

Dear colleague:

This issue of the Sleep Health Newsletter addresses an important area in the management of sleep apnea. As CPAP is by far the most successful way to treat obstructive apnea, getting patients to use it regularly is mandatory. We believe this can be consistently accomplished if the right approach is taken. Hopefully you will find this discussion helpful in managing these patients. If we can be of further help, do not hesitate to contact us at 1-877-SLEEPHC or visit our new Web Site www.sleephealth.com.

We look forward to your comments.

Sincerely,



David P. White, M.D.
Corporate Medical Director,
Sleep HealthCenters, LLC



Sleep HealthCenters®

Better Sleep. Better Health. It's that Simple.

For more information about *chronic insomnia* and other *sleep disorders*, call **toll-free**

1-877-SLEEPHC (877-753-3742)-MA

1-888-681-9622- CO

www.sleephealth.com

“CPAP Therapy in the Management of Obstructive Sleep Apnea”

Author: David I. Slamowitz, M.D.

Obstructive Sleep apnea syndrome is a common sleep disorder characterized by repetitive episodes of partial airway narrowing (hypopneas) and airway collapse (apneas). This disorder has been associated with multiple adverse systemic consequences including hypertension and cardiovascular risk. In addition, the presence of multiple episodes of airway collapse with resultant arousal and sleep fragmentation can cause daytime somnolence and fatigue the consequences of which are neurocognitive deficits, decreased quality of life and an increased risk of motor vehicle accidents. It is estimated that the prevalence of sleep apnea syndrome is 4% among men and 2% among women.

Since its description in 1981, CPAP therapy has become the medical therapy of choice for the treatment of obstructive sleep apnea over other therapeutic options such as upper airway surgery or an oral appliance. With CPAP positive pressure is generated in the upper airway by a blower device which directs airflow downstream to the patient via a tubing system connected to several types of interfaces (see below). It is generally accepted that the primary therapeutic action of the device is related to the maintenance of upper airway patency through pneumatic splinting. CPAP therapy is indicated for all patients with a respiratory disturbance index (RDI) of > 5 events per hour associated with symptoms of excessive daytime somnolence. Patients with an RDI of > 30 events per hour should receive therapy regardless of symptoms due to their inherent risk of cardiovascular disease. The optimal CPAP level for treating OSA is generally determined in a sleep laboratory setting through a “titration” which can be performed either as part of a split night study (where half the night is diagnostic and the other half of the night is devoted to the CPAP titration) or during a full night titration. Patients who begin CPAP therapy report improvements in daytime sleepiness and quality of life measures. Objective measures of improvement have also been seen in OSA patients with regard to blood pressure, reduction in risk of motor vehicle accidents and improvements in neurocognitive function. Although daytime somnolence can improve after just one night of therapy, maximal improvement in neurocognitive symptoms can take as long as two months of therapy.

Several therapeutic options are currently available to maximize patient comfort with regard to positive airway pressure delivery. Pressure ramping allows for the delivered pressure to rise from a negligible pressure to the targeted therapeutic pressure over a set time (5- 30 minutes). The initial lower pressure can make it easier for patients to fall asleep. Bi-level pressure therapy provides the ability to independently adjust the inspiratory (IPAP) and expiratory (EPAP) pressures. This can achieve a therapeutic expiratory pressure (needed to maintain airway

cont. on pg 2

David P. White, M.D.

Dr. White is an Associate Professor of Medicine at Harvard Medical School, past President of the American Academy of Sleep Medicine (AASM) and, through his position at Brigham & Women's Hospital in Boston, the Corporate Medical Director for Sleep HealthCenters, LLC

Robert D. Ballard, M.D.

Dr. Ballard is an Associate Professor of Medicine at the University of Colorado, Director of the Sleep HealthCenter at National Jewish Medical and Research Center in Denver and Regional Medical Director for Sleep HealthCenters, LLC.

Abstract of Note...

