

# **Clinically controlled trial of plaque reduction and inflammation control of Gingiva with the ultrasonic toothbrush Emmi®-dental**

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## 1 Executive Summary

Dental caries and periodontal diseases are the two major bacterial diseases of the oral cavity, and they are still highly prevalent. Besides microbiologic, immunologic and genetic factors of resistance to these infections, the personal oral hygiene using tooth brushes and fluoride containing dentifrices represents the most important tool of prevention. However, the long-lasting use of abrasive brushes and pastes leads to the real risk of combined erosive-abrasive lesions of teeth and gums.

Therefore, the evaluation of alternative bio-physical methods for non-abrasive reduction of bacterial biofilms on teeth is of great clinical importance. The generation of ultrasound in a selected frequency is in this sense a plausible approach.

Therefore, the efficacy of plaque control was assessed in a clinically controlled study using the ultrasonic toothbrush Emmi®-dental Professional (EMAG AG, Mörfelden- Walldorf) on 16 subjects aged 20 to 34 years. The reduction of dental plaque on all sites of teeth was intraorally photo-documented and blinded assessed using a modified Planimetric Navy-Plaque-Index. Gingival health was clinically also assessed on all sites of teeth by the Gingiva Index. The study was approved by the Ethical Committee of the University of Witten/ Herdecke, and the subjects signed a written consent.

The study protocol for 28 days started with professional meticulous tooth cleaning, a 4-day training period, another 3-day plaque-regrowth, and the follow-up was documented after 7 and 21 days. The ultrasonic toothbrush was according to the manufacturer (Emmi®-dental) exclusively ultrasound activated.

This is, therefore, the first pure ultrasound study, because all other studies included in the meta-analysis of the Cochrane Reports 2005 and 2010 deal with combined sound/ ultrasound devices.

The test toothbrush Emmi®-dental Professional demonstrated a well pronounced reduction of plaque after 4 training days and a 3-day plaque-regrowth period in all 16 subjects according to the cross-over protocol. This plaque reduction on all sites of teeth after one single toothbrushing was measured with more than 20% compared to the non-cleaned teeth. During follow-up for 7 and 21 days, the area free of plaque was kept by 45%.

The plaque reduction was better at the front teeth compared to the

posterior teeth. Maxillary and mandibular teeth were equally well cleaned. The assessment of plaque control along the gum line and between the teeth demonstrated a clear reduction of plaque at this high risk areas.

The parallel assessment of gingival health using the Gingiva Index demonstrated extremely low scores over the whole study period indicating that most sites were free of inflammation. Therefore, the tooth brush is contributing to gingival health.

According to the Cochrane Reviews of 2005 and 2010, meta-analyzing different powered toothbrushes for plaque control and gingival health, ultrasonic toothbrushes tested so far were combined sound/ ultrasound models. Therefore, the results presented in this Executive Summary are unique, demonstrating effective plaque removal and tooth cleaning ability of the powered ultrasonic toothbrush. The most important advantage of this powered toothbrush is the non-abrasive movement over the tooth groups to exclude any abrasive risk for teeth and gums when in permanent use. This is a completely new biophysical dimension of effective tooth cleaning and control of the bacterial biofilms with no brushing action at all.

### **Clinical conclusion**

The tested exclusively ultrasound-activated toothbrush Emmi®-dental Professional is effective in plaque reduction. The ultrasonic toothbrush contributes to gingival health and avoids completely abrasive brush movements. Therefore, the risk of abrasive lesions on teeth and gums is excluded.