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CHARACTERIZATION BY ATR-FTIR OF IRRADIATED BONE

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In medical and dental surgeries the bone cut is very common. In some cases, the use of laser can be more advantageous than drill, due to less mechanical damage and more defined cut. However, it is necessary to know the effects of laser irradiation on bone tissues, regarding its possible undesirable chemical changes. In this study, ATR-FTIR (Attenuated Total Reflectance - Fourier Transform Infrared) spectroscopy was used to compare ablated and non-ablated bones, and to verify the chemical changes promoted by irradiation. Rabbit bones were cut in three blocks of 1,0x1,5cm, and samples were polished down to 100 μm . Firstly, samples were analyzed by ATR-FTIR; after this initial analysis, all samples were irradiated using a pulsed Er,Cr:YSGG laser, with 2.8 μm wavelength, at energy density of 6.06 J/cm^2 . During irradiation, samples were positioned at a motorized translation stage and were moved at speed of 13 mm/s to avoid pulse overlapping. After irradiation, samples were submitted to a new ATR-FTIR analysis. In order to verify any changes due to irradiation, the area under phosphate ($1030\text{--}1150\text{ cm}^{-1}$), amides ($1680\text{--}1200\text{ cm}^{-1}$), water ($3600\text{--}2400\text{ cm}^{-1}$), and carbonate (around 875 cm^{-1} and between $1560\text{--}1410\text{ cm}^{-1}$) bands were calculated, and normalized by phosphate band area. All data were subjected to ANOVA/Tukey analysis at 5% significance level. It was observed that Er,Cr:YSGG irradiation promoted a significant decrease on the contents of water, amides I, and III, evidencing that laser treatment caused an evaporation of the organic content of bone and changed the collagen structure. Also was observed significantly shift, about $2.33 \pm 0.20\text{cm}^{-1}$ of the carbonate band (around 875 cm^{-1}), and an increase of the width in amide II/carbonate band. According to the results of this study, Er,Cr:YSGG laser irradiation promoted chemical changes on bones. These changes could be the responsible for laser cuts to have initial stages of healing faster than drills.