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Lifestyle modifications and the resolution of obstructive sleep apnea syndrome: a case report

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Abstract

Objective: This purpose of this case study is to describe a natural method to help in management of obstructive sleep apnea syndrome (OSAS), which is known to be a common and debilitating condition.

Clinical Features: Obstructive sleep apnea syndrome is typically managed with a continuous positive airway pressure (CPAP) device, which the patient wears during sleep to help maintain respiration. This report describes the chiropractic management and resolution of OSAS with dietary modifications in a 55-year-old man who wore a CPAP for 10 years.

Intervention and Outcome: After adhering to dietary modifications for 3 months, the patient no longer required the use of the CPAP device and continues to have a normal active lifestyle almost 7 years later.

Conclusion: Dietary modifications may be an effective tool to improve the management of OSAS.

Introduction

The term *obstructive sleep apnea syndrome* (OSAS) was first used in 1965 to describe a syndrome that was characterized by recurrent interruptions of breathing during sleep due to temporary obstruction of the airway by lax, excessively bulky, or malformed pharyngeal tissues (soft palate, uvula, and sometimes tonsils), with resultant hypoxemia and chronic lethargy.[1]

Although there is no definitive pathophysiologic cause of OSAS, the condition is thought to be multifactorial and related to narrowing of the upper airway, increased collapsibility of upper airway tissues, aberrant airway reflexes, upper inspiratory muscle dysfunction, and increased local and systemic subclinical inflammation.[2-6] Obesity, swollen and inflamed naso-oropharyngeal tissues, underlying

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tissue adiposity, and increased systemic inflammation have all been implicated as possible promoters of OSAS.[6,7] Type 1 Arnold-Chiari malformation can also promote OSAS.[8,9]

Sleep disorders, including OSAS, have been long recognized as having a significant impact on health and well-being, an impact that is thought to rival smoking.[10] Snoring is associated with myocardial infarction, stroke, and hypertension, which suggests that even a mild degree of sleep-disordered breathing may have adverse health effects.[11-13]

Primary presenting signs and symptoms of OSAS include snoring, unrefreshed sleep, daytime sleepiness, nocturnal choking, nocturia, and morning headaches. Reduced libido and enuresis are less common symptoms.[14,15] Obesity is also considered an indicator; however, it is known that about 50% of OSAS sufferers are not obese.[14] The metabolic syndrome X is commonly associated with obesity and is thought to help promote numerous conditions such as type 2 diabetes, coronary artery disease, hypertension, epithelial carcinomas, acne, skin tags, and polycystic ovarian syndrome.[16] Interestingly, syndrome X appears to be more common in OSAS patients.[14,17,18] Among nondiabetic men, the severity of OSAS has recently been linked to increased levels of hemoglobin A1c and fasting glucose[19]; and within the adolescent population, the incidence of OSAS appears to parallel the rise in obesity.[20]

Treatment has historically centered on the use of a continuous positive airway pressure device (CPAP), which the patient wears during sleep to help maintain respiration. The CPAP helps with sleeping and reduces the choking that otherwise wakes a patient from sleep.

This case report describes a patient who, during a visit for back pain, questioned as to whether doctors of chiropractic may be able to provide relief from OSAS. A dietary regimen was recommended to help with weight loss and inflammation reduction. Within 3 months, the patient experienced complete relief of OSAS; and this has been maintained for approximately 7 years.

Case report

A 55-year-old white man sought chiropractic manipulative care for chronic low back pain in January of 2004. He suffered from back pain for most of his adult life, since approximately the age of 25 years, and found that spinal manipulation modulated the pain and allowed him to maintain optimal function. During the history-taking process, the patient also complained of suffering from obstructive sleep apnea for the past 11 years, since 1993. In 1998, he underwent surgery for the correction of a deviated nasal septum and to clear nasal obstruction by removing the adenoids and uvula. Despite surgery, OSAS persisted; and the patient was reliant on a CPAP device from 1993 to 2003.

Result of examination of the head, eyes, ears, nose, and throat was unremarkable; and no apparent cause of OSAS was noted. There were no breathing difficulty at rest or under stress, no evidence of sinusitis, and no evidence of oral or other anatomical abnormalities. Although nasopharyngeal adiposity is considered causative for OSAS, no pictures of the adenoids, soft palate, or uvula were taken before lifestyle changes; so the potential of subtle tissue size changes could not be accounted for.

