Snoring: A Precursor to Medical Issues

INTRODUCTION

Snoring and the constant disruptions to sleep can cause severe sleep deprivation. If you’re snoring and suffering from sleep apnea, your sleep is no doubt being interrupted and can cause numerous problems. It can cause you to be unfocused in your waking hours, affect your memory adversely, increase risk for health problems such as type-2 diabetes, heart failure, stroke, or even dementia. Additionally, it can impact loved ones. Increased irritability as a result of sleep can affect the way a person interacts with loved ones or co-workers. It can also deprive a spouse or partner of sleep, which can not only lead to resentment, arguments, frayed nerves, and lost patience, it can also force a spouse or partner to experience the terrible physical and psychological effects of sleep deprivation such as fatigue, daytime sleepiness, clumsiness or weight loss or weight gain (PLOS Medicine, 2004). Sleep deprivation is a serious issue that can be just as harmful to the human body as starvation or dehydration. Sleep is necessary for survival and functionality.

Today, in our modern society, sleep deprivation is often dismissed as a common fact of life. Generally, modern society more often than not encourages day-time productivity and sleep curtailment is often considered harmless and efficient. The advent of artificial light has made it possible to increase or adjust time for work and leisure. People are able to work or sleep any time during the day. However, these adjustments in sleep schedules can result in substantial sleep loss. According to polls conducted by the National Sleep Foundation, the average duration of sleep for Americans had fallen to 6.9-7.0 hours. Moreover, during the second half of the 20th century, sleep duration has appeared to have decreased by 1.5-2 hours. Hence, today, many people are in bed only 5-6 hours per night on a regular basis (National Sleep Foundation, 2001-2002).

Sleep loss can have many adverse effects on the human body. A chronic sleep-restricted state can cause fatigue, daytime sleepiness, clumsiness and weight loss or weight gain. It can also adversely affect the brain and cognitive function. There are several adverse effects of sleep deprivation on the human body:

**Lower Metabolism:** Alterations of pituitary-dependent hormones during sleep loss with an increase in the early evening levels of the stress hormone cortisol and a decrease in nocturnal thyroid-stimulating hormone (TSH) by more than 30% (Lancet, 1999).

**Increased Appetite:** Sleep restriction is associated with reductions in leptin (appetite suppressant) and elevations in ghrelin (the appetite stimulant) and increased hunger and appetite, especially an appetite for foods with high-carbohydrate contents (Journal of Clinical Endocrinology & Metabolism, 2004).

**Risk of Diabetes:** Sleep loss may adversely affect glucose tolerance and involve an increased risk of type-2 diabetes with one study showing higher levels of blood glucose in the state of sleep debt despite normal or even slightly elevated insulin responses, causing significant impairment of glucose tolerance (Lancet, 1999).

**Brain Activity:** A 2000 study showed regions of the brain's prefrontal cortex, an area that supports mental faculties such as working memory and logical and practical reasoning, displayed more activity in sleepier subjects indicating that the brain of the average sleep-deprived subject had to work harder than that of the average non-sleep-deprived subject to accomplish a given task (UC San Diego Health System, 2006).

**Risk of Dementia:** A new study suggests people who have been diagnosed with sleep apnea or have trouble sleeping deeply may be at more risk of developing dementia. According to the Journal of American Academy of Neurology, people who spend less time in deep sleep are more likely to have a loss of brain cells compared to people who spent more time in deep sleep, also called slow wave sleep. A loss of brain cells is a trademark trait of Alzheimer’s disease and dementia (American Academy of Neurology, 2014).
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Side from poor sleep quality and daytime sleepiness, in recent studies, sleep-disordered breathing has been connected to insulin resistance and glucose intolerance, frequently found in people with type-2 diabetes. Type-2 diabetes is the most common form of diabetes, affecting 90% to 95% of the 26 million Americans (Centers for Disease Control and Prevention, 2013). People with type-2 diabetes make insulin; however, their bodies cannot make enough or cannot properly utilize the insulin. When there isn't enough insulin or the insulin is not used as it should be, glucose (sugar) can't get into the body's cells and when glucose builds up in the blood instead of going into cells, the body's cells are not able to work properly. Over time, increased levels of glucose in the blood can damage the nerves and small blood vessels of the eyes, kidneys, and heart and lead to atherosclerosis, or hardening of the arteries that can cause heart attack and stroke.

