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Impact of upper airway abnormalities on the success and adherence to mandibular advancement device treatment in patients with Obstructive Sleep Apnea Syndrome

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1. **When was the work published?**

   The article was published online by Elsevier Editora Ltda on September 7, 2015.

2. **What are the main points of the article? Write a 150- 200 word summary of the article that accurately conveys the content of the article.**

   Obstructive Sleep Apnea (OSA) is a form of sleep apnea that results from some degree of blockage in the upper airway. This obstruction occurs when the muscles in the tongue and throat becomes relaxed. One possible treatment is the use of a Mandibular Advancement Device (MAD). The MAD works by opening the collapsible part of the airway by shifting the mandible forward. As a result of moving the mandible forward, the device maintain the opening of the airway. The main goals of this research were to determine whether upper airway abnormalities have any effect on the success and adherence to Mandibular Advancement Device in people with Obstructive Sleep Apnea Syndrome. In doing so, the researchers assessed patients with mild to moderate OSA using a series of protocols, which includes questionnaire to measure the patients' sleepiness, polysomnography done during sleep and examination of patients' upper airway, neck and facial skeletal. The results from the procedure was used to separate patients into groups and further analysis was done to draw conclusions, report findings, and answer the questions posed by the researchers. The main conclusion from the study is that 64.3% of patients responded positively to the treatment with MAD, and 60.7% showed good adherence to treatment. The study concluded that patients with nasal abnormalities had a lower success rate to MAD treatment compared to patients without nasal abnormalities. However, adherence to the MAD treatment was not impacted by the presence of facial skeletal or upper airway abnormalities.

3. **Does the work meet the standards to be considered an appropriate/ academic/ scholarly source? Justify your choice.**

   Yes. This work can be considered an appropriate academic source for several reasons. First, the researchers in this study are professors in higher education or medical doctors, and holds either a medical degree, PhD degree or experience in the subject matter. Based on the language of the article, the intended audience are likeminded doctors, researchers and professors. The research is also published in a scientific journal titled, *Brazilian Journal of Otorhinolaryngology*, which aim at producing scientific findings to the scientific, scholastic and professional community. Finally, the format of the article follows a format that includes an abstract, methodology, results, conclusion and references that is generally seen in other academic articles.

4. **Are the qualifications of the author(s) appropriate for an academic article? Briefly describe the authors' qualifications.**

   Yes. Based on the topic of this research the qualifications of the authors are appropriate for this academic. Based on their qualifications, each authors that contributed to this research are subject matter experts in their respective fields. Renato Prescinotto has a medical and master's degree from the Federal University of Sao Paulo in Brazil. He specialized in Otorhinolaryngology. He published five scientific research papers and has vast experience in sleep medicine. Fernanda Louise has a master degree in Medicine of Otorhinolaryngology from Faculty of Medicine of ABC in Santo André, Brazil, and a PhD in Psychobiology from Federal University of Sao Paulo. He contributed to eight scientific publications and focuses mainly on sleep medicine. Ilana Fukuchi is a resident physician and specializes in Otorhinolaryngology. Luiz Carlos Gregorio has a medical,

master's and PhD degree in Otorhinolaryngology from Federal University of Sao Paulo. He focuses mainly in sleep apnea, snoring and continuous positive airway pressure. Paulo Afonso Cunali has a degree in Dentistry from Federal University of Parana, and a PhD in Occlusion. He focuses on treatment of sleep apnea and snoring with MADs. Sergio Tufik graduated in Medicine from Faculty of Medical Science of Santa Casa de Sao Paulo. He has a master in Physiology from University of Sao Paulo and a PhD in Psychopharmacology. Lia Rita Azeredo Bittencourt is an associate professor of Medicine and Sleep Biology at the Federal University of Sao Paulo.

5. **Is the purpose clearly stated? Restate the purpose of the paper in your own words.**

   Yes. The purpose of this research was to determine if irregularities in the upper airway, in patients diagnosed with obstructive sleep apnea syndrome, have any effect on using and sticking to the Mandibular Advance Device treatment.