The patient rarely experienced 6 hours of uninterrupted sleep; and even with the CPAP machine, he suffered from wakefulness and restlessness throughout the night. Consequently, the patient never felt fully rested in the morning and suffered from afternoon lethargy. As OSAS is known to be associated with chronic inflammation and obesity, the option of lifestyle management was presented.

Our patient made the commitment to pursue a state of wellness with nutrition and exercise, referred to herein as *anti-inflammatory* lifestyle changes. The most tangible goal was weight loss, and the operational and mental goal was to promote an anti-inflammatory state with each meal and snack.

The patient was encouraged to avoid the consumption of refined sugar, refined grains, and whole grains in favor of more nutrient-dense foods including vegetables, fruits, lean meats, fish, skinless chicken, omega-3 eggs, and nuts. If a starchy carbohydrate was desired, the recommendation was to consume a modest portion of sweet or other potatoes. The use of spices was encouraged to replace table salt. Ginger, turmeric, and garlic were recommended as well as others that appealed to the patient, as they have an anti-inflammatory effect.[21] Several terms have been used to describe this pattern of eating including the *polymeal*,[22] the *hunter-gatherer* or *paleodiet*,[23] and the *anti-inflammatory diet*.[24]

The patient adhered to several anti-inflammatory dietary changes, such as a significant increase in vegetable consumption, as well as lean meats and omega-3 eggs. Foods containing a high concentration of omega-6 to omega-3 fatty acids were avoided, such

as corn and other vegetable/seed oils, as well as foods made with corn and wheat flour.

The consumption of junk food snacks and soft drinks was reduced to an occasional occurrence. The patient also made a conscious effort to "slow down when eating" and was mindful of feelings of fullness, so as not to overeat. The patient reported that he never felt meal or food deprived as he had experienced on previous weight loss diets. Alcohol consumption was significantly reduced from 4 to 5 drinks several nights per week to 1 glass of red wine 3 to 4 nights per week.

In August of 2005, the patient began taking several supplements that are thought to assist in the process of inflammation reduction including a multivitamin, magnesium (400 mg/d), fish oil (1.2 g of omega-3 fatty acids per day), coenzyme Q10 (100 mg/d), and a anti-inflammatory botanical (1.5 g of turmeric, ginger, and bioflavonoids).[25-27] Supplementation has been consistent up to September of 2010.

The patient was initially sedentary and was encouraged to exercise to facilitate weight loss and to increase feelings of well-being. The patient began to walk on a daily basis and gradually increased the intensity and distance. For approximately 1 year, from March 2005 to 2006, he engaged in weight training at a local gym. Since that time, he decided to substitute moderately heavy yard work for weight training and included core stabilization exercises. He presently jogs 4 to 5 days per week for approximately 60 minutes. In April and July of 2010, he completed 5-km races.

The status of OSAS symptoms in this patient was assessed periodically when the patient sought manipulative care for his low back pain. Blood pressure, use of blood pressure medications, and body weight were also monitored (Table 1).

A dramatic change in sleep habits took place within 3 months of initiating anti-inflammatory lifestyle changes. Before lifestyle modifications, the patient reported that he rarely experienced 6 hours of uninterrupted sleep, even while using the CPAP machine; and this was associated with long bouts of wakefulness throughout the night. By March of 2004, after 3 months of lifestyle modification, the patient no longer needed to use the CPAP device. Furthermore, since that time, the patient has reported 6 to 8 hours of continuous sleep and feeling well rested upon waking; and according to the patient's spouse, there were no more snoring or apnea episodes during the night.