People who suffer from snoring are more at risk than others. Those that snore are more prone to be overweight, don't exercise, have high blood pressure, or have low HDL cholesterol are more at risk than others. However, recent studies show that there are more emerging risk factors than just the ones named above. According to the Journal of Internal Medicine, snoring can be a risk factor for the development of diabetes. Snoring can be defined as the vibration of respiratory structures and the resulting sound, due to obstructed air movement during breathing while sleeping. Sometimes the sound may be soft; however, it sometimes can be loud and unpleasant. In one study that the Journal of Internal Medicine published, out of 2,668 of men aged 30-69 years:

- 5.4% reported that they had developed diabetes during the 10-year period compared with 2.4% of those without habitual snoring
- 13.5% of obese snorers, developed diabetes compared with 8.6% of obese non-snorers

The study concluded that, in males aged 30-69 years, habitual snoring is associated with an increased incidence of diabetes within 10 years. Although obesity is the main risk factor for developing diabetes, coexistent habitual snoring may add to this hazard (Journal of Internal Medicine, 2000). Hence, snoring or disrupted breathing could very well be risk factor for Type-2 Diabetes. Furthermore, in addition to type-2 diabetes, snoring can often be a symptom or factor of other health problems.

Other studies show that snoring is also connected to obstructive sleep apnea (OSA), a medical condition in which a person's airway becomes partially or completely obstructed during deep sleep, which causes a temporary pause in breathing; this pause triggers the brain to arouse from sleep. These sleep disruptions can occur many times a night. These frequent awakenings have many repercussions including:

**High blood pressure:** Among patients with OSA and resistant hypertension, CPAP treatment for 12 weeks compared with control resulted in a decrease in 24-hour mean and diastolic blood pressure and an improvement in the nocturnal blood pressure pattern (Journal of the American Medical Association, 2013).

**Stroke:** In a cross-sectional study of 110 subjects (with severe snoring defined as greater than 50% of sleep time), subjects had significantly increased odds of carotid artery atherosclerosis. The study concluded that carotid artery tissue exposed to vibration produced dose-dependent endothelial dysfunction (Laryngoscope, 2013).

**Heart failure:** OSA is a well-documented risk factor for cardiovascular disease and mortality (Journal of the American College of Cardiology, 2008).

**Diabetes:** A study by Department of Medicine, University of Chicago evaluated the impact of untreated OSA on hemoglobin A1c (HbA1c), the major clinical indicator of glycemic control, in patients with type 2 diabetes and found a robust graded relationship between the severity of OSA and glycemic control (American Journal of Respiratory and Critical Care Medicine, 2010).

Sleep is essential to our cognitive functioning, our physical health and our mental health. Disrupted sleep can cause impairments in judgment, decision making, learning and general cognitive functioning. In addition it can negatively affect our moods and lead to irritability, anxiety and even depression.

Different methods of reducing snoring and/or sleep apnea include:

**Sleep Position:** sleeping on one's side will sometimes help solve the problem.

**Lose Weight:** extra fatty tissue in the throat area adds to the likelihood of snoring. Many people have reversed both a snoring and sleep apnea problem simply by losing weight.
Alcohol and Sedatives: Avoid alcohol and sedatives at bedtime. Alcohol and sedatives around bedtime can relax loose muscles in the throat even further leading to snoring and an increased likelihood of a blocked airway.

CPAP (Continuous Positive Air Pressure): A CPAP machine supplies pressurized air with a mask and tube that connects the nose and face. The increased pressure splints the airway and prevents collapse during sleep. It is 100% effective when used, but compliance with the treatment is low as a result of discomfort. Also, some feel that the tubing and sound from the machine are off-putting to sexual intimacy.

Anti-Snoring Oral Appliance: Dental mouthpieces hold the jaw in a forward position to open the airway in the back of the throat; this insures you get an adequate amount of oxygen. FDA-approved oral appliances are effective and well tolerated by most patients.

Surgery and Procedure Options for OSEA:

Soft Palate Surgeries:

Uvulopalatopharyngoplasty (UPPP): Enlarges the airway by removing or shortening the uvula and removing the tonsils and adenoids, if present, as well as part of the soft palate or roof of the mouth (Laryngoscope, 1989).

Expansion Sphincter Pharyngoplasty: Involves repositioning the muscle that is directly behind the tonsil, pulling the soft palate forward, with the goal of opening the area behind the soft palate for breathing (Kezirian, 2014).

