MORPHOLOGICAL AND CHEMICAL CHARACTERISTICS OF DIFFERENT TITANIUM SURFACES TREATED BY BICARBONATE AND GLYCINE POWDER AIR ABRASIVE SYSTEMS

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Purpose
The aim of this in vitro study was to investigate possible morphological and chemical changes induced by the use of glycine powder or sodium bicarbonate powder air polishing on machined and acid-etched titanium surfaces.

Materials and methods
The glycine powder (granulometry <65 μm) and sodium bicarbonate powder (granulometry <150 μm) were applied on 2 machined healing abutments and on 2 acid-etched healing abutments. The samples were characterized by scanning electron microscopy (SEM) coupled with energy dispersive X-ray spectroscopy (EDXS). The analyses were performed at different steps: 1) as received (right after opening their packaging, Fig.1,2); 2) after 20 minutes air exposure (Fig.3,4); 3) after aging in artificial saliva (Fig.5,6); 4) after glycine or sodium bicarbonate powder air polishing for 5 seconds (Fig.7,8); 5) after repetition of steps 3 and 4 with longer time of polishing (20 seconds) (Fig.9-14).

Results
SEM observations did not reveal any change in the morphological characteristics of titanium surfaces either using glycine or bicarbonate powder. EDX analysis demonstrated a greater quantity of carbon on abutments treated with sodium bicarbonate powder and a greater amount of silicon on abutments treated with glycine. After immersion in artificial saliva, abutments treated with sodium bicarbonate showed a greater amount of salts on their surface. Greater oxidation and more salts were visible on acid-etched surfaces compared with machined ones.

Conclusions
Air polishing using glycine and sodium bicarbonate powder appeared to be a safe system for professional oral hygiene of titanium dental implants both with machined and acid-etched surfaces, although acid-etched abutments and abutments treated with sodium bicarbonate harbored more salts. More studies are needed to evaluate the clinical significance of the present results.

References

Fig.1 Machined abutment (Ra = 0.0263 ± 0.0036 μm).
Fig.2 Acid-etched abutment (Ra = 0.489 ± 0.079 μm).
Fig.3 Machined abutments after oxidation (SEM 250x).
Fig.4 Acid-etched abutments after oxidation (SEM 250x).
Fig.5 Machined abutments aged in artificial saliva (SEM 2000x).
Fig.6 Acid-etched abutments aged in artificial saliva (SEM 2000x).
Fig.7 Machined abutments treated with glycine (left, SEM 2000x) and sodium bicarbonate (right, SEM 2000x) for 5 seconds.
Fig.8 Acid-etched abutments treated with glycine (left, SEM 2000x) and sodium bicarbonate (right, SEM 2000x) for 5 seconds.
Fig.9 Machined abutment treated with glycine and aged in artificial saliva on the left; machined abutment treated with bicarbonate and aged in artificial saliva on the right (SEM 500x).
Fig.10 Acid-etched abutment treated with glycine aged in artificial on the left; acid-etched abutment treated with bicarbonate and aged in artificial on the right (SEM 500x).
Fig.11 Machined abutment treated again with glycine for 20 seconds on the left (SEM 1000x); machined abutment treated again with bicarbonate for 20 seconds on the right (SEM 1000x).
Fig.12 Acid-etched abutment treated again with glycine for 20 seconds on the left (SEM 1000x); acid-etched abutment treated again with bicarbonate on the right (SEM 1000x).
Fig.13 Machined abutment treated again with glycine for 20 seconds on the left and EDX analysis below; machined abutment treated again with bicarbonate for 20 seconds on the right and EDX analysis below.
Fig.14 Acid-etched abutment treated again with glycine for 20 seconds on the left and EDX analysis below; acid-etched abutment treated again with bicarbonate on the right and EDX analysis below.

Fig.11 Machined abutment treated again with glycine for 20 seconds on the left (SEM 1000x); machined abutment treated again with bicarbonate for 20 seconds on the right (SEM 1000x).