

Diode Laser in Pediatric Dentistry

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Abstract: *Laser technology in pediatric dentistry is a viable treatment modality for children and adolescents. Diode laser has one of the most versatile ranges of wavelengths available due to the number of different therapies that can be performed in several tissues. They provide a comfortable and stress-free environment to the pedodontist and child by offering an excellent haemostatic effect, easy application, reduced pain, swelling and the use of post-operative antibiotics. The aim of this paper is to review the various diode laser applications in pediatric dentistry.*

Keywords: Diode laser, LLFT, Laser safety, Laser hazards

1. Introduction

During the last few years, the use of laser techniques has dominated the dentistry world as an alternative to different traditional methods or in combination with these. In 1951, Towns proposed the concept of MASER, an acronym coined for microwave amplification by stimulated emission of radiation. Meanwhile another American physicist, Gordon Gould, a Columbia graduate student in 1957 used the term LASER for the first time. The use of lasers in dentistry has been evolved since 1960's by Maiman [1].

Diode laser is the most frequently used laser in dentistry due to its reliability, versatility and convenience, together with its handiness and simple setting-up [2]. The diode laser contains a solid active medium and is composed of semiconductor crystals of aluminium or iridium, gallium, and arsenic. Diodes are available in wavelengths of 635,670,810,830,980 nm. As its wavelength is poorly absorbed by hard dental tissue, diode laser is safe and well indicated for soft oral tissue surgeries in regions near the dental structures for cutting, vaporization, curettage, blood coagulation and haemostasis in the oral region. The chromophore of diode lasers is pigmented (coloured) tissues, specifically melanin, haemoglobin and oxyhaemoglobin. Its use in contact mode provides tactile feedback during surgical procedure.



Diode Laser Unit

Maximum control of laser-tissue interaction can be achieved if the incident laser beam is perpendicular to the tissue surface. Thermal changes at the target site can be effectively controlled by modifying the amount of energy delivered to the target site by moving the handpiece closer or farther from the target site. Faster laser beam

movement will also reduce heat build-up in the target tissue and aid thermal relaxation. Diode lasers are used in continuous wave and pulsed wave mode following Einstein's theory of stimulated emission. Continuous wave mode is used for surgical procedures and pulsed mode in frenectomy, pulpotomy and periodontal procedures and as canal disinfectants. CW mode can ablate tissue faster heat and buildup heat resulting in collateral damage of the target tissue and adjacent tissue. This heat buildup can be reduced by moving the laser beam faster [3].

An optic fiber in dental diodes is a flexible handpiece used for comfortable handling and aid lasers beam to the target tissue. The smaller diameter fiber will deliver the increased power density; this allows the decreased power setting. The rule of thumb followed while using diode lasers is to achieve the same rate of work from either larger or smaller diameter of fiber. In small diameter fiber, decreased power setting is used and conversely an increased power setting in large diameter fiber [4].

Pediatric dentistry is an age defined specialty based not on a particular skill, but encompassing all aspects of child development in health and disease. Working with children is different from working with adults, it is essential to be familiar with age-appropriate skills and functioning, and development.

This century has seen advent of advancements even pediatric dentistry is also influenced by all such advancements [5]. Such changing trends help us to raise the standards by incorporating child-friendly approaches into dental care. The main advantages of the laser therapy over scalpel surgical procedures on oral tissues are greater precision, bloodless surgical procedures, sterilization of the surgical area, minimal swelling and scarring, no suturing, and less or no postsurgical pain [6]. Therefore, the diode lasers can provide a paradigm shift in pediatric dentistry by working as a replacement or a tool in conjunction with the conventional methods for providing a stress-free and comfortable treatment to the children.

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2. Clinical Applications of Diode Laser

1. Caries Detection and diagnosis

The DIAGNOdent unit contains a laser diode (655nm, modulated, 1 mW peak power) as the excitation light source, and a photo diode combined with a band pass filter (transmission > 680 nm) as the detector. DIAGNOdent showed higher sensitivity and accuracy as compared with other conventional methods for detection of enamel caries, whereas for detection of dentinal caries, even though the sensitivity was high, accuracy of the DIAGNOdent device was similar to other conventional caries diagnostic methods (Goel 2009). It can also be used as an alternative diagnostic method in detection of proximal caries in primary teeth [7].



