CPAP, BI-LEVEL POSITIVE PRESSURE, AND OXYGEN TITRATION

Fifteen years ago, when I performed my first continuous positive airway pressure (CPAP) titration, the equipment used was composed of a vacuum cleaner blower and a pneumotach inside of an anesthesia mask. The patient had been diagnosed with obstructive sleep apnea. As a respiratory therapist, apnea usually meant one thing: the patient is not breathing and ventilation must be performed for the patient. In addition, low oxygen saturations usually require the addition of supplemental oxygen. Right? All respiratory therapists knew these facts; we had been trained to recognize and respond to low oxygen saturations and apneic conditions.

In polysomnography, treating the apneic patient with cyclically occurring desaturations requires the RT to unlearn the typical responses. What is happening to the patient who is making the effort to breathe, which is apparent from the paradoxical movement of the patient’s chest and abdomen, but no airflow is detected? How long can an apnea last before resuscitation is indicated, especially when accompanied by an extended sinus pause or ventricular arrhythmia? 

Diagnosing the sleep disorder

When performing polysomnography, these physiological parameters are exactly what are to be recorded to accurately diagnose the patient’s disorder. The polysomnographic technologist must be well trained in order to know when to continue to monitor and when to intervene. The events being recorded may constitute a serious health concern that does need immediate intervention, but the test must be diagnostically valid. Inappropriate intervention may jeopardize validity.

The patients who present with particularly difficult challenges include those with neuromuscular disease, cardiovascular disease, and stroke. These patients often have a mixture of symptoms and can have an obstructive as well as a central component to their sleep-related breathing disorders.

Titration

Titration involves a fine-tuning of pressures in order to have optimal sleep quality, acceptable oxygen saturations, and control of apnea. Overtitration increases the likelihood of a central component emerging, and underti-
tration may allow enough obstructive component to remain that sleep is still fragmented from arousals. Bi-level therapy has improved the titration options for these patients, allowing control of the blood oxygen level, hypoventilation, and apnea to be done independently. In addition, the use of CPAP in congestive heart failure can actually improve cardiac output.

Positive pressure therapy

For the patient with neuromuscular disease, positive pressure therapy can be delivered at prescribed intervals with a spontaneous or timed-triggering device. This ventilatory assistance can be delivered noninvasively for the patient who needs support only during sleep.

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The recent addition of auto-titration positive airway pressure therapy has provided an option for the patient who has a positional apnea or sleep stage dependent apnea. The supine position and/or rapid eye movement (REM) sleep often cause the severity of the apnea to increase. For the patient who does not require high pressures during non-REM or when in the lateral or prone positions, a variable pressure device may improve compliance. Published works have shown the auto-titration device to be a useful tool in the monitored environment, and work continues to be done to confirm whether use at home produces an improved long-term compliance.

The positive pressure delivery devices as well as the interface options for patients continue to improve. Manufacturers of the equipment have listened and responded to patients’ concerns and problems with the interfaces: the masks are more comfortable, more durable, more pliable, and hypoallergenic. The blowers are smaller, quieter, and more affordable. Compliance has been shown to improve with the addition of cool or heated humidity.

Patient compliance considerations

Acceptance and compliance with positive pressure devices involve all members of the health care team, the patient, and family members. Patients with severe symptomology such as debilitating daytime sleepiness often receive their motivation from the resolution of symptoms.
tainly the introduction of positive airway pressure therapy, the experience in the sleep lab during testing, and the follow-up of the patient are extremely important. The support system must be in place for the patient, especially during the first several weeks of use. The expeditious treatment of side effects will help the patient tolerate the therapy.

Education of the family members as well as the patient will help the family realize the importance of the therapy and contribute to the support that the patient will desperately need. Community support groups are also excellent resources for patients and definitely help them realize they are not the only people with these problems.

Ensuring safety in the sleep lab

Oxygen administration and titration in the sleep laboratory must have a clearly defined policy and procedure. Supplemental oxygen can effectively treat nocturnal hypoxemia at a low flow rate.6 However, oxygen administration may not be safe for many patients with obstructive sleep apnea and has, in fact, been shown to prolong the apnea event.9 Supplemental oxygen usage in the patient with neuromuscular disease may worsen hypercapnia.10 These possibilities must be considered when implementing a procedure for oxygen titration during the polysomnogram.

More research needed

Even now, 15 years after my first CPAP titration, the health care system is still not sufficiently identifying the obstructive apnea patient. While the patient may report snoring and poor sleep, often the relationship of those symptoms to obstructive sleep apnea is not correlated. We must continue to educate all health care providers that breathing while asleep or awake differs tremendously. An appropriate treatment for an awake condition may be detrimental to the patient during sleep. Education has advanced tremendously in recent years concerning sleep-related breathing disorders; however, there is still much to be done.

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References