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Sleep disordered breathing - confusion not clarification!

Abstract

Over the past 50 years the incidence of disrupted sleep has been on the increase. The only 'new' treatment to date has been the advent of HNS - hypoglossal nerve stimulation, becoming FDA approved in 2014. Otherwise it has just been the development of smaller and quieter PAP machines and lighter and more comfortable oral appliances.

HNS is exorbitantly expensive and well outside the financial range of the majority of sufferers. In addition, it is claimed to be 75% effective **in reducing AHI,** which metric has become increasingly regarded as not relevant to addressing the problem. The basic premise is that **Sleep Disordered Breathing** is the culprit and every attempt being made focuses on addressing this issue during **sleep**.

If the process of 'Sleep' truly disordered 'Breathing' nobody would ever sleep!

The moment they fell asleep their breathing would become disordered and they would wake up. The exception to this statement is that if daytime breathing **is already disordered** then the process of sleep will make it worse. It will exacerbate the problem, not cause it.

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Introduction

Cliches and oft repeated memes become popular because they actually do make sense and encapsulate behaviors and ideas in a few choice words or phrases.[1,2]

Eldridge Cleaver - 1968

"*There is no more neutrality in the world. You either have to be **part of the solution**, or you're going to be **part of the problem***".[3]

Albert Einstein - 1946

"*We cannot solve problems with the same thinking we used when we created them".*[4]

I created my own meme back in 2009

"You're either busy living or you're busy dying, you cannot be busy staying the same"

Why are these three quotations important and how do they relate to the topic of sleep?

After 30 years of involvement in the world of breathing, sleep, asthma, hypertension, TMD, dentistry, orthodontics and various areas of postural and structural dysfunction, I think it is fair to say that the outcomes are not stellar. The moment the word 'syndrome' is included, we know that we don't know, and, at best, are making informed guesses. When in doubt - add 'idiopathic' just to be safe.[5-8]

Apart from specific surgeries, I can't think of many branches of current medicine that can state, hand on heart, that the problem has been 'cured'. Managed, maybe, but cured, unlikely. "Why is it so?" This term was coined in 1959 by the legendary Professor Julius Sumner Miller who ran educational programs on American TV, and this became his stock phrase. The answer to this is surprisingly simple, but as with many simple concepts, tends to become shunned in favour of more complex and confusing explanations. Occam's Razor is again ignored. This is a perfect example where a term was created, decades ago, without thinking it through, and this term has remained in common usage, despite it making **absolutely no sense.** In addition to it not making any sense, it, in fact, actually perpetuates the problem by placing the emphasis on the consequence and not the cause. It is this incorrect focus that causes current '**best practice**' and **gold standards**' to be **part of the problem** rather than **part of the solution**.[9,10]

Furthermore, to echo Einstein, it is not possible to address this problem with the mindset that created the initial misconception. As I stated previously, I will agree 100% that if **breathing** is already **disordered**, then **sleep** will most certainly make it worse, but **sleep** will not **create the condition**.[11] Sleep is a normal physiological condition during which the body is meant to heal and regenerate itself. Of course there are many changes during sleep, physiological, emotional, biochemical and structural, but this should not cause any problems to someone with functional daytime breathing. Allowing for the exceptions in the disclaimer above, I can say with a high degree of certainly, that the majority of people do not wake up because they can't '**sleep**'. They wake up because they can't '**breathe**'. Therefore, the correct terminology should be **Breathing Disordered Sleep**.[12] This is substantiated by the fact that the two accepted best practice and gold standards for addressing SDB are not **sleep devices**, but rather **breathing devices.** CPAP is a breathing machine not a sleep machine, and a mandibular advancement splint is not a sleep appliance, it is a breathing appliance. You might wonder why this is important. It is important because it then places the emphasis on the true problem which is '**breathing**' and not '**sleep**'.[13] Continuing to focus on sleep being the problem causes treatment to be centred around sleep, and that simply does not work. Sure, it is possible to get temporary interventive relief, but that comes with its own set of problems.[14]

Any intervention will result in an equal and opposite compensation elsewhere in the body, and there are reams of studies showing the long-term effects of both PAP and MAD therapies. This is because the underlying causes have been ignored and focus placed on symptom management.[15-18]

What are the underlying causes of Dysfunctional Breathing?

It might be wise at this stage to define the term Dysfunctional Breathing. It can fall into either one, or both of the following categories.

Physical Dysfunction - where the mechanics and dynamics created through compensatory postural habits make it close to impossible to breathe in a coherent way that will allow for stability of the Autonomic Nervous System. When this happens and breathing moves to the upper chest and mouth, the transit time of the CO_2 rich breath over the lung surface tissue is significantly truncated so it is not possible to fill the 600 million alveoli with CO_2 before exhaling the excess.[19]

This results in perennially low $ETCO_2$ and it is this low level that causes the chemoreceptor in the brainstem to lower its response threshold and regard a baseline of 30 - 32mm Hg as being 'normal'. This is one of the prime reasons for rejection of CPAP as the machine and mask rapidly increase retained CO_2 causing a feeling of 'claustrophobia' or 'drowning'.

Biochemical Dysfunction - where there is a mismatch between breathing behaviour and physiological demand, resulting in compromised biochemistry that keeps the body in sympathetic dominance.

It is best explained using the example of a car engine idling at a traffic light waiting for it to change. The motor is just ticking over waiting for the instruction to perform. Most cars idle at anything between 600 - 750 rpm and are 'relaxed and silent'. What would you do if your car's engine was idling at 2500 rpm? Just sit there and say 'oh well, that's just the way it is'? I think not - you would have it fixed pretty quickly.

