Integrated breathing and relaxation training (the Papworth method) for adults with asthma in primary care: a randomised controlled trial

Elizabeth A Holloway, Robert J West

Background: An integrated breathing and relaxation technique known as the Papworth method has been implemented by physiotherapists since the 1960s for patients with asthma and dysfunctional breathing, but no controlled trials have been reported. This study evaluated the effectiveness of the Papworth method in a randomised controlled trial.

Methods: Eighty-five patients (36 men) were individually randomised to the control group (n = 46) or to the intervention group receiving five sessions of treatment by the Papworth method (n = 39). Both groups received usual medical care. Assessments were undertaken at baseline, post-treatment (6 months after baseline) and at 12 months. The primary outcome measure was the St George’s Respiratory Symptoms Questionnaire (SGRQ). Secondary outcome measures included the Hospital Anxiety and Depression Scale (HADS), the Nijmegen dysfunctional breathing questionnaire and objective measures of respiratory function.

Results: Post-treatment and 12 month data were available for 78 and 72 patients, respectively. At the post-treatment assessment the mean (SD) score on the SGRQ Symptom subscale was 21.8 (18.1) in the intervention group and 32.8 (20.1) in the control group (p = 0.001 for the difference). At the 12 month follow-up the corresponding figures were 24.9 (17.9) and 33.5 (15.9) (p = 0.007 for the difference). SGRQ Total scores and HADS and Nijmegen scores were similarly significantly lower in the intervention group than in the control group. The groups did not differ significantly following the treatment on objective measures of respiratory function except for relaxed breathing rate.

Conclusions: The Papworth method appears to ameliorate respiratory symptoms, dysfunctional breathing and adverse mood compared with usual care. Further controlled trials are warranted to confirm this finding, assess the effect in other patient groups and determine whether there is some effect on objective measures of respiratory function.

METHODS

Participants and setting

The study was undertaken in a semi-rural GP practice in Welwyn, Hertfordshire with eight partners and 16 500 patients; 612 (4%) patients aged ≥16 years are registered on the practice asthma database. The study took place between October 2004 and January 2006.

All 612 adult patients on the asthma register of the practice were initially approached to complete a postal survey about their condition; 359 patients responded. At the conclusion of the survey, respondents were invited to attend a physiotherapy-orientated asthma assessment. A total of 142 patients responded positively and 109 actually attended the assessment, 85 of whom met the inclusion criteria for the trial (fig 1; consort flowchart of patient withdrawals is available online at http://thorax.bmj.com/supplemental). Patients included in the study had to be aged 16–70 years, able to understand, read and write English, with a commitment to participate for possibly eight attendances, willing to give written informed consent and with no serious co-morbidity. The intention was that as few patients as possible would be excluded so that the sample would be maximally representative of a general practice asthma caseload. One patient in the control group requested withdrawal from the study to be able to receive treatment with the Papworth method. Six and 12 month data were available for 78 patients.

Abbreviations: HADS, Hospital Anxiety and Depression Scale; SGRQ, St George’s Respiratory Questionnaire

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There are currently an estimated 5.2 million people with asthma in the UK and 300 million worldwide. Management is primarily through medication, although it is recognised that non-pharmacological approaches to reducing symptoms and improving health-related quality of life merit attention.

A sequence of integrated breathing and relaxation exercises known as the Papworth method was developed in the 1960s (box 1). This method focuses on problems of dysfunctional breathing including hyperventilation and hyperinflation that are often found in asthma sufferers. The cycle of breathlessness and wheezing is frequently accompanied by anxiety and compound by complex physiological mechanisms. It is believed that the Papworth method leads to reduced asthma symptoms, anxiety and symptoms arising from hypopnoea. The present study was designed to investigate this hypothesis.

A Cochrane review on breathing exercises for asthma found seven small-scale randomised controlled trials satisfying its inclusion criteria. Trends towards improvement were found but no reliable conclusions could be drawn concerning the effectiveness of breathing training for asthma, and it was recommended that further trials be undertaken (see also Thomas et al’s). The interventions included in the review were predominantly based on either ancient yoga practices or “Butyko techniques”, where emphasis is placed on hyperventilation and a reduction in β2 agonist use. To our knowledge, no randomised controlled trials of the Papworth method exist, despite the fact that it is in quite widespread clinical use.
Box 1 Summary of the Papworth method of treatment

The PM integrates five components, the principal one being specific breathing training:

