

AAO Foundation Final Report Form

1. Type of Award: Orthodontic Faculty Development Fellowship Award (OFDFA)
2. Name of Principal Investigator: Thikriat Al-Jewair, BDS, MSc, MS, FRCD(C)
3. Title of Project:
 - a. A longitudinal pilot study of the effects of clear aligners on upper pharyngeal airway dimensions in adults with class II malocclusion: A CBCT and sleep questionnaire study
 - b. The effects of vibrational appliances on maxillary canine retraction
4. Period of AAOF Support: 07-01-18 to 06-30-19 (extension until 08-30-2019)
5. Amount of Funding: \$20,000

Summary/Abstract of Completed Projects:

1. **Effects of Mechanical Vibrations on Maxillary Canine Retraction and Perceived Pain: A Pilot, Single-Center, Randomized Controlled Clinical Trial**

The aim of this study was to investigate the effect of mechanical vibratory stimulation on maxillary canine retraction and pain perception in adolescents undergoing full-fixed orthodontic treatment with extraction. A pilot randomized controlled clinical trial was conducted at the University at Buffalo orthodontic clinic. Twenty-one healthy adolescents who underwent full-fixed orthodontic treatment with maxillary first-premolar extraction were recruited. Subjects were randomly assigned to the experimental group (N=10) that used a mechanical vibration device or the control group (N=11) that did not receive a vibration device. The evaluation timepoints were T0= Day of initial canine retraction; T1=4 weeks post-initiation; T2=8 weeks post-initiation and T3=12 weeks post-initiation. Three-dimensional palatal landmark superimpositions were made to assess amount of tooth movement (mm) at each visit, monthly rate of tooth movement (mm), and perceived pain levels (VAS scores). The total amount of tooth movement was observed in the control versus experimental groups respectively as 1.12 ± 0.22 mm versus 1.39 ± 0.36 mm at 4 weeks ($p=0.05$), 2.59 ± 0.37 mm versus 2.49 ± 0.76 mm at 8 weeks ($p=0.702$) and 3.54 ± 0.23 mm versus 3.37 ± 1.37 mm at 12 weeks ($p=0.716$). The rate of tooth movement was 1.21 ± 0.32 mm/month in the control and 1.12 ± 0.20 mm/month in the experimental groups which was not statistically significant at any of the timepoints and neither was the level of pain. This study found no statistically significant differences in canine retraction and pain perception between the experimental and control groups.

2. **Effects of clear aligner therapy for Class II malocclusion on upper pharyngeal airway morphology and daytime sleepiness**

The aim of this study was to evaluate the effects of clear aligner therapy (CAT) on the upper airway dimensions and on daytime sleepiness in adult subjects with dentoskeletal class II malocclusion. This pilot prospective cohort study was conducted from August 2017 to February 2019. Inclusion criteria were healthy females and males over the age of 18 years, Angle class II division 1 malocclusion, first molar relationship of end-to-end or greater, overjet <10mm, and presenting for multi-arch comprehensive orthodontic treatment with clear aligners. Treatment mechanics included mandibular dentoalveolar advancement with class II elastics without maxillary sequential distalization programmed into aligners. Post-treatment changes in dentoskeletal cephalometric measurements and upper airway dimensions were assessed using CBCT images. The treatment effect on daytime sleepiness was evaluated using an Epworth Sleepiness Scale (ESS). No statistically significant treatment changes were observed in upper airway dimensions or dentoskeletal cephalometric analyses. Subjects with excessive daytime sleepiness at pre-treatment reported an improvement post-treatment, but no significant difference in the mean ESS

score was found. Treatment of class II division 1 malocclusion in adults by mandibular dentoalveolar advancement using CAT has no statistically significant effects on the airway morphology or daytime sleepiness.

Were the original, specific aims of the proposal realized?

Yes. In terms of teaching, as graduate program director, I am involved in clinical teaching, didactics, and research in the advanced orthodontic program, where I have served as the course director for multiple courses. Additionally, I attended multiple workshops and courses on teaching and learning, with a focus on assessment and feedback. I have reviewed and improved my courses by working with colleagues and mentors. In terms of education, I attended multiple conferences and workshops, such as the 2018 Educational Leadership Conference hosted by the Society of Educators, the 2018 NESO Annual meeting, and the 2019 Dental Sleep Medicine meeting. The knowledge and experience I gained from these meetings were invaluable. I also participated in professional development seminars at the University at Buffalo and University of Missouri-Kansas City. With respect to research, I was able to complete the two projects funded by the AAOF award, as well as to conduct several other studies that were published during the funding cycle (details included below). Moreover, I realized the aim of improving my clinical skills in the areas of 3D imaging and micro-implant supported expansion. It would not have been possible to attain the above goals without the AAOF's support and that of my mentors, who were instrumental in helping me to excel this past year.

Were the results published?

1. Effects of Mechanical Vibrations on Maxillary Canine Retraction and Perceived Pain: A Pilot, Single-Center, Randomized Controlled Clinical Trial

The study was accepted in the Journal of Odontology and the article is *In Press*.

1. Effects of clear aligner therapy for Class II malocclusion on upper pharyngeal airway morphology and daytime sleepiness

A manuscript was drafted and it will be submitted to an orthodontic journal.