Numerous health and quality of life improvements occurred during this nearly 7-year process. Most notable was the significant reduction in blood pressure from 140/90 mm Hg with medication to 120/80 mm Hg without medication. Despite a personal and family history of hypertension, the patient stated that this was the first time since the age of 25 years that his

Table 1 Patient progress

September 1993	Diagnosed with OSAS and issued CPAP apparatus.
June 1998	Nasal septum surgery including adenoid and uvula removal; OSAS unaffected and still 100% CPAP reliant.
January 2004	Patient began anti-inflammatory lifestyle modifications to pursue wellness. Blood pressure at 140/90 mm Hg with 75 mg of atenolol. Weight: 225 lb.
March 2004	Patient is 100% free of OSAS and CPAP reliance. Blood pressure maintained at 120/80 mm Hg with 75 mg of atenolol. Weight: 215 lb.
January 2005	Patient remains free of OSAS and CPAP reliance. Blood pressure maintained at 120/80 mm Hg with 75 mg of atenolol. Weight: 210 lb.
August 2005	Continues to be free of OSAS and CPAP. Blood pressure maintained at 120/80 mm Hg with 75 mg of atenolol. Weight: 201 lb.
June 2006	Continues to be free of OSAS and CPAP. On salt-reduced diet and hypertension maintained at 128/80 mm Hg with only 50 mg of atenolol. Weight: 185 lb.
December 2006	Atenolol was reduced to 25 mg.
June 2007	Maintained improvement and 100% free from OSAS and CPAP; no longer taking antihypertensive medications, and blood pressure is maintained at 122/80 mm Hg. Weight: 185 lb.
March 2009	From June 2007 to March 2009. Continued to be free of OSAS and hypertensive medications. Blood pressure is maintained at 124/80. Walking for exercise. Weight: 185 lb.
March 2010	Remains free of OSAS and hypertensive medication. Maintaining diet and walking for exercise. Blood pressure is 115/70 mm Hg. Weight: 178 lb.
September 2010	Remains free of OSAS and hypertensive medication. Blood pressure is 120/80 mm Hg. Weight: 176 lb.

family physician considered reducing the dosage of his hypertension medication, which commenced approximately 2 years after lifestyle modifications began. At the time of this writing, the patient was no longer taking antihypertensives and maintained a blood pressure of 120/80 mm Hg.

For the majority of the patient's adult life, he weighed between 210 to 260 lb. His weight before initiating lifestyle changes in January of 2004 was 225 lb. As of September 2010, he weighed 175 lb, a 50-lb reduction. The patient also reported several subjective improvements in quality of life:

- Sexual improvement with increased desire and pleasure despite a steady decline before lifestyle changes.
- Increased energy and stamina during activities of daily living and exercise.
- Increased positive mental attitude and mental body image, increased optimism, decreased frustration and decreased mood swings, better mental capabilities and clarity.
- Improved quality of life and ability to pursue activities of daily living and hobbies such as hiking, backpacking, and sleeping on his lake boat.
- Increased agility and balance. Walking steep uneven grades when hiking had improved.
- General increased feeling of well-being.
- Felt more refreshed, lighter, and in tune with his body.
- Patient felt better rested in the morning than he did despite surgery, during CPAP device use, and even before CPAP use.

In summary, after 3 months of adhering to an anti-inflammatory lifestyle, our patient was able to completely eliminate using the CPAP device, despite 10 years of prior dependence. At the time of this report, the patient had been CPAP-free for nearly 7 years. The patient expressed a previously absent desire to continue exercising and pursuing health through diet and exercise.

An additional clinical outcome occurred in our patient that is worth mentioning. Around 1987, the patient was diagnosed with hemochromatosis for which therapeutic phlebotomy was the treatment. However, in 2007, the patient was told by his physician that he must have been misdiagnosed because he no longer manifested increased iron storage in his regular blood tests and no longer required therapeutic phlebotomy.

Discussion

Detailed reviews on OSAS are available.[28–33] As stated earlier, OSAS is a remarkably common condition; however, it is often misdiagnosed or underdiagnosed. For example, before diagnosis of OSAS, patients more frequently received diagnoses of a variety of different diseases compared with controls, including hypertension, congestive heart failure, cardiac arrhythmias, cardiovascular disease, obstructive airway disease, and depression.[34] Smith et al[34] state that "what might be even more disturbing is the possibility that sleep apnea patients are being treated for an illness (depression) that they may not have. This is because some of the classic symptoms of apnea (sleepiness, loss of energy) may be misinterpreted to represent depression." This is thought to be of particularly importance for elderly patients, as "failure to recognize this syndrome may lead to missed opportunities to successfully treat intellectual decline."[35]

