**The Mallampati Index as a Screening Tool for Dementia Caused by Sleep Apnea**

By

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**Introduction**

 Dementia is a devastating disease that damages or destroys nerve cells in the brain. Persons with dementia experience a decline in memory, judgment, and cognitive skills, and eventually will be unable to care for themselves.1 Obstructive sleep apnea (OSA) is a breathing disorder that causes persons to stop breathing during sleep, thereby reducing oxygen levels to the brain. OSA has been linked to dementia.2 Research shows that 80-90% of obstructive sleep apnea (OSA) cases are undiagnosed.3 Patients with memory issues should be screened for OSA and OSA should be ruled out before a dementia diagnosis is made.

**Hypothesis**

 Diagnosis and treatment of obstructive sleep apnea, using screening tools, including the Mallampati Index, can reduce the cases of dementia.

**Obstructive Sleep Apnea (OSA)**

 Obstructive sleep apnea is a breathing disorder that causes persons to stop breathing hundreds of times during the night. This reduces the oxygen levels to the brain, which eventually causes memory problems.4 Sleep apnea doubles a person’s Alzheimer’s disease risk.5 Many research studies have linked sleep apnea to dementia. A VA Pacific Islands Health Care System study showed that elderly men with lower oxygen levels in their blood during sleep showed more “microinfarcts” in the brain. Microinfarcts are tiny brain abnormalities that may be a precursor to dementia.6 A Mayo Clinic patient with concentration issues was diagnosed with sleep apnea, and within a year of treatment, the patient’s neuropsychological tests were in the normal range.7

 Risk factors for sleep apnea are excess weight, family history, large neck circumference, being male, smoking, nasal congestion from allergies, use of alcohol, sedatives or tranquilizers, and having a narrow throat. Like dementia, sleep apnea increases with age.8 Persons with dementia may have another risk factor since some take sedatives or tranquilizers to control behavior.

 Loud snoring is a symptom of OSA. Anyone who snores loudly should be screened for sleep apnea.

 Nine percent of men have been diagnosed with sleep apnea, whereas only 4% of women have been diagnosed with sleep apnea.9 Women comprise 66% of Alzheimer’s cases.10 Older women may not receive proper screening since sleep apnea is usually associated with overweight men. As many as 80-90% of persons with sleep apnea have not been diagnosed.11

**The Mallampati Index**

 The Mallampati Index is a noninvasive visual assessment used to determine the difficulty of endotracheal intubation for administering anesthesia.12 Research trials have indicated that the Mallampati Index is a predictor of sleep apnea.13

 The Mallampati Index classification is determined by viewing the pharynx with the mouth open and the tongue at rest. The scale used is:

 Class 1: Entire tonsil clearly visible

 Class 2: Upper half of tonsil fossa visible

 Class 3: Soft and hard palate clearly visible

 Class 4: Only hard palate visible14

Pictorial representations of this scale are available on the internet.

 Class 1 patients have a wider opening and are less susceptible to having sleep apnea. Class 3 and Class 4 patients have a higher probability of having sleep apnea because their airways can easily become blocked.15 A study at the University of California at San Francisco Sleep Disorders Center found that for every 1-point increase in the Mallampati score, the probability of having sleep apnea increased more than 2-fold and the Apnea-Hypopnea Index (AHI) increased by more than 5 events per hour.16 AHI measures the partial and complete pauses in breathing while asleep. The Mallampati Index classification is a simple and non-invasive technique, and should be adopted as part of the screening process for OSA. Pictures in the literature displayed a variety of tongue positions (at rest, depressed, extended, etc.) for determining the Mallampati classification. The proper tongue position needs to be clarified to use the Mallampati Index classification as a screening tool and for data collection.