Yet - it is commonly accepted by the general medical community that 'normal breathing' can be between 12 - 20 breaths per minute. That is like an idling speed of 2000 - 2500 rpm. In most cases one ends up with a behaviour pattern where the physical dysfunction triggers the biochemical dysfunction and the unbalanced biochemistry perpetuates the physical state. Truly a vicious circle. The major driver of physical dysfunction is compromised posture. Posture is a lot more than how we sit or stand. It is the expression of the responses to the proprioceptive stimuli generated in all three dimensions of space. What allows us to remain upright and not fall over? What do we do in order to counteract this process when we do in fact want to lie down? We have to selectively utilise all of our senses to ensure that what we want to do is possible, appropriate and safe. We would not lie down in the middle of a highway because our sight, sound and touch, as well as sense of smell would tell us that it would not be appropriate. What causes us to compromise our posture? Certainly, conscious movements such as reaching, bending, climbing and stretching are short-term postural distortions. They are usually not serious as we only do them for short periods at a time. Then there are the unconscious or subconscious drivers which we develop very early on in life, in fact from birth.

These unconscious postural compensations are driven by one major event - survival. In this context survival means having the ability to take the next breath, for if we can't do that its all over. If we are having trouble taking the next breath, for whatever reason, we will either find a way to make it happen or we will die. It is that simple. The most common compensations we make are to use the mouth and upper chest rather than the nose and diaphragm as it is so much easier. We lift our chins to open the airway, round shoulders to facilitate intercostal muscle movement, hunch forward, stretch our necks - or whatever else brings relief and the ability to breathe. We then hold our breath multiple times a day, sometimes up to 10-20 seconds without even noticing it. It is very common for people to say they are constantly finding that they have stopped breathing. People in professions and occupations that require fine manual dexterity such as dentistry or jewellery making report that they continually hold their breath when concentrating.

"Why it is so"? It is in fact a Central Apnoea triggered by a reduction in the release of oxygen from the blood to the brain (Bohr Effect). This reduction in O_2 release is often caused by over-breathing, literally breathing more than required to satisfy physiological demand, and it is the extra air per breath and the number of breaths per minute, together with inappropriate mechanics and dynamics, that lower the pressure of the end-tidal CO_2 in the alveoli. This increases the pH in arterial blood and prevents the Bohr Curve shift, at which point the pH should reach its release point of 7.35. The breath hold rapidly increases CO_2 retention, adjusts the pH and the Central Apnoea is resolved.

There are several research papers that cover this phenomenon and they prove, conclusively, that the addition of CO_2 via a special mask resolves CSA during sleep. It doesn't take a great leap of imagination to appreciate that preventing the loss of CO_2 in the first place will prevent the Central Apnoea episodes from happening.

This process starts right from birth and only gets worse as we get older unless we are able to detect and remediate what is causing the problem. The cause of the problem is as explained above. Survival depends on being able to 'take the next breath' and the body will do whatever is required to make this happen. At 60,000 to 70,000 breaths a day during the first 6 months of life, any compensations created by the infant in order to survive are bound to create a survival pattern. As we get older that pattern remains and we literally repeat it in every breath we take because that has become our 'new norm'.

The result of this is a constant state of hypocapnia which, over a period of time is read as 'normal' by the chemosensory centre in the medulla and the body resets itself to trigger breathing at a level which is not commensurate with effort, rather with habit. Any normal rise in CO_2 such as mild effort, climbing an incline or stairs, or even mild exertion will be read by the brain as extreme effort and breathing rate will increase accordingly. This increase in rate will further lower the $ETCO_2$ until it reaches the pH that provokes bronchoconstriction to prevent further loss.[19]

This is the body's defense mechanism against over breathing and is lifesaving. It is not a disease, and is certainly not the 'asthma' which is so misdiagnosed and over diagnosed. This happens for the very simple reason that the gold standard diagnosis is based on total rapid evacuation of all air from the lungs totally depleting the vital CO_2. The moment this happens it triggers an emergency bronchoconstriction to prevent further loss. Diagnosing 'asthma' this way is flawed as it is the very provocation that causes the response.

Every habit has a payoff - even if that payoff is ultimately negative - it serves a short-term purpose. There are far more frequent compensations made during the ⅔ of the time we are awake and functioning than during the ⅓ of the time that we are trying to recover at night, and it is these compensations that become the 'new normal' and create a significant daytime load. [20,21]

It is this allostatic load that drives the night time disturbance as we're not able to employ the various daytime compensations when we're asleep in bed. The effect on the nervous and muscular systems

as we go through the various sleep stages allows for only two options. We wake up or we die.[22]

Conclusion

In this particular context and cohort of people it is the Breathing that Disorders the Sleep - it is not the Sleep that Disorders the Breathing. Addressing daytime dysfunctional breathing will go a long way to resolving night time disruption.

Recommendation

The solution is simple though not necessarily easy. The daytime dysfunction has to be identified and addressed and as a result of the reduction in the daytime load, the nighttime load will reduce proportionately. It is necessary to identify and remediate those dysfunctional habit patterns that drive the over breathing. The body needs to return to the state where it is not 'breathed' to some dysfunctional pattern or forced rhythm, but is guided by its physiological demand at the time.

What are the challenges?

The prime challenge is the requirement for habit change. Habit change becomes far easier when one understands what is happening and can see how behavior drives dysfunction. This habit change needs to be gentle, totally doable and spread out over the entire day so that the gradual process becomes entrenched as the 'new habit'.

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Conflict of interest

The author states that he has no conflict of interest.

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