Prairie State College

DH109
THE COMPARISONS OF POLISHING PRODUCTS

ACTIVITIES:
PLEXIGLASS ABRASION EVALUATION

1. You will be given a plexiglass sheet. Identify it with your name. You will be expected to submit your plexiglass with your rubric form. Your summary paper will be submitted online in the folder in D2L labeled "Comparisons of Polishing"

2. On a piece of plexiglass label the different abrasive agents that can be utilized for polishing: M.I. Paste, TP, Tin Oxide, Fine, Med, Coarse & Pumice

3. On your plexiglass identify the **least abrasive to the most abrasive agent** with a perm marker. Note the effects of abrasion. Results are to be used for Guidelines Summary paper questions # 3-6.

4. Results are to be used for summary paper guideline questions #3-6.

GUIDELINES FOR SUMMARY ON POLISHING PRODUCTS

In your summary on, the following topics 3-7 should be addressed.

1. Utilize the Competency Evaluation Rubric as a guideline to write a summary paper of your findings from the above activities. The paper should be 3-4 pages, Arial font no larger than 11 pt. with 1.5 line spacing. See polishing, Abrasion Rubric for specific information.

2. When completed, hand in plexiglass, evaluation form and rubric form. Make sure everything is completed properly and stapled or paper clipped together. Submit your paper online (D2L) as instructed in class by (Student assistant name).

3. Describe each type of polishing agents and what effects they had on the plexiglass.

4. Utilizing the literature provided and chapter 16 in your text, explain the purpose of each polishing agent and the factors
affecting the rate of abrasion and literature included in the syllabus (Chpt. 16).

5. Explain the purpose of why we polish the goal of polishing, the purpose of the proper polishing sequence, and the factors affecting the rate of abrasion (Chpt. 16).

6. Explain how the five (5) important polishing variables affect the outcome of polishing (see Young™ handout)

7. Hand in plexiglass evaluation form and rubric form. Your paper also needs to be submitted in a Word document on D2L.

Name:_____ Date:_____ Score: _____

Plexi Glass or egg should accompany **this form**

Summary paper should be submitted online

POLISHING AND ABRASION RUBRIC

*This rubric must accompany the materials **turned** in for grading.

CATEGORY	EXCEEDS STANDARD (4 PTS EA)	MEETS STANDARD (3PTS EA)	NEARLY MEETS STANDARD (2 PTS EA)	DOES NOT MEET STANDARD (1 PT EA)	NO EVIDENCE (0 PTS EA)	SCORE
Title Page	Title Your name, Teacher's Name, Course Period, Date, Name on Plexi Glass and Abrasion Type Labeled Neatly	Evidence of six	Evidence of five	Evidence of four or less	Absent	
Thesis Statement	Clearly and concisely states the paper's purpose in a single sentence, which is engaging, and thought provoking.	Clearly states the paper's purpose in a single sentence.	States the paper's purpose in a single sentence.	Incomplete and/or unfocused.	Absent, no evidence	
Introduction	The introduction is engaging, states the main topic and previews the structure of the paper.	The introduction states the main topic and previews the structure of the paper	The introduction states the main topic but does not adequately preview the structure of the paper.	There is no clear introduction or main topic and the structure of the paper is missing.	Absent, no evidence	
Body (4 pts each – total 12 pts) ***Polishing*** □ Describe each type of cleaning and polishing agents and what effects they had the plexiglass. □ Explain the purpose of each polishing agent and the factors affecting the rate of abrasion utilizing literature provided in Ch. 16 of your text. □ Explain the purpose of why we polish, the goal of polishing, the purpose of the proper polishing sequence and the factors affecting the rate of abrasion (Ch. 16)	Each paragraph has thoughtful supporting detail sentences that develop the main idea.	Each paragraph has sufficient supporting detail sentences that develop the main idea.	Each paragraph lacks supporting detail sentences.	Each paragraph fails to develop the main idea.	Not applicable	
Organization, Structural Development of Idea	Writer demonstrates logical and subtle sequencing of ideas through well-developed paragraphs; transitions are used to enhance organization.	Paragraph development present but not perfected.	Logical organization: organization of ideas not fully developed.	No evidence of structure or organization.	Not applicable	
Conclusion	The conclusion is engaging and restates the thesis.	The conclusion restates the thesis.	The conclusion does not adequately restate the thesis.	Incomplete and/or unfocused.	Absent	
Mechanics	No errors in punctuation, capitalization, and spelling.	Almost no errors in punctuation, capitalization, and spelling.	Many errors in punctuation, capitalization, and spelling.	Numerous and distracting errors in punctuation, capitalization, and spelling.	Not applicable	
Usage	No errors sentence structure and word usage.	Almost no errors in sentence structure and word usage.	Many errors in sentence structure and word usage.	Numerous and distracting errors in sentence structure and word usage.	Not applicable	
Citation	All cited works, both text and visual, are done in the correct format with no errors.	Some cited works, both text and visual, are done in the correct format. Inconsistencies evident.	Few cited works, both text and visual, are done in the correct format.	Absent	Not applicable	
Due Date of Review	REVIEW TURNED IN ON TIME OR EARLY	1 DAY LATE Max 80%	2 DAYS LATE Max 75%	3 DAYS LATE Max 70%	4 DAYS LATE 0 Score	

