Study to Evaluate the Effectiveness of an Iontophoretic Toothbrush in the Removal of Dental Plaque

By R.L.Van Swol, D.E.Van Scotter, A.R.Dentino, J.J.Pucher

A clinical study at Marquette University School of Dentistry has demonstrated the effectiveness of a manual Hukuba hyG Ionic Toothbrush in unsupervised brushing for six months. The double-blind study had 64 adult subjects ranging in age from 18 to 67 years. They were divided into two groups: Group 1, the test group, had 30 subjects using the hyG Ionic Toothbrush **with** an active battery. The control group, Group 2, had 34 subjects using the hyG Ionic Toothbrush **without** an active battery.

The mechanism for the ionic action is due to a change in the polarity of the teeth. The tooth is normally negatively charged and the plaque is positively charged. Opposite charges attract and bond to each other. The plaque, therefore, is attached to the tooth surface by "ionic bonding".

The hyG toothbrush has a three (3) volt lithium battery located under the metal band on the handle. The battery is similar to a watch battery and just as safe. The toothbrush bristles are negatively charged through the metal rod with the brush head. When holding the metal band on the toothbrush handle with moistened fingers, the positively charged ions are transferred to the teeth.

The tooth polarity changes from negative to positive. The positively charged tooth ions repel the positively charged plaque ions. The positively charged plaque ions are then attracted to the negatively charged bristles of the hyG toothbrush for removal from the oral cavity.

BEFORE: Opposite polarity makes plaque (+) adhere to teeth (-).

AFTER: hyG temporarily reverses polarity of tooth surface from (-) to (+), repelling plaque toward negatively polarized hyG toothbrush head.

This important ionic exchange along with the normal mechanical action of the bristles on the tooth surface enhances plaque removal. Moist finger contact with the metal band on the hyG toothbrush handle is essential to maximize ionic transfer of plaque molecules between the teeth and the toothbrush bristles.

RESULTS

Plaque scores were determined at baseline, three and six months using the Turesky-Gilmore-Glickman Index. Likewise, gingival indices were determined using the Loe Silness Gingival Inflammation Index.

Group 1 (test) showed a 36.17% reduction in plaque from baseline to month six, compared to only 18.56% for the control group. Improvement in gingival health was 51.87% for the test group and 30.18% for the control group. The average changes in both plaque and gingival indices were statistically significant for the test group using the hyG ionic toothbrush with an active battery.

The toothbrushes were identical except for the presence of the active battery. **The ionic action from the three (3) volt lithium battery produced the significant plaque and gingival changes observed.**

The Hukuba hyG Ionic Toothbrush is a safe and effective oral cleansing device when used unsupervised on a regular basis in the removal of human dental plaque.

Plaque removal. Estimates according to O'Leary's PCR ($p<0.01$) and PHP ($p<0.05$), the efficacies of the lithium battery toothbrush and the control toothbrush differed significantly.

1. **Improvements in gingivitis.** In terms of the PMA index ($p<0.05$), the lithium battery toothbrush produced better results than the control toothbrush.

2. **Changes in bacterial levels.** No changes in oral microorganism levels were observed after the experimental period, no matter which kind of toothbrush was used.
3.
4. **Plaque accumulation compared in terms of caries risk group.** In the low risk group, no significant differences were observed between the toothbrushes before and after the experimental period. In the high risk groups, however, the lithium battery toothbrush removed bacterial plaque more effectively.

1993 study, Maki Y. ET AL., Tokyo Dental College