6. **Is the experimental design clearly described? Describe the design in your own words.**

   Yes, the experimental design is clearly defined in the article. The experimental design included patients that were diagnosed with mild to moderate obstructive sleep apnea syndrome. Prior to using the MAD, patients were asked to complete a sleepiness questionnaire, which researchers used to measure patients' sleepiness. Researchers also measured patients' BMI and examined patients' upper airway, neck and facial skeletal, and performed sleep test at night. Patients were then given a custom made mandibular advancement device, which was adjusted to meet patients' comfort, and an overnight test was done to study the patients' sleep. This procedure was done on the first day patients were given the mandibular advancement device, and again after 120 days of using the

mandibular advancement device. During the length of the study, each patients was asked to complete a sleep diary and daily questionnaire about the use of the mandibular advancement device. Based on the results from the procedure, researchers were able to separate patients in groups with good and poor compliance, and groups with treatment success and treatment failure with the MAD. The groups were compared using the data from the patients' neck circumference and body mass index, sleepiness questionnaire, sleep study, daily questionnaire and diary, and the physical examination of their upper airway and facial skeleton.

7. **Have the possible influences on the findings been identified and controls instituted? Describe and evaluate the use of controls and possible influences (spurious variables)**

   Yes. The authors identified the factors that could affect the outcome of the experiment and took necessary steps to control them. The sample size did not include "patients with other sleep disorder rather than OSAS, with previous clinical or surgical treatments for OSAS, users of alcohol, stimulants or sedatives, those with loss of posterior dental support that would compromise the retention of MAD, those with active periodontal disease, and those with protrusion displacement greater than 6mm" (Prescinotto, 2015, p. 665). Since the authors identified patients with these factors, and took action to exclude these patients from the sample size, it is safe to say that the results of the study were not influenced by any spurious variables.

8. **Has the sample been appropriately selected (if applicable)? Describe the sample used in the study, and evaluate its appropriateness.**

Yes. The sample size was suitable for the experiment. The sample included 30 patients but only 28 completed the protocol and were included in the study. The sample size was taken from a clinic that focuses on sleep disorder, and patients were confirmed by sleep test to have mild to moderate obstructive sleep apnea syndrome. The patient's age ranged from 25 – 65 years and included both genders. Only patients with obstructive sleep apnea syndrome rather than other patients with **the loss of posterior dental support** because that would affect the retention of the mandibular advancement device. The sample was also appropriate for this study because every patient diagnosed with mild to moderate sleep apnea syndrome had an equal chance of being selected to participate in the study.

9. **Has the reliability and validity of the article been assessed? Evaluate, and state the test/diagnosis results.**

   The researchers sought out to determine if there were any impact to the success and adherence to using MADs in patients with OSAS. The study was conducted, and the test results measured exactly what the researchers wanted to determine. As a result, the researchers were able to conclude that 64.3% of patients reacted successfully to the mandibular advancement device treatment, and 60.7% showed good adherence to the mandibular advancement device. The study also concluded that neither upper airway nor facial skeletal irregularities had any significant connection to the treatment success or adherence. I believe the reliability of this article was also assessed because this article referenced other scholarly literature that performed similar studies and reported comparable results. For example, the authors of this study cited a published study by Marklund et al., which found that there was no meaningful relationship between adherence to mandibular advancement device and factors like upper airway

abnormalities, age, gender or nasal obstruction. The article by Marklund et al. was also published in a peer-reviewed medical journal, CHEST. In addition, there were 24 more studies that were referenced throughout the article, which helps to strengthen the reliability and validity of the findings.

10. **Is the experimental therapy compared appropriately to the control therapy? Describe and evaluate the use of the control group.**

    In this retrospective investigation, researchers collected data based on patients diagnosed with OSA. Although the study included a specialized sample population, there was no control therapy. All the patients in the sample population was diagnosed with mild to moderate obstructive sleep apnea syndrome confirmed by sleep test, and were candidates for mandibular advancement device treatment. The authors used the patients' clinical information, physical measurement, sleep test, patient daily questionnaire and sleep diary data in order to assess the sample population. Based on the results, the authors were able to divide the patients in several groups; treatment success, treatment failure, good adherence to mandibular advancement device and poor adherence to mandibular advance device. Each group was study to determine the success and adherence of mandibular advancement device treatment to obstructive sleep apnea. In one sense, the baseline data that was collected during the evaluation process, which was prior to the use of the MAD, could be considered the case control study. The data collected after the MAD was implemented is therefore compared to the case control study or control group.

11. **Is the investigation of sufficient duration? Evaluate, and explain your reasoning.**

    Based on the experiment design and its hypothesis, I think the duration of this experiment was sufficient. The experiment lasted for 120 days. The time is sufficient because it

allows researchers to adjust the MAD to the patients' comfort level. This is important because the data could be compromised and inaccurate if the device was uncomfortable and did not fit well in patients' mouth. Overall, I think this duration is adequate because it gives the authors an opportunity to capture any changes in patients sleeping behavior that could occur over time.

