Clinical Preventive Dentistry

The Clinical Efficacy of Wooden Interdental Cleaners in Gingivitis Reduction

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ABSTRACT—Seventy-seven subjects completed a 6-week clinical study designed to determine the effectiveness of wooden interdental cleaners in reducing gingivitis severity, using a recently developed diagnostic technique, the Interdental Bleeding Index. After a baseline examination, all subjects were given a medium toothbrush for use during the duration of the study. No instruction in toothbrushing technique was given. After 14 days, subjects were reexamined, and two balanced groups were formed. One group was instructed to use wooden interdental cleaners once a day in addition to brushing. The other group continued with just their regular toothbrushing, thus serving as the control group. A final examination of gingival bleeding sites was conducted at the end of 6 weeks. The improvement in the gingival health, as measured by the Interdental Bleeding Index was 8.8% in the brushing-only group, and 52.2% for the group using the wooden interdental cleaners as a supplement to brushing. This represents a highly significant ($p < 0.0001$) incremental benefit realized by the use of wooden interdental cleaners in addition to toothbrushing to reduce gingival inflammation. With proper instruction, the Interdental Bleeding Index could be a valuable tool for dentists and dental hygienists, as well as a patient-motivating device for monitoring gingival health.

Various gingival indices have been developed employing visual criteria and bleeding upon probing as a means of evaluating the status of the gingival health (PMA-Index, Gingival Index, Sulcus Bleeding Index, Gingival Bleeding Index, and Papilla Bleeding Index).[1-4] Numerous studies have shown that sulcular bleeding is a very sensitive indicator of early gingival inflammation.[1-10] Muhlemann and Son[2] demonstrated that bleeding from the sulcus represents the first clinical sign of gingivitis, preceding any visible color change or edematous swelling. In a variety of ways, this work has been confirmed by many researchers.[5,6,10-14] Positive correlations have been reported between the standard clinical indices of gingival inflammation and/or histologic evaluation.[12,13,15-21] Using morphometric analysis, a high degree of correlation was found between interdental bleeding areas and a greater percent of inflamed connective tissue as determined with a wooden interdental cleaner.[22]

This study was conducted for the purpose of evaluating the efficacy of wooden interdental cleaners (Stim-U-Dent®, Johnson & Johnson Products, Inc., New Brunswick, NJ) in reducing gingivitis as measured by the Interdental Bleeding Index.[23] The cleaners themselves were used as a measuring device.

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MATERIALS AND METHODS

Eighty volunteer subjects, over the age of 21, were recruited to participate in the study. Approximately 120 subjects were screened in order to find 80 with the proper qualifications. The requirements for inclusion in the study were as follows:

- The subjects could not be current users of dental floss or interdental cleaners.
- Twenty natural teeth had to be present excluding those with full crown restorations.
- A prophylaxis was not allowed for two months prior to entry in the study.
- No heavy calculus could be present, nor any clinical signs of advanced periodontal disease.
- Subjects had to have at least ten interproximal bleeding sites identified with a wooden interdental cleaner.

Interproximal bleeding sites were evaluated using the Interdental Bleeding Index. A wooden interdental cleaner was inserted from the facial aspect of each interdental space in such a way as to depress the papilla 1 to 2 mm. The path of insertion was strictly horizontal, with no apical angulation. The wooden interdental cleaner was inserted and removed four times in each interproximal site. The space between the second and third molars was excluded. The presence or absence of bleeding within 15 seconds was recorded.[23]

After a baseline examination for gingival bleeding sites, all subjects were given a medium texture toothbrush (Reach Plus®, Johnson & Johnson Products, Inc., New Brunswick, NJ) to use twice a day in their usual manner for the duration of the study. Subjects were instructed not to use any additional oral hygiene aids, including mouthwashes. Each participant kept a diary card documenting their home care routine.

Fourteen days later, all subjects were reexamined and scored. On the basis of these gingival bleeding scores, two balanced groups were formed. One group was instructed to use wooden interdental cleaners according to label directions, in conjunction with their new toothbrush. The other group was instructed to continue using the toothbrush only.

After 28 days of following the respective treatment regimes, the subjects returned for their final examination of gingival bleeding sites. All clinical scoring was performed by the same clinical examiner.

RESULTS

The results are presented for the 77 (of the original 80) subjects who completed the entire study schedule. All pertinent data are shown in Table 1 for both the brushing only group (N = 39), and the brushing and interdental cleaner group (N = 38). The Interdental Bleeding Index was derived by dividing the number of bleeding sites by the total number of sites at risk. (Note: In an intact dentition, with no full restorations, there would be a maximum of 26 sites at risk, as the site between the second and third molars was not scored).

At week zero (baseline), the scores for the designated brushing only, and brushing and interdental cleaner groups were 0.695 ± 0.109 and 0.739 ± 0.118 respectively. There was no statistical difference in the scores for the two groups, indicating that the groups were properly balanced.

