The ablation threshold of Er,Cr:YSGG laser radiation in rabbits jaws

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One of the laser applications that is of great interest in medicine and dentistry is the cut of mineralized tissues such as bones and teeth, which is a fairly common procedure during surgeries. For this application the ablation threshold of the irradiated tissues is one characteristics of utter importance for a safe and efficient use of lasers in medicine and dentistry, given that the used of radiant exposure lower than the threshold, cause surface temperature higher and potentially harmful for the tissues. The present work used a geometrical technique to find the ablation threshold in rabbit jaws. In this technique knowing the radius of maximal damage and the energy of the laser pulse, the ablation threshold can be calculated. To get the samples, the bone jaw was cut in rectangular segments, measuring approximately $10mmx5mm$. The samples were screwed and polished, to decrease the defects of surface, allowing the identification of the ablation holes. The samples were irradiated with a pulsed Er,Cr:YSGG laser ($Waterlase$, $Biolase$, USA), with a wavelength of $2780nm$, and moved in the axis of propagation of the laser beam (z) using a controlled motorized stage ($Newport$, ESP300). It was used a sapphire tip (diameter of $0,6mm$) at the output of the fiber ($ModelG6$, $Biolase$). The samples were irradiated with three different energies per pulse ($90mJ$, $100mJ$, and $120mJ$), corresponding to the radiant exposure of $32J/cm^2$, $35J/cm^2$, and $42J/cm^2$). Three ablation holes were made for each radiant exposure, and the diameter of crater considered for the ablation threshold was the average of the diameter of the three holes. During the irradiation the sample was refrigerated with air and water to simulate an in vivo application. The diameter of the ablations craters were measured with an optical microscope ($ContinuunIR, Nicolet$ - USA), with increase of $100X$. The ablation threshold calculated for the three energies are compatible ($10,4J/cm^2$, $11,6J/cm^2$, and $13,4J/cm^2$, respectively), and also with values reported in other literature studies. Acknowledgments: CEPOF (05/51689-2), PROCAD/CAPES (0349/05-4), CNPq (555170/2005-5).