The Dental Hygienist's Guide to Polishing

Rubber cup and air-powder polishing are professional services performed by dental hygienists during preventive, therapeutic, or maintenance care appointments. The primary goal of the polishing procedure is selective stain removal on coronal tooth surfaces. Secondary benefits of polishing include plaque biofilm removal and a smooth surface that reduces future adherence of plaque biofilm and extrinsic stain. After dental scaling and debridement, selective stain removal leaves the teeth stain-free, lustrous, and feeling clean and smooth.

This guide reviews information that every dental hygienist should know in order to clean and polish tooth enamel and dental restorations safely and effectively, and to teach patients about the value and limitations of polishing. It should be used in conjunction with knowledge of evolving evidence-based research literature, professional judgement, and an understanding of the patient's values.

This guide was reviewed and edited by: Michele Darby, RDH, MS, Chairperson, Gene W. Hirschfeld School of Dental Hygiene, Old Dominion University and Pamela Brilowski, RDH, MS, Director, Waukesha County Technical College Dental Hygiene Program

DEFINITIONS

Abrasive Agent – A material composed of particles of sufficient hardness and sharpness to cut or scratch a softer material. Known to clean away stains, plaque biofilm and polish substrates.

Air-Powder Polishing – The process of cleaning and polishing the dentition and some dental restorations using a device that mixes air and water pressure with a powder such as sodium bicarbonate, aluminum trihydroxide, glycine, calcium sodium phosphosilicate, or calcium carbonate to remove remaining plaque biofilm and extrinsic stain after scaling.

Cleaning – The process of removing plaque biofilm and extrinsic stain from tooth surfaces after scaling using a latex-free cup and/or bristle brush on a prophylaxis angle attached to a low-speed handpiece; accomplished with an appropriate grit abrasive agent. Selection of grit coarseness depends on the severity and type of stain as well as the assessed patient's needs.

Coronal Polishing – Polishing crowns of teeth to remove visible extrinsic stains. Does not include scaling to remove calculus.

Dental Biofilm – Non-mineralized mass of structured communities of microorganisms bound together by an intermicrobial enclosed matrix that is interwoven with channels that deliver nutrients to the microorganism.

Grit – Term used to reference the particle size of different abrasive agents. Fine, medium, and coarse refer to particle size.

Oral Prophylaxis – Prevention of plaque biofilm and stain accumulation by professional cleaning and polishing the teeth. Ultrasonic, sonic, and/or hand scaling is included in the oral prophylaxis procedure.

Polishing *(also known as cosmetic polishing)* – The process of achieving a smooth, mirror-like enamel or material surface that reflects light and is characterized as having a high luster; accomplished with a finer grit abrasive agent. May also encompass cleaning.

R.P.M. – Acronym for revolutions per minute. Used when discussing the speed of prophy cup rotation during polishing.

Selective Stain Removal *(also known as rubber cup polishing and extrinsic stain removal)* – The process of cleaning and polishing tooth surfaces to remove extrinsic stains that may remain after scaling using a latex-free cup and/or bristle brush on a prophylaxis angle attached to a low-speed handpiece, and an appropriately selected abrasive agent.

Selective Polishing – The polishing method supported by and term used by the American Dental Hygienists' Association. Polishing is omitted on surfaces that are stain-free and on restorative materials.

Substrate – A surface material to be cleaned and polished, e.g., tooth structure or a dental restoration.

