A NOVEL APPROACH TO EVALUATE HEAT GENERATION DURING GINGIVECTOMY PROCEDURE: A CLINICAL CASE REPORT

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Introduction

Thermal imaging has been shown to be a useful method for analyzing patterns of temperature change, which can help locate areas of maximum heat production. Crandell & Hill (1966) first used thermal imaging for dental research purposes, as a diagnostic aid for periapical abscesses.[1] Since this time, thermal imaging technology has improved and found application in periodontology, for studying the thermodynamic behavior of human gingiva[2,3] as well as several other dental disciplines, however, thermal cameras have not been used during gingivectomy procedure, therefore, the aim of this study was to evaluate heat generation with thermal camera during gingivectomy procedure with Er:YAG, Nd:YAG lasers and electrocautery.

Materials and Methods

A 18 year old male patient referred our clinic with the complaint of gingival enlargement in upper and lower anterior areas of the jaws. Gingival surgery was performed with Er:YAG laser [Fotana AT Fidelis III, Ljubljana, Slovenia] (with air+water cooling or with air cooling), Nd:YAG laser [Fotana AT Fidelis III, Ljubljana, Slovenia] and electrocautery device [Servotome Classic System, Satelec, France] in each quadrant. The treatment was performed under local anesthesia. Er:YAG laser parameters were set at 200 mJ, 10 Hz and Nd:YAG laser parameters were 4 watt, 50 Hz. Temperature profiles induced by the lasers and electrocautery were measured using an infrared camera (Optris GmbH, Berlin, Germany) during the entire interval of the application and cooling periods. The thermal camera was connected directly to the computer. The lens was oriented toward the operation area and fixed during the recording period. The temperature changes of the surface were measured and reproduced on the display as a diagram and a color image. A colour-graduated scale was used to conveniently indicate the temperature at the treatment site.

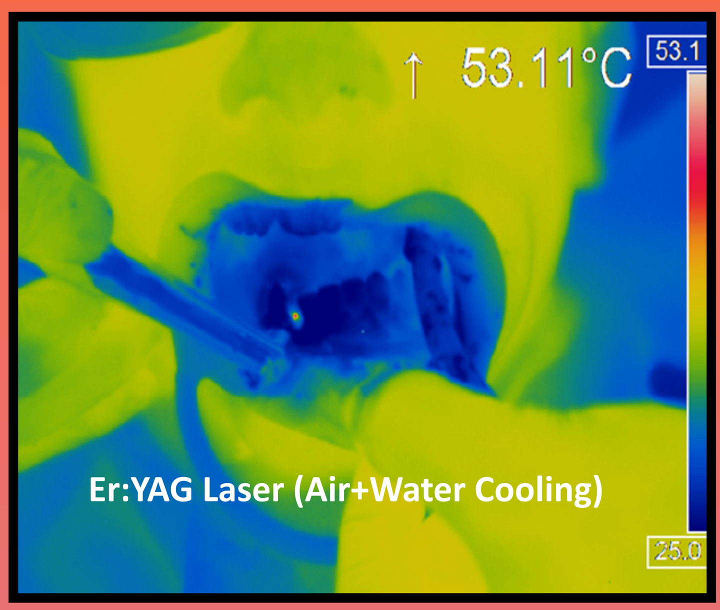

Fig 1: Thermal camera image of Er:YAG laser with air+water cooling.

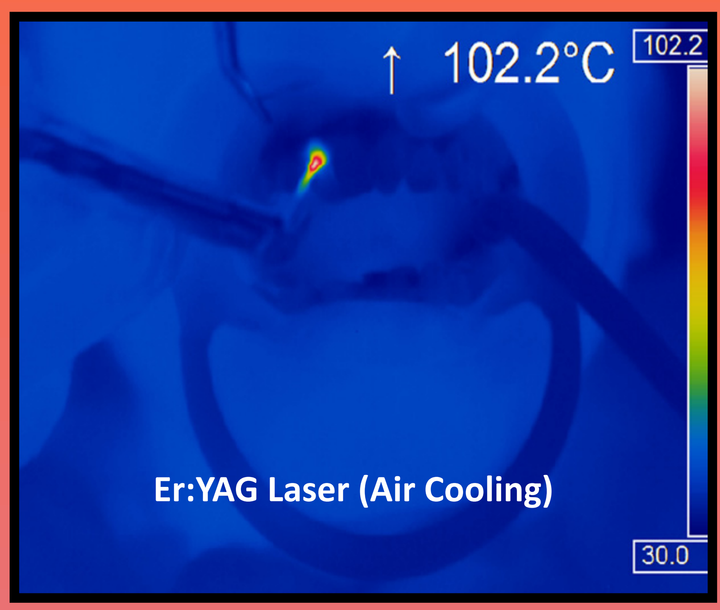

Fig 2: Thermal camera image of Er:YAG laser with air cooling.

Fig 3: Thermal camera image of Nd:YAG laser.

