Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2018;9:1:82-84.

# Effect of Surface Finishing of Abraded CAD CAM Zirconia Blocks on Adhesion by Streptococcus Mutans

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## ABSTRACT

**Background**: The purpose of this study was to evaluate the effect of various surface finishing methods on early bacterial adhesion of CADCAM zirconia blocks used in dentistry. Thirty CAD CAM zirconia specimens were divided into 3 groups according to their surface finishing protocols: DA (Diamond abraded), DG (Diamond abraded and glazed), DP (Diamond abraded and polished) and submitted to bacterial adhesion testing. It was found that the diamond abraded and glazed group (DG) demonstrated the least bacterial adhesion.

**Keywords:** CAD CAM, zirconia, bacterial adhesion, surface roughness.

## INTRODUCTION

The relationship between bacterial adhesion and the surface of dental materials has been extensively researched in recent years[1]. Proliferation of the initial adhering microorganisms may explain the importance of surface roughness in initial plaque formation[2]. Initial attachment of bacteria on roughened surfaces is aided by surface irregularities, where bacteria are protected from salivary flow, oral hygiene aids and masticatory function and can attach to other surfaces of the restoration[3].

Polishing procedures generally increase the smoothness of the restorative surfaces. When polishing procedures are ignored, critical roughness may lead to further bacterial attachment. Previous studies mostly examined streptococci bacteria, as they are "early colonizing bacteria" [4]. This investigation aimed to assess the influence of finishing and polishing protocols on the bacterial adhesion to Zirconia specimens. The null hypothesis was that the finishing and polishing protocols would not influence the bacterial adhesion to Zirconia specimens.

## MATERIALS AND METHODS

Thirty zirconia CAD CAM blocks (Sirona, Germany) of 1cm x 1cm x 0.2cm were divided into three groups randomly. Ten study specimens were surface abraded using diamond burs (control group - DA), ten were glazed after surface abrasion (glazed group- DG) and ten were polished with ceramic polishing kit (Shofu, Japan) after surface abrasion (polished group- DP). Surface roughness was then measured. After artificial saliva coating, the specimens were incubated in *Streptococcus mutans* standard cell suspension in BHI broth for 24 h at 37 °C. After 24 hours of biofilm development, 1 ml of 99% methanol was added for 15 minutes for fixation of biofilm. Supernatants were removed and specimens were washed with phosphate buffer saline. 2 ml of 0.1% crystal violet solution was added. After 20 minutes, the excess

**Received:** Oct. 3, 2018: **Accepted**: Nov. 20, 2018
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pISSN 2278-0076
eISSN 2321-9270

crystal violet was removed by washing with sterile distilled water. Bound crystal violet was released by adding 2 ml of 95% ethanol. The absorbance was measured at 570 nm and standardized in relation to area of specimen (Absorption/ $cm^2$)

## RESULTS

The mean colorimetric reading at 570 nm for the three groups was as follows:

DA group- .72
DP group- .41
DG group- .29

The results of the present study showed that different finishing techniques resulted in differences in bacterial adhesion.

## DISCUSSION

These findings are in accordance with previous studies that investigated the plaque formation on restorative materials[5]. These studies showed that increased surface roughness leads to an increased bacterial adhesion or plaque formation following its growth. The influence of the finishing protocols was verified by few studies[6], and their results corroborate with the findings of the present investigation. Studies comparing different materials according to their surface roughness and bacterial adhesion also reported results that are in accordance with our findings[7]. The present study found that surface roughness and bacterial adherence were influenced by finishing/polishing protocols.

There is a lack of information in the present literature comparing different finishing and polishing protocols for the same material. Usually, studies compare polished materials to verify the influence of the material in the surface roughness and bacterial adhesion[8]. The present study compared clinical and laboratory polishing protocols. This study demonstrated that laboratory finishing protocols resulted in a smoother surface than the clinical polishing method evaluated, leading to less streptococcal adhesion.

Streptococci adhered stronger to rougher surfaces and, are therefore, more difficult to remove[9]. Many organic and inorganic materials have been used to reduce the bacterial adhesion to dental materials including plant extracts[10].

The correlation between surface roughness and bacterial adhesion related in this study was also found by other investigations[11]. Further studies evaluating the bacterial adhesion on different restorative materials in the presence of saliva under simulated clinical conditions such as brushing, mastication, and chemical cleaners will be of benefit.

## CONCLUSION

Within the limitations of the present in vitro investigation, the following conclusions could be drawn:

1. Increased surface roughness was directly related to increased bacterial adhesion.

2. Specimens abraded without glazing or polishing, presented increased surface roughness and consequently increased bacterial adhesion.

3. Specimens that were clinically polished showed increased bacterial adhesion compared to those which were lab glazed. [11]

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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