CHARACTERIZATION OF THE TOPOGRAPHIC SURFACE OF TI CP PROTOTYPE IMPLANTS SUBMITTED TO SIMILAR TREATMENT TO THOSE FOR DECONTAMINATION IN PERI-IMPLANTITIS

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ABSTRACT

With the increased use of osteo-integrated implant some problems were identified, among them the peri-implantitis and the need for solution was urgent. The treatment of this disease starts with debridement of the affected area, decontamination of the surface of the implant for later on to proceed with the regeneration of the lost area. Aiming to evaluate the modification in the surface provoked by chemical and physical treatment on TI cp prototypes, disk of this metal received similar treatment to those for decontamination of surface of implants affected by peri-implantitis, to further characterization of the surface in SEM. The treatment have characterized the following groups: I – material was only machined; II – immersion in a 10% citric acid solution; III – immersion in a 37% solution of phosphoric acid; IV – immersion in a solution of acid tetracycline; and V – sodium bicarbonate flush. Results did not show marked differences among groups on the characteristic of the surfaces. Therefore, it is concluded that the surface treatment of the original Ti cp machined implants preserves the main surface characteristics of the original prototypes.

KEY WORDS: implants; peri-implantitis; decontamination; superficial topography.

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INTRODUCTION

In the last four decades dental implants anchored in bone tissue become a predictable and largely accepted modality of treatment for total or partially edented patients, consisting in part of the reconstructive dentistry. The rate of success of dental implants has reached 95% of bone-integrated permanence after two year of insertion (ALBREKTSSON; HANSSON, 1986).

Such result express the biocompatibility of inorganic material, such as titanium, which basis for discussion is the physical and chemical characteristics of solid surface. The relevance of such properties relies in the fact that all primary interactions are based in the atomic dimension in the implant/tissue interface. Therefore, the various types of interactions (van der Waals, strong chemical interaction, etc) are dependent of the real microstructure of the surface of the implant in an atomic scale. In this connection, it is important the preparation of the surface of the implant in a controlled way since in a molecular scale the basic chemical and physical interactions in the implant/host interface are the same, regardless of the type of inorganic material involved (KASEMO; LAUSMAA, 1987).

The superficial energy, dictated by the superficial roughness, topography, composition of the implant, sterilization and thermal treatment, may exert influence in the determination of which protein will be adsorbed in the surface, as well as whether the cell will adhere or not to the surface by themselves (BOYAN et al., 1996; SCHWARTZ et al., 1996).

Taking these points into consideration, the aim of this study was to characterize, in scan electronic microscopy (SEM) the superficial topography of prototypes of Ti cp submitted to similar superficial treatments as those used for decontamination of surfaces of implants with peri-implantitis and/or peri-mucositis.

MATERIALS AND METHODS

The methodology of the present study consisted in the treatment of commercially pure titanium prototypes (Ti cp) and the characterization by scan electronic microscopy. The surface treatments

were similar to those for superficial decontamination of implants in the treatment of peri-implantitis.

The prototypes were disks 4.76 mm in diameter and 2.0 mm thick (FIGURE 1) and were separated in five groups. These prototypes undergo surface treatment that characterized each group. It should be stressed, however, that the initial and final cleansing of the surface were equal for all of them, consisting in bath with trichlorethilene, two baths in absolute alcohol and passivation in a sterilizer at 180ºC for 30 minutes. Finally, the pieces were packed for AUTOCLAVE sterilization.

FIGURE 1 – Picture of the implant prototype. Disc of Ti cp – 4.76 mm of diameter and 2 mm wide.

However, intermediate treatments were made in the surfaces of the prototypes between the initial and final treatments during three minutes, characterizing the differences among each group, as follows:

Group I – in this group the prototypes undergo only initial and final treatment and were included as control group.

Group II – immersion in a 10% solution of citric acid under ultra-sound.

Gruop III – immersion in a 37% solution of phosphoric acid under ultra-sound.

Gruop IV – immersion in a solution of acid tetracycline under ultra sound.

Gruop V – an air-flush of bicarbonate with a Prophy II (Dabi atlante S.A. Indústria e Comércio de Equipamentos Médico-Odontológicos);

RESULTS

The surface characteristic can be seen in FIGURES 2, 3, 4, 5 and 6 (1500 x).

