ORIGINAL RESEARCH

Comparison of Enamel Surface Roughness after Brushing with Herbal and Non-herbal Toothpastes

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Abstract

Aims: The present study was undertaken to compare the effect of herbal and non-herbal toothpastes on the enamel surface of human permanent maxillary premolars by measuring surface roughness and SEM observation and analyzing the element content in both types of toothpaste.

Materials and methods: Forty specimens (10/group) were brushed using distilled water, non-herbal toothpaste, or two different herbal toothpastes on the buccal surfaces with their respective group's toothpaste or distilled water. The specimens were brushed twice a day; 2 minutes per time in the morning and evening routinely for 15 days. The roughness average (Ra value) was measured using a Profilometer. SEM observation and element content in both types of toothpaste were also determined. The data was analyzed using the paired samples *T*-test, the Kruskal–Wallis test, and the Mann–Whitney *U* test at a significance level of 5%.

Results: The enamel surface roughness after brushing with non-herbal toothpastes was 0.049 µm while the other two herbal toothpastes were 0.095 and 0.071 µm respectively. Ra value of enamel in both herbal toothpastes groups were higher than the non-herbal toothpaste ($p = 0.000$). While Ra values of non-herbal toothpaste after brushing for 15 days were not significant difference from distilled water, control group. SEM revealed both herbal toothpaste resulted in rougher enamel surface than non-herbal toothpaste and distilled water. The volume of elements in each toothpaste was relatively similar.

Conclusion: Although toothpastes containing herbal substances increase enamel surface roughness, it is below the upper limit of enamel roughness (0.2 µm) to cause bacterial accumulation in the clinic.

Clinical significance: Herbal toothpaste brushing has no significant pathological effect on enamel.

Keywords: Brushing, Herbal toothpaste, Non-herbal toothpaste, Surface roughness.

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Introduction

Abrasion is the mechanical wearing of dental hard tissue and commonly affects cervical tooth structure. This noncarious tooth loss typically involves the enamel, dentine, and may involve the cementum, resulting in gingival recession. The main predisposing factors for abrasion are the toothbrushing method and the type of toothpaste used.

The type of toothbrush, vigorous brushing force, and brushing technique can result in severe abrasion. A horizontal brushing technique combined with a medium or hard bristled toothbrush exceeding 2 minutes brushing time can cause abrasive lesions, especially at the cervical area.[1] The force from manual toothbrushing is higher compared with using an automatic toothbrush and increases the amount of abrasion of sound and eroded dentine.[2]

Toothpaste is an important component in the etiology of abrasion. Most toothpastes contain abrasive agents for cleaning, maintaining, and improving tooth health. There are two types of toothpaste commercially available; synthetic and herbal formulations. Synthetic toothpastes typically contain abrasive agents, such as calcium phosphate, calcium carbonate, silica or hydrated silica for removing debris and stains.[3] The relative dentine abrasivity (RDA) is the standardized measurement of toothpaste abrasivity.[4] A dentifrice with an RDA score less than 100 is safe for preventing enamel abrasion.[5]

Some people prefer herbal toothpastes because their components come from natural plants and avoid the side-effects of allergy irritation from synthetic formulations. Herbal toothpastes are available as toothpowders and toothpastes with different formulations. However, some consumers suspect that herbal toothpastes are abrasive to tooth structure. The study of Benjavongkulchai et al.[6] revealed that herbal toothpowder had the RDA value more than herbal toothpaste formulation of the same manufacturer. Most commercial toothpastes contain a combination of abrasive ingredient, detergent and therapeutic agents. However, the abrasivity of tooth structure by using contemporary herbal toothpaste is currently not understood.
The purpose of this study was to investigate:

- The abrasive effect of herbal toothpastes compared with a non-herbal toothpaste on the enamel surface of permanent teeth by measuring the surface roughness with profilometer and SEM observation.

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