The majority of children today exhibit some degree of malocclusion, and it has been well documented that this is related to soft tissue dysfunction.\(^1\) In fact, it is now so well accepted that the muscles of the tongue, lips and cheeks play a major role in tooth position and jaw development\(^2\) that there are contemporary pre-orthodontic clinics around the world using myofunctional philosophy to treat children between the ages of 5 and 15 (Myobrace\(^\text{®}\) Pre-Orthodontic Center). However, despite these evolutionary myofunctional treatment systems achieving outstanding results, a small percentage of cases that prove difficult to treat remains. This raises questions regarding what is causing these stubborn cases as well as how best to treat them when all obvious poor myofunctional habits, such as digit sucking, tongue postural issues and dysfunctional swallowing patterns, have all been addressed in the myofunctional sense. It appears that answers may be uncovered by examining the child’s airways and breathing patterns.

Relevant literature explains how mouth breathing is a significant factor in the etiology of malocclusion.\(^3,4\) In short, when mouth breathing occurs, the tongue moves down in the mouth to allow the passage of air above it. Furthermore, an open-mouthed posture can affect the direction of growth as the muscles pulling on the jaws are affected. However, the real details of why children habitually mouth breathe are not so well documented.

**Breathing dysfunction factors**

**Factor 1: Tongue and head posture.** Breathing through the mouth causes the tongue to lower and also alters the head posture. This low tongue posture then leads to reduced maxillary growth\(^13,14\) and increases in vertical growth (Figs. 1a, b).

**Factor 2: The Bohr effect and cellular hypoxia.** It is important to be mindful that breathing dysfunction includes more than just mouth breathing. It also includes habitual hyperventilation, which means the patient will constantly be breathing an excess of air. This will then cause the bond between haemoglobin and oxygen to be strengthened (Bohr effect), and while blood oxygen saturation can be normal, oxygen-strengthened (Bohr effect), and while blood oxygen saturation can be normal, oxygen saturation can be normal, oxygen—hemoglobin complex formation is increased. Therefore, oxygen release to cells.

Relevant literature explains how mouth breathing and low tongue posture cause crowding and a narrow upper arch. (Fig. 3)

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The increased norm (\(~43.5\) ml min at rest) is hypothesized that habitual hyperventilation causes the trigger point at which the brain detects a level of CO\(_2\) sufficient to prompt the breathing reflex to become too low, and patients become sensitive to healthy CO\(_2\) levels, causing them to breathe an excess of air. Because such patients can get locked into this cycle of habitual hyperventilation, they may need extra help breaking the mouth-breathing habit.

**What can help these patients?**

An increasing number of dental professionals are focusing on innovative techniques to help patients break the cycle of habitual hyperventilation. These techniques involve a combination of breathing and airway awareness exercises intended to assist the patient to become accustomed to breathing smaller, healthier volumes of air. As a result, these patients learn to breathe less (retain more CO\(_2\)), and more O\(_2\) is released to their cells and tissues. Additionally, airways remain clearer, and tongue posture improves when mouths remain closed.

These techniques are used by Myobrace Pre-Orthodontic Centers to treat the difficult 5 percent of cases where the patient does not adapt to a better breathing habit using Myobrace appliances along with myofunctional and breathing activities alone.

To predict which patients may require help correcting their airway dysfunction, they can be divided into three groups during treatment planning. It is important to note that the groups remain flexible.

*Group 1 — Unlikely to require assistance (5 percent of patients):* asthma, previous ENT; medications; regular illness.

*Group 2 — May possibly require assistance (50 percent of patients):* asthma, previous ENT; medications; regular illness; current ENT; multiple/several medications; constant illness.

*Group 3 — Likely to require assistance (5 percent of patients):* asthma, current ENT; multiple/several medications; constant illness.

Patients classified into Groups 1 and 2 are likely to change their airway dysfunction after treatment with the Myobrace System\(^5\), which encourages correct breathing. However, patients classified into Group 3, and in some instances those in Groups 1 and 2, are likely to require additional assistance.

**Identifying habitual hyperventilators**

Generally, habitual hyperventilators show:

- Mouth breathing; lips apart at rest.
- Shoulder/upper chest breathing at rest.
- Audible breathing at rest.
- Medical history of enlarged tonsils and/or adenoids, asthma, hay-fever, recurrent respiratory infections, snoring, teeth grinding or sleep apnea.
- Narrow upper arch form.
- Forward head/shoulder posture.

My observations as a breathing educator and dentist practicing myofunctional orthodontics is that in addition to malocclusions, patients with poor breathing patterns also tend to have sinus congestion, asthma, hay-fever, enlarged adenoids or tonsils as well as ADD, Asperger’s and other syndromes on the autism spectrum.

**Factor 3: Becoming locked into a cycle of habitual hyperventilation.** Patients who habitually hyperventilate become accustomed to breathing greater than the physiologic norm (\(~43.5\) ml min at rest). It is hypothesized that habitual hyperventilation causes the trigger point at which the brain detects a level of CO\(_2\) sufficient to prompt the breathing reflex to become too low, and patients become sensitive to healthy CO\(_2\) levels, causing them to breathe an excess of air. Because such patients can get locked into this cycle of habitual hyperventilation, they may need extra help breaking the mouth-breathing habit.

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**Conclusions**

It is clear a correctly functioning tongue acts as a natural retainer, but when a patient habitually breathes through his or her mouth, the tongue is prevented from function in this correct way. In contrast, when the mouth remains closed and the tongue sits correctly, increased orthodontic stability can be expected.

Furthermore, when a patient maintains a closed-mouth posture and high-tongue posture, treatment time can be expected to lessen as forces exerted on the teeth and jaws will work favorably. Finally, it has been well-documented mouth breathing is not in the best interests of health, growth and correct development.\(^6,7\) Therefore, it is reasonable to assume encouraging correct functional breathing patterns will have a much more far-reaching effect than just correcting crooked teeth and jaws. Simply fixing the teeth and jaws is potentially missing a huge piece of the puzzle at the expense of possible health gains and future orthodontic stability.

References available from the publisher.