



System and Method for Diagnosis, Monitoring, and Treatment of Obstructive Sleep Apnea

Key Investigator

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Field

Sleep Apnea

Technology

Medical Device
Treatment

Advantages

Improved Compliance

Status

Available for licensing University rights

Patent Status

PCT US/2019/014931

UMB Docket Reference

UMB-2018-039

External Reference

- Frost & Sullivan: American Academy of Sleep Medicine 2016
- Obstructive Sleep Apnea. Circulation 132, e114-e116 (2015)
- J. Am. Coll. Cardiol. 62, 569-576 (2013)
- BMC Pulm. Med. 14, 188 (2014)
- Proc. Am. Thorac. Soc. 5, 173-178(2008)

Related Docket References

JW-2013-068
JW-2016-017

Summary

Sleep Apnea treatment represents a \$6 billion market in the United States. Current treatment methods suffer from poor compliance rates. The inventors have proposed a novel ultrasound device to diagnose and treat sleep apnea.

Market

Obstructive sleep apnea (OSA) is a sleep disorder caused by repetitive episodes of upper airway obstruction that results in episodes of oxygen deprivation during sleep. OSA affects over 30 million Americans. Untreated OSA increases the risk of heart attack, stroke, and diabetes. Regularly disturbed sleep resulting from untreated OSA leads to significant neurological and psychological symptoms such as daytime sleepiness, chronic fatigue, depression, and cognitive impairment. The economic burden of untreated OSA estimated cost approaches \$150 billion per year.

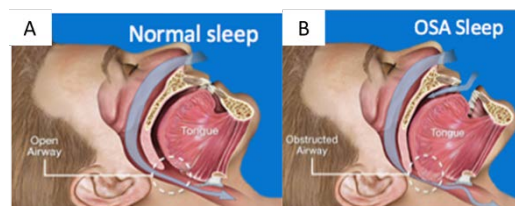


Figure 1: Airway collapse during OSA. (a) The upper airway is kept open by coordinated muscular action during sleep. (b) As muscle tone in the body relaxes during sleep, the soft tissues surrounding the upper airway can collapse obstructing airflow.

Technology

The principal treatment for OSA is continuous positive airway pressure (CPAP). CPAP is a positive airway pressure ventilator which applies a constant flow of air pressure to a patient's throat to ensure that the airway remains open during sleep. CPAP equipment is bulky and requires a patient to wear a mask that covers the patient's nose, mouth or both the nose and mouth. Although CPAP is an effective treatment for OSA, a significant portion of OSA patients do not initiate or abandon therapy. It is estimated that as many as 83% of patients cease CPAP treatment within a month. As a result, new methods for treating OSA are needed. One alternative involves the electronic stimulation of the hypoglossal nerve which has been shown to reposition the tongue, thereby reducing OSA. Unfortunately, the technique requires the surgical implementation of an electrode array into the patient's body, an expensive and risky alternative to traditional CPAP treatments.

The inventors are developing a noninvasive device that stimulates the hypoglossal nerve using ultrasound. The proposed device will integrate ultrasound transducer that will be used to detect an OSA event and when such an event is detected, provide ultrasonic transcutaneous stimulation to the hypoglossal nerve.

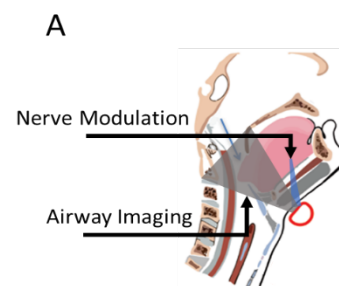


Figure 2: Schematic of ultrasound transducer placement and focal plane for imaging and stimulation.

Technology Status

Ultrasound identification of OSA has been proven. Work to develop a wearable device that can be used to image and treat an OSA event is planned.