TYPES OF DENTAL STAINS

Extrinsic Stain

- Occurs on the external tooth surfaces and calculus
- Examples: tobacco, red wine, chlorohexidine, tea, coffee
- Controlled with proper oral self-care, rubber cup polishing, hand, sonic, or ultrasonic scaling and air-powder polishing

Intrinsic Stain

- Occurs on the internal tooth structure
- Examples: fluorosis, tetracycline stains, hypoplasia, trauma discoloration
- Cannot be removed with oral self-care, rubber cup polishing, hand, sonic, or ultrasonic scaling or air-powder polishing
- Managed by dental restorations or tooth whitening

FIVE IMPORTANT POLISHING VARIABLES

Prophylaxis Paste Abrasiveness

- Select the least abrasive agent to accomplish stain removal. Use of medium and coarse prophylaxis paste is rarely needed

Abrasive Quantity in Polishing/Cleaning Agent

- The concentration of abrasive particles in a paste is directly correlated with its abrasiveness
- Use wet agents because drier agents increase abrasion
- For air-powder polishing, the ratio of particles to water should be the lowest required

Cup & Brush Contact Time on the Substrate

- Use short, intermittent pressure between rubber cup and the tooth or restorative materials
- Heat and tooth structure loss increase with contact time
- For air-powder polishing, keep air powder spray moving and nozzle at 3-4 mm off the substrate

Cup or Brush Rotation Speed

- Use low speeds to reduce abrasion and heat build-up
- 3000 r.p.m. is the maximum speed recommended

Applied Force on the Substrate

- Use a light, intermittent polishing technique to avoid excessive heat and abrasion. For air-powder polishing, the high air pressure setting is more abrasive than the low setting

POLISHING CONSIDERATIONS*

Careful consideration of patient conditions must occur to achieve the full benefits of rubber cup and air-powder polishing. The benefits of cleaning and polishing include stain and biofilm removal for enhanced patient satisfaction. As with any patient care procedure, both risks and benefits must be weighed.

Rubber Cup Polishing

- Stain-free areas
- Newly erupted teeth, especially primary teeth
- Areas of decalcification, hypocalcification, hypoplasia, demineralization
- Areas of gingival recession (exposed cementum or dentin)
  - *Dentin abrades 20-25 times faster than enamel*
  - *Cementum abrades 30-35 times faster than enamel*

- Acute gingival or periodontal inflammation
- Immediately after deep scaling, root planing, or extensive periodontal debridement
- Restored tooth surfaces: composite, veneers, glass ionomer, porcelain, gold, titanium (unless special polishing agents or devices are used for these materials)
- Implants (specially-designed ultrasonic and sonic tips can remove soft and hard deposits safely)
- Patients who have:
  - *Rampant or early childhood caries*
  - *Dentinal hypersensitivity*
  - *Xerostomia*
  - *Respiratory problems which may be further compromised by contaminated aerosols, e.g., asthma, emphysema, chronic bronchitis, cystic fibrosis, lung cancer and persons who carry oxygen*
  - *Communicable disease that could be spread via contaminated aerosols*
  - *High risk of adverse effects from infective endocarditis if not premedicated*
  - *Allergies to the cleaning and polishing paste ingredients*

Air-Powder Polishing

- Areas of gingival recession (exposed cementum or dentin)
- Acute gingival or periodontal inflammation
- Restored tooth surfaces: composite, veneers, glass ionomer, cements, porcelain, gold, titanium (unless special polishing agents or devices are used for these materials)
- Patients who have:
  - *Rampant or early childhood caries*
  - *Dentinal hypersensitivity*
  - *Xerostomia*
  - *Communicable disease that could be spread via contaminated aerosols*
  - *A compromised immune system and are susceptible to infection*
  - *High risk of adverse effects from infective endocarditis if not premedicated*
  - *Respiratory problems which may be further compromised by contaminated aerosol, e.g., asthma, emphysema, cystic fibrosis, chronic bronchitis, lung cancer and persons who carry oxygen*
  - *Allergies to the air-powder ingredients*
  - *End-stage renal disease, Addison's disease, Cushing's syndrome or metabolic alkalosis*
  - *Sodium-restricted diets (use sodium-free polishing powder such as aluminum trihydroxide and calcium carbonate, or calcium sodium phosphosilicate)*
  - *Conditions in which they must take potassium, anti-diuretics, or steroid-therapy*

*Considerations may vary with the assessed needs of the patients and the materials and devices used.

