Mouth-breathing, malocclusion and the restoration of nasal breathing

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Introduction

Most dentists and orthodontists are aware of the impact that mouth-breathing has on the development of the maxilla. Most are also aware of the fact that, even after successful realignment of teeth, unless a retainer is used, relapse usually occurs. The tongue is nature's retainer and, at the lateral force exertion of 500 Gm, provides the balance required against the inward force pull of the cheek muscles, also at around 500 Gm. In an ideal world, these two forces would balance each other, and normal maxillary development would take place. The primary teeth would erupt smoothly and evenly, and even in the mixed dentition stage, there should not be overcrowding or malalignment of teeth.

What causes mouth-breathing to occur and what can be done about it? The answer to this lies in the basic physiology that we all studied during the early part of our careers. At the time that we learnt it, we were not able to see its overall importance, as we had yet to study the full gamut of anatomy and physiology to see how it all interrelated. By the time this happened, we had forgotten most of it. So, it should not come as any surprise that the information that follows will certainly strike a chord and probably elicit the usual comment "But I knew that!"

Discussion

Before attempting to discuss what constitutes functional as opposed to dysfunctional breathing, it is necessary to understand the mechanism of breathing in all its complexity. Functional breathing is initiated when the carbon dioxide (CO_2) level in the arteries ($PaCO_2$) reaches 40 mm Hg and stimulates the medullary response at the base of the brain. This in turn sends a signal to the diaphragm, causing it to contract and relax, and so the breathing cycle is maintained. So what goes wrong (Fig. 1)?

There are norms for blood pressure, pulse, temperature, chemical content of the blood and so on, but there is no such thing as normal breathing. Breathing has to be appropriate for the activity at the time, and what might be okay when running around the football field, is certainly not okay when sitting on a couch watching a football game, beer in hand and loads of high-fat, salt-laden snack food at hand.

Therefore, in the absence of normal breathing, the best we can hope for is the determination of functional breathing at rest (Fig. 2).

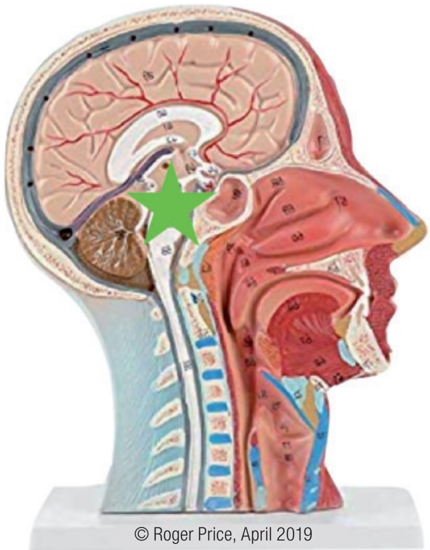

Fig. 1: What makes us breathe?

One of the prime roles of breathing is to maintain the pH of arterial blood at the optimal chemical axis, which ranges from 7.35 to 7.45.

This is a critical function, as it controls the transport and release of oxygen throughout the body.

When the chemoreceptors in the brainstem sense an imbalance in the chemical axis, breathing is adjusted automatically to restore optimal function.

This can increase or decrease breathing rate, depth, volume, mechanics, dynamics and behaviour patterns.

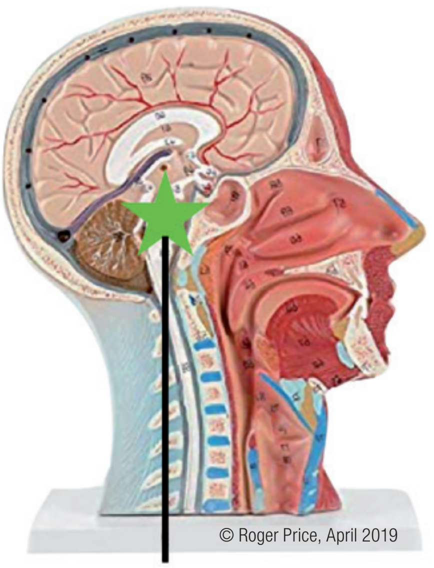

Fig. 2: Functional breathing at rest.