DIAGNOdent Unit

2. Laser Applied Fluoride Therapy (LAFT)

Stern and Sognnaes in 1972 first suggested the use of laser irradiation to inhibit dental caries. Different explanations for the increased acid resistance of laser treated enamel have been suggested, such as decreased enamel permeability, alteration in chemical composition or a combination of both. Similar results have been found when investigating the effect of addition of fluoride application before or after laser treatment, leading to an increased fluoride uptake and decreased rate of dissolution in acidic solution [Vlacic et al 2007]. Diode with reduced wavelength 810-980 nm has highest coefficient of thermal absorption of hemoglobin with minimal interactions with hydroxyapatite and water. This property of diode makes it suitable for use in LAFT therapy without affecting the tooth structure. Loosely bound calcium fluoride and firmly bound fluoride was evaluated in LAFT using diode laser at 2 W and 5 s exposure time. The minimum inflammatory infiltrate and reversible pulpal changes was observed in the power settings of 2 W and 3 W and exposure time of 5 s, 15 s and 30 s these findings were suggestive that for LAFT using 810 nm diodes 2W 5s can be recommended. However to benefit the enhanced firmly bound fluorides formation in LAFT procedures can use increase the power settings of diodes to 3 W and 15s [4].

3. Disinfection of periodontal pockets and root canals

Diodes of 810-980 nm are used in the disinfection of periodontal pockets and in Photoactivated dye disinfection of pockets diodes of 635,670 830 nm are used. The wavelengths of diode lasers are well absorbed by the pigmented anaerobic microorganisms (Prevotella intermedia and Porphyromonas gingivalis). The laser photonic energy penetrates diseased epithelium and granulation tissue leading to coagulative changes due to

increase in temperature of microorganism and reduce their colony forming activity.

4. Vital pulp therapy

Diode lasers in root canal therapy are used for disinfecting the canals and as pulpotomy medicaments. In deep dentinal caries, diode (810 nm) at 1.5 W, 10ms on and 10 ms off for 10-15 s defocuses at 4-5 mm used as decontamination of dentinal wall and 0.5 -1W in CW for 5-10s defocused at 10mm in continuous mode for dentin melting.

Diode laser optic fibres are inserted within the canals, 3 mm short of apex and withdrawn gradually approximately at one minute of lasing time per canal. Disinfecting primary canals using diode lasers can be beneficial owing to its canal morphology and the cooperation levels of the children. Lasing primary canals can be more time effective and provokes less anxiety in children compared to conventional methods of disinfection. Diodes as canal disinfectant and combination of Diodes with 2% chlorhexidine solution showed the highest antimicrobial efficacy against Enterococcus faecalis. These findings are suggestive that 810 nm Diodes laser can be an effective tool for cleaning and disinfecting the root canal system when used alone or in combination as canal irrigants at 2.5 power setting and 5 s exposure time with cycle repeated 4 times.

In pulpotomy procedure the pulp amputation is done using 810 nm diodes at 2 W in CW for 10 -15 s until charred layer appears. The human clinical trials showed that any variation in laser application parameters, including the power, frequency, exposure time, and water/air dry-mode, causes different results in pulp tissue. Saltzman et al (2005) used a diode laser with 3W reported less radiographic success compared to formocresol pulpotomy.

A diode laser (940 nm, Ezlase, Biolase Technology Inc. USA) in a young permanent tooth with traumatically exposed pulp has proved to be an effective technique for Pulpotomy in an immature tooth.(Vijay et al 2004) Therefore, the use of soft-tissue diode lasers can influence the treatment outcome and should be seen as a predictable tool for vital pulp therapy.

5. Non vital pulp therapy

Diode laser (810nm) at 2W in pulsed mode demonstrated decontamination of root canal up to 750micrometer. When associated chemical chelators are used, invitro bacteriocidal effectiveness of 99.95% on E.fecalis, but lasers alone are not effective in removal of debris.

6. Internal bleaching of non-vital teeth

Diode laser 810 nm of 1.5 -2W in CW is used to activate the whitening gel 2-3 times for 30 sec. The use of laser limits the adverse effects of gel on enamel and dentin and provides a quick, comfortable and long lasting result.

7. Oral pathology removal

Diode laser 810nm of 1.5- 2W in CW is used for excision of papilloma, fibroma, mucocele, ranula, eruption cyst and of 3-4 W in CW for lip hemangioma.