Effective Compliance during the First 3 Months of Continuous Positive Airway Pressure - A European Prospective Study of 121 Patients

Jean Louis Pepin, Jean Krieger, Daniel Rodenstein, Andre Cornette, Emilia Sforza, Pierre Delguste, Chrystele Deschaux, Veronique Ggriller and Patrick Levy

Effective compliance (time spent at the effective pressure) with nasal CPAP in obstructive sleep apnea has been reported to be poor. The aim of our study was to evaluate effective compliance in a large European multicenter study. One hundred twenty-one consecutive newly treated patients (initial apnea-hypopnea index [AHI] = 62.0 +/- 29.5/h, AHI under CPAP = 6.4 +/- 8.1/h, CPAP pressure = 8.7 +/- 2.6cm H₂O, BMI = 33.1 +/- 6.8 kg/m²) were randomly allocated to a group with (MC+) (n=58) or without (MC-) (n=63) a control unit measuring effective compliance at 1, 2 and 3 months, which was compared with the built-in time counter data. MC+ data were 94 +/- 10, 98 +/- 5, and 96 +/- 9% of counter data at 1, 2 and 3 months respectively. Using criteria of regular use already reported in the literature (at least 4h of nCPAP per day of use and nCPAP administered more than 70% of the days) we found 77, 82 and 79% compliant patients at 1, 2 and 3 months respectively, 79% of the patients meeting these criteria each month. Although there were no pulmonary functions or polysomnographic differences between the two subgroups, the compliant patients did report greater improvements in minor symptoms. We found a close correlation between effective use of CPAP and the machine run time. The main result of our study was a higher effective compliance than previously reported with approximately 80% of the patients being regular users versus 46% in a previously published study. This may result from different technical and medical follow-up.

AM J RESPIR CRIT CARE MED 1999; 160:1124-1129

Sleep Health *Newsletter*TM
1400 Centre Street, Suite 109
Newton, MA 02459

“CPAP Therapy in the Management of Obstructive Sleep Apnea”

Author: David I. Slamowitz, M.D.

cont. from pg 1

patency) that is generally lower than standard CPAP and thus can relieve chest discomfort related to high expiratory pressures. In the past decade, autotitrating positive airway pressure devices have gained much attention. These devices adjust the level of pressure delivered based on a sophisticated algorithm which detects obstructive respiratory events through the monitoring of parameters such as a ir flow, pressure, snoring or

other airway sounds. Several studies suggest that these devices are capable of determining optimal CPAP settings for most OSA patients. During a night of use, these devices generate a mean CPAP level that tends to be lower than the "optimal" CPAP level determined through a manual titration. Thus it is conceivable that patients intolerant of the recommended "fixed" therapeutic pressure may have better adherence with auto CPAP devices. Lower pressures may also reduce the aerophagia, which may be problematic for some patients. However, these possible benefits have not been well studied. In addition, although these devices have inherent diagnostic capability, this has not been evaluated adequately in the home setting. Therefore, a prior diagnostic polysomnogram is recommended prior to use of these devices.

There are several interfaces that can be used between the patient and the CPAP device to achieve maximal comfort. Typically, a self-sealing flexible plastic nasal mask is tried first. These come in variable sizes and can also be custom-made. A properly fitted mask can alleviate problems related to air leaks such as conjunctivitis and bridge of the nose ulceration and bruising. Conjunctivitis from air leaks can also be prevented with an eye patch. Other available interfaces include a nasal pillow system and no mask or an oronasal mask, which

delivers pressure via the nose and mouth simultaneously. The nasal pillow system can be tried with patients who have claustrophobia related to the standard mask. Use of an oronasal mask can alleviate dryness of the upper airway particularly in patients who mouth breathe. These patients may also benefit from a chin-strap.

Several particularly troublesome symptoms related to CPAP use including nasal congestion, nasal or oral dryness, rhinorrhea and epistaxis, have

been reported in up to 65 percent of patients and may be responsible for decreased CPAP adherence. Several mechanisms have been proposed as causative factors. First, stimulation of pressure sensitive mucosal receptors may lead to vasodilation and mucus production. Second, a fixed nasal obstruction caused by the presence of a polyp or deviated septum can be responsible. Third, recent studies suggest that the high unidirectional flow over oral and nasal mucosa caused by mouth leaking (which can be a particular problem with patients who have undergone a uvulopalatopharyngoplasty) can cause both oral and nasal dryness. This in turn can promote the release of inflammatory mediators that can increase mucosal blood flow and engorgement of deeper capacitance vessels leading to nasal congestion and worsening mouth leak. This creates a vicious cycle of worsening nasal congestion. Finally, mucosal dryness can cause epistaxis and rhinorrhea. Heated humidification (but not cold passover humidification) can partially restore the relative humidity of inspired air during CPAP use. In fact, use of heated humidification has recently been shown to increase adherence in patients with nasal symptoms. Of note use of a full-face mask as mentioned above can totally prevent reductions in inspired air humidity. Other therapeutic options to treat nasal congestion and rhinorrhea

