

In Vitro Histological Evaluation of the Surgical Margins Made by Different Laser Wavelengths in Tongue Tissues

Ana-Salvaterra Azevedo, Luís-Silva Monteiro, Fernando Ferreira, Maria-Leonor Delgado, Fernanda Garcês, Sofia Carreira, Marco Martins, Juan Suarez-Quintanilla

Abstract: Background: Lasers have become standard tools for the surgical treatment of oral lesions. The purpose of this study is to determine the surgical margins and histologically evaluate the tissue thermal effects induced by different types of surgical instruments. Material and Methods: Cuts were made in pork tongues' mucosa with different lasers (Er:YAG at 2W with and without air / water spray and at 4W with and without air / water spray; CO₂ at 3.5W and 7W in pulsed mode and at 7W in continuous mode; the diode laser at 3.5W and boost 3.5W in pulsed mode; Nd:YAG at 6W, 40Hz and electroscalpel at 5W and conventional scalpel as control. Macroscopic and microscopic morphological changes were evaluated.

Results: The results of this study showed that the surgical instruments that caused greater tissue damage extension were: the Nd:YAG laser (670.68µm), the diode 3.5W and boost PW (626.82µm), the CO₂ 7W CW (571.18µm), the CO₂ at 7W PW (485.45µm), the diode 3.5W PW (456.15µm), the electroscalpel (409.57µm) and lastly the CO₂ laser 3.5W PW (306.19µm) and Er:YAG (74.66µm) laser, regardless of power, mode or air / water spray used. An association between the Tissue Damage Extension and the Degree of Carbonization ($r = 0.789$; $P = 0.01$), and an association between the Tissue Damage Extension and Regularity of the Incision were found ($r = -, 299$; $P = 0.01$).

Conclusions: The results of this study suggest that lasers can be used in soft tissues biopsies of the oral cavity, enabling a correct histopathological analysis, as long as the biological effects of each laser type are considered. The

Er:YAG laser revealed its potential for biopsies of the oral mucosa ensuring a successful histological evaluation and

the CO₂ laser at 3,5W in pulsed mode presented itself as the best choice for surgeries with hemostasis.