Patients with OSAS also typically use more medical resources compared with symptom-free aged-matched subjects. During a 5-year period before OSAS diagnosis, OSAS sufferers, compared with controls, recorded a 23% to 50% greater utilization when measured by physician fees, number of physician visits, and number of nights spent in the hospital.[34]

Intriguingly, physicians misinterpret signs and symptoms of OSAS from the perspective of the medical specialty; and this should not be a surprising finding when the complications of OSAS are considered. The complications associated with OSAS are vast, which should alert clinicians to thoroughly investigate complaints of daytime sleepiness during the patient interview. Examples of complications include excessive daytime sleepiness, impaired concentration and memory, headache, depression, nocturnal epilepsy, episodic hypertension, dysrhythmias, heart block, angina, systemic hypertension, ischemic heart disease, congestive heart failures, stroke, pulmonary hypertension, cor pulmonale, diabetes, metabolic syndrome, insulin resistance, obesity, leptin resistance, nocturia, enuresis, impotence, polycythemia, hypoxemia, reperfusion injury, hypercapnia, intrathoracic pressure changes, subclinical inflammation, chronic liver injury, increased coagulation, endothelial dysfunction, vascular oxidative stress, sympathetic activation, vasoconstriction, increased levels of circulating catecholamines, tachycardia, impaired heart rate variability, and restless leg syndrome.[12,14,36-39]

The wide spectrum of complications is likely to be caused by the chronic inflammatory state associated with OSAS. Indeed, increased plasma levels of C-reactive protein (CRP) have been independently associated with OSAS, whereas the severity of OSAS is positively correlated with CRP levels.[2] C-reactive protein is widely accepted as an assessment for the extent of inflammation within the body. For example, in addition to cardiovascular and cerebrovascular disease, consistently elevated CRP levels have been strongly correlated with subclinical chronic inflammation and are suspected as an indicator of chronic diseases such as diabetes, hypertension, cancer, and osteoarthritis.[13,40-43]

Research has shown other inflammatory markers to be increased in patients with OSAS, such as interleukin-6, interleukin-8, tumor necrosis factor–α, leptin, resistin, adhesion molecules, and free radicals.[3,6,40,44-46] Elevated levels of these same inflammatory markers have also been implicated with increased risk of cancer death, cardiovascular and cerebrovascular disease, diabetes, and hypertension.[6,13,40,41,44-46]

Patients with OSAS also express an inflammatory spike following sleep as demonstrated by increased nasal pentane and nitric oxide levels.[47] Pentane is a nonspecific marker of inflammation and is the most common product of cell membrane polyunsaturated fatty acid peroxidation by free radicals. In addition to OSAS, acute asthmatic episodes, smoking, and cystic fibrosis are all associated with upper airway inflammation and demonstrate elevated pentane levels.[47]

Although CPAP is considered the most efficacious approach for managing nocturnal respiration in OSAS, nonpositive airway pressure devices, such as mandibular advancement appliances, are also available.[48-51] Research has yet to demonstrate that one device is consistently superior to others, and individual patient preferences play a role.[51-54] Several Cochrane reviews are available on the management of OSAS with CPAP and other oral appliances.[55-57]

The general use of a CPAP machine includes applying the facemask breathing apparatus with attached air hose to a bedside machine that constantly hums throughout the night. Getting in and out of bed requires attachment and reattachment of the facemask. Patients are often limited to back or side sleeping, which does not permit the user to fully roll over comfortably while sleeping. The cumbersome nature of the CPAP device does not typically allow for the restful sleep that normal individuals experience, and so even OSAS patients treated with the CPAP device are typically fatigued during the day.

Most authorities agree that medications are not generally effective, as there is no appropriate drug therapy for OSAS. A Cochrane review indicated that no significant beneficial effects were found for medroxyprogesterone, clonidine, mibefradil, cilazapril, buspirone, aminophylline, theophylline doxapram, ondansetron, or sabeluzole.[58]

A dietary method for managing OSAS?

It is now becoming increasingly understood that a chronic inflammatory state underlies the development and expression of most chronic diseases, including heart disease, cerebrovascular disease, peripheral vascular disease, cancer, diabetes, Alzheimer disease, arthritis, osteoporosis, and depression.[22-24,59-65] In other words, although the phenotypic disease expression of the chronic inflammatory state may be different, the underlying state is essentially the same and demands a similar treatment approach from the perspective of lifestyle. Indeed, Nicklas et al[66] explained that being overweight or obese, smoking, sedentary living, an inadequate intake of fruits and vegetables, and an insufficient intake of omega-3 fatty acids create a state of chronic inflammation, which can lead to various individual-specific disease expressions, such as coronary artery disease, congestive heart failure, stroke, age-related disability, diabetes mellitus, Alzheimer disease, and osteoarthritis.

