



# AAE POSITION STATEMENT

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*The following fact sheet was prepared by the AAE Research and Scientific Affairs Committee to address issues being raised by some endodontic patients. AAE members may photocopy this position statement for distribution to patients or referring dentists.*

## USE OF LASERS IN DENTISTRY

Laser use in dentistry was suggested approximately 35 years ago as a means of using energy generated by light to remove or modify soft and hard tissues in the oral cavity. A Laser is an acronym for Light Amplification by Stimulated Emission of Radiation. The radiation involved in generating laser light is nonionizing and does not produce the same effects attributed to x-radiation. The Food and Drug Administration has approved the use of various lasers as devices to remove diseased gingival tissues and for other soft tissue applications, the removal of dental caries, as an aid in placing tooth-colored restorations, and as an adjunct in root canal procedures, such as pulpotomies. This position paper concentrates on root canals.

Lasers emit light energy that can interact with biologic tissues, such as tooth enamel, dentin, gingiva or dental pulp. The interaction is the effect of the particular properties of laser light including: 1) monochromaticity, where the light is all the same color (same wavelength); 2) coherence, where the waves of light are all in phase; and 3) collimation, where the light rays are parallel to each other and do not diverge. Applying this light energy results in the modification or removal of tissue. In root canal treatment, the dental pulp is removed and the walls of the root canal system are enlarged by melting and resolidifying the dentin. Once the preparation is completed, the root canal is obturated, and the laser is used to soften and mold the obturating material to the prepared root canal system. These procedures are accomplished by the interactions between the laser light and the tooth substances enamel and dentin. These interactions are thermal (increased temperature), chemical (breaking of tissue chemical bonds), and acoustic (generation of temporary stress waves that can lead to fracture of enamel and/or dentin or cavitation of tissue).

Root canal treatment is currently performed using a combination of hand and rotary instruments to remove the soft tissue, clean the root canal space and shape the space to receive the obturating material, usually gutta-percha. This biocompatible material is then placed with an adhesive cement using special hand instruments to ensure complete sealing of the root canals. These procedures are performed by endodontists, dental specialists who limit their practices to endodontics, with an exceptionally high success rate on the majority of teeth.

Laser energy, when added to root canal procedures, presents advantages and disadvantages. Currently, root canal procedures clean the canal space. Studies using extracted teeth inoculated with bacteria have shown that lasers can reduce the quantity of microorganisms. The walls of the prepared canal space contain tubular openings that harbor organisms, and the preparation itself causes formation of a layer of debris (smear layer) composed of organisms and tooth substances. Laser energy can remove the smear layer as well as dentin from the canal wall and will melt and resolidify the dentin to close the tubular openings. The laser also may aid in welding tooth-like materials (not as yet produced) to the resolidified walls, resulting in denser root canal packing.

The advantages of using the laser, however, are balanced by several disadvantages. Root canal spaces are rarely straight and more often are curved in at least two dimensions. Root canal instruments used to clean the space throughout its length can be curved to follow the curvatures in a tooth root. Laser probes can clean an area in a root canal space that is straight as long as the probe is in contact with the dentinal wall. The probes are made of glass and cannot be curved to follow the natural curvatures of the tooth root. When in contact with the dentinal wall, laser probes are capable of cleaning an area in the root canal space that is straight.

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Further, the interactions involved between laser energy and the tissue cause rises in temperature. These increased temperatures can char the canal space, damaging it to the point that the tooth may be lost. The increased temperatures also may extend to the outer surfaces of the tooth, damaging the soft tissue that connects the tooth to the surrounding bone. If the temperature is high enough, the bone surrounding the tooth may also be damaged, adversely affecting the entire area, which can result in ankylosis.

While the FDA has approved one laser (diode) as an adjunct for removal of pulp tissue in a pulpotomy procedure, more research is required to develop laser energy for use in endodontics so that it is equal, if not superior, to present treatment modalities. Until that research is complete, patients should ask about the use of lasers in root canal treatment, especially in light of the high success rate of non-laser procedures carried out by those trained to perform them.

A reference list is available upon request.