Breathing Re-Education in Asthma: an Efficacious Adjunct

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Asthma airways are prone to constriction by a combination of inflammation, constriction of smooth muscle and increased secretions of mucus. Narrowing of the airways induces a feeling of a hunger for air, accelerating the respiratory rate and volume as a compensatory mechanism. The feeling that one is not getting enough air may also encourage a switch from nasal to mouth breathing.

While it is entirely logical that bronchoconstriction results in an increase to breathing volume, it may also be plausible that increased breathing volume contributes to bronchoconstriction. This article examines the contributory role of chronic hyperventilation in asthma.

While most medical textbooks list normal minute ventilation for a healthy adult of between 4 and 9 litres[1], individuals with asthma demonstrate resting ventilation of between 10 and 15 litres per minute.[2,3,4]

Normal breathing during rest involves regular, silent diaphragmatic breaths drawn in and out through the nose. Persons with asthma on the other hand commonly display oral breathing, regular sighing and sniffing with visible movements from the upper chest. During an exacerbation of asthma, respiratory rate, wheezing and breathlessness all increase relative to severity.

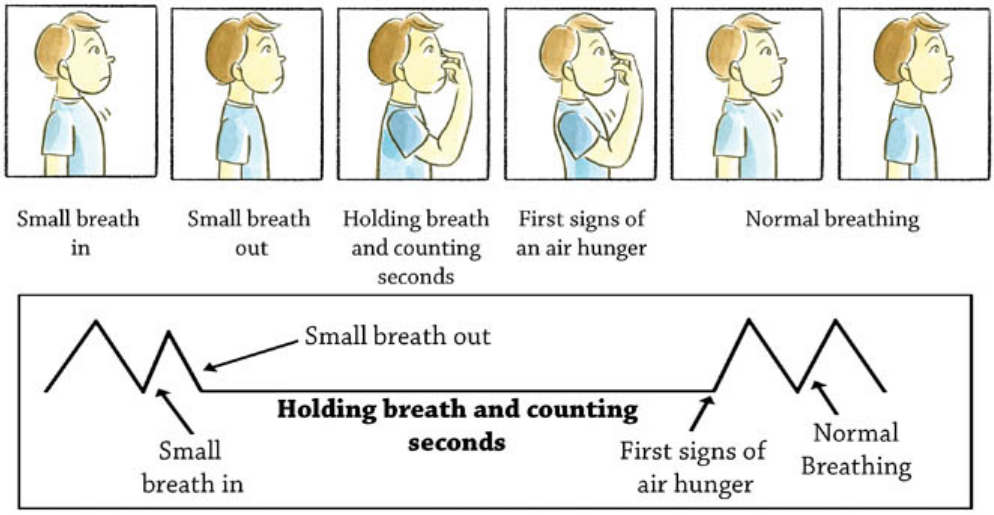
According to Hallani et al. in a paper published in the European Respiratory Journal, asthmatics switch to oral breathing at a significantly lower nasal load than controls.[5] Kairaitis supports this finding and notes that, asthmatics are more likely to breathe through their mouth, a factor which may contribute to the pathogenesis of their asthma.[6] Mouth breathing also causes a reduction in lung function in mild asthmatics and plays a role in the pathogenesis of acute asthma exacerbations.[7]

Practical examples of increased breathing volume causing asthma symptoms include laughter, stress and physical exercise. Laughter is often cited as the best medicine, although many asthmatics experience fits of coughing and wheezing following a good hearty laugh. The American Thoracic Society published a paper entitled *laughter induced asthma: It's no joke*.[8] The authors found that laughter was the second most common trigger of asthma after exercise, affecting up to 56% of people with asthma. While the exact cause of the laughter induced asthma could not be determined, the authors cited hyperventilation as a possibility.[8]

Breathing a higher volume of unconditioned air into the lungs as during laughter literally sucks the moisture from the inner walls of the airways, causing them to narrow and constrict. This results in a feeling of chest tightness, wheezing, coughing or breathlessness.[7]

A number of researchers have determined an inverse relationship between length of breath hold time (BHT) and breathing volume [9,10] along with a positive correlation with FVC and FEV in asthma and COPD patients.[11,12]

Over the past fifteen years, I have measured the comfortable breath hold time of thousands of individuals with asthma. Persons with mild asthma consistently hold their breath for up to twenty seconds, moderate for fifteen seconds and severe for up to ten seconds. The measurement I apply was developed by the Late Russian Dr Konstantin Buteyko and is known as the "control pause".



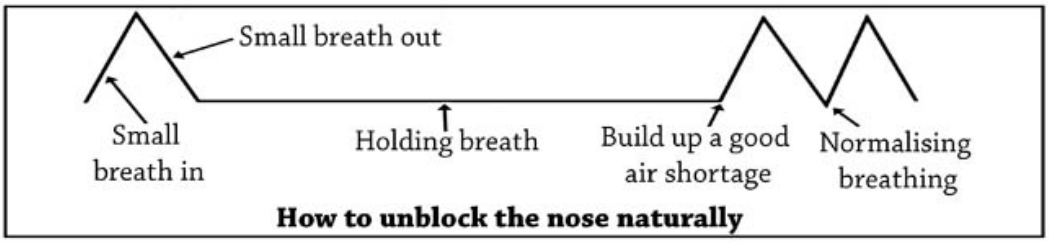
Measuring the Control Pause

- Take a small, silent breath in through your nose and allow a small silent breath out through your nose.
- Hold your nose with your fingers to prevent air from entering your lungs.
- Count the number of seconds until you feel the first distinct desire to breathe in.
- At the first distinct desire to breathe in, you may also feel the first involuntary movements of your breathing muscles. Your inhalation at the end of the breath should be calm.
- Release your nose and breathe in through it.