Was AAOF support acknowledged?

Yes, the support of the AAOF was acknowledged.

Have the results of this proposal been presented?

Yes, the results were presented at the following meetings:

- 97th general Session & Exhibition, IADR/AADR/CADR Annual Meeting. Effects of vibrational appliances on orthodontic tooth movement and perceived pain. J Dent Res 98 (Spec Iss A): 1698, 2019. Taha K, Al-Jewair T, Warunek S, Conley R, Arany P.
- 2017 NESO Annual Meeting. A Randomized Controlled Trial on the effects of vibrational appliances on canine retraction and perceived pain. Taha K, Al-Jewair T, Warunek S, Conley R, Arany P.
- 2020 IADR Annual Meeting (submitted). Effects of clear aligner therapy for Class II malocclusion on upper pharyngeal airway morphology and daytime sleepiness. Al-Jewair T, Kurtzner K, Giangreco T, Warunek S, Lagravere-Vich M.

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

AAOF's support has had a significant impact on my career. The projects that were funded and the research that was conducted allowed me to collaborate with colleagues from various institutions and to participate in multiple meetings. The results of the first study above were shared with the orthodontic community. The same will be done with the second study, now that it has been completed. The funds were also used to support my development as a clinician and an educator. My resume has been significantly boosted by the activities that this AAOF award has enabled me to engage in. Please see the summary of activities in which I was involved during the funding cycle.

Accomplishments during the award cycle:

Book Chapter:

1. Al-Jewair T, Farsaii A. Toward evidence-based precision orthodontics. In: Kim-Berman H, Franchi L, Ruellas A, eds. *Effective, Efficient and Personalized Orthodontics: Patient-centered Approaches and Innovations*. Craniofacial Growth Series, Department of Orthodontics and Pediatric Dentistry and Center for Human Growth and Development, The University of Michigan, Ann Arbor, MI 2018;55:27-50.

Refereed Journal Articles:

1. Al-Jewair T, Herbert AK, Leggitt VL, Lee Ware T, Hogge M, Senior C, Carr R, Da Silva J. (August 2019) Evaluation of Faculty Mentoring Practices in Seven U.S. Dental Schools. *J Dent Educ*. DOI: <https://doi.org/10.21815/JDE.019.136>.
2. Al-Jewair T, Kumar S. (July 2019) Review and application of the Mini-Clinical Evaluation Exercise (Mini-CEX) in advanced orthodontic education: a pilot study. *J Dent Educ*. DOI: 10.21815/JDE.019.131.
3. Hasanin M, Kaplan S, Hohlen B, Lai C, Nagshabandi R, Zhu X, **Al-Jewair T**. (July 2019) Effects of Orthodontic Appliances on the Diagnostic Capability of Magnetic Resonance Imaging in the Head and Neck Region: A Systematic Review. *Int Orthod*.17(3):403-14.
4. Lai C, Bush P, Warunek S, Covell D Jr, Al-Jewair T. (May 2019) An In-Vitro Comparison of Ultraviolet Versus White Light in the Detection of Adhesive Remnant During Orthodontic Debonding. *Angle Orthod*. 89(3):438-445.
5. Manzella K, Warunek S, Conley RS, Al-Jewair T. (November 2018) A Controlled Clinical Study of the Effects of the Ni-Ti Memoria® Leaf Spring Activated Expander. *Aust Orthod J*. 34(2):196-201.

Oral Presentations:

1. The 51st Annual Scientific Congress of the Korean Association of Orthodontists, South Korea: "Upper and lower body heights may predict craniofacial growth in adolescents with Class I occlusion." 2018
2. 96th General Session, IADR Annual Meeting, London. "The efficacy of oral appliance therapy in adults with sleep-disordered breathing: A logic model framework." 2018

Poster Presentations:

1. Al-Jewair T, Ghorbani R, Franchi L. Comparison of treatment outcomes with crowned and banded mandibular Anterior Repositioning Appliance (MARA): a clinical controlled study. *J Dent Res* 98 (Spec Iss A): 3851, 2019.

2. Lowe R, Makowka S, Manzella K, Warunek S, Al-Jewair T. Forces generated by the NiTi Memoria Leaf Spring Activated Expander. J Dent Res 98 (Spec Iss A): 2701, 2019.
3. Marwah S, Wu Y, Yu G, Al-Jewair T. Correlation between craniofacial structures and nasopharyngeal airway in pubertal adolescents. J Dent Res 98 (Spec Iss A): 0894, 2019.

Meetings attended:

1. American Board of Orthodontics Educator/Advocate Workshop
2. Jeryl English Educational Leadership Conference, Society of Orthodontic Educators
3. The 119th American Association of Orthodontists Annual Session
4. Greater Kansas City Orthodontic Meeting
5. 2018 ADEA Annual Session and Exhibition
6. American Academy of Dental Sleep Medicine Annual Meeting
7. The 51st Annual Congress, Korean Association of Orthodontists
8. 2018 NESO Annual Meeting
9. 96th General Session & Exhibition, IADR Annual Meeting

Respectfully,

T. Al-Jewair