

A Comparison of Prophylaxis and Polishing Pastes on Extrinsic Stain Removal

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Abstract

This study compared 2 prophylaxis pastes and a polishing paste in three areas: extrinsic stain removal ability, visible enamel surface scratching, and enamel abrasivity. Phase 1 involved staining and polishing extracted teeth. Phase 2 involved polishing extracted teeth and viewing pictures made by a scanning electron microscope. Phase 3 involved laboratory analysis and acquisition of Relative Enamel Abrasivity numbers. The results of the study showed that the polishing paste removed extrinsic stain almost as well as one of the prophylaxis pastes, and better than the other. In addition, the polishing paste visually scratched tooth enamel the least and had the lowest REA number of the three pastes studied. It was thus concluded that it matters which paste is used in rubber cup polishing. It was not simply the heat and friction of the rubber cup that was potentially damaging to the enamel. The polishing paste was less damaging than the prophylaxis pastes and removed extrinsic stain successfully.

Introduction

Since the early 1900's, polishing the exposed surfaces of teeth has been an integral part of oral hygiene professional care (Fones, 1916). For nearly a century, routine rubber cup polishing has been a widely accepted procedure by dental professionals. Patients believe that polishing is an important part of a dental hygiene appointment, and expect it to be done regularly.

Initially, rubber cup polishing was believed to remove bacterial plaque and inhibit new plaque accumulation. It was believed that smooth polished tooth surfaces impeded the build-up of new plaque after a dental prophylaxis appointment. Scratched enamel surfaces were thought to be more plaque retentive than smooth enamel. Now we know, through past research, that an abrasive paste may actually create a rougher tooth surface than existed prior to rubber cup polishing (Jefferies, 1973).

Numerous studies have shown that rubber cup polishing can be damaging to the teeth and oral tissues (Wilkins, 1999). Three serious consequences can result from this damage. First, continuous polishing over time can roughen tooth structure by wearing away the enamel layer. The result of this can be thermal sensitivity. Second, rubber cup polishing removes the outermost layer of enamel, which contains naturally protective fluoride. Once that outer enamel surface is altered, susceptibility to dental caries increases (Brundevold, Gardner & Smith, 1956). Finally, besides the inadvertent removal of the fluoride layer during polishing, morphologic changes in tooth structure can occur over time as well. Polishing for thirty seconds with a prophylaxis paste may remove as much as four microns of the enamel surface (Vrbic, Brundevold & McCann, 1967; Thompson & Way, 1981). If polishing is performed repeatedly over the years, tooth loss could be substantial.

The concept of selective polishing was introduced in dental hygiene curriculum in 1976. Dental hygiene textbooks and the American Dental Hygienists' Association encourage the practice of selective polishing. This concept asserts that each individual tooth should be evaluated with the idea that rubber cup polishing is a potentially damaging procedure. Today rubber cup polishing is believed to be primarily a cosmetic

procedure with little therapeutic benefit. Yet patients seem to expect it, and dental hygienists are ethically obligated to remove plaque and stain from their patients' teeth. If rubber cup polishing is required to remove tenacious stain, it would seem logical that dental hygienists would want to use a paste that is the most effective, yet least abrasive.

Purpose of the Study

This study will compare the extrinsic stain removal ability, amount of enamel scratching, and abrasivity of three commonly used and commercially available pastes routinely used in rubber cup polishing.

Methodology

Nupro® Fine prophylaxis paste, Clinpro™ prophylaxis paste, and CPR™ (Cosmetic Polishing Restorative) polishing paste were the products compared in this study. There are many prophylaxis pastes available on the market today. Nupro® was chosen due to the fact that it is a widely used and well known prophylaxis paste among dental hygienists today. Clinpro™ was chosen because of its claims to transition from coarse to fine during polishing. There are approximately four cleaning pastes available today and CPR™ was chosen because it comes in the same convenient single use units as the prophylaxis pastes.

