A ROLE FOR BREATHING ASSESSMENT AND RETRAINING AS AN ADJUNCT IN ASTHMA MANAGEMENT

Asthma management – looking to the past

Breathing exercises as taught by respiratory physiotherapists were a central part of asthma strategies prior to the 1980s. With the advent of more effective asthma drugs at that time there was a trend toward pharmacologic centred management and breathing exercises went out of favour.

While the breathing exercises recommended at that time may have conferred some benefit, there was an emphasis placed on big volume breathing, which can exacerbate asthma symptoms and may explain why these exercises are no longer prescribed. [1]

This report aims to re-establish a role for breathing assessment and retraining as an adjunct in the management of asthma and other respiratory disorders. The primary goal of breathing retraining in this context is to normalise each aspect of the breathing pattern (rate, rhythm, volume, mechanics and use of the nose), for all situations (awake, asleep, at rest, during eating, speech and exercise).

The specific goal of breathing retraining is to achieve physiologically normal breathing. [2]

Physiologically normal breathing

There is wide variation in what is quoted today as a normal respiration rate with up to 20 breaths per minute accepted as normal. For example, one contemporary medical text gives 12 to 20 breaths per minute for the typical respiratory rate for a healthy adult at rest. [3] Another gives normal resting breathing rates between 10 and 14 breaths per minute. [4] However, the established physiological norm for adult respiration rate is 8 to 12 breaths per minute. [5]

Generally accepted criteria for physiologically normal breathing at rest, when sleeping and up to moderate levels of physical exertion are:

- Rate: 8-12 breaths per minute for an adult (higher for children).[5]
- Minute volume: 4-6 litres of air per minute with an average tidal volume of 500 ml.
- Mechanics: Diaphragmatic – 80 per cent of breathing effort at rest should be diaphragmatic with minimal engagement of upper chest and accessory breathing muscles.
- Rhythm: Rhythmic, smooth and regular.
- Sound: Inaudible.
- Route: Nasal for inhalation and exhalation – Air flows in through the nose, where it is warmed, filtered and humidified before being drawn into the lungs.

Sources for physiologically normal breathing. [5 6 7 8]

Typical baseline breathing pattern in asthma

There is a substantial body of evidence that dysfunctional breathing patterns including chronic hyperventilation (over-breathing) are characteristic of baseline breathing in people with asthma. Hyperventilation is a mechanism that is often overlooked in asthma. It has been suggested that hypocapnia is the rule in asthma until respiratory failure sets in. [9] In the first trial of the Buteyko method of breathing retraining for asthma in the western world the average minute volume of participants identified with asthma was 14 litres. [12] Hyperventilation, whether spontaneous or exercise induced, is known to cause asthma. [9 10 11 12]

Hyperventilation as referred to here is a pattern of over-breathing, where the depth and rate are in excess of metabolic needs of the body at that time. [4] During hyperventilation the rate of removal of carbon dioxide (CO_2) from the blood is increased. As the partial pressure of CO_2 in the airways and blood decreases, airways and blood vessels can spasm and constrict. Hyperventilation also results in respiratory alkalosis, characterized by increased alkalinity of the blood which strengthens the bond between oxygen and haemoglobin. This further reduces oxygen delivery to the brain and other organs. [13]

Hyperventilation as a possible mechanism for asthma

Loss of CO^2 through hyperventilation can trigger bronchoconstriction. [14 15 16]

Loss of CO^2 through hyperventilation can trigger mast cell degranulation and histamine production. [17 18 19 20]

In a study of 101 asthmatic patients during acute attacks of bronchospasm hypoxia was observed in 91 subjects and 73 showed hypocapnia and respiratory alkalosis. CO^2 retention was found in 11 patients but only at extreme degrees of obstruction. [21]

Despite the lack of published literature, it is logical to surmise that over-breathing could potentially trigger asthma in susceptible individuals by increasing delivery of allergens and germs and by dehydration of airways resulting in excess mucus production. Mouth breathing and over-breathing also override normal nasal filtration and humidification of inhaled air contributing to airway trauma and possible inflammation.