- Breathing training, including teaching of appropriate minute and tidal volume and the development of a pattern of breathing suitable to current metabolic activity. Elimination of dysfunctional breathing, including hyperinflation and hyperventilation patterns is discussed. A specific Papworth method diaphragmatic breathing technique is taught to replace the use of inappropriate accessory muscles of respiration. Emphasis, when relaxed, is placed on calm slow nasal expiration. Patients are encouraged to “nose-breathe” rather than “mouth-breathe” and eradication of habits such as yawning, sighing, etc is taught and practised.
- Education, with the emphasis on the recognition and physical management of stress responses and specifically the interaction with breathing patterns.
- Relaxation training, specific and general.
- Integration of “appropriate” breathing and relaxation techniques into daily living activities. Initially the techniques are taught in a semi-recumbent position progressing to sitting, then standing and during daily living activities.
- Home exercises with an audiotape or CD containing reminders of the breathing and relaxation techniques are supplied at the third treatment. Encouragement is given to practise at least once a day with the tape.

and 72 patients, respectively. The reasons for loss to follow-up were primarily related to logistical or practical difficulties in attending (fig 1; consort flowchart of patient withdrawals is available online at http://thorax.bmj.com/supplemental).

Study design and procedures

This was a two-arm randomised controlled trial comparing an intervention group receiving five treatments by the Papworth method with a control group receiving no additional treatment. Both groups continued to receive usual asthma care including medication and routine asthma education from a practice nurse. The usual care did not include advice about breathing exercises.

Randomisation was undertaken by a computer-generated number sequence assigning consecutive subject ID numbers either a 1 or 2 to denote intervention or control condition. Masking/blinding of patients and therapist was obviously not possible; patients had to sign an informed consent and it is obvious whether they were receiving the treatment or not. Whereas it might in principle have been possible for the follow-up assessments to have been undertaken by an assessor blind to the randomisation, resources did not permit this.

The primary outcome measure was the St George’s Respiratory Questionnaire (SGRQ). This assesses impaired respiratory symptoms and quality of life relating to these. It has good repeatability and is sensitive to changes in disease activity. A change in SGRQ Total score of 4 points is regarded as clinically significant. The questionnaire yields three subscale scores relating to (1) experience of symptoms, (2) their impact and (3) impairment in levels of activity. It also yields a total score. Secondary self-report measures were the Hospital Anxiety and Depression Scale (HADS) yielding separate scores for anxiety and depression, and the Nijmegen questionnaire to assess hypocapnic symptoms (breathlessness accompanied by dysfunctional breathing in the form of hyperventilation). A portable capnograph was used to measure end-tidal carbon dioxide and a portable capnograph (Better Physiology) was used to measure end-tidal carbon dioxide and relaxed breathing rate over a 10 min period and standard spirometric parameters were also assessed (Micromedical Microloop). Each assessment session took approximately 1 hour. Assessments took place at baseline, post-treatment (approximately 6 months after baseline) and at 12 months. Ethical approval was obtained from the local research ethics committee.

Intervention: the Papworth method

Between the baseline and post-treatment assessment, the intervention group received five 60 min individual treatments with the Papworth method from a respiratory physiotherapist, as summarised in box 1. Ideally, the Papworth method is taught to patients in periods of remission in order that the techniques may be integrated into daily life activities and implemented at the first sign of symptoms.

Sample size and power calculation

The sample size was calculated on the basis of a difference between intervention and control groups in the primary outcome measure (SGRQ Total score) of 12 units at post-treatment assessments, as found in a pilot study, and a standard deviation of the difference between baseline and post-treatment assessment of 14 units. With these parameters, 23 patients in each group would yield 80% power at the alpha = 0.05 level (two-tailed). To take account of attrition rates of the order found in similar interventions (eg, Thomas et al), we initially aimed to recruit 28 patients to each arm of the trial. In the event, a larger number of volunteers came forward from the recruitment process and, to avoid wasting the opportunity, these were included. The original randomisation process had generated sufficient numbers to include the extra participants.

Data analysis

Analyses were undertaken with SPSS V.11.5. Analysis of covariance (ANCOVA) was used to compare the control and intervention groups on primary and secondary outcomes at post-treatment and 12 month assessments, controlling for baseline scores. The outcome variables were normally distributed apart from two SGRQ domain scores (“activities” and “impact”) which had a positive skew which was not judged to be so great as to invalidate the use of an analysis of covariance with this sample size.

