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5th World Congress on
Materials Science & Engineering
June 13-15, 2016 Alicante, Spain

Influence of hydroxyapatite granule size, porosity and crystallinity on tissue reaction, *in vivo* characterization of the materials and *in vivo* SEM analysis

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Some studies have demonstrated that osteointegration and degradation processes are influenced by physical and chemical properties of the material. The present study compares 2 hydroxyapatites (HAs) and how the physico-chemical properties like chemical composition and particle morphology influence the material performance *in vivo*. The biological behavior of both (HAs) was evaluated with a histomorphometric study of the newly forming bone and mineral degradation, in retrieved bone biopsies following maxillary sinus augmentation, in 10 clinical cases. The HAs were characterized thorough powder X-ray diffraction XDR analyses, gas pycnometry and scanning electron microscopy SEM. Quantitative analyses were made by an Electronic Dispersive X-ray Spectroscopy (EDX) system. Ten patients were selected who required bilateral sinus augmentation. Following elevation of the lateral sinus walls, one material was placed in the right sinus and the other in the left sinus, as determined by randomized choice. Nine months after sinus lifting, a trephine bone core was harvested from the previously elevated maxillary sinus and sent for histomorphometric analysis. The specimens were processed for observation under a scanning electron microscope with backscattered electron imaging (SEM-BSE). The X-ray diffraction showed that both HAs were composed of single phase HA. Both HAs are porous and exhibit intraparticle pores (35-60%) around 0.03 μm. The particles size range varied (250-1000 μm). Strong differences were observed in terms of crystallinity, the HA (B) granules exhibit low crystallinity, crystal size is 732 nm, while (HA) A structure consisted of a highly crystallinity and the crystal size is 325 nm. Scanning electron microscopy revealed that newly formed bone had become closely attached to both HAs. Histomorphometric measurements on the bone biopsies showed that for the HA (B), the newly formed bone represented (23.5±2.4%), residual graft material (25.1±2.3%) and for connective tissue (51.4±3.4%), while for the HA (A) newly formed bone (28.5±2.4%), residual graft material (31.3±2.3%) and non-mineralized connective tissue (40.2±3.4%). The HAs assessed in the study were shown to be biocompatible and osteoconductive when used for maxillary sinus elevation. The HA (A) was not a complete resorbable material over the time period covered by this study. Despite the similar characteristics of the 2 HAs the differences found in terms of crystallinity may determine different behavior of these materials. Detailed information about graft material characteristic is crucial to evaluate their clinical outcomes.

Biography

Maria Piedad Ramírez Fernández completed her Doctor of Dental Surgery in Odontology from Granada University, Spain (1996), PhD in Implant Dentistry from Murcia University, Spain (2009), MSc in Implantology and Biomaterials from Murcia University, Spain (2009), MSc in Animal Care and Research in Biomedical Sciences from Granada University, Spain (2011) and MSc in Advanced Implantology from Murcia University, Spain (2013). She is working as a Research Assistant at International Cathedral of Research Implantology and Biomaterials, UCAM, San Antonio Catholic University of Murcia. She published more than 40 papers in journals with JCR. She is also doing her second PhD in Biomaterials at the Miguel Hernández University, Elche, Spain. She has won 1st prize at 2nd International Congress of Bone Regeneration, Madrid, Spain in 2008, 1st Prize at 3rd International Congress of Bone Regeneration, Madrid, Spain in 2009 and 1st Prize at 3rd National Meeting, Spanish Society of Oral Surgery, Zaragoza, Spain in 2010. She also won a Special Award for Doctorate in Dentistry from the University of Murcia in 2011, 1st prize of Spanish Society of Oral Surgery (SECIB), Zaragoza, Spain and 1st prize at IX National Meeting, Spanish Society of Oral surgery.

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