P-BR-113

BASIC RESEARCH

Implantoplasty: tungsten carbide bur vs diamond sonic tip. Preliminary results of an in vitro study.

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Abstract

Implantoplasty (IP) was found to be a promising treatment for peri-implantitis. The aim of this study was to evaluate the efficacy of diamond sonic tips (Komet, Germany) compared to tungsten carbide egg-shaped burs (Komet), in terms of treatment time, surface roughness and weight loss. Micro-CT analysis of the implant before and after IP was also performed in order to evaluate volume differences.
IP with diamond sonic tips resulted to be more time-consuming and expensive, but it was more conservative in terms of implant modification. A comparable final surface roughness was obtained with both methods.

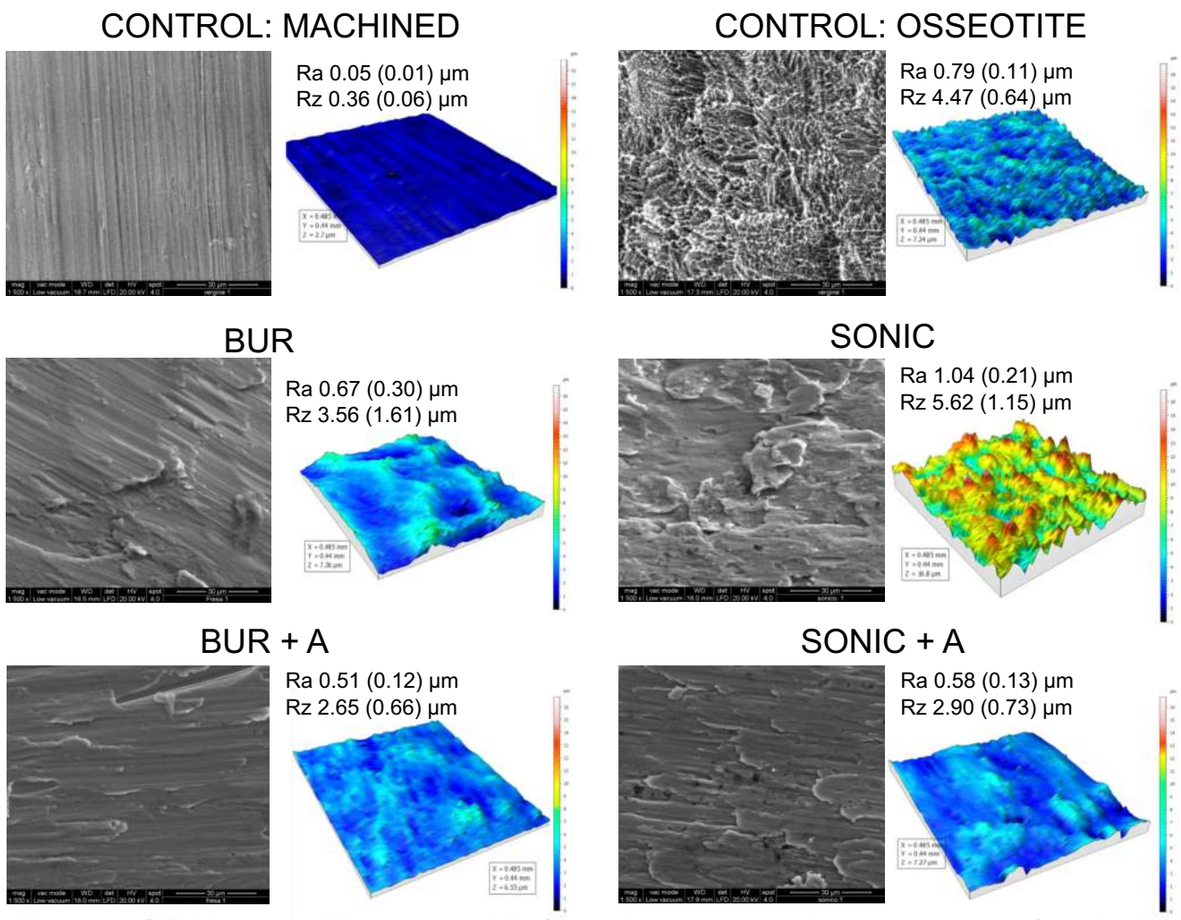

Figure 1. SEM images, 3D maps and Ra/Rz values, expressed as mean value (standard deviation), of: MACHINED, OSSEOTITE, BUR, SONIC, BUR+A and SONIC+A surfaces.

Background and Aim

IP is one of the options for the treatment of peri-implantitis. Several methods have been described for removing the threads of the implants and for smoothing and polishing implant surfaces, including rotary instruments and piezoelectric devices. The use of sonic tips has not been reported so far for this application. The aim of this study was to evaluate the efficacy of diamond sonic tips compared to tungsten carbide egg-shaped burs, both in combination with finishing Arkansas burs, in terms of treatment time, surface roughness, weight variations and high resolution morphology.

