Calcium Analysis from Gamma Sterilized Human Dentin and Enamel

Claudia Bianchi Zamataro, Nielsen Grosko Kuchar, Marcos Antonio Scapin, Nathalia Zanini, Pedro Castro, Thais Freitas Rabelo, Amanda Caramel Juvino, Denise Zezell

Center for Lasers and Applications - Nuclear and Energy Research Institute - IPEN - CNEN/SP

Gamma radiation changes the patients′ oral cavity undergoing radiotherapy. Alterations cause an unsaturated environment of calcium and phosphate into the oral cavity. After approval of the Ethics Committee, 20 human teeth were sectioned to obtain 20 human enamel and 20 dentin samples, polished plane. Samples were randomized in the irradiated group and control group (untreated). Then, the treatment group was irradiated with 25.0 kGy at the ^{60}Co multipurpose irradiator. After the gamma irradiation, Fourier Transformed Infrared Spectroscopy (FTIR), percentage of surface microhardness loss (%SMHL) and Scanning Electron Microscopy (SEM) were performed. At the end, acidic biopsies were performed to quantify the concentration of calcium present in the samples. FTIR showed that the molecular structure of HA of the enamel is similar to the non-irradiated, with no formation or loss of molecular compounds occurring. X-ray fluorescence at enamel samples was performed. Microscopic morphological analysis did not shown significant differences. Surface microhardness is an indirect indicator of the mineral content of the samples. The mean obtained was 258.2 (38.8) KHN within the hardness spectrum of the healthy natural enamel. The compounds present in the samples and the values of the ratios of Calcium and Phosphate oxides and relation between the elements Calcium and Phosphorus. The ratio of the most stable oxides shows a variation with linear correlation. In the enamel, the ratio (Ca/P) shows a change in the elemental content with linear correlation ($R^2 = 1$). These findings lead us to a new hypothesis of behaviour of the HA crystal versus gamma irradiation. On the other hand for the irradiated dentin, the Knoop hardness number was within the range of the spectrum similar to that of natural dentin of human origin. X-ray fluorescence shows that irradiated dentin has great similarity with natural dentin from the point of view of chemical composition. SEM analyses showed that there was no thermal damage or interprismatic morphological changes in the hydroxyapatite structure of human dental dentin outside the buccal environment when using doses of gamma irradiation up to 25 kGy. Acknowledgements: CNEN PQ, CNPq/INCT 465763/2014-6, PQ 309902/2017-7, CAPES PROCAD 88881.068505/2014-01.