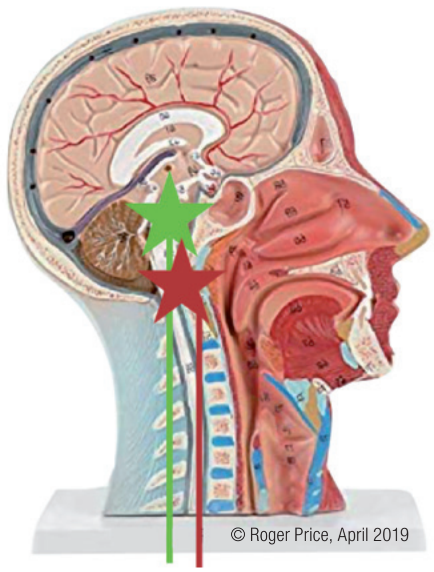

Fig. 3: Why breathing changes.

THERE IS NO SUCH THING AS NORMAL BREATHING
Breathing is directly linked to activity, nutrition, stress levels and other external factors. The chemical axis requires constant monitoring and reacts instantaneously to any pH imbalance.

There is however a definition for functional breathing at rest, which is:

- Breathing in and out through the nose
- Driven by the diaphragm, not the chest
- 8–12 breaths per minute
- Minute volume of 5–6 litres
- Silent.

Under these conditions optimal alveolar pressure of CO_2 will be close to 40 mm Hg.

The constant exposure to stressors of various natures initiates the flight–fight response, which automatically triggers responses.

Among these are:

- Larger and faster breaths, which reduce the amount of CO_2 stored in the lungs.
- The tendency to mouth breathe in anticipation of threat or escape.
- Changes in blood clotting levels, endorphin release, blood flow away from vital organs to the muscles of flight or fight, and the body prepares for action.
- This action usually never occurs, as the dangers are perceived rather than real, and the body then has to resettle. If this is a regular occurrence, then symptoms appear.

In the 64 years since starting my studies as a pharmacist, and moving on to many other "-ology" and "-opathy" modalities, I have seldom come across a doctor or dentist who has looked at a patient, counted the number of breaths he or she takes per minute and commented that he or she is breathing for two or three people. The medical professional surely enough comments about overeating or excessive drinking, but breathing is never even noticed.

Anything that happens to the human body that the system wants to resist or reject sets up a stress response. This stress response, or mini-flight or fight, causes the release of adrenalin from the adrenal glands, and our breathing rate subsequently rises. This applies to what we ingest, what stressors we encounter factually, as well as emotionally or perceptually, and what physical stresses are placed on the body through poor posture and other anatomical abnormalities.

The constant messages of increased breathing rate or hyperventilation cause the chemoreceptors in the brainstem to reset themselves at what is now regarded as the "new normal", and the standard breathing rate subse-

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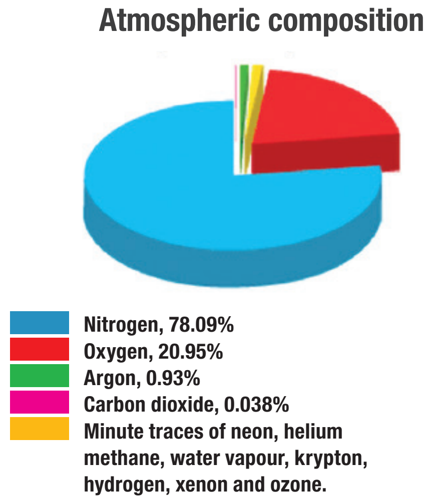
Residual alveolar pressure of CO_2 drops below 40 mm Hg owing to constant loss through the open mouth.

Fig. 4: The problem with mouth-breathing.