Methods and Materials

9 cylindrical 4x13mm implants with a hybrid surface (machined/moderate rough) were used to evaluate surface wear obtained using: 1) a sequence of 2 tungsten carbide egg-shaped burs with decreasing toothing attached to a high-speed handpiece (BUR); 2) a sequence of 2 torpedo-shaped Sonic tips attached to an air scaler (SONIC). Both groups were then treated by finishing with Arkansas burs (BUR+A and SONIC+A). The duration of the procedures was recorded. High resolution surface topography before and after IP was analyzed. Scanning electron microscopy (SEM) coupled with energy dispersive x-ray spectroscopy (EDS) was also used to investigate surface morphology and elemental composition. Implant weight variations and micro-CT were used to compare implants before and after IP.

Results

Mean time of 7min 19s with a standard deviation (SD) of 28s and of 13min 28s (SD = 53s) was recorded for BUR+A and SONIC+A groups, respectively. BUR Ra was significantly lower than that of the SONIC, while no statistically significant differences were found after polishing with Arkansas. Surface features were confirmed by SEM qualitative analysis. EDS showed residues of diamond particles onto implant surfaces in both SONIC groups (SONIC and SONIC+A). Micro-CT revealed a mean volume reduction of the implants after treatment of 10 (±1)% and 3 (±1)% for BUR+A and SONIC+A, respectively. Moreover, BUR+A showed a mean cross-sectional area reduction of 20 (± 3) % in the region treated with IP, while in SONIC+A it was 6 (±2)%. Similarly, statistically significant differences in weight were found between the two groups after IP. Furthermore, Nichel peaks were observed on implant surface in SONIC group.

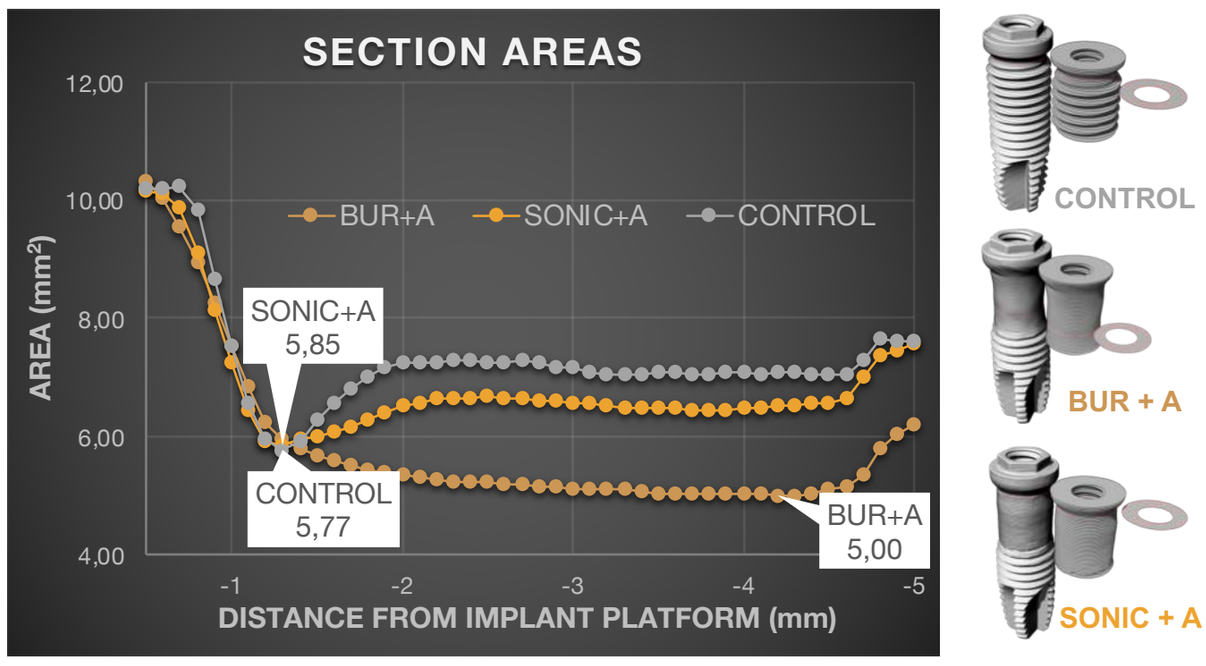

Figure 2. Micro-CT results. On the left, graphical representation of cross-sectional area differences between CONTROL, BUR+A and SONIC+A. Callout blocks refer to the minimum cross-sectional area in each group. On the right, representation of STL models obtained from Micro-CT analysis and their cross-sections. Minimum cross-sectional areas are highlighted as well.

Conclusion

A comparable implant surface was obtained with both treatments. SONIC was found to be more time-consuming and resulted in almost complete destruction of the tips' diamond coating after two treatments, but it was more conservative in terms of implant modification. Further studies are needed to determine whether IP performed with sonic tips can cause a different mechanical resistance weakening compared to burs, and the role of debris in the surrounding soft and hard tissues *in vivo*.

References

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