCPT group; however, the study reported no difference between groups (likely because the original analysis accounted for baseline differences).

### Authors' conclusions

We are uncertain whether CCPT has a more positive impact on respiratory function, respiratory exacerbations, individual preference, adherence, quality of life, exercise capacity and other outcomes when compared to alternative ACTs as the certainty of the evidence is very low. There was no advantage in respiratory function of CCPT over alternative ACTs, but this may reflect insufficient evidence rather than real equivalence. Narrative reports indicated that participants prefer self-administered ACTs. This review is limited by a paucity of well-designed, adequately powered, long-term studies. This review cannot yet recommend any single ACT above others; physiotherapists and people with CF may wish to try different ACTs until they find an ACT that suits them best.

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### See also

Main E, Prasad A, van der Schans CP. Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis. CochraneDatabase of Systematic Reviews 2023, Issue 5. Art.No.:CD002023.DOI: 10.1002/14651858.CD002011.pub3

### Keywords

pharmacological\_intervention; Airway clearance drugs -expectorants- mucolytic- mucociliary-; Chest physiotherapy; Postural Drainage; Percussion; Positive-Pressure Respiration- PEP- pep mask; Active Cycle of Breathing Technique -ACBT-; forced expiration technique; High Frequency Chest Wall Oscillation -HFCWO-; VEST Airway Clearance System; oscillating devices; Acapella; flutter; Intrapulmonary Percussive Ventilation; Vibration; exercise; Autogenic drainage;