

Ufi Gel hard C - Surface roughness and microorganisms

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The colonization of dentures with microorganisms can lead to a considerable decrease in wearing comfort. Since microorganisms prefer to colonise in poorly accessible areas, creating as smooth a surface as possible on the denture is worthwhile. A study at the University of Strasbourg analysed the surface structure of Ufi Gel hard C, the hard relining material from VOCO.

The final condition of the surface of a denture relining should be compatible with the surface of the mucosa on which it rests. Through minimal mechanical friction and adherence of food residue, a smooth surface on the relining material provides not only a pleasant wearing comfort, but it also has a decisive influence on the colonization of microorganisms.^{1,2} Colonized *Candida* under the denture relining can cause an infection (*thrush*). In order to keep the colonization density to a minimum, a finishing polish of the relining material is necessary after polymerisation.

University of Strasbourg study

The University Louis Pasteur in Strasbourg tested Ufi Gel hard C for these criteria. The Ufi Gel Hard C™ test specimens were also successively treated with different finishes (tungsten and silicone polishers) after polymerisation, left untreated after polymerisation or covered with an acetate protective foil prior to polymerisation to counteract the formation an oxygen inhibition layer on the surface. The surfaces were then analysed with a scanning electron microscope (SEM), atomic force microscope (AFM) as well as an optical profilometer. Four different situations were examined in this study:

- Group A - Control group (untreated)
- Group B - Tungsten polisher
- Group C - Tungsten and silicone polishers
- Group D - Control group (barrier to prevent an inhibition layer)

Results of SEM examinations

The results of the scanning electron microscopic examination are shown in Figure 1. It is clearly visible that the surface becomes progressively smoother from Group A to Group D. Since covering the direct relining with protective foil is impossible in the surgery, successive polishing of the cured material is the best way to achieve the smoothest surface possible.

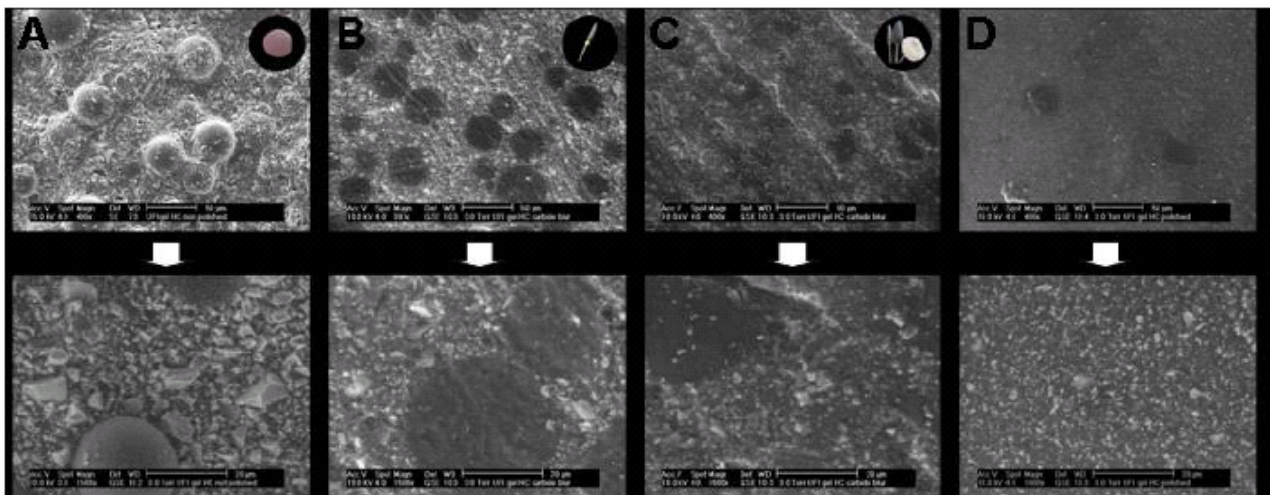


Figure 1: SEM images (Philips XL30, resolution x 400 ET x 1600) of the surfaces of the test specimens

Results of the AFM examinations

The images from the atomic force microscope show an analogous picture. In Figure 2, it is clearly visible that the additional polishing step in Group C resulted in a significant smoothing of the surface.

