

# EFFECT OF DENTURE CLEANERS ON SURFACE MICROROUGHNESS AND HARDNESS OF COBALT-CHROMIUM ALLOYS

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## Introduction

Cobalt-Chromium alloys have been widely used for removable partial denture frameworks because of their satisfactory mechanical properties and relative low cost. Dental prostheses require hygiene to promote good oral and systemic health. Chemical cleaning solutions may be important alternatives/adjuvant methods to mechanical cleaning because they are accessible, easy to use, and cost-effective. Besides dedicated effervescent tablets, various chemical cleaning agents are used by patients. Changes in the physical and mechanical properties of Co-Cr alloys have been reported related to the contact with chemical sanitizers, having effects on the efficiency and longevity of the prostheses [1-3]. The aim of the study was to evaluate the effect of cleaning solutions on the surface of Co-Cr alloys in relation to the hardness and surface roughness.

## Materials

Samples of non-precious alloys on cobalt-chromium basis: Wironit (Bego GmbH) [W], Heraenium CE (Kulzer GmbH) [H], Diadur (DFS - Diamon GmbH) [D], C alloy (Vaskut Dental Kft) [C], Micronium Exclusiv (Schütz Dental GmbH) [M] were cast according to the alloy manufacturer's instructions. They were finished, polished with 600-2000 grit sandpaper, and polishing paste, cleaned with alcohol. As cleaning solutions Corega Double Power (GSK Pharmaceuticals Ltd) [CT], Protefix Active Cleanser (Queisser Pharma) [PT], 9% acetic acid solution - vinegar [V], 3% hydrogen peroxide [O], 5.25% sodium hypochlorite [N] and distilled water [DW] as control were chosen. The specimens were divided in 6 groups and immersed in 50 ml of each solution, which was replenished every 1 hour. The immersion contact time was 900 minutes, simulating 6 months of a 5 minutes daily immersion. The surface roughness was measured with a profilometer SurfTest SJ-201 (Mitutoyo, Kawasaki, Japan) with 0.8 mm reading length cut-off, for all groups. Arithmetic average roughness (Ra) and maximum absolute vertical roughness (Rz) measurements were performed. Leeb microhardness (HL) values were obtained by using a digital hardness tester Dyna Pocket (Zwick, Germania). Statistical analyses were performed.

## Results

Surface roughness Ra, and HL hardness values are represented in Figures 1, 2.

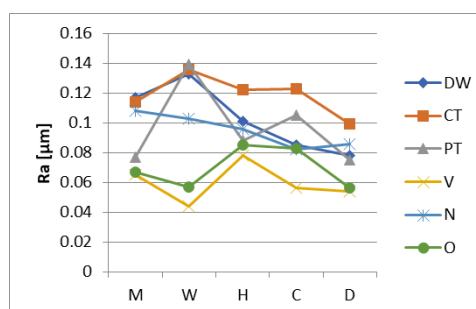


Figure 1: Mean Ra values after immersion.

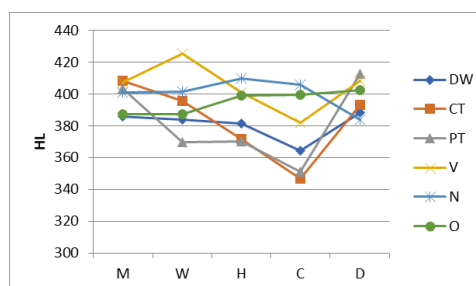


Figure 2: Mean HL values after immersion.

Relative to cleaning solutions, roughness was significantly decreased for [V]. HL values increased significantly for [V] ( $p=0.01$ ), [N] ( $p=0.02$ ) and [O] ( $p=0.01$ ). As a result of roughness-hardness correlations records, a very strong negative correlation has been measured ( $r=-0.76$  for Ra-HL and  $r=-0.84$  for Rz-HL).

## Discussions

Based on the obtained test results, it can be concluded that cleaning agents do not significantly affect the surface roughness of frameworks cast from Co-Cr alloys. Instead cleaning agents like acetic acid, hydrogen peroxide, and sodium hypochlorite increased surface hardness values, which would correspond to more brittle surfaces. Complementary studies are needed to evaluate this aspect over time on the longevity of the prostheses.

## References

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