12. **Have the research questions or hypothesis been answered? Restate the research questions and/or hypotheses in your own words, and describe if or how they are answered.**

    Yes. The research questions were answered from the study conducted. The researcher wanted to evaluate patients with obstructive sleep apnea syndrome and determine whether upper airway abnormalities have an impact on effectively using and adhering to mandibular advancement device treatment. The researchers answered these questions by evaluating patients who were confirmed by sleep test to have mild to moderate obstructive sleep apnea syndrome, and who were candidates for mandibular advancement treatment. First, the researchers collected all the patients' clinical data, took measurement of their neck circumference and body mass index, examined their upper airway and facial skeletal, and performed overnight sleep test on the patients. Researchers recorded, analyzed and compared the data collected during the experiment protocol. Based on the results, the researchers divide the patients in several groups; treatment success, treatment failure, good adherence to treatment and poor adherence to treatment. Researchers used the baseline evaluation data, which did not include the use of the MAD, data collected once the MAD was used and highest comfort level was attained with the device, polysomnographic test data and the questionnaires data to answer the questions of their

research. The information revealed a decrease in the patients' sleepiness score from 13.4 ± 6.1 to 11.7 ± 6.3 ($p = 0.02$), measured using the Epworth Sleepiness Scale. It also showed a reduction of the Apean- Hypopnea Index, or number of apnea and hypopnea events per hour of sleep from 17.5 ± 8.8 to 8.8 ± 6.0 ($p < 0.001$). There was also a decrease in the amount of time where oxygen saturation was below 90%, from 0.71 ± 1.4 to 0.07 ± 0.14 ($p = 0.017$). Overall, after all the data was analyzed, the researchers concluded that 60.7% of the sample population had good adherence to MAD, and 64.3% responded positively with the MAD treatment.

13. **Do the interpretations and conclusion logically follow the experimental finding? Restate the conclusion, and explain if or how they follow the experimental findings.**

    Yes, the interpretations and conclusion were reasonable based on the findings from the experiment. After the study was conducted and the researched gathered all the data, they were able to conclude that mandibular advancement treatment were significantly lower in patients with upper airway abnormalities. The researcher also concluded that upper airway abnormalities did not affect adherence to the treatment using mandibular advancement device. The researcher used the data from their study to report conclusions that were supported based on the data only from this study. It also referenced other scholarly literatures that reported similar results from this study's findings.

14. **Do you agree or disagree with the article and findings? Explain why?**

    Based on the data presented in this article, I agree with the research findings. Obstructive Sleep Apnea occurs when some degree of blockage exists in the upper airway during sleep. This study was done to evaluate whether upper airway abnormalities has an effect on the success and adherence to Mandibular Advancement Device in people with

Obstructive Sleep Apnea Syndrome. In doing so, the authors isolated factors that could affect the outcome of the experiment and therefore presented unbiased results. The study reported that 64.3% of the patients attained successful treatment with the MAD, and there was a 60.7% of good adherence rate. It was also noted from the study that upper airway abnormalities did not have an impact on treatment adherence to MAD. Since the MAD opens the upper airway to allow for better breathing during sleep, it would be logical to think MAD treatment would be successful in patients who exhibits mild to moderate obstructive sleep apnea syndrome. The data presented supports that finding.

15. **What would you change in the article? Why? Think outside of the box. What would you add or delete?**

Though the mean age and body mass index of the patients in the sample population was 48.8 years and 27.4kg/m^2 respectively, the study did not disclose the mode in the sample size for age or BMI. I would have like the author to factor this information in their analysis of the results. The article indicated that treatment success was visible in the younger age in the sample population. It was also noted that success was lower in patients with weight gain. Therefore, the results could possibly be affected if the sample size consisted of more patients in the younger age range and of healthy weight. This is definitely something that I would change in the article. I would also remove the use of patients' diaries from the study, or perhaps use it for informational purpose rather than making it part of the results. Patients were asked to log the start and end time of their sleep, when they awakened during the night, and when they put on or removed the MAD. The information from the diaries were used to determine whether patients had good or poor adherence to the MAD. The data could be corrupted if the patient forgot to update

their diaries or provide vague entries in their diary. Therefore, I would not make the diary data part of the findings.