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# Laser Safety in Dentistry

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The American National Standards Institute (ANSI) approves that the process under which the general and clinical standards that define the requirements for the safe use of different kinds of lasers and the safe use of lasers specific to healthcare facilities was conducted in a fair and open manner following due process safeguards.

## *Hazards associated with Laser*

***Ocular injuries***: Changes to the eye can occur at much lower laser power levels than changes to the skin. Major cause of ocular injuries is due to operator error. Longer wavelengths interact with structures in front of the eye, causing ablation, scarring and distortion of vision.

## *Skin risks*

Each laser is characterised by its unique wavelength and their penetration depth into the skin depends on its wavelength, the most penetrating being from 700-1200 nm.

The UV-B range of lasers can be the most injurious, resulting not only in thermal damage but possibly in carcinogenesis. UV-A can cause hyper pigmentation and erythema. UV- C seems to have the least effect on the skin due to its short wavelength which is absorbed by the epidermis.

Thermal burns to the skin are rare. Exposure of skin to light beam of higher energy for a longer period of time is required for burn injuries. Nertheless, if it occurs it could be classified as first degree which involves only reddening of the skin or second degree where there is occurrence of blisters on the skin or third degree where the skin gets charred.

## *Non-Beam Hazards*

## *Environmental hazards*

Potential inhalation of airborne hazardous materials that may be released as a result of laser therapy may cause respiratory hazards.

## *Laser Plume*

Plume carries potential risk of nausea, breathing problems, bacterial inoculation. Laser plume from infra-red lasers are less harmful and can be considered similar to the debris that is produced with an airturbine.

## *Electrical hazards*

Exposure to utility power when the power supply is over 50v could cause such hazards.

### *Combustion Hazards*

Class 4 laser systems represent a fire hazard. Enclosure of Class 3 laser beams can result in potential fire hazards if enclosure materials are likely to be exposed to irradiances exceeding 10 watts/$cm^2$.

### *Appropriate tutelage of office personal*

Class 4 lasers in dentistry include those used for procedures involving ablation of tissues and decontamination of bacteria. They operate under high power and pose ocular hazards and damage to skin when exposed directly. According to the ANSI Z136.3 key protocol for safety the operator, dental auxiliaries, and patients in the dental office to be kept safe.

### *Laser safety officer to be identified*

In each facility consisting of laser device a person who is well-trained in laser safety to be identified as the laser safety officer and is held responsible for the laser safety program. The main role of the laser safety officer is to oversee the control of laser hazards in accordance with the ANSI Z136.3 guidelines and also ensure appropriate training of all the members of the team including the front office staff.

Programs that are didactic, focussing more on hands-on, and device-specific are highly recommended for practitioners looking forward to certification courses in laser.

### *A nominal hazard zone to be maintained while using lasers*

The following actions should be taken in compliance with the ANSI standards within the nominal hazard zone:

1. Everyone present in the office must wear appropriate protective eyewear;
2. Each nominal hazard zone entrance must be labelled properly;
3. Precautions should be taken for prevention of fire hazards;
4. Management of laser plume must be done.

### *Engineering Control Measures*

ANSI has recommended laser barriers, protective curtains, laser activation warning system for laser activation, remote interlock connector, personal protective equipment, eye protection, eyewear Requirements, laser filtration masks, protective housing, master switch control, optical viewing system, beam stop or attenuator and interlock requirements as few of the crucial engineering controls.

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