Analysis was undertaken on a “per protocol” basis rather than “intention to treat”. Intention to treat analysis is more common in randomised controlled trials but, in this case, it was expected that loss to follow-up would not have been correlated with lack of improvement but was more likely to be due to practical or logistic issues, nor would it differ between the intervention and control conditions. Moreover, no satisfactory method could be found for imputing a value for patients lost to follow-up. If it turned out that loss to follow-up was high or different in the two study groups, this would undermine the interpretability of the findings.

RESULTS

No significant differences were found between the groups at baseline (tables 1–3). SGRQ Symptom mean scores were lower in the PM group than in the control group after treatment and
DISCUSSION

These results support the hypothesis that the Papworth method ameliorates respiratory symptoms and improves quality of life in a general practice population of patients diagnosed with asthma. The effect was observed with reported symptoms and mood but no significant effect was observed on objective measures of lung function. To our knowledge, this is the first evidence from a controlled trial to demonstrate the effectiveness of the Papworth method.

The effect sizes on symptoms were clinically significant. A reduction of ≥7 points in SGRQ domains in the intervention group is approximately double the change considered to be clinically relevant. Anxiety and depression scores were also reduced to a clinically meaningful degree. Significant reductions in Nijmegen scores together with a reduction in breathing rate were observed in a general practice population of patients diagnosed with asthma. The effect was observed with reported symptoms and mood but no significant effect was observed on objective measures of lung function. To our knowledge, this is the first evidence from a controlled trial to demonstrate the effectiveness of the Papworth method.

A limitation of the study is a lack of detailed information on pharmacological treatment and changes in this over time during the trial. It would in principle be worthwhile examining how far, if at all, the intervention led to a reduction in medication usage or better adherence to medication regimens, but this would have been complicated by changes in prescribing practices while the study was going on and would have been difficult to interpret.

The Papworth method is a multi-component programme and we could not determine what element or elements contributed to its effect or even whether the elements combined synergistically. Because the comparison condition was usual care, we could not determine whether the Papworth method is more effective than usual asthma care alone.

Table 1 Baseline demographic and clinical data

<table>
<thead>
<tr>
<th></th>
<th>Control group (n = 46)</th>
<th>Intervention group (n = 39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%) male</td>
<td>18 (39)</td>
<td>18 (46)</td>
</tr>
<tr>
<td>Mean (SD) age (years)</td>
<td>49.3 (14.2)</td>
<td>50.2 (14.0)</td>
</tr>
<tr>
<td>N (%) married/cohabiting</td>
<td>36 (78)</td>
<td>34 (87)</td>
</tr>
<tr>
<td>N (%) Employment status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N (%) full time</td>
<td>20 (44)</td>
<td>16 (41)</td>
</tr>
<tr>
<td>N (%) retired</td>
<td>10 (22)</td>
<td>11 (28)</td>
</tr>
<tr>
<td>Asthma impact factors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) years since</td>
<td></td>
<td></td>
</tr>
<tr>
<td>asthma diagnosed</td>
<td>27 (17.7)</td>
<td>23 (15.2)</td>
</tr>
<tr>
<td>Mean (SD) years since</td>
<td></td>
<td></td>
</tr>
<tr>
<td>first prescribed releiver</td>
<td>20 (13.6)</td>
<td>17 (13.0)</td>
</tr>
<tr>
<td>reliever medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N (%) ex-smokers</td>
<td>14 (30)</td>
<td>14 (36)</td>
</tr>
<tr>
<td>N (%) current smokers</td>
<td>2 (4)</td>
<td>6 (13)</td>
</tr>
<tr>
<td>Spirometry (% predicted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) FEV&lt;sub&gt;1&lt;/sub&gt; (l)</td>
<td>91.67 (18.43)</td>
<td>87.24 (19.36)</td>
</tr>
<tr>
<td>N (%) FEV&lt;sub&gt;1&lt;/sub&gt; &lt; 80% predicted</td>
<td>8 (17)</td>
<td>6 (13)</td>
</tr>
<tr>
<td>Mean (SD) FVC (l)</td>
<td>96.76 (13.58)</td>
<td>90.55 (18.34)</td>
</tr>
<tr>
<td>Mean (SD) PEF (l/min)</td>
<td>93.62 (21.31)</td>
<td>89.53 (21.80)</td>
</tr>
</tbody>
</table>

FEV<sub>1</sub>, forced expiratory volume in 1 s; FVC, forced vital capacity; PEF, peak expiratory flow.