**Dementia**

 Alzheimer’s disease is the most common form of dementia and accounts for 70% of the cases. Vascular dementia accounts for 10% of the cases and occurs from blood vessel blockage or damage leading to infarcts (strokes) or bleeding in the brain. Persons with sleep apnea have more microinfarcts, so it is possible that sleep apnea is responsible for some vascular dementia cases. Of those with dementia, most have more than one type of dementia, or “mixed” dementia. The most common mixed dementia is Alzheimer’s disease and vascular dementia.17

 Family history is a risk factor for dementia. Persons with a parent or sibling with Alzheimer’s disease are more likely to develop the disease. They may inherit the APOE-e4 gene from one or both parents. However the presence of the APOE-e4 gene does not completely explain all Alzheimer’s cases in families.18 Similar throat structure (Mallampati Index Class 3 and 4) may explain some Alzheimer’s that runs in families. Similar throat structure may also help explain why African Americans and Hispanics have a higher incidence of Alzheimer’s.

**Sleep Apnea Diagnosis and Treatment**

 There is an established diagnosis and treatment protocol for persons suspected of having sleep apnea. The person is referred to a sleep specialist who will examine the patient and complete a survey with questions about sleep apnea risk factors and symptoms. If warranted, the person will be observed overnight in a sleep lab. During the sleep study, the person is connected to a machine that monitors the heart, blood oxygen levels, breathing patterns, lung and brain activity, and arm and leg movements while the person is asleep. The study will determine if the person has sleep apnea.19 Extra training and resources may be required to make the process more tolerable for persons with dementia. A family member may need to be present to help with patient comfort.

 There are home versions of the sleep study that could be more tolerable for a person with dementia. These studies measure heart rate, blood oxygen levels, airflow and breathing patterns. Further testing may be required for a sleep apnea diagnosis.20 A family member will have to administer the home sleep study.

 The most common form of OSA treatment utilizes a Continuous Positive Airway Pressure (CPAP) machine. The person wears a mask over their nose so that the CPAP machine can provide air to keep the airway open.21 Persons without dementia find CPAP machines uncomfortable, therefore persons with dementia may not be able to tolerate a CPAP machine. Other forms of treatment such as oral appliances or surgical options may have to be considered.

**Recommendations**

 There is substantial data to support the hypothesis, and the following recommendations should be implemented immediately. The cost of these recommendations is miniscule compared to the cost of and devastation to persons diagnosed with dementia and their loved one. The recommendations are:

1. Adopt a Mallampati Index classification of 3 or 4 as a risk factor for sleep apnea and include in OSA screening tools.
2. Screen new patients with memory issues for OSA using standard OSA screening tools and the Mallampati Index classification. Patients should be referred for an overnight sleep study based on the screening results.
3. Adopt OSA as an illness to rule out before a dementia diagnosis is made since a definitive dementia disease diagnosis is difficult to obtain.
4. Record the Mallampati Index classification for all persons in existing and new dementia research trials.

 A full evaluation of past and current studies on the relationship between OSA and dementia is needed. Then new research can be developed, such as trials to:

1. Establish the Mallampati Index classification for the general population that includes data by sex, race, and age. This data may already exist.
2. Establish the Mallampati Index classification for persons with dementia that includes data by sex, race, age, and dementia type.
3. Screen persons in the early stage of dementia for sleep apnea. Treat those who are diagnosed with OSA.

 I believe that implementation of these recommendations can begin to reduce the number of new dementia cases.

**Conclusion**

 OSA may be responsible for some cases of dementia. The use of an OSA screening questionnaire in conjunction with the Mallampati Index classification is a quick and cost-effective method of screening patients for OSA. Diagnosis and treatment of OSA is an established process and is covered by most insurance plans. The first four recommendations should be adopted immediately. Trials can then be developed to definitively confirm the hypothesis.

 Dementia is a complex illness with various types and causes. In spite of current research, it is projected that by 2025, there will be 1.4 million new cases of dementia.22,23 If the recommendations listed in this article are implemented, it is highly possible that up to 5% of these future cases can be prevented. This translates to 70,000 less people with dementia, 195,000 fewer unpaid caregivers,24 and $3.5 billion less spent annually by Medicare, Medicaid, and families on their medical care.25 Implementation of these recommendations can be one of the first steps to end Alzheimer’s disease.

**End Notes**

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