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BASIC CUP POLISHING TECHNIQUE

1. Before polishing, provide safety glasses for patient and wear personal protective equipment. Assess patient's health, dental, and pharmacologic history. Evaluate for extrinsic stain, exposed dentin or cementum, aesthetic and other restorative materials, and areas of demineralization, etc.

2. Have patient complete a preprocedural rinse with an antimicrobial mouthrinse
3. Explain purpose and limitations of procedure to the patient
4. If needed, the aesthetic restorations should be polished first. Special polishing agents need to be used on aesthetic restorations to preserve the integrity and longevity of the material (see Dental Substrate Polishing Chart)
5. Fill rubber cup with appropriate polishing agent and apply it to the tooth surface or material to be cleaned and polished. Polish teeth and restorations that require selective cleaning and stain removal
6. Establish finger rest and bring filled cup to contact the tooth surface
7. Apply revolving cup lightly to the tooth surface using a low speed

8. Use light pressure so that the cup slightly flares and slips slightly into the sulcus. Make sure not to flatten the lip of the cup entirely because that can create damaging heat and abrasion

9. Move cup to adjacent area on tooth surface, using an intermittent patting motion
10. Turn and/or lift handpiece to adapt rubber cup to targeted tooth's surface, including proximal surfaces
11. Start with the distal surface of the most posterior tooth of a quadrant and move toward the anterior
12. Work from the gingival third to the incisal third of the tooth
13. Move to next tooth and wipe cup with gauze if needed. Replenish cleaning and polishing agent
14. If using more than one type of abrasive, be sure to switch to a separate rubber cup for each finer grit agent
15. Follow up with professionally-administered fluoride therapy
16. Educate patient about oral biofilm and extrinsic stain control
17. Document service in the patient's record

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commercially prepared prophylaxis polishing paste.7 The scratches of both the fine and coarse grits of this paste are so profound that the circular application with the rubber cup is visible. The roughness created by the paste causes the esthetic restoration to readily retain stain and become severely compromised.

Figure 3: Composite restorative material that has been polished with a leading brand of fine grit polishing paste. Note detection of circular pattern of scratches created by the abrasives applied by the rubber polishing cup.

Glass-Ionomer Cements

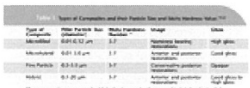

Table 1. Click to enlarge.

GLASS-IONOMER CEMENTS Glass-ionomer cements are not as widely used as composites.8 Glass-ionomer cements are tooth-colored so they are more esthetically pleasing than metallic restorations. However, glass-ionomers have few properties in common with composite materials. While both composites and glass-ionomer cements are used for Class V restorations and other anterior and posterior restorations, glass-ionomers do not have comparable shade matching. They also do not have the strength or wear resistance found in composite resins, making the material useful for temporary and intermediate restorations.9

The glass filler particles in glass-ionomer cements have a Mohs hardness number range of 1-4.5.[10] Glass-ionomer cement restorations are more opaque, more brittle, and have a rougher surface than composite resin restorations.[11] Glass-ionomer cements are made of a calcium strontium aluminosilicate glass powder (base) combined with a water-soluble polymer (acid).[8,9,11] Glass-ionomer cements also contain fluoride ions and can be useful for patients with high caries rates, however, the fluoride levels that are released are not consistent.9 After initial placement of the glass-ionomer cement restoration, there is a large burst of fluoride caused by the high concentration of fluoride ions in the matrix; thereafter, the fluoride is released at a much lower rate.9

Finishing and Polishing

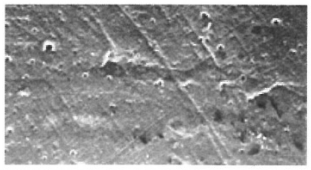

Figure 4: Composite restorative material that has been polished with a leading brand of coarse grit polishing paste. Note detection of circular pattern of scratches created by the abrasives applied by the rubber polishing cup.