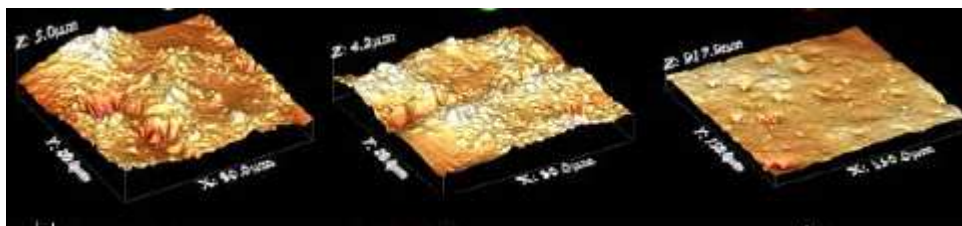


Figure 2: AFM images of the surfaces of the test specimens B (left) C (middle) and D (right)

Results of the profilometry

The mean surface roughness values (Ra) determined with optical profilometry show a tenfold reduction in the Ra between the untreated and polished specimens.

Table 1: Measurement of the surface roughness (Hilti Profilometer) of the specimen groups A through D.

Optical profilometry	Ra (µm)
Group A	7.27 +/- 0.17
Group B	0.83 +/- 0.03
Group C	0.55 +/- 0.04
Group D	0.07 +/- 0.01

The positive effect of the additional polish with a silicone polisher is also clear here.

Colonization with microorganisms

The adhesion of microorganisms to Ufi Gel hard C was also analysed with SEM images (Figure 3). It shows that the amount of *C. albicans*, which were always present after rinsing the test specimens, can be considerably reduced through polishing. The correlation between a smooth surface and lower colonization is immediately visible in the images.

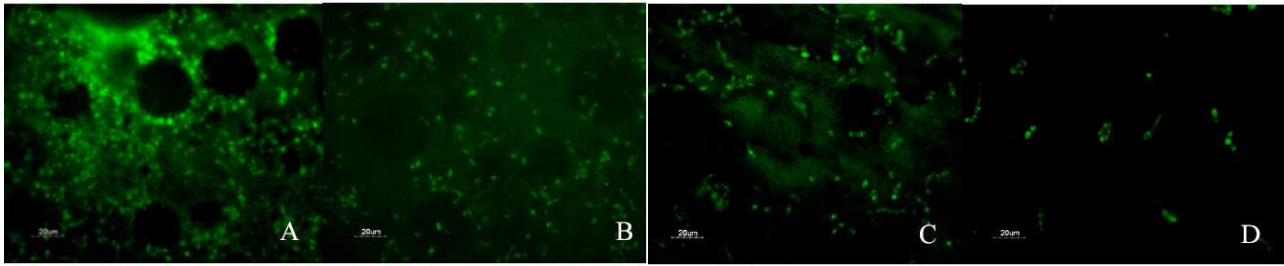


Figure 2: SEM images of the surfaces of the test specimens: *C. albicans* appear green

Conclusion: The degree of colonization of a liner with microorganisms strongly correlates to the surface roughness of the material. The polish is therefore decisive for the long-term success of the treatment. Successive polishing of Ufi Gel hard C with tungsten and silicone polishers results in sufficient smoothness of the material, which eliminates any opposition of a durable lining of the denture with Ufi Gel hard C also from a microbiological viewpoint.

[1] B. Walter, R. M. Frank, *J. Biol. Buccale* **1985**, *13*,145-66.

[2] O. Etienne, C. Taddei, IADR, Istanbul 2004.