FIGURE 2 – Note the surface to a piece belonging to Group I with light roughness produced by the machining process.

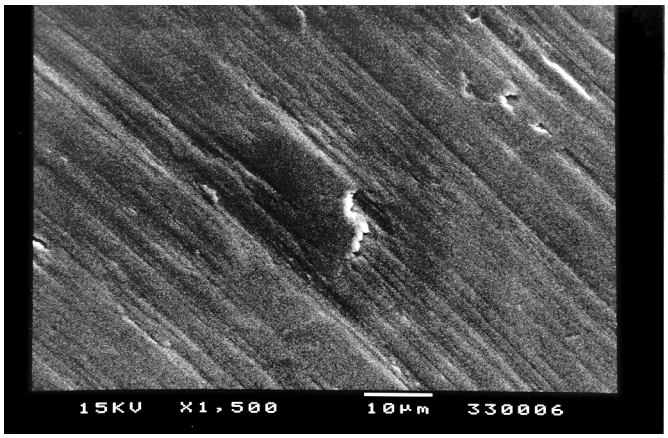

FIGURE 3 – Note the surface of a piece of group II. There is more marked roughness, although still discrete; the surface shows depressions as a possible result of fractures of remains of the micromachinery.

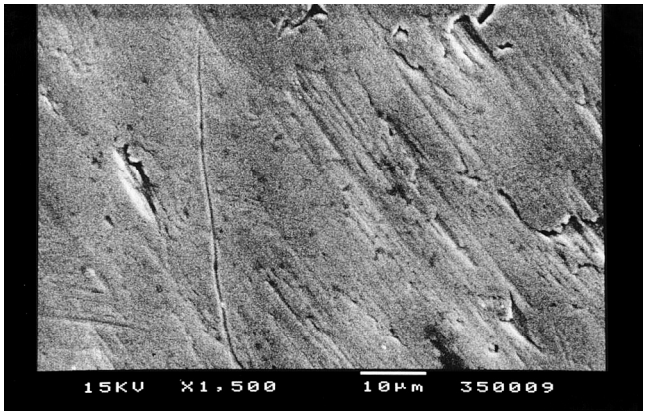

FIGURE 4 – Picture of a piece of group III. Note that the surface is irregular showing discontinued roughness and depressions that might be a result of the micromachinery process.

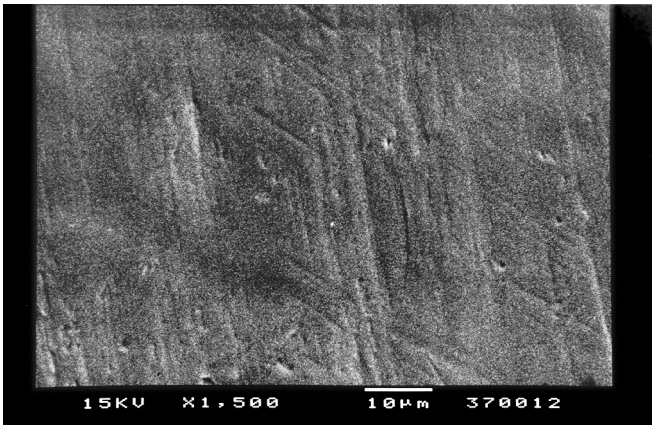

FIGURE 5 – Note the regularity of the surface with minimal roughness and little depressions. Characteristics of pieces on group V.

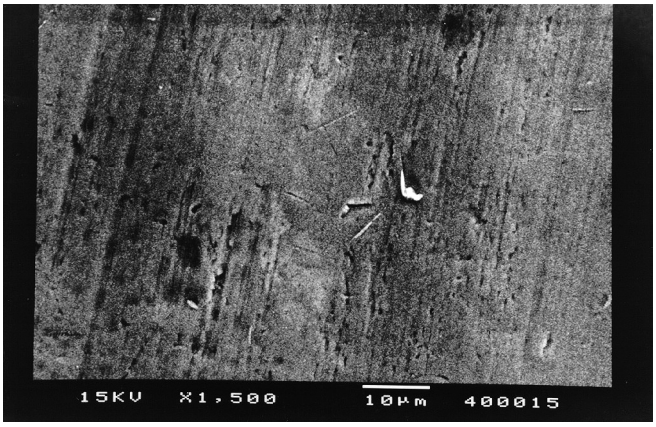

FIGURE 6 – This picture shows the surface of a piece of group V. It can be seen roughness due to machinery as well small perforation and some areas with depressions as a result of remains of the manufacture.

