Evaluate of surface modification on Ti-35Nb-7Zr alloy by acid etching

de Mello, F.Z.D.(1); Pinto, C.(1); Kleingesinds, E.K.(1); de Macedo, B.Z.(1); Ferreira, B.(1); Schneider, S.G.(1);
(1) USP;

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Resumo:
This study aims to evaluate topography characteristics of the effect of 0.6HNO₃:0.4HF acid etching in a microstructure of Ti-35Nb-7Zr alloy under different heat treatments. Recently, α Ti alloys have been considered promising because they have a significant lower elastic modulus when compared to the α and α + γ alloys, making them more favorable to distribute the forces between implant and bone. The Ti-35Nb-7Zr that is the subject of this work is a α alloy that has an elastic modulus between 35 and 60Gpa. The rapid implants osseointegration is related to the surfaces characteristics such as roughness, topography, chemical composition and surface energy. A more rough contact surface increases the contact area between implant and bone, facilitating the initiation of bone regeneration. The etching with strong acids as HNO₃ and HF is one of the ways used to increase dental implants roughness and producing on the surface micro pores with sizes ranging from 0.5 to 2μm in diameter. The Ti-35Nb-7Zr was produced by an arc-melting furnace. The ingots were submitted to heat treatment (1000°C/2h and water quenching-WQ), cold working by swaging procedures. Then, subjected to two heat treatments conditions: i) recrystallization at 700°C/30min WQ to promote grain refinement and improved mechanical properties (strength gain without loss of ductility), ii) recrystallization at 1000°C/30min WQ. The preparation of samples (3mm diameter and 3mm in thickness) followed the usual pattern of metallography, followed by acid etching in proportion 0.6HNO₃:0.4HF for 40 seconds. The surfaces were investigated by using SEM (Scanning Electron Microscope), EDX (Energy Dispersive X-ray Spectroscopy), and contact angle measurements. The results showed that the alloy treated at 700°C/30min the has most favorable conditions for the osseointegration due to the presence of a larger amount of pores compared to the alloy treated at 1000°C/30min.