After 14 days of brushing only, the indices were 0.627 ± 0.120 for the designated brushing only group, and 0.650 ± 0.120 for the designated brushing and interdental cleaner group. These two scores were not statistically different for the two groups. However, each group showed a significant improvement compared with the baseline scores ($p < 0.0001$) according to an analysis of variance. The bleeding scores following the subsequent 28 days of either group showed statistically significant differences between the groups ($p < 0.0001$). The brushing only group showed an index of 0.634 ± 0.144. In comparison, the brushing and interdental cleaner group showed an index of 0.353 ± 0.183. This latter figure represented a 52.2% improvement over the baseline score, in

TABLE 1. *Mean Bleeding Sites and Interdental Bleeding Indices at Each Examination*

	Brushing Only (n = 39)				Brushing and Interdental Cleaners (n = 38)			
Week	No. of Bleeding Sites	No. of Sites at Risk	Interdental Bleeding Index	% Change	No. of Bleeding Sites	No. of Sites at Risk	Interdental Bleeding Index	% Change
0 Baseline	16.2	23.3	0.695	—	16.7	22.6	0.739	—
2	14.6	23.3	0.627	9.8*	14.7	22.6	0.650	12.0*
6	14.9	23.5	0.634	8.8*	7.9	22.4	0.353	52.2†

* Significantly different from baseline ($p < 0.01$).
† Significantly different from baseline and from "brushing-only" control ($p < 0.0001$).

contrast with the final 8.8% improvement in the brushing only group when compared with baseline. No adverse reactions were reported by any of the subjects or observed by the clinical examiner.

DISCUSSION

As illustrated in Figure 1, the improvement in gingival health as measured by the Interdental Index represents a highly significant incremental benefit realized by the use of the wooden interdental cleaners in addition to toothbrushing to reduce gingival inflammation.

The application of this index was facilitated by the fact that the presence or absence of bleeding was easily detected. The use of bleeding (instead of other visual signs of inflammation) as the indicator of initial gingival change has the clinical advantage of being a more objective sign. Bleeding was either present or absent, whereas color change would have required a subjective estimation.[24]

In accordance with the reduction in bleeding sites, the improvement in gingival health was apparent by visual inspection as well. The majority of the subjects using the interdental cleaners exhibited interproximal tissues which adapted snugly to the contour of the teeth, showing little sign of inflammation. The consistency was changed markedly to an overall firm texture. This change in form and reduction in bleeding sites was noted by many subjects using the interdental cleaners. This self-assessment indicated an increased patient awareness of their own improvement in gingival health. These observations also demonstrated the patient's ease in adapting to the instructions for using the interdental cleaners.

Muhlemann and Son,[2] Carter and Barnes,[3] and Lenox and Kopczky[8] noted the usefulness of the phenomenon "bleeding" for individual patient motivation. The presence of bleeding presents immediate negative feedback in relation to a reduced level of gingival health. The dentist or dental hygienist could easily demonstrate the gingival condition to the patient by this obvious clinical manifestation when using the Interdental Bleeding Index.

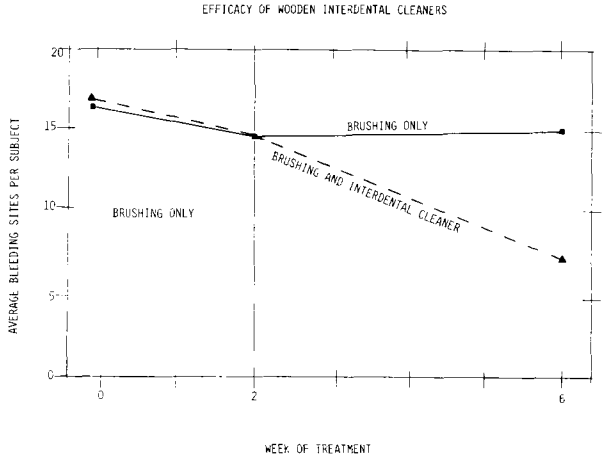

FIG. 1. Efficacy of wooden interdental cleaners.

The fact that bleeding can occur even in the absence of the classical signs of inflammation (color and edema) was significant for those patients who exhibited only a change of form of the gingival tissues. These subjects were not able to discern such a discriminating characteristic; therefore, they often overestimated the condition of their gingival health, when in fact early gingival inflammation did exist. During baseline examinations, subjects were impressed with the presence of bleeding following the insertion of the wooden interdental cleaner, since many of them practiced good brushing habits. However, the fact that they did not floss or use any other interdental cleaning devices resulted in reduced gingival health in the interproximal tissues.

The results of this study indicate that the Interdental Bleeding index could be used clinically for the detection of bleeding in the presence of gingivitis. The index fits the following characteristics of an ideal measurement; 1) minimal time consumption, 2) objective interpretation of results, 3) ease of application, and 4) reproducibility. In addition, the design of the wooden interdental cleaners conforms to the anatomy of the interproximal space which facilitates insertion. All of these characteristics, plus the ease of recording and interpreting the index criteria, indicate that the Interdental Bleeding Index lends itself favorably for use by dentists and dental hygienists as a valuable monitoring tool for gingivitis. The index could serve as a motivating device to encourage patients to include wooden interdental cleaners as part of their oral hygiene regimen.

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