AAO Foundation Award Final Report

Type of Award: Orthodontic Faculty Development Fellowship Award

Name of Principal Investigator: Ahmed Ghoneima

Title of Project: Cone beam computed tomography and airway analysis in obstructive sleep apnea

Period of AAOF Support: (07-01-13 to 06-30-14)

Amount of Funding: $ 15,000

Summary/Abstract: **Objective:** The purpose of this study was to determine the effects of using the elastic mandibular advancement (EMA) appliance on the airway dimensions and on the severity of obstructive sleep apnea (OSA). **Materials and Methods**: Following IRB approval, 45 male Caucasian subjects (mean age 47.3 ± 9.8 yrs) were recruited to participate in the study. Subjects were classified as control group (G1) and OSA group based on an examination by a physician and results of a sleep apnea test. The OSA group was further divided into 3 groups (G2: mild, G3: moderate, G4: severe) based on the severity of the disease and their apnea-hypopnea index level (AHI). OSA subjects were provided with a custom made EMA appliance and home sleep test device a Watermark (ARES™) to monitor their sleep apnea condition overnight. Cone beam computed tomography images were taken twice for each subject prior to treatment and at 2-months into treatment with the EMA appliance in place. Digital 3D models for the airway and the craniofacial skeleton were constructed using 3D Dolphin imaging software. The selected airway volumetric and linear parameters as well as the most constricted area of the airway (MCA) were measured and summarized by the OSA group. The differences in the measurements with and without the appliance were compared using repeated measures analysis of variance (rmANOVA) and $p \leq 0.05$ was considered statistically significant. **Results**: With the use of EMA, statistically significant increases were recorded in the nasopharynx, oropharynx, MCA, and total airway volume while nasal cavity volume, soft palate area, soft palate length and width decreased significantly in OSA groups. The throat angle, sagittal depth of the airway at nasopharynx and oropharynx, lower anterior facial height, posterior facial height and mandibular plane angle increased significantly in SA groups. Groups 2 and 3 showed

significant increase in the soft tissue thickness of the airway at the nasopharynx and oropharynx levels, while in group 4 the increase was only significant at the oropharynx level. The upper posterior facial height and overbite decreased significantly with the use of EMA in OSA groups, while overjet decreased significantly in groups 2 and 3. Patients with moderate and severe OSA demonstrated mean reduction in the severity of OSA, as indicated by the statistically significant decrease in their apnea-hypopnea index and Epworth score. **Conclusion:** The results confirmed the effectiveness of EMA in the treatment of OSA patients, particularly the moderate and severe cases.

Response to the following questions:

1. Were the original, specific aims of the proposal realized?

Yes

2. Were the results published? If not, are there plans to publish? If not, why not?

The manuscript is currently under submission to the AJODO.

3. Have the results of this proposal been presented? If so, when and where? If not, are there plans to do so? If not, why not?

The results of this proposal are planned to be presented at the AAO annual session 2015, IUPUI Research Day, and Burstone Symposium.

4. To what extent have you used, or how do you intend to use, AAOF funding to further your career?

The award provided me with the necessary fund for the successful completion of the project. The fund has also assisted me paying part of the tuition for my part-time faculty advanced standing orthodontic residency program. I consider both the program and the project two major steps in enhancing my career. I was honored to be the recipient of the AAOF award that supported me during this critical period of my career establishment.