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## Review

## Polishing for glass ceramics: Which protocol?

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## ABSTRACT

**Purpose:** The execution of adjustments on ceramic restorations is sometimes necessary for either correction of occlusion and/or inadequate contours or esthetical improvements. Clinically, the surfaces undergo weariness through fine grinding diamond burs which remove the superficial glazing layer. Several materials for ceramic polishing have been used in an attempt to reach a satisfactory surface smoothness. The aim of this study was to perform a literature review on different polishing protocols of several dental ceramics.

**Study selection:** This is a literature review performed through scientific articles published between 2004 and 2012, indexed in MEDLINE, PubMed and Scielo databases. The study selected and analyzed a total of 20 relevant articles that evaluated different types of ceramics, polishing treatment and surface roughness.

**Results:** After an extensive literature review, this study observed: 1 – after the rupture of the glazing layer due to the adjustments of the restorations, the best choice for the polishing of the surface will depend on the type of ceramics used; 2 – glazing procedure provide excellent results regarding to the superficial smoothness; however, if reglazing is impossible, either abrasive rubber cups/points or sandpaper discs followed by the use of diamond polishing pastes results in a satisfactory superficial smoothness; 3 – clinical studies that take into account the behavior of the protocols polishing are scarce and should be encouraged; 4 – the large number of variables influence the final outcome of polishing should be considered.

**Conclusions:** The necessity in standardization of methodologies to enable a comparison among researches.

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## 1. Introduction

By working with ceramic restorations, the dentist often needs to perform clinical adjustments through wear by diamond burs, consequently removing the superficial glazing layer. These adjustments are needed when the restoration exhibits premature occlusal contacts and/or inadequate contours [1–3].

The rupture of the glazing layer increases the superficial roughness, leading to clinical problems: weariness of the antagonist tooth [4]; retention of microbial biofilm [5] and inflammation of the periodontal tissues; staining [6]; unsatisfactory esthetics [7] and smaller resistance to cracks propagation [2,8–11]. Because of these aforementioned reasons, the researchers have stated the use of a reglazing process [12] or polishing of the ceramic restorations [13] as alternatives which result in a greater superficial smoothness.

The reglazing may be performed prior to the luting procedure and involves reheating the ceramics. However, not even is possible to execute such procedure, especially when adhesive ceramic restorations are being used, which demands that the occlusal adjustment be made after cementation [14]. In these cases, the polishing procedure is an important alternative [14–16].

The efficacy of the ceramic polishing systems is a controversial issue in literature. Several studies reported that the final surfaces obtained with the polishing procedure are not comparable with the final reglazing surfaces [17–20]. On the other hand, other authors have reported that the polishing systems did not exhibit the capacity of reaching surfaces similarly to those obtained after the glazing procedure [21].

Different alternative polishing techniques have been described for ceramic restorations [11,22,23]. Several polishing kits are available into dental market. These are composed by a great variety of materials, including: diamond burs, abrasive rubbers cups, felt wheels and diamond polishing pastes. The effect on the superficial roughness generated by the different adjustment [10] protocols followed by the polishing of ceramic restorations is of great interest for the dentist and the superficial roughness have been studied by several researchers [2,3,9–11,19,20,22,24].

This study proposes to show methods of polishing showing better performance. The proper polishing allows a lower retention of bacterial plaque and inflammation of the periodontal tissues, wear of antagonists teeth, more resistance to cracks propagation and better esthetic for the restorations. Considering the above information, the aim of this study was to perform a literature review on the different polishing protocols for the several dental glass ceramics.

## 2. Materials and methods

This is a literature review performed through scientific articles published between 2004 and 2012, indexed in MEDLINE, PubMed and Scielo databases. The search of databases was performed using the keywords: ceramics, polishing methods and surface roughness. Allowing the use of such keywords in English, Portuguese and Spanish.

The inclusion criteria were studies related to methods for polishing the surface in several ceramics, the effect of the type of ceramic in the surface roughness and the effect of polishing in ceramic surface. We excluded studies that addressed other factors that were not related to the descriptors above. Also, we excluded the use of abstracts, by not providing full analysis of the studies presented.

The present study found 45 articles with at least one of the criteria discussed. Thus, in this study selected and analyzed a total of 20 relevant articles that evaluated different types of ceramics, polishing treatment and surface roughness in the same research.

## 3. Results

### 3.1. Classification of dental ceramics

The structure and the mechanical properties of dental ceramics are the factors which are closely related to the polishing efficacy [26,27]. Dental ceramics can be classified into three main categories: glass, particle-reinforced glass, and polycrystalline ceramics [25–27].

Glass ceramics are those which best minimize the optical properties of enamel and dentin. Glass is composed of an atomic network that does not show a normal pattern for spacing (distance and angle) among them, and it has an amorphous structure. The glass contained in dental ceramics derives mainly from the mineral group so-called feldspar and is based on silica (silicon oxide) and alumina (aluminum oxide) [27]. Therefore, the feldspathic ceramics belong to a family so-called aluminosilicate glasses [27]. Feldspar-base glasses are resistant to crystallization during firing presenting a long firing range and being biocompatible.

In reinforced glass ceramic, filling particles are added to the glass composition to improve the mechanical properties and control the optical effects, such as: color, opalescence, and opacity [30]. These filling agents are generally crystalline, but they may also be glass particles with higher melting point. The compositions are based on two or more different materials

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