- Mouth-breathers universally have low tongue posture, leaving the maxilla without support during the growth stage.
- Lack of counterbalancing the inward forces of the buccinators causes the maxilla to narrow and form a high arch, causes nasal incursion and contributes to crowding.
- Chemoreceptors set at dysfunctional level, promoting overbreathing.
- Smooth muscle spasm can cause gastric reflux resulting in stomach acid rising into the oral cavity.
- Disrupted biochemistry has the potential to compromise growth and development.
- Upper respiratory tract infections, such as in the sinuses, tonsils and adenoids, coupled with the inflammation and congestion of the nasopharyngeal and oropharyngeal mucosa, as a result of incorrect breathing, can contribute to upper airway resistance syndrome (UARS).
- As the dysfunctional behaviour patterns change the alkalinity of the blood, less oxygen is released from the haemoglobin to the cells, causing cell death—often presented as eczema.

quently rises from eight to ten breaths per minute to anything from 18 to 30 (Fig. 3). Because the nose is not designed to cope with this volume of air, we become mouth-breathers, and the constant lowering of CO_2 through breathing through the mouth perpetuates the problem (Fig. 4).



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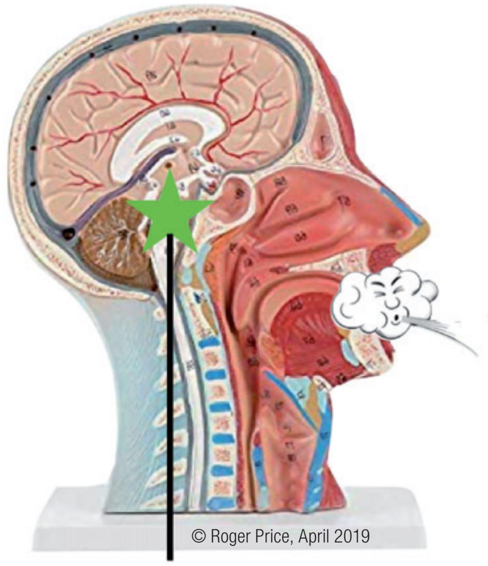
The body requires a constant pressure of CO_2 of 40 mm Hg or 6.5%.

Fig. 5: The carbon dioxide confusion.

- It is a total myth that carbon dioxide is a toxic waste gas and should be breathed out in big breaths to expel it from the body.
- Haemoglobin saturation of blood requires 5% oxygen to be present in the lungs. The air contains 21%—more than 4 times the body's requirements of oxygen.
- Under normal circumstances, the body is never short of oxygen; what is missing is the CO_2 that releases the bonded oxygen to the brain and other cells.

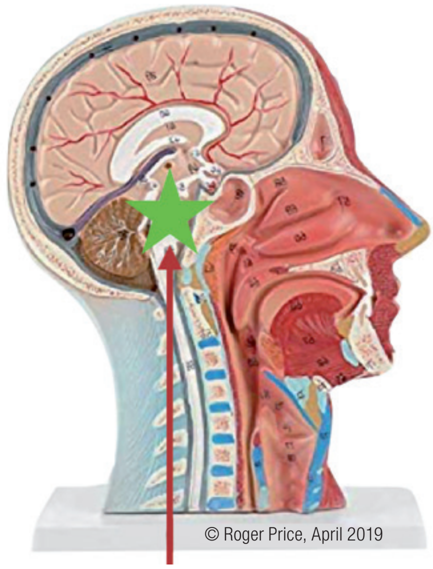
The air contains very little CO_2 as can be seen in Figure 5. We have to produce our own, within the body, to make up the required amounts. This is done primarily as the by-product of the chemical reactions which take place during exercise and digestion. Numerous health problems arise as a result of this, mainly due to the uncontrolled spasm of smooth muscle systems throughout the body, which are dependent on the presence of 40 mm Hg $PaCO_2$ and approximately 6.5% pulmonary content of CO_2 to maintain integrity.

