

AAO Foundation Award Final Report

Type of Award: Biomedical Research Award

Name(s) of Principal Investigator(s): Benjamin Pliska DDS MS FRCD(C)

Title of Project: Maxillary Expansion Treatment of Pediatric Obstructive Sleep Apnea

Period of AAOF Support: 07-01-13 to 06-30-15 (extension granted 12-31-14)

Amount of Funding: \$25,000

Abstract:

Objectives: Obstructive sleep apnea (OSA) in children is a common and serious disease effecting 1-5% of the population. Potential causes of OSA in children include adenotonsillar hypertrophy, obesity, neuromuscular disease and craniofacial abnormalities. The orthodontic correction of posterior crossbite and mandibular retrusion has been shown to be effective at ameliorating OSA symptoms. However it is currently unknown to what extent these forms of orthodontic treatment may be suitable in patients presenting to a tertiary care center for assessment and treatment of suspected OSA. The aim of this study is to report the incidence of malocclusion, and therefore indications for orthodontic treatment, of a population of children with suspected OSA.

Methods: Data collection consisted of a retrospective chart review of 110 patients between the ages of 5-10 referred to the OSA clinic at BC Children's Hospital over a 14 month period. All patients underwent a full clinical assessment by the attending otolaryngologist and orthodontist. The patient record provided comprehensive information regarding the patient history and soft tissues, as well as dentofacial features. Characteristics related to specific indications for early orthodontic intervention were recorded.

Results: The average patient age was 6.3 years. In terms of maxillary constriction, 13.6% of patients had a posterior crossbite, while 4.5% of patients had anterior crossbite. An increase overjet greater than 7mm was reported in 3.7% of patients, and 9.3% of patients presented with an overbite of more than 90%.

Conclusion: Maxillary expansion and mandibular advancement were indicated in 14% and 4% of the sample, respectively.

Questions:

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

The broad objective of this study was to develop a better understanding of the patients most likely to benefit from orthopedic intervention for OSA. To this end and as describe in the above abstract, I was able to determine in what percentage of a patients presenting to a hospital-based clinic with suspected OSA, would orthodontic intervention be possible.

The **specific aims** of the project were:

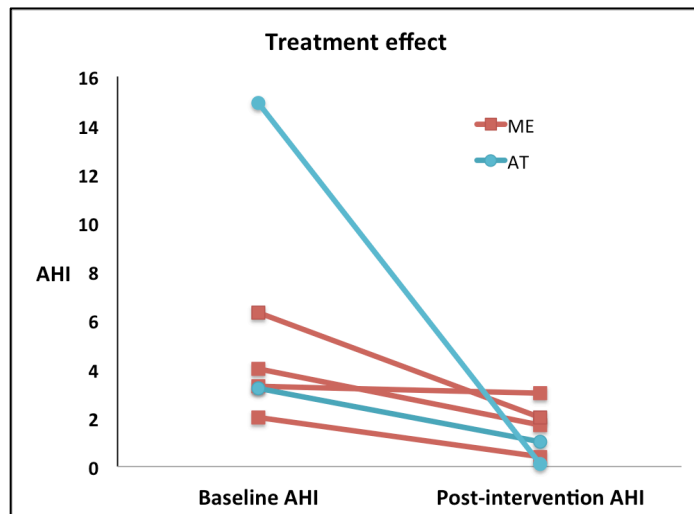
- I. To compare maxillary expansion (ME) and adenotonsillectomy (AT) in a pilot randomized controlled single-blinded crossover study in children with mild to moderate OSA.
- II. To assess the study methodology and feasibility, thereby facilitating the design of a larger-scale, adequately powered study to obtain a definitive comparison of maxillary expansion vs. adenotonsillectomy.