There were three phases to this research study. Phase 1 involved the removal of extrinsic stain. Nine extracted human teeth were stained by soaking them for four days in cola, coffee, or tea solutions. Three teeth were soaked in cola, three in coffee, and three in tea. The color of the stain prior to polishing was measured with the Trubyte Portrait Shade Guide IPN by Dentsply. One tooth soaked in cola, one tooth soaked in coffee, and one tooth soaked in tea were polished for one and one-half minutes with each of the three pastes. The ending tooth color was measured again by the Trubyte shade guide.

Phase 2 involved the amount of enamel scratching caused by the three pastes. The abrasive ingredients in each paste are: Nupro® - pumice, sodium silicate; Clinpro™ - perlite, volcanic glass; and CPR™ - aluminum oxide. Unstained extracted human teeth were marked and ½ polished with one of the pastes. Rubber cup polishing was performed for one minute on each tooth. Pictures were taken of the enamel after polishing with a scanning electron microscope.

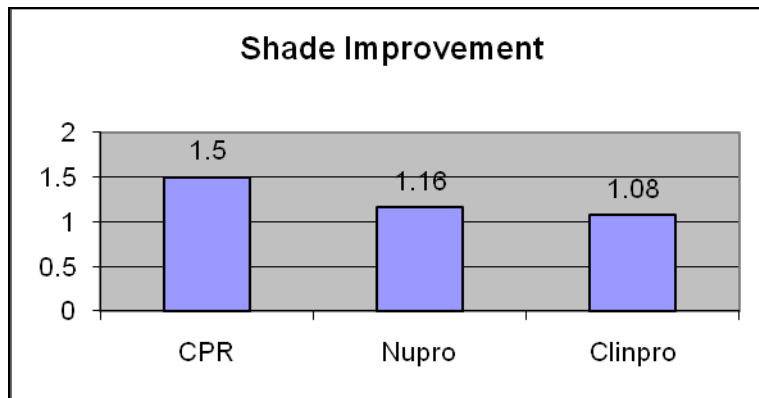
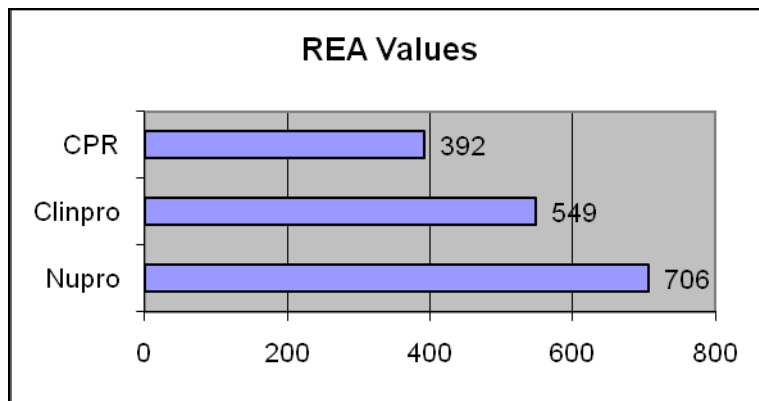
Phase 3 involved the abrasivity of the pastes used in the study. Missouri Analytical Laboratories, Inc. in St. Louis, MO performed multiple analysis on extracted teeth polished with each of the above mentioned pastes and derived an REA (Relative Enamel Abrasivity) number for each product. To measure REA in the laboratory, the tester starts with extracted human teeth. The teeth are irradiated in a neutron flux, mounted in methylmethacrylate (bone glue), stripped of enamel, inserted into a brushing machine, and brushed by ADA standards (reference toothbrush, 150g pressure, 1500 strokes, 4-to-1 water/toothpaste slurry). The radioactivity of the rinsewater is then measured and recorded. For experimental control, the test is repeated with an ADA reference toothpaste made of calcium pyrophosphate, with this measurement given a value of 100 to calibrate the relative scale.

