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Thermal effects associated with the Nd/YAG dental laser

J.A. von Fraunhofer, MSc, PhD;^a D.J. Allen, DDS, MS

^aSchool of Dentistry, Health Sciences Center, University of Louisville, Louisville, KY 40292

ABSTRACT

The heat produced at the dentinal pulpal wall opposite the irradiation site was measured during etching of dental enamel with an Nd:YAG laser in preparation for direct bonding of orthodontic appliances.

Forty extracted human teeth were randomly divided into four groups of 10 teeth. Within each group, the buccal surfaces of 5 teeth and the lingual surfaces of the other 5 teeth were laser treated for 12 sec. Irradiation was performed with a commercial Nd:YAG laser at the power settings of 80mJ, 1W, 2W and 3W. Prior to irradiation, an occlusal access preparation was made into the pulp in order to facilitate the placement of a thermocouple for measurement of temperature changes at the dentinal pulpal wall opposite the irradiation site. The thermocouple was held against the dentinal pulpal wall and the resulting temperature changes were recorded.

Heating effects at the dentinal pulpal wall on both buccal and lingual surfaces showed an increase in heat as a function of the increase in power output from the laser unit ($p < 0.001$). The temperatures measured at power levels 1-3W appeared to be of sufficient magnitude to cause at least localized pulpal inflammation and possible irreversible damage to the pulp tissue immediately opposite the site of laser irradiation.

Dr. von Fraunhofer is professor and director of the Laboratory of Molecular and Materials Science, School of Dentistry, University of Louisville

Dr. Allen obtained his specialty training and his MS degree at the University of Louisville and is now in private orthodontic practice in Wheaton, Illinois

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