Mucocele removal using diode laser

Diode laser of 2-2.5 W in CW with a 320 microfiber is used for removal of sialolithiasis. Pyogenic granuloma (PG) is an inflammatory hyperplasia which occurs in the oral cavity or on the skin. Agulio et al (2002) reported formation of PG as a result of injury to a primary tooth and Milano et al (2001) reported a case of PG associated with aberrant tooth development. Removal of pyogenic granuloma by diode laser in a pediatric patient with 810 nm wavelength, a continuous wave mode, a power output of 3 watt and a 0.4-mm diameter fiber optic offered a new tool for treatment of oral lesions comfortable as possible in pediatric patients and resulted in less stress and fear in children.

8. Orthodontic application

Gingival hyperplasia can manifest during orthodontic treatment as a result of poor oral hygiene: gingivectomy may be necessary to expose the brackets covered by overgrown gingiva. Gingivoplasty may be necessary to remodel the gingival contour and improve the smile line at the conclusion of orthodontic therapy. Gingivectomy is carried out using diode laser (810nm) at 1.5W CW and gingivoplasty is carried out at low power and angulated. Operculectomy, exposure of unerupted teeth can be effectively done using diode laser without affecting the erupting tooth.

9. Periodontal application

The labial frenum is an anatomical landmark that joins the lips and cheeks to the alveolar processes of maxillary and mandibular bones. Complications associated to the hypertrophy of the upper labial frenum can be orthodontic, such as interdental diastema, a periodontal, with predisposition to develop gingival recession or functional recession, dealing with a bad oral hygiene. The labial frenectomy procedure is recommended whenever a pathologic interdental diastema or/and a periodontal risk of losing mucogingival tissue is present. It is suggested that optimal treatment outcomes are achieved when the procedure is performed between 8 and 18 months of age. The frenectomy performed in an infant patient using a diode laser with a wavelength of 980 nm, operated at a power of 3.0 watt in continuous wave mode with a 320-micron quartz optical fibre proved to be a successful method and advocated the use of diode laser as a comparably simple and safe procedure without the need for general anaesthesia. Therefore, Diode laser surgery

may be considered a useful tool for the clinician in performing pediatric labial frenectomy [8].

Lingual Frenectomy procedure is more invasive and difficult to be performed in young children, although the results are more predictable, decreasing the recurrence rate. However, surgery should be performed before the child develops abnormal swallowing and speech patterns. It is carried out with diode laser at a wavelength of 800 nm and power of 2 W in contact mode proved that the laser can be considered as a simple and safe alternative for children while reducing the amount of local anesthetics, the bleeding and the chances of infection, swelling and discomfort.

10. Low Level Laser Therapy (LLLT)

LLLT or biostimulation has three main effects on tissue: analgesics, biostimulation and anti-inflammatory. Laser induces hyperpolarization of the nerve membrane and increases metabolism of acetylcholine, resulting in reduced stimulation and perception of pain. LLLT therapy increases the production of ATP as well as overall activity of cell thereby promoting biostimulation. LLLT modifies blood flow and induces angiogenesis. In addition, modification of lymph drainage reduces inflammation.

LLLT has the following indications in pediatric dentistry: tooth eruption, tooth pain, TMJ pain, treatment of aphthous, traumatic and herpetic lesions, and accelerating orthodontic movement. Docimo R (2003) and Gutknecht N. et al (2007) claimed that the conduction of laser aided procedures on soft and hard tissue is more comfortable and better accepted by pediatric patients and their parents, making the child management easier, reducing psychological trauma during and after dentistry therapy, in favor of a better dentist/infant patient relationship and with a better compliance of the latter. The main characteristic of the diode laser is the laser wavelength.

Many studies have shown that NIR (Near Infrared) zone, which is the laser light around 810 nm, is one of the most versatile ranges of wavelengths available due to the number of different therapies that can be performed in several tissues.

Rossman and Cobb [2000] summarized the advantages of lasers in soft tissue as follows [9]:

- The laser cut is more precise than that of a scalpel.
- The cut is more visible initially because the laser seals off blood and lymphatic vessels, leaving a clear dry field.
- The laser sterilizes as it cuts, reducing the risk of blood-borne transmission of disease.
- Minimal postoperative pain and swelling.
- Less postoperative infection because the wound is sealed with a biological dressing during surgery.
- Less damage occurs to adjacent tissues.
- Minimum anesthesia is required.
- These qualities result in a shorter operative time, faster postoperative recuperation and a better compliance of infant patients.

3. Laser safety

When laser is used in the office or operating room, the surgeon, the staff, and the patient must be aware of the special precautions that must be taken to ensure a safe treatment area for all involved. The nominal hazard zone (NHZ) is defined as the surgical area in which the laser is used and could potentially cause injury or damage, usually related to eye exposure.