Table 2 Effects on symptoms of five Papworth method (PM) treatments compared with usual asthma care only

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-treatment (6 months post baseline)</th>
<th>12 months post-baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>PM</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>(n = 46)</td>
<td>(n = 39)</td>
<td>(n = 45)</td>
</tr>
<tr>
<td>SGRQ Symptoms</td>
<td>35.1 (12.9)</td>
<td>42.9 (21.3)</td>
<td>32.0 (20.1)</td>
</tr>
<tr>
<td>SGRQ Activities</td>
<td>20.2 (17.4)</td>
<td>27.8 (21.3)</td>
<td>17.0 (17.5)</td>
</tr>
<tr>
<td>SGRQ Impacts</td>
<td>14.7 (11.5)</td>
<td>18.2 (14.8)</td>
<td>10.8 (11.0)</td>
</tr>
<tr>
<td>SGRQ Total</td>
<td>19.7 (11.3)</td>
<td>25.2 (16.1)</td>
<td>16.3 (12.2)</td>
</tr>
<tr>
<td>Nijmegen Total score</td>
<td>17.8 (9.1)</td>
<td>19.2 (11.0)</td>
<td>15.0 (9.5)</td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>6.2 (3.8)</td>
<td>6.3 (3.5)</td>
<td>6.2 (3.7)</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>2.2 (1.8)</td>
<td>3.3 (2.5)</td>
<td>2.4 (2.4)</td>
</tr>
<tr>
<td>ET&lt;sub&gt;CO2&lt;/sub&gt; (mm Hg)</td>
<td>39.0 (3.7)</td>
<td>38.3 (5.5)</td>
<td>39.4 (4.4)</td>
</tr>
<tr>
<td>Relaxated breathing rate</td>
<td>15.1 (2.5)</td>
<td>15.0 (3.3)</td>
<td>15.3 (2.4)</td>
</tr>
<tr>
<td>over 10 min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values presented as mean (SD).
SGRQ, St George’s Respiratory Questionnaire scores: range 0–100 (best—worst);
Nijmegen scores: higher scores indicate increased severity in symptoms from hypcapnia: range 0–64 (best—worst); HADS, Hospital Anxiety and Depression Scale: range 0–21 (best—worst); ET<sub>CO2</sub>, end tidal carbon dioxide.
*From analysis of covariance comparing PM and control groups controlling for baseline scores.
Table 3  Effects on spirometric parameters of five Papworth method (PM) treatments compared with usual asthma care only

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n = 42)</th>
<th>PM (n = 38)</th>
<th>Post-treatment (6 months post baseline) (n = 41)</th>
<th>Control (n = 32)</th>
<th>PM (n = 30)</th>
<th>12 months post baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC (l)</td>
<td>3.6 (1.0)</td>
<td>3.4 (1.0)</td>
<td>3.6 (1.0)</td>
<td>3.6 (0.9)</td>
<td>3.6 (0.8)</td>
<td>3.6 (0.8)</td>
</tr>
<tr>
<td>FEV1 (l)</td>
<td>2.8 (0.9)</td>
<td>2.7 (0.9)</td>
<td>2.8 (0.9)</td>
<td>2.9 (0.8)</td>
<td>2.7 (0.8)</td>
<td>2.8 (0.7)</td>
</tr>
<tr>
<td>FVC (l)</td>
<td>3.5 (1.0)</td>
<td>3.4 (1.1)</td>
<td>3.5 (0.9)</td>
<td>3.6 (0.9)</td>
<td>3.4 (0.9)</td>
<td>3.6 (0.9)</td>
</tr>
<tr>
<td>PEF (/l/s)</td>
<td>413.4 (130.1)</td>
<td>408.5 (141.7)</td>
<td>425.9 (120.0)</td>
<td>439.5 (113.2)</td>
<td>407.9 (119.4)</td>
<td>439.3 (109.1)</td>
</tr>
</tbody>
</table>

Values presented as mean (SD).
SGRQ, St George’s Respiratory Questionnaire scores: range 0–100 (best–worst); VC, vital capacity; FEV1, forced expiratory flow in 1s; FVC, forced vital capacity; PEF, peak expiratory flow.

*From analysis of covariance comparing PM and control groups controlling for baseline scores.

ACKNOWLEDGEMENTS

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