A role for breathing retraining in prevention and management of asthma

Published studies show that breathing retraining can help reduce both the symptoms of asthma and the need for both bronchodilator and inhaled corticosteroid medications. [9 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37]

While the mechanisms of breathing training in asthma are unclear, there is evidence that biochemical, biomechanical and psychophysiological aspects of dysfunctional breathing can all potentially impact on asthma symptoms and breathing control. Aggravation of respiratory and non-respiratory symptoms can occur due to hyperventilation, inefficient and aberrant breathing patterns as well as cognitive and emotional factors. [38] Research has demonstrated measurable and sustained improvements in asthma control and lung function coinciding with increased end-tidal CO_2 as measured by capnometry. [39] This research is ongoing and the increasing use of capnometry assisted breath work may help to further establish the validity of the CO_2 hypothesis outcomes for breathing training in asthma.

The 2016 edition of the Scottish Intercollegiate Guidelines Network (SIGN 153) in the 2016 British Guideline on the Management of Asthma stated: "Behavioural programmes centred on breathing exercises and dysfunctional breathing reduction techniques (including physiotherapist-delivered breathing programmes such as the Papworth method, and the Buteyko method) can improve asthma symptoms, quality of life and reduce bronchodilator requirement in adults with asthma, although have little effect on lung function." In all clinical studies of the Buteyko method symptom reduction was accompanied by significant reductions in both beta agonist reliever and inhaled corticosteroid medications, without deterioration in lung function.

These techniques involve instruction by a trained therapist in exercises to reduce respiratory rate and minute volume and to promote nasal, diaphragmatic breathing. Trials that include more than five hours of intervention appeared more likely to be effective. They can help patients' experience of their condition and quality of life although do not affect lung function or airway inflammation. They should ideally be provided as part of integrated medical care.

"Breathing exercise programmes (including physiotherapist-taught methods) can be offered to people with asthma as an adjuvant to pharmacological treatment to improve quality of life and reduce symptoms." [40]

About the Buteyko Institute Method (BIM) of breathing retraining

The Buteyko Institute Method (BIM) of breathing retraining is a health education program taught by a certified instructor. Clients attend a minimum of five 60-90-minute breathing training sessions where they learn breathing awareness and are taught breathing exercises appropriate for their condition.

Breathing exercises are tailored to the individual after an initial breathing assessment. Dysfunctional breathing patterns include mouth breathing, upper chest breathing, absence or restriction of diaphragm breathing, hyperventilation (chronic over-breathing), erratic or irregular breathing, and poor posture.

An assessment may include capnography and pulse oximetry. A capnometer measures the concentration of CO^2 in exhaled air expressed as $EtCO^2$. A pulse oximeter measures the oxygen saturation in peripheral blood, expressed as SpO^2. For most people, a measurement of CO^2 in exhaled air ($EtCO^2$) allows a close approximation of its concentration in arterial blood, expressed as $PaCO^2$. Combined, the two measurements of oxygen and CO^2 help provide a comprehensive picture of breathing behaviour.

The program is designed to assist people to improve the way they breathe. It consists of a series of lectures and practical training sessions including breathing exercises.

The breathing exercises have two purposes:

1. Clients are taught specific breathing exercises to help relieve symptoms associated with breathing-related conditions including but not limited to: asthma, bronchitis, COPD, chronic cough, hay fever, sinusitis, nasal congestion, sleep apnoea and anxiety/panic attacks.

2. The breathing exercises need to be practised daily for a minimum of six weeks. The aim is to normalise each aspect of the breathing pattern (rate, rhythm, volume, mechanics, use of the nose), for all situations (awake, asleep, at rest, during eating, speech and exercise).

Clients attend further breathing assessments at intervals during the programme.

The specific goal of breathing retraining is to achieve physiologically normal breathing. As a client's breathing improves and to achieve this goal it may be helpful to review prescribed COPD/asthma medications with the client's GP.

Clients are instructed not to make any changes to prescription medications without first consulting their prescribing doctor/specialist.

On successful completion of the programme and reduction in symptoms the frequency of daily breathing exercises can be reduced or stopped altogether. However, life-long awareness of the concepts is recommended for results to be sustained.

In summary

Breathing retraining techniques can be applied in helping in the relief of acute asthma symptoms as well as long term management and prevention of asthma. Breathing retraining is complementary to standard medical treatment of asthma.

Call to action

That screening for mouth breathing, upper chest breathing, over-breathing, irregular breathing and other signs and symptoms indicative of breathing pattern dysfunction be included as part of routine health/medical assessment in general practice.

That comprehensive breathing retraining services be made widely available in the public health sector throughout New Zealand.

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