The NHZ is determined by the wavelength of the light, the maximum power, the type of delivery system, the diameter of the beam, and various other physical characteristics of light produced. The greater the calculated NHZ zone, the greater the probability that injury can occur. For simplicity, many operating theatres define the NHZ as the four walls of the room in which the laser being used [10]

Laser classification [11]

Laser used in dentistry are classified with regard to the potential damage.

Class	Output	Use in dentistry	Risk	Safety measures
I	40uW	Laser Caries detection	none	Blink response
IM	400 uW	Scanner	Possible	Laser safety labels
II	1 mW	Aiming beam	Direct viewing	Slight Aversion response
IIM	1mW	Laser caries detection	Significant with magnification	Laser safety labels
IIIR	5mW	Visible aiming beam	Eye damage	Safety eye wear Training for class IIIR
	2mW	Invisible low level therapy		
IIIB	0.5mW	Photodynamic antimicrobial chemotherapy Mucosal scanning	Slight fire and skin risk at maximum out put	Safety eye wear Training for class IIIB
IV	No upper limit	Surgical lasers	Eye and skin Damage Non target tissue Damage Fire hazard Plume hazard	Safety eye wear Safety personnel Training and local rules Possible registration to comply with national regulations

Laser Hazards

Maximum Permissible Exposure (MPE) value indicates the limit above which tissue damage may occur. MPE can be applied to the power output, wavelength, diameter of the beam, and target and non target tissues. The NHZ may be calculated using the following formula

$$NHZ = \frac{1}{\phi} \left[\left(\frac{4\Phi}{\pi * MPE} \right)^{\frac{1}{2}} - a \right]$$

Where ϕ is the emergent beam divergence measured in radians; Φ is the radiant power (total radiant power for continuous wave lasers or average radiant power of a

pulsed laser) measured in watts; and a is the diameter of the emergent laser beam, in centimeters.

Eye Hazards

The eye is composed of pigmented and non-pigmented tissue that will absorb incident laser radiation relative to the wavelength being used. Damage from a laser beam may be due to direct exposure of the unprotected eye or diffuse reflection and is ever-present in those situations where wavelength-specific protective eyewear is not worn. Damage also depends on the type of laser being used, since a free-running pulsed laser will cause more damage than a continuous laser of equal power. This is because the output power of a free-running pulsed laser can achieve high peak power surges in a short pulse followed by long off-time durations. Its peak power is

considerably greater than its average output power. For a continuous-wave laser, the output power and the peak power are the same, regardless of whether it is used in a continuous or gated mode.

In addition, the ability of the eye's lens to focus incident light may significantly increase the hazard posed by those wavelengths that may enter the eye. In current clinical dental use, shorter laser wavelengths (visible to near-infrared, 400-1400 nm), being relatively non-absorbed by water, may result in retinal burns in the area of the optic disc. Some visible wavelengths may selectively damage green or red cones in the retina, producing color blindness. In addition, the 700-1400-nm wavelengths can cause lens damage. The second group of wavelengths, the longer wavelengths (mid- to far-infrared, 1,400-10,600 nm) have high absorption in water, and corneal, aqueous, and lens damage is associated with these wavelengths[2].

Consequently, it is mandatory that all personnel (clinician, assistant, and patient) within the controlled area of Class IIIB, IIIR, and IV laser use should employ suitable eye protection during laser procedures. Measures must be taken to protect the eyes of the staff and patients when the MPE is exceeded, i.e., when the dental laser is on and people are within the NHZ. Eyewear should be constructed of wavelength-specific material to attenuate the laser energy or to contain the energy within MPE values. Standards that specify the nature and suitability of laser protective eyewear are contained in ANSI (ANSI Z136.1 – 2007) for North American users, EN 207/208 for European users, and IEC (IEC 60825) for all other regions. The manufacturer's mark must be imprinted on the eyewear. The wavelength or wavelengths that the protective eyewear is specific for must be stamped on the glass or side shields.



If the eyewear is marked as 810 nm – 2890 nm, then this means that the eyes exposed to all wavelengths between these two outer limits are protected. If one line states 810 nm and then underneath 2890 nm is stamped, it means that eyes are protected only against these two wavelengths and no protection is provided for wavelengths in between. Practitioners using loupes must wear the appropriate protective insert or shield. Glasses and goggles must cover the entire periorbital region, be free of any surface scratches or damage, and be fitted with suitable side panels to prevent diffuse laser beam entry. Practitioners using a microscope must fit the appropriate filters and maintain close eye contact with the oculars.