DISCUSSION

It was intended to evaluate the surface characteristics of commercially pure titanium implants after superficial reconditioning since these characteristics are determinants for the adequate cell response both to the marginal sealing and to the osteo-integration itself (DEN BRABER et al. 1996; DEN BRABER et al. 1996a; BRUNETTE, 1986; 1988; BRUNETTE et al., 1989; CHEROUDI et al., 1991; COCHRAN et al., 1994; EISENBARTH et al., 1996; KÖNÖNEN et al., 1992; ONG et al., 1996).

Taking into consideration that the cleaning of the surface of the material to be implanted influences the tissue healing (BAIER, 1984) and that the superficial decontamination of implants is a fundamental part in the treatment of peri-implantitis in order to obtain the re-osteo-integration (DENNISON et al., 1994; HÜRZELER et al., 1995; MEFFERT, 1996), the proposed treatments based in acids and abrasive flush (citric and phosphoric acid, acid tetracycline and bicarbonate abrasive air-powder) (ARAGONES, 1996; BORGES, 1999; COCHRAN et al., 1994; KÖNÖNEN et al., 1992; PARHAM et al., 1989; RESENDE, 1999) were evaluated in relation to the provoked alteration in the titanium surface.

The analyses by scan electronic microscopy (SEM) gives immediate and relatively precise results in the used scale, allowing an wide vision of the superficial topographic characteristics (RATNER, 1988).

The observation on SEM, as shown in FIGURES 2, 3, 4, 5, and 6, did not made evident clear or easily discernible differences among specimens. In this connection, the different procedures for superficial decontamination/reconditioning seems to exert little influence in the original micro and macro characteristics of the surface. What it was notes was some difference in the definition of the micro-groves; group III showed areas indicating removal of small portions of titanium that lead to the formation perforations; in group II these defects were noted in a minor scale whereas the group IV was the most regular under the inspection by SEM. The lack of definition of variations in the characteristics of the different treated surfaces, detected in the magnification used in the SEM was suggestive that these variations were restricted to an extent of no more than 10 mm.

Therefore, these results seem to agree to the characteristics reported by Parham et al. (1989) that mention a soft rounding of the superficial topography. However, they differ from Borges (1999) and Resende (1999) that report differences mainly among the group only metal worked and the group with chemical treatment plus abrasive flush. These differences may be due to the diversity of acids,

time of exposition to these chemicals, pressure of the abrasive flush and type of the abrasive material. In the present study the used acids were weak whereas in the cited studies the acids are strong ones (sulphuric, fluoridric and nytric); the time of exposition of the specimens was also different- in the present study it was three minutes and in the cited study it was 10, 15 and 30 minutes. Another factor that can justify the difference in the superficial characteristics of the specimens was the pressure produced by the air-flush system: in the present study it was used a system indicated for oral cavity, which pressure is calibrated in order not to cause tissue lesion, whereas the tri-jet used in the other studies is employed to clean prosthetic infrastructures and uses a greater pressure. It should be stressed, however, that in the cited studies the conditioning of the surface was made to the original preparation of the implant.

Maybe this fact can explain the variability of procedures and results that have been proposed in the literature to the treatment of peri-implantitis or the marginal loss of osteo-integration due to other reasons.