Apart from the dental and orthodontic problems caused, myriad other problems arise owing to this dysfunctional breathing. The two with the most impact on the dental and orthodontic professions are snoring and sleep apnoea.



Alveolar pressure of CO_2 drops below 30 mm Hg.

Fig. 6: Central sleep apnoea.



Optimal alveolar pressure of CO_2 returns to 40 mm Hg.

Fig. 7: Restoring functional breathing.

Traditional medical thinking says that central sleep apnoea is the failure of the brain-generated message to breathe, to reach the diaphragm.

Multiple clinical trials at major hospitals refute this notion and have proved that it is the drop in alveolar CO_2 that causes the diaphragm to halt for as long as it takes for the CO_2 to rise to the point where oxygen is again released from the blood to the brain.

This is primarily related to the drop in CO_2 as a result of snoring and mouth-breathing during sleep.

Once breathing recommences, the dysfunctional behaviour pattern will repeat the process and a cycle will be created.

As always, there are choices:
★ Surgical
★ Orthodontic
★ Orthopaedic.

All of these entail four steps:
- Identification of underlying causes of the dysfunctional breathing habit
- Addressing and eliminating these obstacles to optimal function
- Ensuring that any physical impediment is removed in order to prevent relapse
- Rehabilitation to restore optimal function.

Once the system normalizes, the CO_2 returns to balanced function and the organism recovers.

– Snoring

Snoring is essentially the movement of too much air over the loose tissue at the back of the throat, causing it to rattle. Usually accompanied by open-mouth breathing, it perpetuates the loss of CO_2 and maintains the dysfunctional breathing pattern. In many cases, teaching the patient to reduce the breathing rate and to sleep with a closed mouth virtually eliminates the problem.

– Sleep apnoea

Sleep apnoea is a little different in that it is in many cases caused by a disruption of the pH of the blood due to the decrease in CO_2 (Fig. 6). This causes the blood to become too alkaline, leading the brain to think that the body cells are in danger of dying (which they are). The brain's response to this is to suppress breathing for sufficient time for the CO_2 level to rise, for more carbonic acid to be produced to buffer the blood and remove the danger to the cells. Once this has been achieved, the signal to breathe is again given. However, in the case of sleep apnoea, the ensuing breath is a large gasp, and this lowers the CO_2 levels again to danger point. This is why sleep apnoea is characterised by a pause–gasp cycle, which can occur up to 20–50 times an hour. In most cases, this can be controlled by restoring CO_2 levels to normal, ensuring that the pH integrity is maintained and the need to stop breathing is then removed.

Restoring nasal breathing as the norm

The good news is that it is possible to reverse this situation and recreate functional breathing. This requires several steps, which begin with identifying the cause of the original problem. Unless this is done and the habit modified, relapse is a real outcome. It is also necessary to address the breathing mechanics and dynamics so that the optimal levels of retained CO_2 can be restored. The moment this happens the medullary response recognises that retained CO_2 levels have risen and starts to reset the response to the appropriate level (Fig. 7).

about

Dr Derek Mahony is a Sydney-based specialist orthodontist who has spoken to thousands of practitioners about the benefits of interceptive orthodontic treatment. Early in his career, he learnt from leading clinicians the dramatic effect functional appliance therapy can afford patients in orthodontic treatment, and he has been combining the fixed and functional appliance approach ever since. His lectures are based on the positive impact such a combined treatment approach has had on his orthodontic results and the benefits this philosophy provides from a practice management viewpoint.

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Roger Price is an internationally recognised integrative health educator with more than 60 years of experience in various aspects of human health, growth and development. For the past 20 years, he has been working with dentists and orthodontists to correct the erroneous belief that the raft of chronic diseases—caused by fractionated sleep and disturbed sleep cycles—are sleep disorders. This is, in the vast majority of cases, untrue. People do not wake because they cannot sleep; it is because they cannot breathe. He is the Director of Professional Services at the Graduate School of Behavioral Health Sciences.

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