Positive expiratory pressure in patients with chronic obstructive pulmonary disease: a systematic review

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CRD summary
The authors concluded that the findings on the effects of positive expiratory pressure treatment in patients with chronic obstructive pulmonary disease were inconclusive and that further research is needed. This was a generally well-conducted review and the authors’ conclusions are likely to be reliable.

Authors’ objectives
To evaluate the effects of chest physiotherapy techniques with positive expiratory pressure techniques for the prevention and treatment of pulmonary impairment in adults with chronic obstructive pulmonary disease.

Searching
The Cochrane Central Register of Controlled Trials (CENTRAL), DARE, MEDLINE, EMBASE, CINAHL, AMED, PEDro and LILACS (Latin American and Caribbean Health Sciences Literature) were searched up to January 2008 for published articles written in English. Search terms were reported. Bibliographies of selected articles, relevant reviews and other studies were handsearched. Meetings abstracts published in specialised journals, conference proceedings or unpublished sources were excluded.

Study selection
Randomised controlled trials (RCT) comparing positive expiratory pressure treatment with other chest physiotherapy techniques, placebo or no treatment, in participants aged over 18 years with chronic obstructive pulmonary disease (COPD), including chronic bronchitis, emphysema or chronic airway obstruction, were eligible for inclusion.

Outcomes eligible for inclusion were: vital capacity, forced vital capacity, forced expiratory volume in 1 second (FEV₁), expectorated secretions, mucus clearance, arterial blood gas analysis or arterial oxygen saturation, use of medication, subjective ratings or number of exacerbations.

Included trials were of flutter treatment, pursed-lip breathing, blow bottle technique, therapostive expiratory pressure in combination with forced expiratory technique, and positive expiratory pressure mask alone compared with a variety of other chest physiotherapy techniques, placebo or control group. The number and duration of sessions ranged from a single 30 minute treatment to 15 minutes treatment three times a day for six months. Participants in the included studies had COPD or chronic bronchitis, the majority were male and the mean age ranged from 58 to 69 years. Follow up ranged from directly after treatment to 12 months following treatment.

Two reviewers independently selected the studies for inclusion.

Assessment of study quality
The methodological quality of the included trials was evaluated according to van Tulder’s criteria assessing randomisation, allocation concealment, blinding, comparability of groups, compliance, drop-outs, intention-to-treat analyses, and control of co-interventions (with a maximum score of 11). Trials scoring 6 or more were considered to be of adequate quality.

Methodological quality was assessed independently by two reviewers with disagreements resolved through discussion with a third reviewer.

Data extraction
Data were independently abstracted by two reviewers and authors were contacted for additional data.
Methods of synthesis
The trials were combined in a narrative synthesis with analysis conducted separately according to the length of follow-up and type of intervention.

Results of the review
Eleven RCTs were eligible for inclusion (n=223 patients); four parallel RCTs (n=149 patients) and seven crossover trials (n=74 patients). Methodological quality scores ranged from 4 to 8 out of 11. Five trials were considered to be of adequate methodological quality (scored 6 or more). Statistical data were not reported for any of the trials.

Direct effects of positive expiratory pressure treatment (within 1 hour) (n=50 patients; four RCTs): One adequate quality cross-over RCT (n=10 patients) found increased sputum amount directly after flutter treatment and one hour after flutter treatment compared to postural drainage combined with manual chest percussion and breathing exercises. However, there was no difference between the groups on FEV$_1$, saturated oxygen, sputum volume and weight or subjective sensations. One adequate quality cross-over RCT (n=14 patients) found that a positive expiratory pressure mask was inferior to postural drainage with forced expiratory technique in mucociliary clearance. Two low quality trials reported positive effects for pursed-lip breathing on saturated oxygen and flutter treatment on sputum amount.

Short-term follow-up (one hour to six days) (n=51 patients; four RCTs): One adequate quality parallel design RCT (n=27 patients) found an increased sputum wet weight and a decreased weaning time of non-invasive intermittent positive pressure ventilation in a group of patients treated with positive expiratory pressure masks compared to a control group treated with assisted cough and negative inspiratory positive pressure ventilation. The remaining trials were of low quality.

Intermediate follow-up (four weeks) (n=32 patients; one RCT): One adequate quality RCT found that theraposeditive expiratory pressure combined with forced expiratory technique was superior to forced expiratory technique alone in increasing diffusing capacity, increasing six-minute walking distance and lowering cough difficulty scores.

Long-term follow-up (six to 12 months) (n=90 patients; two RCTs): In one adequate quality RCT, a positive expiratory pressure mask used twice daily for 12 months was associated with increased FEV$_1$, less exacerbations and less use of medication compared to diaphragmatic breathing. The other trial was of low quality.

Authors’ conclusions
The findings on the effects of positive expiratory pressure treatment in patients with chronic obstructive pulmonary disease were inconclusive. Further research is needed.

CRD commentary
The review addressed a clear question with well-defined inclusion criteria. Several relevant databases were searched. However, the search was restricted to articles published in English, which may have introduced language and/or publication bias. Appropriate steps were taken in all stages of the review process to minimise reviewer error and bias. A validity assessment was performed and many of the trials were of low quality. However, methodological quality was accounted for in the results. Given the clinical heterogeneity between trials, the decision to combine trials in a narrative synthesis was appropriate.

This was a generally well-conducted review and the authors’ conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further research is needed, particularly into the long-term effects of positive expiratory pressure treatment.

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