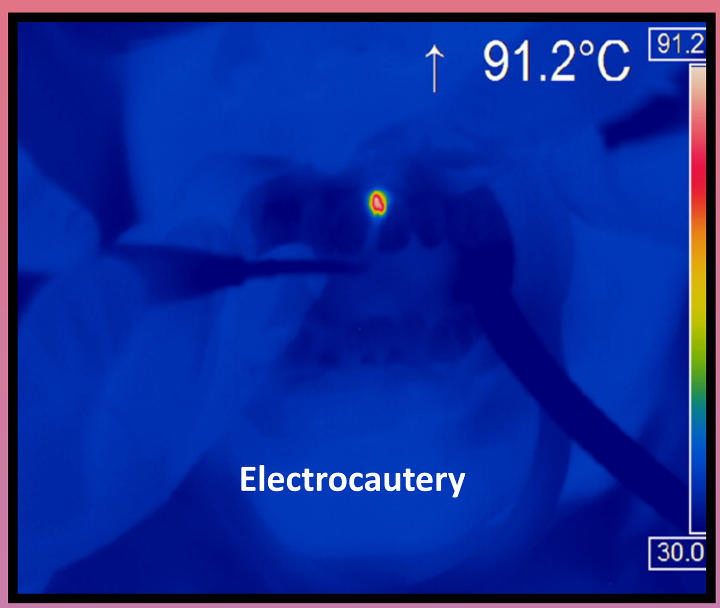

Fig 4: Thermal camera image of Electrocautery.

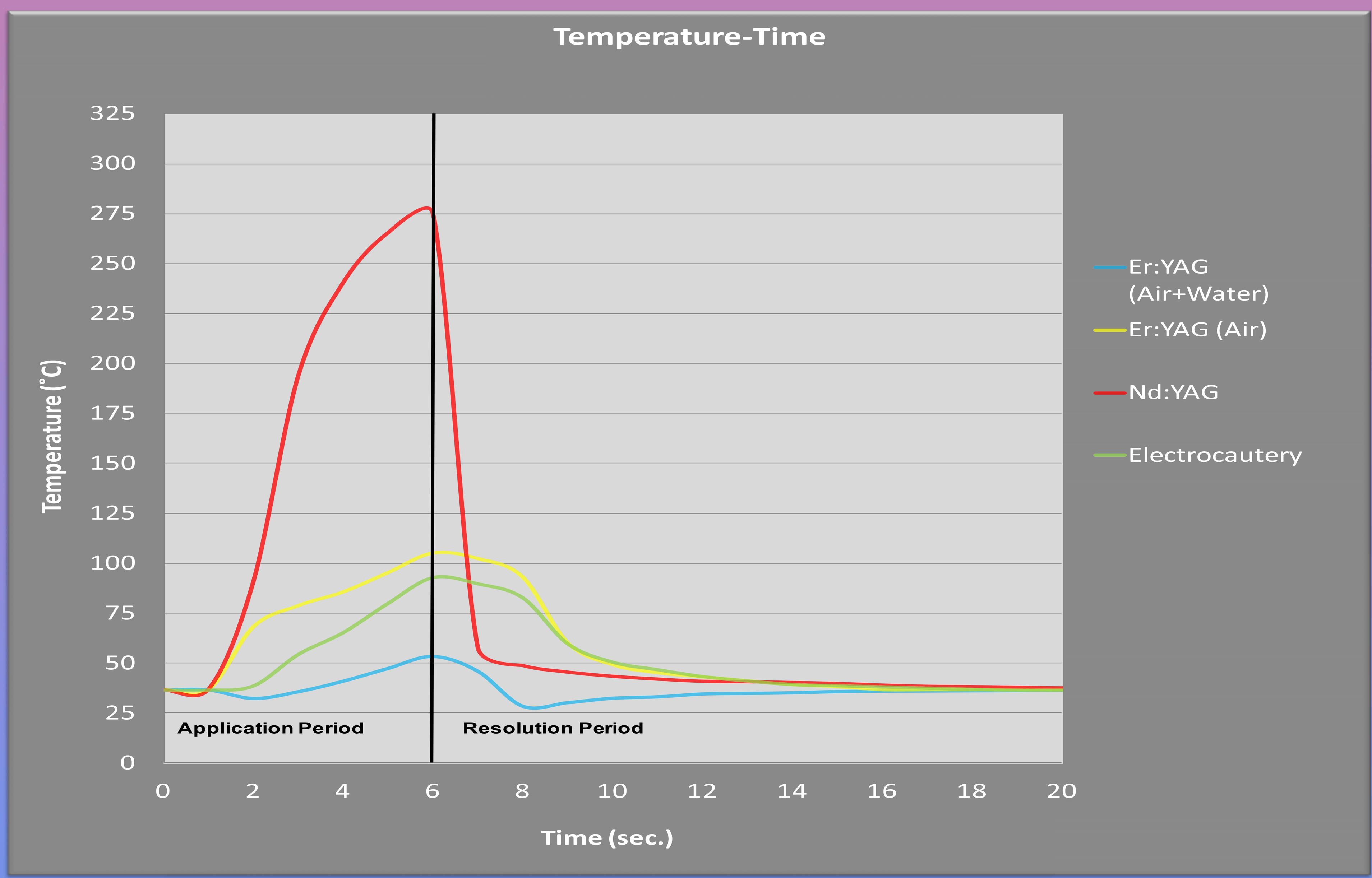

Fig 5: Graph of temperature changes with respect to time including application and resolution periods.

Results

Typical images obtained using the thermal imaging system, for both laser and electrocautery are shown in Figs. 1, 2, 3 and 4. A measurement point was positioned at the site of tip/gingiva contact and the instant maximum temperature was recorded and showed in the figures for all applications. Graph of temperature changes with respect to time were created to observe both in application and resolution periods (Fig 5).

Conclusion

In this clinical case, thermal camera provided instant thermal display of working area. Additionally heat resolution time after application and heat radiation areas were evaluated. Non-contact heat measuring was one of the advantages that eleminated sterilization procedures while working in surgical areas, however, measuring only the superficial heat was the limitation of these cameras.

References

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3.Barnett, M. L., Gilman, R. M., Charles, C. H. & Bartels, L. L. (1989) Computer based thermal imaging of human gingiva: preliminary investigation. Journal of Periodontology 60, 628–633.