Though underpowered due to a small sample size, these aims have been realized and can be highlighted in the following **outcomes**:

Outcome I

- For the period of funding a total of 160 patients referred to BC Children's Hospital with suspected OSA were screened for participation in the trial. 19 patients met the defined clinical eligibility criteria, 18 of which consented to trial participation and were enrolled for a baseline sleep study. Following the baseline sleep study 8 patients were found ineligible (AHI < 2.0 or > 25.0) or withdrew from the trial. The planned interventions were performed on a total of 6 patients who were randomized to initially receive ME treatment and 4 patients who received AT as initial treatment. At the end of the funding period, final data was available on 6 subjects and is presented in Figure 1.

Figure 1: Primary outcome data of apnea-hypopnea index (AHI) for trial subjects



- In children presenting with mild to moderate OSA and maxillary constriction, rapid palatal expansion may be an effective first line of treatment. A larger sample size is required to confirm this with sufficient statistical certainty; however in our limited sample 75% of children were successfully treated first with rapid palatal expansion.

Outcome II

- Through this project the orthodontic assessment of children with suspected OSA has become standard practice at BC Children's Hospital and key collaborative research relationships have been established between the Division of Orthodontics and the Departments of Respiriology and Otolaryngology. The interdisciplinary care of OSA patients established through this project's protocol was used as the model for a multi-centered clinical trial operating grant application to the Canadian Institutes of Health Research in March 2015.

2. Were the results published?

The results presented in the above abstract have been submitted for publication to the journal Sleep Medicine, and the manuscript is currently undergoing peer-review. The clinical data from the randomized trial will be published following the collection of results of an adequate sample size.

During the period of funding the following related manuscripts were published:

- **Pliska BT**, Nam H, Chen H, Lowe AA, Almeida FR. Obstructive Sleep Apnea and Mandibular Advancement Appliances: Long Term Occlusal Effects and Progression of Changes. Journal of Clinical Sleep Medicine 2014;10(12):1285-91
- Zou B, Zhou Y, Lowe AA, Li H, **Pliska B**. Changes in anteroposterior position and inclination of the maxillary incisors after surgical-orthodontic treatment of skeletal class III malocclusions. Journal of Cranio-Maxillofacial Surgery 2015; doi: 10.1016/j.jcms.2014.12.013.
- Quo SQ, **Pliska BT**, Huynh N. Oropharyngeal growth & Skeletal Malformations. Chapter In: Kryger M, Roth T, eds. Principles and Practice of Sleep Medicine, Sixth edition. Elsevier, 2015.

3. Have the results of this proposal been presented?

Yes, the results of the related work has been presented at the following conferences:

Orthodontics for the Otolaryngologist BCCH Pediatric Otolaryngology Residency Program Vancouver, BC	November 2013
Dentofacial Orthopaedics in the Treatment of Pediatric OSA AAO 2014 Annual Session – Doctors Scientific Program New Orleans, LA	April 2014
Dental Treatment Options for Pediatric SDB: Who, What, When? American Academy of Dental Sleep Medicine 23rd Annual Meeting Minneapolis, MN	May 2014
Sleep Disordered Breathing in Children American Association of Orthodontists Winter Conference Miami, FL	February 2015
The Role of Dentistry in Pediatric Sleep Disorders SickKids Hospital - Pediatric Sleep Symposium Toronto, ON	March 2015
Dentofacial Morphology in Obstructive Sleep Apnea American Academy of Dental Sleep Medicine 24th Annual Meeting Seattle, WA	June 2015
Sleep Disordered Breathing in Children Dental Specialists Society of British Columbia – Annual Symposium Vancouver, BC	June 2015

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

The AAOF support in the form of this Biomedical Research Award has provided the funds necessary to to run a pilot study examining the interplay between craniofacial morphology and obstructive sleep apnea in children. This has allowed me to form key research partnerships with medical colleagues at BC Children’s Hospital and generate the data necessary to apply for grant funding from Canadian health agencies for larger clinical investigations. In short, the AAOF has been instrumental in creating an important and productive line of research for my academic career.