Relationship of Headgear Force Duration and Magnitude on Craniofacial Growth and Tooth Movement

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The purpose of this study was to develop and pilot test a research methodology to objectively study, measure, and analyze orthodontic treatment outcome subsequent to headgear therapy with respect to time and force of application. To effectively evaluate the therapeutic effect of the headgear, a novel orthodontic time/force recording (OTFR) headgear was developed, capable of monitoring and recording compliance as well as force levels in realtime. The second component of this study involved the development of a digital three-dimensional measurement system for the quantitative and qualitative analysis of the treatment effects.

Data collected on a pilot sample of patients treated with our newly developed OTFR headgear were analyzed in order to establish the validity of this device in clinical research, and was compared with the currently used compliance monitoring method – the self reported diary. Study models taken on this group of patients at monthly intervals were digitally analyzed using the three-dimensional measurement system for the characterization of molar displacement and the pilot testing of the technique.

The testing of the three-dimensional analysis system has been shown to provide qualitative as well as quantitative results with respect to the molar's spatial displacement subsequent to headgear use. The OTFR headgear appeared to be valid for the monitoring of compliance. The use of patients' self-reported logbook did not correlate with the true compliance as measured using two separate digital timing devices. The future use of such logbooks for the monitoring of compliance does not appear to be warranted.

Future implementation of this novel research design in clinical studies would provide invaluable insight into the treatment effects of orthodontic headgear therapy by facilitating intensive real-time data collection and objective three-dimensional tooth movement analysis.