

AAO Foundation Award Final Report

Principal Investigator	Dr Jennifer Brien Orthodontic resident (Masters thesis on the project)
Co-Investigator	Dr Andrée Montpetit (recipient of the OFDFA award) Assistant Professor Director of the project
Secondary Investigators	Dr Nelly Huynh Assistant Professor Co-director of the project
Award Type	2013 “Subtelny, Baker, Eastman Teaching Fellowship Award”
Project Title	“Effect of Continuous Wear of Invisalign Trays on the Temporomandibular Joints (TMJ) and Muscles of the Facial Complex”
Project Year	2013-2015
Institution	University Of Montreal
Summary/Abstract	<p>INTRODUCTION: The temporomandibular joint (TMJ) is a complex articulation susceptible to pain due to dysfunctions. Fifty percent of the population shows some signs of TMJ dysfunction with a higher prevalence in females. The etiology of temporomandibular disorders (TMD) is still unclear and whether orthodontic therapy is a risk factor is a question that has long been discussed. A well-accepted treatment for TMD is the occlusal splint. Previous studies have shown that disarticulation of the teeth with an occlusal splint helps improve TMJ symptoms and reduce bruxism/clenching events at night. Based on these studies, it seems plausible to assume that an orthodontic treatment using Invisalign® trays should also benefit the patients with TMJ symptoms, or at least should not cause problems in the TMJ and orofacial muscles. Clinically, some patients demonstrated a reduction of orofacial pain following the start of their Invisalign® treatment while others reported more clenching and muscle soreness. At the present time, there is no published data that objectively measured the effects of aligners regarding the TMJ and the orofacial muscles. This prospective clinical study aims to evaluate the effects of continuous wear of Invisalign® trays on the TMJ and the orofacial muscles.</p> <p>MATERIALS & METHODS: The study included 43 adolescents and adults aged 13 to 51 years old (25 females and 18 males) who were randomly selected from the Orthodontic Clinic at the University of Montreal. Two of them were excluded due to poor compliance and discontinuation of orthodontic treatment. The effects over time of Invisalign® trays on the TMJ and the muscles of the orofacial complex were assessed using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). The number of masticatory muscle contractions was measured with sleep electromyograph (EMG) recordings and the frequency of bruxism/clenching events was reported with self-administered questionnaires. Repeated measurements were taken at the following time points: at baseline evaluation (T1), 2 weeks (T2), and 6 months (T3) after the start of the treatment. Repeated measures ANOVA and Brunner-Langer method for numerical values and Cochran-Mantel-Haenszel test for nominal data were used with the significance level set at 5%. Bonferroni-adjusted p-values were used for pairwise comparisons.</p> <p>RESULTS & DISCUSSION: The number of bruxism/clenching events per hour (index) and their mean duration were not statistically different between the three nights with the EMG recordings ($p > 0.05$). However, 67% of the participants reported bruxism/clenching at night at T2 and 64% at T3 compared to 39% at T1,</p>

	<p>which was a significant increase ($p = 0.0112$). Forty-four percent of the patients reported bruxism/clenching during daytime, whereas a significant higher percentage of 66% reported the same at T2 and 61% at T3 ($p = 0.0294$). At T1, 12% of subjects indicated that they woke up with muscle soreness compared to 29% at T2, which was a significant increase ($p = 0.0347$). At T2, there was a significant reduction in the maximum movement amplitude of the lower jaw in all directions ($p < 0.05$). In addition, there was a significant increase in the number of painful sites and in the intensity of pain upon palpation of the TMJ and orofacial muscles with the RDC/TMD assessment compared to T1 and T3 ($p < 0.05$).</p> <p>CONCLUSION: This study revealed no effect of Invisalign® trays on the number of masticatory muscle contractions measured using EMG recordings during sleep over time, but a significant increase of reported bruxism/clenching at T2 and T3. At T2, there was a significant increase of symptoms in the TMJ and orofacial muscles, but these symptoms returned to baseline levels over time.</p> <p>Keywords : Invisalign®, orthodontics, TMJ, muscles, pain, bruxism</p>
Were the original, specific aims of the proposal realized?	Yes
Were the results published? If not, are there plans to publish? If not, why not?	The Masters thesis is completed, minor corrections still need to be done, and the attached article will be ready to be submitted for publication when the corrections will be completed. (Planned for end of june)
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 were presented: -Poster board at the 2014 CAO (Canadian Association of Orthodontists) in Montreal. -Table Clinic at the 2015 AAO (American Association of Orthodontists) in San Francisco under the Charley Schultz Resident Scholar Award.
To what extent have you used, or how do you intend to use, AAOF funding to further your career?	All the funds were used for the realization of that research project (research material, courier fees and patient's aligners). The results are very interesting and open avenues for new projects in the near future.

Dr Andrée Montpetit
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