A clinical comparison of the efficacy of a new and a worn manual toothbrush

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OBJECTIVES
To compare the efficacy with respect to plaque removal of a new CrossAction® manual toothbrush with a CrossAction toothbrush worn by 3 months home-use.

DESIGN
Randomized, cross-over, single-use, single-blind to the examiner.

MATERIALS AND METHODS
This investigation into the effect of toothbrush wear on supragingival plaque removal utilised subjects involved in a 3 month study evaluating a manual and battery operated toothbrush. Following completion of the 3 month study, those subjects in the manual group were invited to participate in a single-use, examiner-blind, cross-over phase. All subjects who took part in the studies gave written informed consent, and the study was approved by an independent Institutional Review Board.

Subjects were between the ages of 18 to 70 years, and in good general health. Subjects were required to be non-smokers with at least 18 scorable teeth (not including third molars, teeth with orthodontic appliances, bridges, crowns or implants). Reasons for exclusion included evidence of neglected dental health, serious medical conditions or use of certain medications (e.g. antibiotics or anti-inflammatory medication within 1 month prior to the start of the study), pregnancy and any physical limitation that would compromise the subject’s ability to carry out normal oral hygiene procedures.

Subjects abstained from all oral hygiene procedures for 23-25 hours prior to the first visit. Subjects received oral assessments of all soft and hard tissues. All tooth surfaces were then stained for the presence of plaque using Trace Disclosing Solution (Young Dental Manufacturing, Earth City, MO). Subjects rinsed with 5 ml disclosing solution for 15 seconds and then rinsed with 15 ml water for 15 seconds. Subjects having a whole mouth mean pre-brushing plaque score of ≥1.5 as measured by the Proximal Marginal Plaque Index (PMI) continued in the study. Subjects were then randomly assigned to one of two treatment sequences, new/worn or worn/new. The toothbrush was an Oral-B® CrossAction manual toothbrush either new or worn by the subjects during the previous 3 months of home use. Subjects brushed for one minute with their assigned toothbrush and toothpaste (Colgate® Regular, Colgate-Palmolive Co., New York, NY). Following the timed brushing, plaque was reassessed, and subjects were instructed to return to their usual method of oral hygiene for a one-week wash-out period. Subjects returned, after again abstaining from oral hygiene for 23-25 hours, at which time they brushed with the alternate brush in the sequence (either new or worn) as previously described.
A total of 46 subjects (29 females and 17 males), with a mean age of 44.35±10.65 yrs (±SD) and an age range of 23-70 yrs completed the single-use, cross-over phase. The two treatment sequences, new/worn and worn/new, did not differ significantly with respect to pre-brushing whole mouth plaque score or with respect to gender, race and age (p>0.05).

Brushing for one minute with either a new or a worn CrossAction toothbrush significantly reduced plaque scores (p<0.0001). A comparison of the efficacy of the new and worn toothbrushes revealed that there was a consistently greater amount of plaque removed by the new toothbrush, however, the difference between new and worn only achieved statistical significance at approximal sites. For the whole mouth, the new toothbrush reduced the PMI from 2.48 to 1.59, a reduction of 0.89. In comparison the worn toothbrush reduced PMI from 2.37 to 1.57, a reduction of 0.80. The difference in reduction of whole mouth plaque scores was not significant. In contrast the reduction at approximal sites was 0.82 for the new toothbrush compared with 0.71 for the worn toothbrush (p<0.05).

**C L I N I C A L C O M M E N T**

Dental professionals and toothbrush manufacturers generally recommend that a toothbrush is replaced every 3 months, this advice being based on the supposition that a worn toothbrush is likely to be less effective than a new one. The American Dental Association (ADA) also makes this recommendation, stating that “worn brushes are not effective at removing plaque bacteria and broken bristles may injure gums”. Not all patients take this advice, however, and evidence indicates that the average age at which a toothbrush is replaced ranges from 2.5 to 6 months. Studies investigating the efficacy of worn toothbrushes are relatively few, and almost all have used brushes artificially worn in a laboratory. These studies have provided conflicting results, but on balance it would appear that a worn brush is likely to be less effective than a new one. The results from the study described above give further weight to the importance of regularly acquiring a new toothbrush. In particular, there was a statistically significant advantage in favor of the new CrossAction toothbrush at hard to reach approximal sites. It would appear that worn splayed bristles are less able to gain access to these important areas, which are often a focus for the development of gingivitis.