would include use of topical nasal steroids as well as use of ipratropium bromide nasal spray. As evidenced above, in recent years extensive efforts have been focused on improving CPAP comfort. A recent large-scale study demonstrated an 80% adherence to CPAP use after one year and close to 70% adherence after four years. In this study patients used their CPAP greater than 5 hours on a nightly basis. Both Epworth sleepiness scale score and respiratory disturbance index severity were predictors of CPAP adherence. Other studies have also demonstrated that CPAP adherence can be increased with intensive patient education and support. Thus, considerable follow-up and attention to detail is required to maximize compliance. It is hoped that a better understanding of the CPAP options available to physicians treating patients with obstructive sleep apnea will improve adherence to this effective therapy.

Dr. Slamowitz is a Medical Consultant with Sleep HealthCenter at National Jewish Medical and Research Center. He is board certified in Critical Care medicine, Pulmonary Medicine and Internal Medicine. He completed clinical and research fellowships at Brigham & Women's Hospital and Long Island Jewish Medical Center. He was a teaching Assistant for sleep physiology at Harvard and is involved in research related to pharyngeal muscle activity, upper airway physiology and OSA.

The *Sleep Health Newsletter* is published by Sleep HealthCenters[®], LLC, as an educational service to healthcare professionals. The Editor invites submissions of original work for consideration in future issues. Manuscripts of 1500 words or less should be mailed to 1400 Centre Street, Suite 109 Newton, MA 02459.

Case Study: Obstructive Sleep Apnea that Persists after Surgical Therapy

by Robert D. Ballard, M.D.

Initial Evaluation:

Mr. G. is a 50-year-old white male who presents for further evaluation of a sleep problem. He has a long history of nightly, loud snoring, recurrent witnessed apneas, and restless, non-restorative sleep that leaves him feeling somnolent and fatigued during the daytime. He was evaluated by an otolaryngologist for these symptoms in 1994, and was told that he had a deviated septum. He was subsequently referred to another sleep program for nocturnal polysomnography in February 1994. The duration of that study was 418 minutes, during which he demonstrated immediate sleep onset and a sleep efficiency of 88%. Sleep architecture was abnormal in that 21% of total sleep time was spent in Stage 1 and < 1% of total sleep time was spent in Stages 3-4. A total of 32 full awakenings and 680 arousals were detected throughout the study. During sleep Mr. G. also demonstrated 533 obstructive apneas, 28 mixed apneas, 25 central apneas, and 86 obstructive hypopneas. The subsequent apnea-hypopnea index (AHI) was severely elevated at 110 events per hour of sleep. Respiratory events typically terminated in an arousal or awakening and triggered oxygen desaturation to as low as 65%. As the study was requested as a precursor to surgery, no continuous positive airway pressure (CPAP) titration was attempted.

Mr. G. subsequently underwent uvulopalatopharyngoplasty (UPPP), septoplasty, and turbinate reduction. He had no follow-up polysomnography, but he did feel that his snoring and daytime sleepiness at least temporarily improved. However, his symptoms have progressively recurred, in that he now has nightly, loud snoring and witnessed apneas that interfere with the sleep of his wife. He is typically to bed by 9 p.m., followed by immediate sleep onset. He awakens 3-4 times nightly with gasping and dyspnea, then returns immediately to sleep. He awakens at 6 a.m. feeling unrefreshed, and then feels fatigued and somnolent throughout the day. Mr. G. admits to dozing off whenever he remains sedentary for more than a few minutes. For example, he often dozes off while waiting at a traffic light or while in a drive-through line at a fast-food restaurant. He denies falling asleep while driving or any motor vehicle accidents. His longstanding hypertension has become increasingly difficult to control, although he denies weight gain. Mr. G. also denies any problems with rhinitis, nasal congestion, or problems breathing transnasally. He has never smoked. He drinks up to 20 cups of coffee daily.

Past Medical History:

1. Long-standing hypertension
2. Obesity

Medications:

1. Reserpine 0.25 mg daily
2. Avapro 150 mg daily

Physical examination: Pertinent exam findings included a blood pressure of 130/108 mmHg; nasal mucosal inflammation with persistently swollen turbinates; elongated, highly-arched soft palate with an absent uvula; moderately large tongue; approximately 3 mm of overjet; neck circumference of 19.5 in.