One of the most important aspects of polishing esthetic restorations is to note the distinction between "finishing and polishing" and "polishing." Finishing and polishing refers to the removal of marginal irregularities, the definition of anatomic contours, and the smoothing away any surface roughness.[12] Figure 5 provides examples of the types of finishers and polishers used in the process. The polishing procedure further enhances the restoration by removing scratches from the surface to produce a very smooth, light-reflecting luster. Finishing and polishing procedures are typically performed in three to four distinct steps.[12,13] Finishing and polishing are critical to the esthetics of tooth-colored restorations and can have a substantial effect on their biocompatibility with tissues, longevity, and overall long-term clinical success.[3,14,15]

Polishing

Polishing refers to the maintenance of the surface characterization of esthetic restorations, recreating a surface luster with smaller and smaller scratches during surface abrasion so that the smallest scratches are smaller than the wavelength of visible light, which is less than 0.5µm.[11] The polishing of esthetic restorative materials incorporates both two-body and three-body abrasion.[4] In two-body abrasive polishing the bound particles are solidly fixed to a substrate, for example, a rubber finisher embedded with diamond particles. Three-body abrasion, in which loose abrasives (the polishing paste abrasive particles) move in the interface space between the surface being polished and the polishing application device, is used more frequently than two-body abrasion. An example of three-body abrasion is the use of a polishing paste and a rubber polishing cup.

Figure 5: Examples of finishers and polishers that can be used in the process of finishing and polishing composite restorations.

The polishing of esthetic restorative materials encompasses the following considerations:[12]

1. The structure and mechanical properties of the esthetic restorative material.
2. The hardness of the esthetic restorative material.
3. The hardness of the prophylaxis polishing paste abrasive or other polishing medium.
4. The physical properties of the material used to carry and apply the prophylaxis polishing paste or other polishing medium. This can vary from a paste to an abrasive-embedded prophylaxis cup or an abrasive-embedded polishing disc with various shapes (flame-shaped, conical, round, or diamond finishers).

Glass-ionomers typically have a rougher surface than esthetic composite materials, however, they should be polished using a light pressure and a slow speed.[16] If a polishing product indicated for use on glass-ionomers does not remove stain, a fine finishing disc or rubber polisher can be used. Glass-ionomer restorations desiccate, which can lead to cracking and premature deterioration of the restoration, and should be lubricated with a petroleum jelly or water prior to polishing.[16] Glass-ionomers will never have the shiny, smooth nondetectable surface than can be achieved with a polished esthetic composite restoration.

Additional Considerations

Both manual and powered instrumentation around restorations should help produce and preserve the surface characterization of all restorations. The goal is to create the smoothest surfaces possible for teeth and restorative materials without inflicting damage or jeopardizing the marginal integrity of cemented castings. In particular, powered instrumentation with ultrasonic scalers can damage composite restorations (hybrid and microfilled), glass ionomers, laminate veneers, and titanium implant abutments. Ultrasonic instrumentation can also alter the margins of amalgam restorations and fracture porcelain.[17] The tips of scalers should never be directed into the spaces where enamel and the restorative material abut.

Patients must also be provided with oral selfcare instructions.[5] Patients must be instructed to use the least abrasive toothpaste because individual esthetic materials will respond uniquely to the abrasive particles in toothpaste.[18] The hardness of esthetic restorative materials rivals the hardness of cementum and dentin, not enamel.[4] On the other hand, the hardness of abrasive agents used in toothpastes are hundreds of times harder than natural tooth structures[4] and even more so than esthetic restorative materials.

Summary

When esthetic dental restorations are encountered during charting, they should be included in the treatment plan for the specific polishing procedures that are required. If the brand and type of esthetic restoration are known through the patient chart, the polishing procedures and products used should be those recommended by the manufacturer. If not possible, alternative polishing procedures should be used. A cleaning agent containing feldspar and rubber polishing cup can be used on all esthetic restorative materials with no chance of damage to the surface characterization.

The principles for polishing esthetic restorations are the same as for natural teeth. If the polishing agent used has more than one size grit polish the coarsest grit polish should be used first, followed by each successively smaller grit polish. During polishing, mixing larger abrasive particles with smaller particles will not produce the desired shiny surface because the particle sizes will mix. Each size grit must be applied separately. Therefore, to prevent each grit size from being contaminated with the previous size grit, the rubber cup or applicator must be replaced between applications. During the polishing procedure, the polishing paste should be frequently renewed in the polishing cup because the paste may dry as the binders are expressed during use, which will make the paste more abrasive.

Keeping esthetic restorative materials looking like they were just placed is a service highly valued by patients and is another reason to emphasize why dental hygiene appointments are so important.

Caren M. Barnes, RDH, MS, is a professor in the Department of Dental Hygiene, and the coordinator of Clinical Research, Cruzan Center for Dental Research, both at the University of Nebraska Medical Center, College of Dentistry, Lincoln. She is also an editorial board member of *Dimensions of Dental Hygiene*.

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