Lateral Pharyngoplasty: Performed on patients who have tonsils, this procedure involves some tissue removal and extensive repositioning of soft palate tissue (roof of the mouth) as well as the lateral pharyngeal tissues (side of the throat) (Kezirian, 2014).

Uvulopalatal Flap: The lining of the mouth (mucosa) over a portion of the soft palate is removed to allow a folding of the soft palate muscle, making the soft palate shorter without removing muscle (Kezirian, 2014).

Palatopharyngeal Flap: Involves removing some of the hard palate (bone on the roof of the mouth) in the back where it meets the soft palate so that the soft palate can then be pulled forward and sewn into place (Kezirian, 2014).

Z-Palatoplasty: Partially divides the soft palate in the middle and pulling each half forward and laterally. This procedure works best for patients with scarring on the sides of the throat, which can occur after tonsillectomy or other previous soft palate procedures (Kezirian, 2014).

Relocation Pharyngoplasty: Involves sewing together the muscles on the side of the throat in a specific way and requires very little tissue removal (Kezirian, 2014).

Hypopharyngeal Procedures:

Tongue Radiofrequency: Involves a controlled cauterization of the tongue muscle that creates a scar that shrinks the tongue enough to make it less likely to fall back to block breathing during sleep (Kezirian, 2013).

Genioglossus Advancement: Involves cutting the portion of the bone in the lower jaw where the muscle attaches and pulling it forward to bring the anchor point of the tongue forward, thereby creating more room for the tongue to relax during sleep without blocking breathing (Kezirian, 2013).

Lingual Suspension/Tongue Fixation: Involves inserting a bone screw into the lower jaw and a cable is subsequently threaded through the base of the tongue and anchored to the bone screw (Laryngoscope, 1997).

Partial Glossectomy: A number of procedures that involve removal of a portion of the tongue for patients who have enlarged tongues due to large muscle mass and/or fat (Kezirian, 2013).

Hyoid Suspension: The hyoid bone is mobile and allows the structures that attach to it to collapse and cause airway blockage. The Hyoid Suspension procedure requires a neck incision to secure the hyoid bone, a U-shaped bone in the neck, either slightly downwards to the thyroid cartilage, or upwards to the lower jaw (Kezirian, 2013).

Maxillomandibular Advancement Surgery (MMA): In this surgery, the mandible and hyoid bone are surgically shifted forward to alter the position of the pharyngeal muscles and the base of the tongue. In MMA, both the upper (maxillary) and lower (mandible) jaws are cut and reconfigured (Laryngoscope, 1998).
Jaw advancement surgery can enlarge the space for breathing in the throat because the structures that surround the throat are effectively attached to the jaws. Advancing the jaws moves these structures forward, reducing their ability to produce blockage in the throat (Kezirian, 2014).

Genioglossal Advancement with Hyoid Myotomy (GAHM Surgery): In this procedure, the genial tubercle and the hyoid bone are advanced following a limited mandibular osteotomy. The hyoid is fixed to the anterior margin of the mandible or, in a more recent reform, fixed to the thyroid cartilage (Laryngoscope, 2014).

Pillar Procedure: Involves the insertion of 3-5 braided polyester implants (pillars) into the tissues of the soft palate at the back of the mouth (Kezirian, 2013).

Hypoglossal Nerve Stimulation (HGNS) Upper Airway Stimulation: Electrical signals are generated by an implanted neurostimulator and delivered to the ipsilateral HGN via an implanted cuff electrode. Respiration is monitored via implanted thoracic leads that sense changes in bio-impedance with chest wall motion, delivering stimulation immediately prior to and during the inspiratory phase of respiration, when the upper airway is most vulnerable to sleep related narrowing and collapse. HGNS can produce a significant decrease in OSA severity and a reduction in OSA-associated symptoms. One study showed a 67% postoperative success rate in the reduction of AHI (Apnoea–Hypopnoea Index) (SLEEP, 2011).