Non-Target Oral Tissue Hazards

The constraints of the oral cavity pose specific risks in access and accidental damage to adjacent or non-target tissue. The close approximation of multiple chromophores (molecular compounds that absorb light or laser energy

such as hemoglobin, water, hydroxyapatite, and melanin in oral tissue) demands care during the use of any surgical laser wavelength to avoid unintentional vaporization of other tissues. During any surgical ablation procedure using laser energy, attention is required to focus the beam onto the target tissue and avoid accidentally damaging adjacent tissues. Anodized, dull, non-reflective, or matte finished instruments should be employed. Coated (i.e., ebonized) instruments should be inspected regularly to ensure integrity of the coating. Glass mirrors should not be used because they absorb heat from the laser energy and may shatter. Stainless steel or rhodium mirrors may be used safely, providing measures are taken to minimize possible unwanted reflection. Parallel monitoring of the adjacent tissues by all dental staff present at the time of treatment is to be ensured. Assistants need to be trained in recognizing adverse or unexpected tissue change as they play a role in monitoring the dental situation, especially if the dentist is using a microscope or other accessory that might reduce the clinician's wider field of vision[11].

Skin Hazards

Any potential for damage to the skin through inadvertent exposure to Class III B and IV lasers will be relative to the ablation threshold of the skin structure and the incident laser energy. Subablative power levels will pose little threat, other than reversible tissue warming. Visible and near-infrared wavelengths (400-1400 nm) have the potential to pass through the epidermis into the superficial and deeper structures respectively. Mid- to far-infrared wavelengths (1400-10,600 nm) will interact with surface structures. The governing factor in structural damage is the particular laser wavelength's absorptive potential relative to the tissue elements (chromophores) such as pigment (shorter wavelengths) and water (longer wavelengths), together with the power density value of the laser beam, duration of laser exposure and spot size. It is important that all those involved in the use of Class IIIB and IV lasers are adequately protected against inadvertent skin exposure [11].

Chemical Hazards

Laser plume poses a significant hazard and occurs as a result of the development of aerosol by-products due to laser-tissue interaction. These products can contain particulate organic and inorganic matter including viruses, toxic gases, and chemicals. American National Standard for the Safe Use of Lasers in Health Care Facilities states that the hazard area for laser-generated airborne contaminants (LGACs) may be greater than the laser's identified NHZ. Examples of the products contained in LGAC include human papilloma virus, human immunodeficiency virus (suspected), carbon monoxide, hydrogen cyanide, formaldehyde, benzene, acrolein, bacterial spores, and cancer cells. Of particular importance in restorative dental procedures, other hazardous products may be present in the plume. The hazard presented by the LGACs may include eye irritation, nausea, breathing difficulties, vomiting, and chest tightness together with the possibility of transfer of infective bacteria and viruses. To combat such risk, regular surgical protective clothing must

be employed and specific fine-mesh face masks capable of filtering 0.1-micron particles must be worn. Use of high-speed evacuation must also be used. It has been determined that for carbon dioxide laser surgery, the evacuation tube should be held as close as 1 cm from the target site; at 2 cm, the evacuation ratio had diminished by 50% [11].

Thermal Injury

The most common cause of laser-induced tissue damage is thermal in nature, where the tissue proteins are denatured due to the temperature rise following absorption of laser energy [2].

1. The thermal damage process (burns) is generally associated with lasers operating at exposure times greater than 10 microseconds and in the wavelength region from the near ultraviolet to the far infrared (0.315 μm -103 μm). Tissue damage may also be caused by thermally induced acoustic waves following exposures to sub-microsecond laser exposures.
2. With regard to repetitively pulsed or scanning lasers, the major mechanism involved in laser-induced biological damage is a thermal process wherein the effects of the pulses are additive. The principal thermal effects of laser exposure depend upon the following factors:
 - The absorption and scattering coefficients of the tissues at the laser wavelength.
 - Irradiance or radiant exposure of the laser beam.
 - Duration of the exposure and pulse repetition characteristics, where applicable.
 - Extent of the local vascular flow.
 - Size of the area irradiated.

