Treatment of mild obstructive sleep apnea using twin block oral appliance

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Abstract

Objective: Obstructive sleep apnea (OSA) is a condition where obstruction of upper airways appears periodically while patient asleep that can be complete (apnea) or partially (hypopnea). This condition is most common on male population with obese body. A prosthodontist can try to help by providing oral appliances (OA) for patient to use while they were asleep. OA were designed to thrust mandible forward and downward so that minimize the chance for obstruction of upper airways to occur.

Case Report: A forty years old patient was complaining about his bad sleep quality. He stated that he often awakens gasping for air while sleeping for almost 3 months, he also stated that he felt exhausted and sleep during daytime. Patient then prompted to undergo sleep test using home sleep test device ApneaLink Air from Resmed. According to the data gathered by the device, patient was diagnosed having mild sleep apnea and then treated with OA twin block.

Results: Patient felt improvement on his sleep quality, even though home sleep test while using oral appliance had not been done.

Conclusion: Oral appliance can be used to improve patient with mild obstructive sleep apnea sleep cycle.

Keywords: Mandibular advancement splint, Obstructive sleep apnea, Oral appliances

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Introduction

Obstructive sleep apnea (OSA) is state of the occurrence of upper airways obstruction periodically during sleep that might resulted in total obstruction of the airways (apnea) or partial obstruction of the airways. Obstruction might cause patient to awaken from his/her sleep due to the increased effort in breathing to maintain air supply in his/her body. OSA is linked to a various harmful effect, such as: daytime sleepiness, fatigue, impaired cognitive performance, an increased in occupational and traffic accident. Approximately 2–4% of middle-aged men and 1–2% of middle-aged women have clinically significant OSA. In obese males around 3–4 % have more than 5 OSAs per hour. OSA most commonly occurs in children around age 2-6 years and then become less frequent as the tonsils and adenoids involute. Adult population might develop OSA and the odds ratio are doubled every ten years.

Among the etiologic factors that might cause OSA, obesity is one of the major risk factors for OSA. This was caused by the surplus of adipose tissue that deposited around the neck rather than elsewhere in the body, might cause narrowing on upper airways. Adult with severe OSA might have few symptoms that can be felt by patient, such as: Noisy breathing or snoring, sudden awakening from sleep gasping for air, and tiredness during daytimes. Patient which had clinical feature, such as loud snoring, BMI > 40 kg/m2, daytime sleepiness, history of stroke, and neuromuscular disease can be categorized as high-risk population that might got OSA.

The gold standard to diagnose OSA is by applying series of examination from simple questionnaire and clinical examination to sleep test. The questionnaire that can be used for initial screening for possibilities that patient had OSA is the STOP-BANG questionnaire. Using this questionnaire patient is evaluated whether he/she had a snoring history, tiredness during daytime, had been observed gasping for air while sleeping, and history of high blood pressure value. Using this questionnaire, patient BMI also measured is it exceed 35 kg/m2, asked how old he/she is, is he/she older than 50 years old, circumference of the neck were also measured is it larger than 40 cm and patient gender were determine whether its male or female. For every question answered “yes”, the patient will receive 1 score, the OSA risk were then classified as low risk 0-2 score, mild risk 3-4 score, and high risk over 5 score.

The clinical examination that can be used to evaluate patient risk of having OSA is the Mallampati classification. Mallampati classification is an assessment to evaluate visibility of upper airways structure when patient sat in upright position and asked to straighten his tongue forwards while mouth wide open. The classification were divided into four...
case: Class I, soft palate, fauces, pillars and uvula are visible; Class II, soft palate, fauces and uvula area visible; Class III, soft palate and base of uvula are visible; and Class IV, soft palate is not visible at all.8 The higher the class of the Mallampati classification the higher the risk for the patient to have OSA.4,9

To determine grade of severity from patient with OSA, a polysomnography test need to be done. This test will record data while patient asleep during night time and that data can be extracted to be analyzed further.10 Data which will be recorded consist of electroencephalogram, electrooculogram, electrocardiogram, blood saturated oxygen level, breathing pattern or respiratory effort, air flow and hearth rate. Yet, the most crucial data obtained during recording is what was Apnea Hypopnea Index or can be shorten as AHI-Index. AHI-index determined as the occurrent off how many patient had hypopnea or apnea during one hour time of recording. OSA severity is defined as mild for AHI score >5 and <15, moderate for AHI score between 15 to 30, and severe if the AHI score was over 30.10,11

Case Report
Forty years male patient, working as dentist assistant were complaining about his condition that easily get tired while working. It was rather believed that he often awaken during night time as or gasping for air. It was also known that he often snored while sleeping. Patient did not mind that his case was published on clinical journal. A series of clinical examination from STOP-BANG questionnaire, Mallampati classification, and home sleep test were scheduled for this patient. Patient body appears to be slightly obese figure 1 with height 165 cm and weight 85 kg which resulted in his BMI around 31 kg/m2. Scoring for others STOP-BANG questionnaire answered “yes” except for the age of the patient which not yet reaches 50 years old. Here we can conclude that based on questions answer in STOP-BANG questionnaire patient can be categorized as high risk OSA patient.

