Poster 5

ATR-FTIR SPECTROSCOPY TO STUDY THE EFFECTS OF LASER IRRADIATION IN BONES TISSUE

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The use of Er,Cr:YSGG laser on bone cut can provide a series of advantages for surgeon and patient. However, for a safe and efficient application it is necessary to know the exact effects that the laser causes on the bone tissue. The aim of this work was to study the effects of Er,Cr:YSGG irradiation in bone tissue using the ATR-FTIR technique.

This study was approved by the by Animal Ethics Committee of IPEN (6/CEPA-IPEN/SP). Pieces of tibia rabbit bone were divided in six groups with three samples per group. In one of groups the samples did not undergo any treatment; and in the others the samples were laser irradiated with different energy densities: 3 J/cm^2, 6 J/cm^2, 8 J/cm^2 12 J/cm^2, 14 J/cm^2. The Er.Cr:YSGG laser (Waterlase®, Biolase, USA) was used, this is an infrared pulsed laser with wavelength of 2780 nm and frequency of 20 Hz. The infrared spectra acquisition was made using an ATR accessory (Smart Orbit, Thermo, EUA) coupled in a FTIR spectrometer (Nicolet 6700, Thermo, EUA). The spectra range analyzed was from 4000 to 550 cm^{-1}, with a resolution of 4 cm^{-1} and 80 scans per spectra.

The spectra of the 18 samples were obtained, and the observed bands were identified. For a semi-quantitative analyses, the area under each band was calculated and normalized by the phosphate band area (1030 cm^{-1}) of the same spectrum[1]. The phosphate band was used because it is the most stable component of mineral tissue when occur temperature increase[2]. The statistical analysis was performed with the software Origin 8.0, using the paired sample t test at 5% significance level.

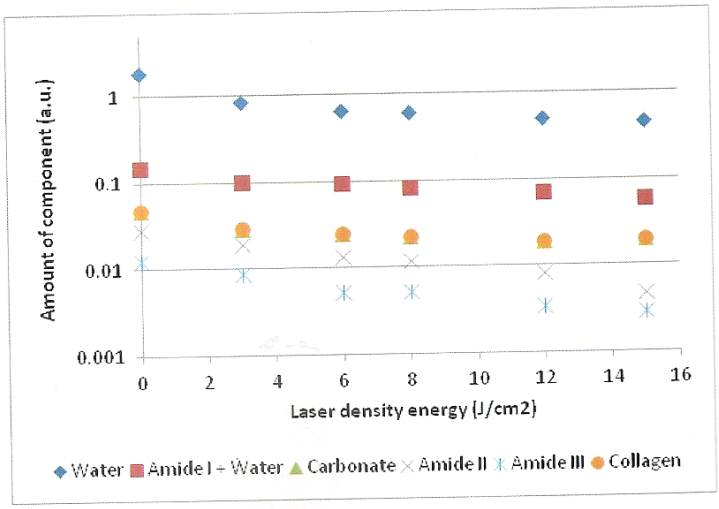

Figure 1: Organic material loss as the increase of laser energy density

The results showed a gradual material loss as the energy density increase in the bands of water, amide I, carbonate locates on 1409 cm^{-1}, amide II, amide II and the collagen located on 1023 cm^{-1} (Figure 1). This is probably caused by the temperature rise due to laser irradiation. The results are the first steps in testing the Er,Cr:YSGG laser efficacy as a cutting tool, a pivotal aspect of its consolidation in clinical procedures.

References

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