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AAO Foundation Final Report Form

Type of Award: **Biomedical Research Award**

Name of Principal Investigator: **Benjamin Pliska**

Institution: **University of British Columbia**

Title of Project: **The effects of simulated arch constriction on airway function during sleep**

Period of AAOF Support: **07/01/19 to 06/30/20, with No Cost Extension granted to 06/30/23**

Amount of Funding: **\$30,000**

Summary/Abstract

Study Objectives: Recently, it has been speculated that changes to the dental arch form following orthodontic treatment with extractions may have negative effects on the upper airway space. With relation to obstructive sleep apnea, a reduction oral cavity volume could potentially lead to posterior positioning of the tongue and an increase pharyngeal collapsibility. This study used level-3 polysomnography to characterize the functional changes to the airway while wearing an oral appliance simulating severe arch constriction.

Methods: For this single-blinded prospective randomized cross-over trial, 34 participants were recruited from the student/staff population of the Faculty of Dentistry at the University of British Columbia. The Epworth Sleepiness Scale, STOPBANG questionnaire, lateral cephalograms and digital dental casts were gathered from all subjects. Arch constriction was simulated by adding 5mm to the lingual/palatal aspects of the dentition using vacuum-formed retainers (VFR). Each participant completed three at home sleep studies with a level-3 sleep monitor: The initial baseline test, and after random allocation of 7 days to either the control appliance (regular VFR), or the simulated arch constriction appliance (thick VFR), following a crossover of appliances. Mean PO₂ and RDI were gathered and compared from the three sleep studies.

Results: Paired t-tests of RDI from all three groups showed no statistical significance: Control vs. regular VFR (p=0.896), control vs. thick VFR, (p=0.055) and regular VFR vs. thick VFR(p=0.100). 5 of 34 participants had RDI values ≥ 5.0 for at least one of the studies. Respective RDI comparisons in these subjects with sleep-disordered breathing showed no statistical significance between sleep studies(p=0.262, 0.803, 0.329).

Conclusions: Simulated constriction of dental arches did not result in significant changes of the respiratory disturbance index or blood oxygen levels during sleep.

Clinical Significance: Claims that orthodontic treatment involving extractions negatively affect airway function during sleep are not supported by the results of this study.

Were the original, specific aims of the proposal realized?

Yes – the original aims of this project have been successfully realized. The results of this study have provided initial evidence that the constriction of the dental arches and crowding of the tongue space within the oral cavity using this simulated arch constriction protocol, does not negatively impact respiratory function during sleep in a cohort of healthy adults.

With the feasibility of this line of research and protocol proven successful, I plan to investigate this same question in differing patient populations, notably patients with OSA who use CPAP to manage their disease, in the near future.

This BRA award has contributed to the MSc. thesis project of an orthodontic graduate resident at the UBC Faculty of Dentistry, and created a line of research that will be pursued as my career progresses.

Were the results published or presented?

The results of this study have yet to be published, though the data will be submitted for the poster presentations at upcoming research and orthodontic conferences – notably the PCSO 2023 meeting and AAO 2024 annual session. As the orthodontic resident assigned to this project finalizes her MSc. thesis in the Fall of 2023, the results will be prepared and written up for publication in the orthodontic literature in order to be disseminated to a wide audience. The AAOF will be recognized for the integral role the funding provided played in success of the project.

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

The funding from the AAOF was vitally important to this project, without which it is unlikely that it would have been initiated. I have been fortunate to have benefited from direct support from the AAOF multiple times in my career, and each time this has allowed me to pursue projects of significant importance and interest to the field of orthodontics and affiliated health sciences. This project has been allowed me to create a new line of clinical research for myself and future orthodontic residents at the University of British Columbia, making a true impact in the advancement my academic career.

Accounting for the Project:

All funds distributed for this project have been completely exhausted, and were used as planned and stipulated in the originally approved budget.