Discussion 1:

This is a classic presentation for long-standing, severe obstructive sleep apnea (OSA). This male patient has nightly, loud snoring, witnessed apneas, daytime somnolence, a neck circumference > 17 in, and hypertension. A sleep study performed 6 years ago confirmed severe obstructive sleep apnea with marked hypoxemia and sleep disruption. Mr. G. was at that time treated with UPPP, septoplasty, and turbinate reduction. Although reported success rates with this surgical approach vary, a recently published large meta-analysis suggests that an immediate clinically significant response (reduction in the AHI by > 50% with a residual AHI < 20) occurs less than 50% of the time. Predictors for a negative outcome to this therapy reportedly include obesity and severity of disease, suggesting Mr. G. was not an ideal candidate for this surgical approach. Other studies have suggested that even if there is a good initial response to UPPP, there is a high rate of relapse, such that 4 years after surgery the enduring success rate may be reduced to as low as 20-30%. For these reasons, the American Academy of Sleep Medicine has suggested UPPP with or without septoplasty/turbinate reduction is appropriate for those patients with primary snoring, mild OSA, or moderate-to-severe sleep OSA that has not responded to, or tolerated CPAP therapy. They have also endorsed a repeat polysomnogram to confirm the outcome subsequent to such surgery.

Follow-up: Mr. G. underwent a repeat nocturnal polysomnogram in May 2000. That study was performed in a split-night format, with the baseline portion confirming the persistence of severe obstructive sleep apnea with an AHI of 127. Obstructive apneas and hypopneas were again disruptive of sleep and triggered oxygen desaturation to as low as 67%. In short, his OSA was virtually unchanged from that observed in 1994. After the baseline portion of the study, nasal CPAP titration was initiated at 5 cmH2O, and due to persistent obstructive apneas and hypopneas was progressively increased to a maximum of 19 cmH2O. Mr. G. was troubled by mouth breathing at higher levels of nasal CPAP, and did not tolerate CPAP administered via a full-face mask. His best response was ultimately to nasal CPAP at 15 cmH2O administered with a chinstrap. He slept for 66 min while treated in this fashion, spending 10 min in Stage REM. Although his AHI continued to be mildly elevated at 10

events per hour, these events were primarily transitional hypopneas that did not disrupt sleep or cause significant desaturation.

Mr. G. was subsequently started on home nasal CPAP therapy at 15 cmH2O with a chinstrap and a heated humidifier. He also began a regimen of twice daily saline nasal washes followed by a nasal topical corticosteroid. With this regimen and one change of his mask, his CPAP compliance meter indicates that he is now sleeping with CPAP an average of 6.8 hrs nightly. He reports that he is feeling better rested during the day, and is no longer dozing off at work or while sitting in his car. He does have a persistence of some fatigue and a lack of energy in the afternoon. Finally, his hypertension persists, although it is now well controlled in response to a regimen of hydrochlorothiazide and amlodipine.

Discussion 2:

As expected, the repeat polysomnography confirmed the persistence or recurrence of OSA that was at least as severe as that documented in 1994. It seems most likely that Mr. G. has had severe OSA during at least these last 6 years. These findings underscore the importance of performing an expeditious follow-up study in any patient treated for OSA with an oral appliance or any surgical approach other than a tracheotomy. In this case it seems likely that Mr. G.'s untreated OSA predisposed him to the development of fixed hypertension and may have also contributed to irreversible cognitive deficits.

During his most recent sleep study, it was apparent that Mr. G. tended to mouth breathe at higher levels of CPAP. It has been reported that UPPP may promote this pattern of breathing in some patients subsequently treated with nasal CPAP, as apparently the reduction of the palatal surface area may prevent the palate from effectively sealing off the oral cavity when breathing transnasally. This may in effect make subsequent nasal CPAP therapy less effective. Finally, tolerance and compliance with CPAP therapy have received a great deal of attention during the last decade. Some of the earlier studies to actually quantitate CPAP compliance suggested that < 50% of patients treated with CPAP used their device even a minimally acceptable amount of time. During recent years extensive effort has focused upon improving CPAP comfort, including new masks, quieter CPAP systems, ramp features, heated humidifiers, and anti-inflammatory nasal regimens. More recent studies have suggested that the use of these techniques as part of a comprehensive program to optimize patient comfort and compliance can yield success rates of greater than 80% in patients treated with CPAP. We believe that this is an achievable goal for any sleep program committed to the diagnosis and therapy of sleep disorders.