Although oral appliances are not FDA-approved specifically for obstructive sleep apnea, oral appliances have been suggested by the American Academy of Sleep Medicine for use in patients with mild to moderate obstructive sleep apnea and prefer them to continuous positive airway pressure (CPAP) therapy, or who do not respond to, are not appropriate candidates for, or who fail treatment attempts with CPAP. Several studies showed success rates in mild to moderate OSA averaged 57 to 81%. Success rates ranged between 14 and 61% among those subjects who were classified as severe (Apnea-hypopnea index defined as >30 in some studies and >40 in others). Most of the studies that showed success with mild to moderate OSA were designed on the general principle that advancing the mandible, and holding it forward during sleep, would allow unobstructed breathing (SLEEP, Vol. 29, No. 2, 2006). It is important to note that there are a number of over-the-counter oral appliances sold illegally on the Internet, which are not only ineffective, but also dangerous and can result in damage to the teeth, bone support and the jaw join.

Nonetheless, American Academy of Sleep Medicine maintains that the presence or absence of obstructive sleep apnea must be determined before initiating treatment with oral appliances to identify those patients at risk due to complications of sleep (SLEEP, Vol. 28, No. 4, 2005). Moreover, the severity of sleep-related respiratory problems must be established in order to make a proper treatment decision and that the ultimate judgment regarding propriety of any specific care must be made by the physician, in light of the individual circumstances presented by the patient, available diagnostic tools, accessible treatment options, and resources (SLEEP, Vol. 29, No. 2, 2006).

Ultimately, along with CPAP therapy, surgery remains one of the most viable options for treating snoring and OSA. Eric J. Kezirian, MD, MPH is a sleep surgeon in the Department of Otolaryngology-Head & Neck Surgery at the Keck School of Medicine of USC in Los Angeles, California and author of “Snoring without OSA and Health Consequences: the Jury Is Still Out” (SLEEP, 2013). He indicated that no single treatment is right for everyone.

“There is a wide range of surgical procedures available to treat snoring and obstructive sleep apnea. These procedures work to stiffen, remove or reposition tissues surrounding the airway to reduce the snoring vibration and open the space for breathing during sleep. Surgery can target the nose, soft palate, and/or tongue. A key part of evaluation by a surgeon is determining the cause of the snoring and sleep apnea in order to select procedures that will achieve successful outcomes in a personalized approach.”

- Eric J. Kezirian, MD, MPH
CONCLUSION

Sleep is essential for a person’s health and wellbeing. Most healthy adults are built for 16 hours of wakefulness and need an average of 8 hours of sleep a night. The harsh sound of snoring can disrupt a person’s sleep. In addition, it can also be a nuisance to a bed partner, which can often result in discord. More importantly, snoring can also be a symptom of an underlying health condition, which may lead to further health issues. Snoring has been linked to obstructive sleep apnea, diabetes, stroke, heart failure, dementia, and more. Left untreated, complications from snoring, disrupted breathing, and lack of sleep can often lead to fatal health problems.

There are different ways to stop snoring. Avoiding sedatives or alcohol before bedtime, changing sleep positions, losing weight or even surgery can often alleviate snoring. However, although lifestyle changes can often alleviate snoring, medical devices and surgery are also available. Oral appliances, CPAP machines, and surgery have positive success rates.

It is vital to seek the help of a medical professional in order to determine the best treatment plan. Doctors can conduct a sleep study or perform polysomnogram (PSG) and diagnose sleep disorders, including sleep apnea, which is often linked to snoring. For more information, contact your local health professional today.

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RESOURCES

The American Sleep Apnea Association
1717 Pennsylvania Avenue, NW Ste. 1025
Washington, DC 20006
Ph. 1-888-293-3650
https://www.sleepapnea.org

American Academy of Sleep Medicine
2510 North Frontage Road
Darien, IL 60561
Ph. 630-737-9700
https://www.aasmnet.org

National Sleep Foundation
1010 N. Glebe Road, Ste. 310
Arlington, VA 22201
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https://www.sleepfoundation.org

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ABOUT APNEA SCIENCES

snoring disorder and provides it under SnoreRx (http://www.snorerx.com) brand name. The company was founded in 2009 and is based in Laguna Niguel, California.

Apnea Sciences Corporation is dedicated to improving the lives of those who snore. Apnea Sciences encourages the community to prioritize healthy sleep and to create greater conversations to raise the awareness of the risks of untreated sleep disorders, such as sleep apnea.

The aim of this white paper is to increase awareness in the community, reduce unnecessary injuries, disabilities, and premature deaths associated with snoring and the resulting health risks.

If you are interested in joining sleep-related discussions, find us on:
https://twitter.com/snorerx or on https://www.facebook.com/pages/SnoreRx/213474948810872

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