CPAP, BiPAP and Oxygenation
What does it all mean?

Dr. Marny Eulberg, MD

Question:

I had polio when I was 18 months old. I worked extremely hard for almost 30 years in a factory, 10 and 12 hours a day. I had to retire on disability at 42. Now, at 61 things are getting worse. I'm so tired, I can't do anything longer than 15 minutes. I've been on a CPAP for a long time.

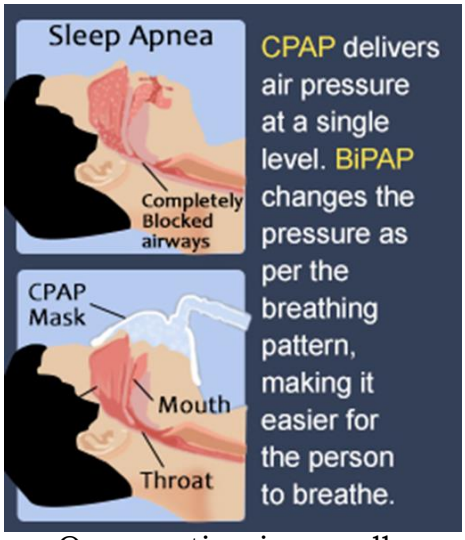
I had a new sleep study done and was diagnosed with both obstructive sleep apnea and central apnea. My CPAP was set on 14. Now they want me on a BiPAP that is set at 18/13.

The question I'm asking is - will this make me dependent on the BiPAP? My muscles are getting weaker. I feel like I have real muscle pain right now and I feel like I'm in a fog. I'm very tired.

Dr. Eulberg's Response:

Your situation, as you know, is complicated because of so many different medical problems that affect diverse parts of your body. As I understand your email, one of your major concerns is your breathing and the recommendation for BiPAP and the settings, which seem to you, to be quite high. Since we have limited space in this newsletter, I will limit my response to the issues of breathing and possible treatments and also try to provide some basic education to individuals who also may be using CPAP or BiPAP.

It is important that all people with breathing challenges understand the difference between oxygenation and ventilation. Oxygenation is how much oxygen is absorbed by the lungs and is then carried around the body by the blood. Ventilation is the amount of air that is moved into and out of the lungs with each breath or within one minute. So, ventilation includes the oxygen that is brought in with each breath and the carbon dioxide that is expelled with those breaths. It is possible to have normal ventilation but low oxygenation, such as when a person with normal lungs and normal breathing muscle function is in a low oxygen environment at a high altitude, like that of Mount Everest. It is also possible to have normal oxygenation with decreased ventilation especially if someone is receiving supplemental oxygen, but at the same time they can suffer from build-up of excess carbon dioxide. Of course, if someone is taking less breaths per minutes than is needed, they likely will have decreased oxygenation and decreased ventilation.



Oxygenation is usually measured by the "pulse oximeter" that clips on a person's finger. Oxygen levels in the blood is most precisely measured by testing a sample of blood taken from an artery. High carbon dioxide levels are suggested by high levels of bicarbonate (HCO_3) in the blood (venous blood); carbon dioxide (CO_2) can only be measured from an arterial blood sample (ABGs = arterial blood gases).

Hypoxia (less oxygen in the blood than normal) can be due to muscle weakness of the respiratory muscles, taking less breaths per minute than is needed or taking very shallow breaths, or various disorders of the lungs themselves so that oxygen is not absorbed into the lung tissue and then transferred to the blood. Decreased ventilation can be due to messages not getting from the brain to tell the body to take a breath (central apnea); partial or intermittent

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blockage of the airway (such as in obstructive sleep apnea), decreased depth of each breath which can be due to weakness of respiratory muscles (diaphragm, chest muscles, some abdominal muscles, and some neck muscles); the effects of significant obesity (one form of restrictive lung disease); or the effects of medications/drugs/large doses of alcohol that are respiratory depressants. This is not a complete list of all possible causes but includes the more common causes.

For those less familiar with some of the terms/acronyms-- CPAP stands for Continuous Positive Airway Pressure, which means a certain amount of air pressure is continuously supplied by a machine to keep tissues in the throat and upper airway from collapsing and acting as a one-way valve to block air going out the lungs. The person using CPAP actually has to exert slightly more force than usual to breathe out (exhale) against the constant pressure coming in. BiPAP is a term used for Bi-level Positive airway Pressure which means that pressure is used to push air in as the person begins to inhale and there also is some positive pressure applied to the airway as the person exhales. The settings for BiPap are expressed as two numbers: the first number is the pressure used during inhalation and the second number is the pressure that is maintained during exhalation. Settings may seem to be higher than "normal" for several reasons including leaks around the mask (difficulty getting a good snug fit of the mask/interface), stiffness of the person's airway including the lungs (example scarring of lung tissue from prior infections, COPD, interstitial lung diseases, pulmonary fibrosis), or significant weight/bulk of the person's chest.

In your specific case, you said your doctors want the new settings on your BiPAP to be 18/13. This means the pressure against which you would be breathing out would be slightly lower (13 cm) than it was with your CPAP which had a pressure of 14 cm.

You cannot get "dependent" on oxygen or breathing machines by using them; it is not like becoming physically dependent on narcotics. If you find that, in the future, you cannot function without use of these devices, it is because you need them and you have learned to appreciate the benefits. Your breathing muscles may become weaker over time, simply because they have overworked for years and are "wearing out" or your condition is getting worse. It has been found that for most polio survivors with breathing problems using some form of respiratory assistance at night actually allows them to breathe better in the daytime because the respiratory muscles have had a chance to rest, get their nutrients restored, have the waste products that have built up expelled, and get a "second wind" (pun intended) !

It is unlikely that any changes to your breathing equipment will help with your pain, although if you do indeed start sleeping better that can make dealing with the pain a bit easier.

Different Styles of CPAP/BiPAP Masks
www.thecpapshop.com/all-cpap-masks

Dr. Eulberg's inventory of informative Articles and Videos are available in the Living with Post-Polio Syndrome section of our website.