The patients then evaluate with Mallampati classification. As Mallampati classification can be a useful tool to identification for patient with OSA1. Patient was instructed to sit with back straight against the backrest seat with head in an upright position. After that, he asked to move his tongue forward. The operator observed anatomical landmarks that was visible and determine which classification suited with patient condition. As we can see at figure 2, we can only see the hard palate of patient, so we concluded that patient on Class IV Mallampati and might had higher risk of OSA based on Mallampati classification.12,13

To determine the AHI score, patient was prompted to schedule home sleep test, using ApneaLink home sleep test device from Resmed. This device will be set up prior to patient sleep time and will record the saturated blood oxygen level, heart rate, breathing pattern and effort, and calculate the AHI score. ApneaLink device can be categorized as simple and user-friendly device, after 10 minutes of explaining and demonstrating how to set up the device patient already able to set up the device by himself figure 3A and figure 3B. The record should be lasted for minimum 3-5 hours so that patient should be encouraged to sleep early. After the recording process the device were delivered back to the clinic and the data will be extracted and printed on paper figure 4.

Result from the sleep test came out that

A CASE REPORT

Figure 1. Patient posture appearance frontal view

Figure 2. Patient evaluation for Mallampati classification.

Figure 3. A. Frontal apneaLink set up, B. Literal apneaLink set up.
patient got AHI score 5.1 figure 4. This patient can be categorized as mild OSA patient. Because of the diagnosis for this patient is stated, operator then determine the suitable treatment for this patient would be fabrication of OA or Mandibular Advancement Device (MAD). It was believed that OA may improve upper airways patency during sleep by enlarging the upper airways and retaining the tongue for not collapsing and clogging the upper airways. The golden standard for OSA patient treatment however is not OA, but the Positive Air Pressures device that applied during sleep. The acceptance from the patient for receiving the Positive Air Pressure relatively low for South East Asia population.

As stated before, the OA was fabricated to retained mandible in a slightly protruded position. With the expectations that this position clearing the airway and slightly holding the tongue so as not to fall back and obstruct the upper airway. The design in which we use for the OA is the non-titrable twin block appliances figure 5. The patient was instructed to use the device for the next 3 days and was scheduled to control his condition after using the device. On scheduled visits to the clinic after using the OA device, the patient stated that at first he was not accustomed to sleeping with the device in his mouth but later he became accustomed to OA and felt his sleep quality improved.

Discussion

Oral Appliances (OA) that are used in the management of mild to moderate OSA cases are usually in the form of tools that function to change the position of the mandible anteriorly, or hold and pull the tongue anteriorly, or prevent the soft palate and uvula from pressing downwards. As time goes by, the more popular OA used is OA with the function of advancing the mandible anteriorly. This was stated by a study conducted by Dieltjens which stated that OA who repositioned the mandible tended to be more acceptable to patients than OA who pulled the tongue position. Literature studies conducted by the American Academy of Sleep Medicine and the American Academy of Dental Sleep Medicine, stated that OA with the function of pulling the tongue position has clinical evidence of lower OSA treatment results compared to OA with the function of repositioning the mandible.

An OA that functions to reposition the mandible can be a prefabricated device or a device made specifically for one patient. Judging from the construction, this type of OA may consist of a splint block connecting the maxilla and mandible in a protrusion position, and an OA consisting of two splint blocks, the maxillary and mandibular splints, which when occluded are in a protruded mandibular position. In the manufacturing process, the mandibular repositioning type OA would be better if it included a regulating component that can vary the position. After that, he asked to move his tongue against the backrest seat with head in an upright position. Patient was instructed to sat with back straight and slightly obese figure 1 with height 165 cm and body mass index (BMI) 28.6. Patient body appears to be categorized as high risk OSA patient. It was also known that he often snored while sleeping. Patient did not mind that his case was categorized as high risk OSA patient. Here we can see at figure 2, we can only see the hard palate of patient and might had higher risk of OSA based on clinical evidence. As Mallampati classification can be a useful tool to identification for patient with OSA. As Mallampati classification was visible and determine which class the patient got: Class IV.

The patients then evaluated with Mallampati and STOP-BANG questionnaire, which not yet reaches 50 years old. Here we can see at figure 2, we can only see the hard palate of patient and might had higher risk of OSA based on clinical evidence. As Mallampati classification can be a useful tool to identification for patient with OSA. As Mallampati classification was visible and determine which class the patient got: Class IV.
able to OSA patients due to the ease of use and maintenance of the equipment used.

**Conclusion**

Upon treating patient wild mild OSA it is important to choose the most accepted treatment available and affordable. Patient quality of life can be improved just by using OA rather than expensive CPAP device when patient OSA classification is between mild to moderate OSA. Our OA patient that being treated with twin block oral appliances to move his mandible slightly forward and downward shows improvement in his sleep cycle during the night time while using oral appliance. Less fatigue and sleepiness were felt by him during day time due to better sleep quality.

**Acknowledgment**

None.

**Conflict of Interest**

The authors report no conflict of interest

**References**

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