Fire Hazards

The high temperatures that are possible in the use of Class IV and certain Class IIIB lasers can themselves either cause ignition of material and gases or promote flash-point ignition. ANSI Z136.3 has allowed gaseous conscious sedation procedures, such as the use of a nose piece to deliver oxygen and nitrous oxide mixtures to be used during laser operation. However, a closed-circuit delivery system must be used and a scavenging system must be connected to the high-volume evacuation to minimize gas leakage. Within the NHZ, use of aerosols, alcohol-soaked gauze, and alcohol-based anesthetics is to be avoided. Consequently, it is important to request that the patient remove any lip products that may contain an oil-based substance that is considered flammable, such as petroleum jelly. Additionally, tissue cleansing or preparation agents that contain alcohol or other flammable chemicals carry specific risk of burning during laser use. If the patient carries an oxygen tank, then the laser should not be utilized for the dental procedure, unless the patient will remain comfortable with the oxygen turned off and the nose cannula removed during the laser portion of the procedure [11].

With general anesthetic procedures, there are three aspects to be considered:

1. Ignition sources (of which lasers are an example)
2. Fuel sources (gauze, drapes, preparation fluids, alcohol, and anesthetic gases)
3. Oxygen-enriched atmosphere (more than 21% oxygen).

The laser energies used in tissue ablation may surpass the flash point of some anesthetic aromatic hydrocarbons used in general anesthesia, and the presence of oxygen and nitrous oxide will support any combustion. Many materials that are not normally flammable may burn in an oxygen-enriched atmosphere. Endotracheal tubes need particular consideration to prevent the laser beam from burning a hole in the tube and combusting with the gases. Consequently, the tubes should be resistant to the laser beam and have suitable coating, a wavelength-specific reflective coating if possible, to prevent the possibility of combustion of the material and subsequent airway burns. Care should also be taken to prevent the build-up of blood onto endotracheal tubing, as this may lead to an increased fire hazard [2].

Other Hazards

Additional hazards associated with laser use include service and mechanical hazards. Potential service hazards include electrical, water, and air supply lines and cables, as well as connectors and filters. The laser should be serviced regularly according to the manufacturer's recommendations and only by qualified personnel. The practitioner should inspect the supply lines and cables, clean and maintain the external portions of the laser, and change necessary filters or other user-serviceable items. In addition, many surgical lasers use a coaxial air or water supply which may be under pressure. No attempt should be made to access internal parts of the machine during use. Capacitors can retain an energy charge, even when the laser is no longer connected to the electrical supply outlet. Laser machines employ multilevel safety features (fusible plugs, interlocks, pressure relief valves, and warning lights) to inactivate the machine in the event of a component failure. Additional hazards may exist such as heavy articulated-arm delivery systems or the risk of needle-stick injury with fine quartz fiber-optic tips. Care must be taken around the cables and wires associated with the laser, as tripping over and wrenching these cables and fibers can be dangerous [2].

Limitations of Lasers in Pediatric Dentistry:

Laser use requires additional training and education for the various clinical applications and types of lasers. High start up costs is required to purchase the equipment, implement the technology, and invest in the required education and training. Since different wavelengths are necessary for various soft and hard tissue procedures, practitioner may need more than one laser. Wavelength-specific protective eyewear should be provided and consistently worn at all times by the dental team, patient, and other observers in attendance during laser use. When using dental lasers, it is imperative that the doctor adhere

to infection control protocol and utilize high speed suction as the vaporized aerosol may contain infective tissue particles. Practitioner should exercise good clinical judgment when providing soft tissue treatment of viral lesions in immune-compromised patients; as the potential risk of disease transmission from laser generated aerosol exists. To prevent viral transmission, palliative pharmacological therapies may be more acceptable and appropriate in this group of patients [5].

4. Conclusion

Diode laser has shown to be able to supply an exhaustive therapeutic efficacy in the different clinical situations in which it has been employed, together with a precise and fast performance, speeding restorative tissue processes, reducing pain and postoperative edema. These peculiar characteristics make the diode laser a user-friendly tool of undoubted help in different pediatric dentistry. A diode laser can be used in pediatric dentistry as a tool needed to reach a therapeutic result and a helping device to complete conventional therapy. With advantages of easy and faster application, better coagulation, no need for suturing, less swelling and pain and better de-epithelialization, diode lasers can be used as an effective aid in paediatric dental treatments.

Though American Academy of Pediatric Dentistry recognizes the use of lasers as an alternative method of providing soft and hard tissue dental procedures for infants, children, adolescents, and persons with special health care needs, dental professional requires additional training to use and apply on pediatric dental patients. In the present scenario, lasers can be a useful adjunct to our regular pediatric dental practice [12].

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