

Functional appliance treatment and stability in Class II/1 malocclusion, and masticatory muscle characteristics

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- I. Antonarakis GS, Kiliaridis S (2007) Short-term anteroposterior treatment effects of functional appliances and extraoral traction on Class II malocclusion. A meta-analysis. *Angle Orthodontist* 77: 907-914.
- II. Kiliaridis S, Mills CM, Antonarakis GS (2010) Masseter muscle thickness as a predictive variable in treatment outcome of the twin-block appliance and masseteric thickness changes during treatment. *Orthodontics and Craniofacial Research* 13: 203-213.
- III. Antonarakis GS, Kjellberg H, Kiliaridis S (2012) Predictive value of molar bite force on Class II functional appliance treatment outcomes. *European Journal of Orthodontics* 34: 244-249.
- IV. Antonarakis GS, Kjellberg H, Kiliaridis S. Bite force and its association with stability following Class II/1 functional appliance treatment. *European Journal of Orthodontics* (accepted for publication 2012).



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ABSTRACT

Functional appliance treatment and stability in Class II/1 malocclusion, and masticatory muscle characteristics

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Aims: To evaluate the short-term antero-posterior effects on Class II division 1 malocclusion in growing children using functional appliances, and investigate whether the functional capacity of the masticatory musculature can be used as a predictive variable in determining the treatment and post-treatment effects following functional appliance treatment.

Material and Methods: Firstly, a literature search was carried out identifying prospective clinical trials on the treatment of Class II malocclusion using functional appliances or/and headgear in growing children. The data provided in the publications underwent meta-analysis using the random effects model with regard to SNA, SNB, ANB, and overjet. Then, two samples of Class II malocclusion growing children, 22 treated with twin-block appliances and 25 with activators, were examined and associations between treatment outcomes and masseter muscle thickness measured by ultrasound or maximal molar bite force, respectively, were determined. Finally, 28 Class II malocclusion growing children having undergone activator treatment were followed-up post-treatment and relationships between maximal molar bite force and post-treatment outcomes and stability were determined.

Results: Functional appliances used in the treatment of Class II division 1 malocclusion growing children may bring about an improvement in sagittal intermaxillary relationships mainly by acting on mandibular position. Twin-block appliances also seem to act on the maxilla. During and following this treatment, an adaptation of the masticatory muscles is observed, namely a decrease in masseter muscle thickness and in maximal molar bite force during treatment, and an increase in maximal molar bite force once appliances are discontinued. Children with thinner pre-treatment masseter muscles show a greater proclination of mandibular incisors, distalisation of maxillary molars and posterior displacement of the cephalometric A point during treatment, as well as a less pronounced increase in posterior facial height, condyle-ramus height, and mandibular unit length. Likewise, children with weaker maximal molar bite force pre-treatment show greater improvement in dentoalveolar sagittal relationships, as well as greater changes in SNB and ANB angles. Following activator treatment, children who show dentoalveolar sagittal relapse are more likely to have a lower maximal molar bite force pre-treatment. Moreover, children with an obtuse gonial angle are more likely to show greater incisor compensation during treatment, as well as a greater risk of relapse post-treatment.

Conclusions: Mild atrophy of the masticatory muscles may occur due to their decreased functional activity during functional appliance treatment. The functional capacity of the masticatory muscles, and their impact on mandibular morphology and gonial angle shape, may play a role in contributing to the variation seen as regards treatment outcomes and stability.

Keywords: Class II malocclusion, functional appliances, masticatory muscles, stability, ultrasonography, bite force

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