Appreciating that a chronic inflammatory state underlies the expression of most diseases represents somewhat of a paradigm shift for most health care practitioners, which should lead to implementation of a 2-pronged treatment approach. In addition to using specific therapies that apply to individual conditions, such as CPAP for OSAS, treatment should also include lifestyle modifications that reduce the lifestyle-induced proinflammatory state, which should include appropriate dietary modifications and exercise.[22,24,64,66-69]

Franco et al[22] outlined an anti-inflammatory eating program called the *polymeal*, which consists of the following foods: fish, fruit/vegetables, spices such as garlic, nuts such as almonds, red wine, and dark chocolate. They estimate that such an eating program will lead to a 63% to 84% reduction in the expression of cardiovascular disease. Despite the cardiovascular disease focus of the polymeal, the same recommendations can be applied to many other chronic inflammatory conditions.[22,59,64] Essentially, patients need to focus their consumption on vegetables and fruits, omega-3 animal products if possible, lean animal protein, and raw nuts and rely less on food with less

nutrient density per calorie including grains, legumes, and dairy products.[22,24,59,64] This dietary approach is identical to the Dietary Approach to Stop Hypertension, save for the avoidance of grains, legumes, and dairy.[70]

Motivation is extremely important when assisting patients in the self-management of any chronic condition such as OSAS. Lifestyle changes are difficult for most individuals, and so physician and family support is extremely important. Although it is said that many OSAS patients are unable to realize a healthy lifestyle and sustained weight loss,[14] this sentiment should not be interpreted as a reason to avoid providing advice related to healthy living as a viable addition to palliative care. Accordingly, we strongly urge that physicians maintain an optimistic attitude and encourage their OSAS patients in their pursuit of appropriate anti-inflammatory lifestyle modifications. The case presented herein is an example of the potential success that can be achieved through one's dedication to living a healthy lifestyle. Of importance to note is that our patient was not monitored or counseled in the traditional dietician or nutritional counselor sense. The patient desired to function in an ad libitum fashion and was encouraged to do so as long as anti-inflammatory foods were the focus. Although this approach may be argued by some, there is no evidence to suggest that motivated individuals require counseling after a healthy eating program is outlined. Indeed, infants of weaning age are capable of choosing appropriate foods in a self-selection environment.[71,72]

Limitations

Although it is demonstrated in this case presentation that the therapeutic interventions that were used for this given patient proved successful, it would be irresponsible to suggest that such an intervention would lead to remission in all OSAS cases. The challenge with treating OSAS patients is identifying the underlying cause. Our patient was highly compliant and clearly a dietary responder, suggesting that excess body weight and chronic inflammation were the cause of OSAS in his case. A patient with lax, bulky, or malformed pharyngeal tissue also may not have responded well.

Conclusion

The prevalence of OSAS may be surprisingly high. One study suggests that approximately 1 in 5 adults has mild OSAS and 1 in 15 has moderate OSAS, whereas other reports indicate a prevalence of 2% to 5% of the adult population.[6,12-14] Based on the prevalence of OSAS, it is likely that many patients visiting a doctor of chiropractic will be suffering from OSAS as a secondary complaint. Although we agree that doctors of chiropractic function largely as spine care physicians,[73] it is clear that chiropractors can help manage proinflammatory conditions such as OSAS that can be treated with lifestyle interventions such as dietary modification.

To our knowledge, this is the first published OSAS case history wherein lifestyle modifications led to a complete resolution of the condition. Further research is recommended to identify which subset of OSAS patients would most likely respond to dietary modifications.

Funding sources and potential conflicts of interest

No funding sources were reported for this study. David Seaman is a consultant for Anabolic Laboratories, a nutritional supplement company; however, this patient appears to have achieved his outcome by diet and exercise. The supplements were secondary and not uniquely available from Anabolic. No other conflicts of interest were reported for this study.

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