The premise of the control pause is that a lower BHT corresponds with a higher ventilation during rest and greater airway obstruction. Furthermore, each five second increase to the control pause corresponds to reduced exercise induced asthma, coughing, wheezing, breathlessness and chest tightness across all variants of asthma.

Results a study of 13 patients with acute asthma concluded that the magnitude of breathlessness, breathing frequency and breath hold time correlated with severity of airflow obstruction and, secondly, that breath hold time varies inversely with the magnitude of dyspnea when it is present at rest.[11]

The first step to normalising breathing volume is to decongest the nose and make a permanent switch to nasal breathing. The switch to nasal breathing is followed by employing breathing exercises designed to bring breathing volume towards normal.



The nose can be decongested for both allergic and non allergic rhinitis by holding the breath as follows:

> Take a small, silent breath in and a small, silent breath out through your nose.
>
> Pinch your nose with your fingers to hold your breath.
>
> Walk as many paces as possible with your breath held. Try to build up a large air shortage, without overdoing it of course!
>
> When you resume breathing, do so only through your nose; your breathing must be calmed immediately.
>
> After resuming your breathing, your first breath will usually be bigger than normal. Make sure that you calm your breathing as soon as possible by suppressing your second and third breaths.

You should be able to recover this breath hold within two to three breaths. If you cannot, you have held your breath for too long.

Wait for about a minute or so and then repeat.

Repeat this exercise five or six times until the nose is decongested.

The above exercise formed part of a pilot study at Limerick Regional Hospital ENT department which investigated the Buteyko Method for rhinitis in asthma patients. Results showed a 70% improvement in nasal symptoms which persisted at 3 month follow-up as long as the patients continued with the exercises.[13]

The nose performs significant functions including warming, humidifying and filtering incoming air. A high concentration of nitric oxide exists in the nasal airway, making it imperative to breathe through the nose.[14] Breathing through the mouth bypasses the nose, resulting in a diminished role for nitric oxide. According to Scadding; 'nasal nitric oxide probably explains some of the benefit of nasal rather than mouth breathing'.[15]

In the upper airways, nitric oxide provides a first line defence against microorganisms through antiviral and antimicrobial activity. In the lungs, it is involved in ventilation perfusion.[16, 17]

Ventilation perfusion describes the ratio of the amount of air to the amount of blood reaching the small air sacs in the lungs per minute. In a perfect situation, the oxygen provided from breathing would be just enough to saturate the blood fully with oxygen.

Two factors which negatively influence ventilation perfusion are breathing through the mouth and gravity. This can lead to a situation where the higher parts of the lungs receive more ventilation, and the lower parts greater amounts of blood. Nitric oxide produced in the nasal cavity helps with a more efficient matching of blood flow to ventilation. With each breath drawn through the nose, nitric oxide is carried into the lungs where it helps to counteract the effects of gravity on blood flow in the lungs by redistributing the blood more equally throughout the lungs.[17]

In a paper published in the American Review of Respiratory Disease, researchers studied the beneficial effects of nasal breathing on exercise-induced asthma. The study observed that most asthma subjects spontaneously breathe with their mouths open when instructed to breathe 'naturally'. The authors found that mouth breathing during exercise caused the airways to narrow. In contrast, when subjects were required to breathe only through their nose during exercise, exercise-induced asthma did not occur at all. The paper concluded that "the nasopharynx and the oropharynx play important roles in the phenomenon of exercise-induced bronchoconstriction".[18]

In another study, researchers Mangla and Menon studied the effects of nasal breathing and oral breathing on exercise-induced asthma. Fifteen people were recruited for the study. As in

the previous study, participants were required to breathe only through their nose. The study found that 'the post-exercise bronchoconstrictive response was markedly reduced as compared with the response obtained by oral (mouth) breathing during exercise, indicating a beneficial effect of nasal breathing'.[19]

That elite athletes with asthma often favour swimming above other forms of exercise is not a coincidence. When swimming, the face is immersed underwater, serving to restrict breathing volume. Although the swimmer draws his or her breath in through the mouth, ventilation is less than when compared to running or cycling. Another beneficial factor from swimming is that the body's weight on the water exerts gentle pressure on the chest and tummy, which further restricts breathing.

In the words of respiratory consultant Dr Peter Donnelly, 'In most land based forms of exercise, patterns of breathing are not constrained, ventilation increases proportionately throughout exercise and end tidal CO_2 tensions are either normal or low. Therefore, there is no hypercapnic stimulus for bronchodilation and asthmatics have no protection'.[20]

Although the act of swimming is beneficial, spending time in chlorinated pools is not because chlorine can cause damage to lung tissue leading to swimming-related health hazards.[21]

Breathing exercises aimed at normalising breathing volume have been attracting recent attention. The current valid edition of the British Thoracic Society (BTS/SIGN) Asthma Management Guidelines published in 2016, gave the evidence for the Buteyko Method, the highest evidence grade of 1++ in respect to their ability to reduce asthma symptoms and improve quality of life (as an adjunct to pharmacotherapy).

There are currently 16 studies investigating the Buteyko Method for asthma. Results report significant improvement to asthma control and reduction of asthma symptoms across children and adults with asthma. [4, 22,23] Respiratory consultant Professor Robert Cowie from the University of Calgary, Canada who acted as independent investigator in one of the trials commented that "75% control is about as good as anyone has got in any study of asthma. The neat thing about it is that it has no side effects. It's very safe. The Buteyko Method certainly has been shown to be an important adjunct to treatment."[24]

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