Objectives: This study reports on modern dentifrice promoted wear data assessed via profilometry (3DP) and microhardness indentation (IL); historical data for dentifrice wear and subsequently adopted safety standards; and correlations between modern and historical data validating long-term product safety.

Methods: A V-8 brushing machine was used to brush flattened enamel or dentin samples under standardized conditions for 10,000 (3DP) or 1,500 (IL) strokes. Profilometry samples had a masked control surface with demarcations used to combine pre and post-brushing surface maps permitting tooth substrate volume lost assessment which converted into an average z-axis mineral loss. For IL studies, Vickers hardness indent changes versus baseline permitted average z-axis mineral loss evaluation. An extensive literature search illustrated the clinical and laboratorial history of oral hard tissue abrasion assessment and subsequent correlation and industrial regulation (ISO/TC 106 N 897).

Results: Dentin wear for low (DCPD), mid (silica) and high (alumina-silica blend) RDA dentifrices measured: 11.7 ± 4.2; 45.2 ± 5.2; 55.5 ± 5.8 microns respectively; enamel wear measured: 0.32 ± 0.16; 0.71 ± 0.12; 1.13 ± 0.16 microns respectively. Results correlate with those of Kitchin & Robinson (1948) showing 1mm of tooth material loss in 100,000 strokes. Data collected by Stookey and Muhler (1968) show linear trend for enamel and dentin wear. Present and historical data approximate enamel wear at <10% of dentin wear.

INTRODUCTION

Early scientists and dentists believed that a toothpaste’s primary role was to clean the accessible region of the oral hard tissue; however, it was recognized that enhanced oral hygiene helps prevent tooth decay, maintains healthy gingiva, and reduces the intensity of mouth odor. Abrasive dentifrices are the most viable option available to clean the mouth and prevent extrinsic stain build-up. How abrasive should a dentifrice be? This question was tackled and answered in the 1940s and 1950s. Researchers correlated a laboratory abrasion scale with clinical measures of toothpaste cleaning ability. They discovered that above a certain abrasiveness, any small gain in cleaning ability was purchased at the cost of greatly increased tooth abrasion as measured by the depth of a cervical notch abraded at the gum line. They recommended an abrasion limit that the industry adopted and that provided the eventual foundation for the 250 RDA limit. All pastes that fall under this limit are safe when used appropriately. The American Dental Association (ADA) has recommended that dentists work with their patients to help them choose the least abrasive paste that keeps their patients’ teeth free of unsightly extrinsic stain.

ABSTRACT

Direct Assessments of Tooth Wear Susceptibility – Comparison to Abrasion Standards
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RESULTS

RESULTS (Cont.)

CONCLUSION

Proportional dentin wear to enamel correctly dimensions dentin wear as pivotal in maintenance of safety standards in dentifrices. A 250 RDA score limits dentifrice abrasion to a level that is effective to prevent stain accumulation and safe for daily use. Modern and historical quantitative methodologies correlate directly with radiotracer techniques and results confirm rationales for dentifrice abrasive safety standards.