It should also be stressed that the acid conditioning in the preparation of specimens influence the ionic composition of the surface thus interfering in the oxide layer of the surface as was suggested by Ong et al. (1993) and Moncada (1996). In the other hand it has been made some connection between the air-flush and aluminum oxide (ONG et al., 1993), while Binon et al (1996) consider that Ca, Na, F and Cl ions could be residues of salts of the water used in the cleansing of implants. On the other hand, in the biological milieu the interaction of the superficial roughness with the organic components lead to the formation of a layer of macro-molecules that modify the cell behavior with the possibility of adsorption of more protein components of serum in order to preserve the protein synthesis of the extra-cellular matrix (MARTIN et al., 1995). There is induction of alterations in the superficial energy of the material with repercussion in the adsorption of seric products, in the cell growth and in the integration of the implant (BAIER, 1984; CHEROUDI et al., 1991; KASEMO; LAUSMAA, 1987). Besides that, in the areas of peri-implantitis there is bacterial contamination.

Therefore, the re-establishment of the original topographic characteristic of implants seems to be a questionable point facing the treatment of areas of peri-implantitis.

The presence of such irregularities appears in the very beginning of the preparation of specimens, being related to different conditioning factors of the surface of implants such as the metalographic preparation, flushing with glass spheres and aluminum oxide,

lengthy acid treatment (strong acids) with different acids (BORGES, 1999; MONCADA, 1996; RESENDE, 1999).

In this regards, Moncada (1996) observed clear topographic variations processed by different surface preparations, what was not observed in the present study. A reason for that could be the fact that the mentioned author analyzed mainly the original preparation of the implants, whereas the manufacturing conditions are more critical and determinant for the characteristics itself. In this sense, the acid conditioning uses strong acids for lengthy period (up to 20 minutes) what is not possible while treating implants in areas of peri-implantitis.

Although the superficial roughness, both regarding type and dimension, is considered important to the bone apposition, there is not yet a definition of the ideal roughness (MONCADA, 1996).

However, there are evidences of this influence since the rough surfaces shows greater bone apposition with a greater resistance to tensional forces and to the removal torque when compared to smooth surfaces (BUSER et al., 1991; CARLSSON et al.,1988; MONCADA, 1996; THOMAS; COOK, 1985).

Although this analysis was not possible to be made in the present study the evidence of the superficial characteristics of implants, including its homogeneity for the different types of treatments, it is possible to envisage the occurrence of this process.

In addition, it should be mentioned that the superficial texture of the implant seems to have some specific selectivity to the cell population influencing their function and proliferation by means of the cell shape (CARLSSON, L. et al., 1988).

Therefore, it is important to analyze the biological response elicited by tissue after the conditioning of the surface of the implants by processes related and associated to the treatment of peri-implantitis in order to estimate the effect of the variations on the surface of implants in the re-establishment and manifestation of properties due to the biocompatibility.

CONCLUSIONS

Considering the adopted methodology and the results in the conditions of the present study, it seems valid to conclude that the superficial treatment of machined original titanium cp implants by conditioning with citric acid for three minutes, or phosphoric acid for three minutes or acid tetracyclin for three minutes or bicarbonate air-flush for three minutes, as a general rule, preserve the main superficial characteristic of the original prototypes.

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Doença de Parkinson: proposta de protocolo de anamnese

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RESUMO

O objetivo deste estudo foi descrever um instrumento de anamnese específica para coleta de histórico clínico em pacientes portadores de doença de Parkinson e apresentar sua aplicação em 30 indivíduos de ambos os sexos, com idade entre 47 a 89 anos. Dos sintomas avaliados, o tremor na realização do movimento foi o que apresentou maior evolução, seguido de queixas de sialorréia, tremor em repouso, alterações dermatológicas, alterações da deglutição e voz. Tais aspectos enfatizam a necessidade do acompanhamento fonoaudiológico, considerando que a maioria dos sintomas, que apresentaram evolução significativa, envolvem diretamente manifestações relacionadas à área fonoaudiológica. Os resultados demonstraram que este instrumento possibilitou a padronização dos dados, para fins comparativos da evolução clínica de um mesmo paciente e entre pacientes.

PALAVRAS-CHAVE: Doença de Parkinson; anamnese; evolução clínica.

INTRODUÇÃO

A Doença de Parkinson foi descrita pela primeira vez em 1817, por James Parkinson e é atualmente definida como um distúrbio neurológico degenerativo, idiopático, que acomete igualmente homens e mulheres, na maioria das vezes após os 50 anos (CAM-