

# 0928. Effect of Cleaning Regimens on Abrasion/Gloss of Denture Acrylic

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## Summary

Three types of cleansing products (a conventional dentifrice, an abrasive-free cleansing foam, and a soaking tablet solution) were compared in a crossover clinical study. A custom-made acrylic prototype denture (Figure 1) facilitated manual brushing and provided reliable instrumentation. Surface abrasion was measured using a profilometer, and gloss was measured both instrumentally by a Betagloss meter and visually by dental examiner evaluations.

Both the cleansing foam and the soaking solution did not cause surface abrasion and loss of gloss after 90 minutes of hand-brushing, and were not significantly different from each other at all time points. The dentifrice caused surface abrasion and loss of gloss, and was statistically different from the other two denture cleansers.

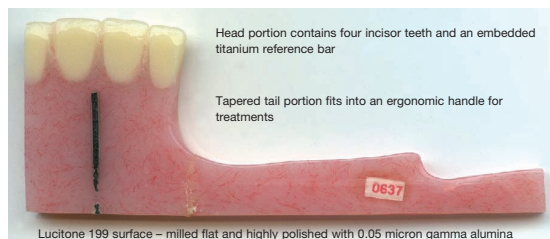


Figure 1. Acrylic prototype denture.

## Introduction

Denture wearers have several methods to clean stains, plaque, and food debris from their prostheses. They often utilize brushing with toothpaste because it is a fast and easy means of denture cleansing.

However, the use of conventional dentifrices, which typically contain abrasive silica-based cleaning ingredients, may potentially damage a denture's smoothly finished acrylic surface. Combined with individual patient variables, such as pressure and amount of toothpaste used at each brushing session, denture acrylic may be subject to increased roughness and dulling from the use of such abrasive-containing cleansers.

Soaking tablets, which work by effervescent action, effectively kill microorganisms and remove stains, but patients often do not follow an adequate soaking schedule. A novel, abrasive-free foaming denture cleansing liquid was developed to bridge this gap between soaking and brushing by offering safe, effective cleaning when applied by brushing.

## Objective

To measure the amount of abrasion and loss of gloss to denture acrylic caused by hand-brushing with a conventional silica dentifrice, an abrasive-free denture cleansing foam, or a soaking tablet solution.

## Methods

- Twenty-six denture wearers brushed the denture prototypes for 2 minutes three times daily.
- An Oral-B 40 toothbrush was used to apply the following treatments:
  - a conventional silica-abrasive dentifrice (Crest Cavity Protection)
  - an abrasive-free denture cleansing foam (Polident Fresh Cleanse)
  - a soaking tablet solution (Polident 3-minute Denture Cleansing Tablets) after a 3-minute immersion.
- After 0, 30, 60, and 90 total minutes of hand-brushing, the acrylic surface of each prototype denture was assessed for abrasion and gloss.

## Results and Discussion

### Abrasion

- Profilometry measurements indicated that both the cleansing foam and the soaking tablet solution caused no abrasion to the surface (Figure 2).
- Brushing with the silica-containing dentifrice resulted in a progressive removal of acrylic.
- The cleansing foam and soaking tablet solution were statistically significantly better than dentifrice at all time points ( $p \leq 0.0001$ ).
- Figure 3 shows two typical profilometer traces before and after 90 minutes of continuous brushing with the dentifrice. It removed an average of 6.6 microns of acrylic and caused significantly more abrasion (wear) than the other two denture cleansers.

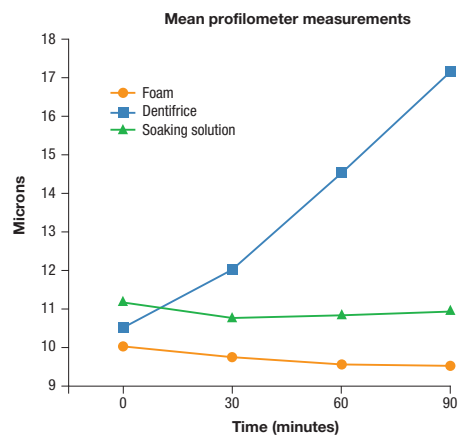


Figure 2. Depth of abrasion over time.

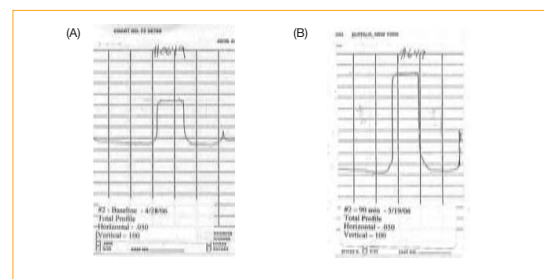


Figure 3. Sample profilometry traces before (A) and after (B) treatment with a silica-containing dentifrice.

### Ra value and surface roughness

- To investigate the roughness created by the three types of denture cleansers, profilometry was used again to obtain the mean Ra value of the prototype surface at the completion of the trial. With respect to dental materials, clinically smooth surfaces may minimize plaque formation, although it has been reported that those above a threshold of 0.20 microns may lead to increased plaque attraction (Kuhar *et al. J Prost Dent* 2005;93:76-85).
- Consistent with previous results, the cleansing foam and the soaking tablet solution performed similarly, both resulting in surface roughness values of 0.05 microns at the end of 90 minutes. This is comparable to that of lathe-polished denture acrylic. The silica-containing dentifrice, at 0.29 microns, demonstrated a statistically significant rougher surface ( $p < 0.001$ ).

### Gloss

- Gloss meter data indicated that both the cleansing foam and the soaking tablet solution resulted in no statistically significant loss in gloss.
- The silica-abrasive dentifrice significantly dulled the highly polished denture acrylic.
- After 90 total minutes of brushing with the dentifrice, the gloss scores decreased significantly from a mean (standard deviation) baseline value of 9.2 (0.1) to 8.5 (0.2) ( $p < 0.0001$ ; Figure 4).
- The examiner also noted a visual dulling and loss in gloss for the denture prototypes brushed with the dentifrice. Both the cleansing foam and soaking solution maintained the highly polished surfaces.
- The gloss/polish data corresponded with the abrasion data indicating changes to acrylic following use of a conventional dentifrice, potentially changing intended surface details. Degradation of the smooth, highly polished acrylic surface of a denture may result in increased bacterial colonization and accumulation of denture plaque, malodor, and stain.

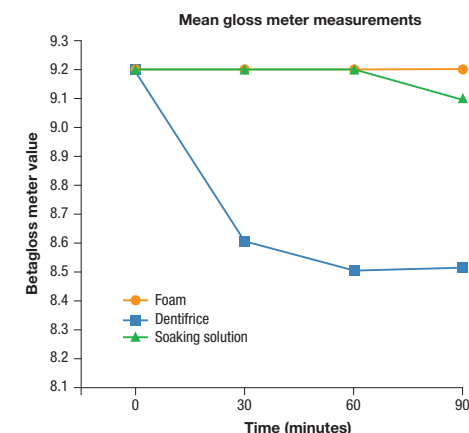


Figure 4. Gloss meter measurements over time.

## Conclusion

- Denture cleansers, such as soaking tablets and liquid-to-foam cleansers, are abrasive free and do not cause roughness, loss of gloss, or wear to the surface of denture material.

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