Results

Phase 1 results were acquired by determining the number of shades polishing lightened each of the stained teeth using the Trubyte guide . These numbers were then averaged for each paste. Nupro® Fine prophylaxis paste averaged lightening the teeth 1.66 shades, CPR™ polishing paste averaged lightened the teeth 1.33 shades, and Clinpro™ prophylaxis paste averaged lightening the teeth 1.00 shade.

The results of Phase 2 are shown in Figures 2, 3, and 4 on the poster. These images of the enamel of the unstained extracted teeth were magnified 250 times. It appeared that CPR™ scratched the enamel the least, followed by Clinpro™, and then Nupro®.

CPR™ was found to have the lowest REA number in Phase 3 of this study – 392. Clinpro™ was next with an REA number of 549, and Nupro® had the highest REA number with 706.



Conclusion

Phase 3 results showed that CPR™ had the lowest REA number. The lower the REA number, the least abrasive a paste is on teeth. Clinpro™ had a higher REA number than CPR™, but less than Nupro®, which was the most abrasive. Clinpro™ prophylaxis paste claims to use a patented technology known as integrated abrasion variability. This formulation supposedly starts out coarse to remove stains quickly, then breaks down to a fine paste to provide a high-luster enamel polish. This process should result in less abrasion to the enamel during rubber cup polishing. Nupro® is the industry leader in prophylaxis paste sales in the United States. Six out of every ten dental offices reported

using this paste because of the splatter-free formula, according to Dentsply (the manufacturer) reports. Nupro® also has the most flavors available of all prophylaxis pastes available on the market today.

In Phase 1 of this research, there were only slight differences in the extrinsic stain removal ability of the three pastes studied. Nupro® lightened the teeth the most, which was not surprising since it was the most abrasive. Since Clinpro™ was the second most abrasive paste, one would think it would have been the second best in extrinsic stain removal ability. However, it was the CPR™ that was second best in extrinsic stain removal ability, with Clinpro™ coming in last in extrinsic stain removal ability.

CPR™ was originally produced as a cleaning paste for dental restorations only, but has been found safe to use on natural teeth. Cleaning agents do not contain abrasive particles. They contain a cleaning agent that is naturally occurring and should not abrade or alter the surface characterization of esthetic restorations or tooth structures. This is obviously true, because rubber cup polishing with CPR™ produced the least scratching than Clinpro™ or Nupro® in Phase 2 of this study. CPR™ has been found to be less abrasive than some toothpastes due to its small particle size. It should not be surprising that when the pastes themselves were viewed through the microscope, CPR™ paste had the smallest particle size.

Implications

The researchers in this study predicted that there would be no statistically significant differences between the three pastes studied in terms of stain removal ability, enamel scratching, and enamel abrasivity. They felt it would be the heat and friction created by the rubber cup itself that damages the enamel during a dental prophylaxis. Prophylaxis or polishing pastes should help minimize this damage (due to reducing heat produced and friction created) and should therefore all be appropriate products to use if rubber cup polishing needs to be performed. The researchers predicted that it would make no difference which type of paste was used in rubber cup polishing.

The results of this study proved the researchers wrong. CPR™, a polishing paste, removed extrinsic stain almost as well one of the two prophylaxis pastes, and better than the other, yet produced less enamel scratching and had the least abrasivity number. The results of this study support the philosophy of selective polishing. Rubber cup polishing is damaging to the enamel and should be selectively performed. However, it does matter which type of paste is used. Polishing pastes and prophylaxis pastes both remove extrinsic stain. However, polishing pastes scratch the enamel less and are less abrasive than prophylaxis pastes. Furthermore, it was also discovered that it matters which prophylaxis paste is used, if a prophylaxis paste is chosen for rubber cup polishing. Clinpro™ scratched the enamel less and was less abrasive than Nupro®, which is the industry leader, and but was slightly inferior at extrinsic stain removal ability.

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