REVIEW ARTICLE

Applications of Laser in Dentistry: A Review

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ABSTRACT

The proposition to use laser technology in the field of health and sciences dates back to 1916 when Einstein propounded the ideology of intensifying the photo-electric waves into a solitary one wave frequency. About 100 years later, laser technology proves to be an indispensable part of dental treatment. Laser, with endorsed research programs, has manifested a diverse set of advantages ranging from revamped efficiency to precision cutting. The sole objective of the article is to review the applications of the laser technology in our current dental setting.

KEYWORDS: LASER, Dentistry

INTRODUCTION

Even though Albert Einstein had initially developed the idea of employing lasers in the health sector, the initiative to maneuver it particularly in dentistry emerged by the ideology of Theodore Maiman.[1] In the year of 1989, a distinct laser was manipulated for use only in the field of dentistry for the very first time.[2] In the epoch of novelty in the discipline of science and technology, variegated approaches for the utilization of laser technology have now evolved. Lasers are fundamentally derived from the process of permuting the electromagnetic power to thermal form. The laser is accessible in a diverse range depending on the wavelength manipulated which in turn controls the practical application in the dental sciences. An extensive ambit covers the wavelength of laser that span from 200 to 10500 nm which could be employed in the field of medicine and para-medicine disciplines.[3]

Currently, the most widespread utilized laser form is the soft tissue laser which has numerous application along with multitudinous assistance in the form of superior sterilization and shriveled surgical site. Moreover, lasers are preferred in a pediatric patient which helps to reduce anxiety and apprehension associated with the use of endodontic instruments. Employment of lasers is widened to avoid using anesthesia in patients, significantly decline post treatment symptoms as well reduce the need for sedative medications. Nonetheless, lasers could be traumatic if not used judiciously and so it is imperative that properly trained personnel and health care providers should be handling it.[4]

TYPES OF LASER

The three basic types of Lasers employed, which are as follows:

Types of LASER
High Power
Intermediate Power
Low Power

Table 1 –Classification Based on Power

a) **High Power**: With an exorbitant power of over 500 megawatts, the laser technology work with a significantly ameliorated kinetic energy which results into thermal correspondence along with heat fabrication. The remedial outcomes of the utilization of high power laser work on the principle of the thermal interactions.[5]

b) **Intermediate Power**: With a controlled power ranging from 250-500 megawatts, the intermediate power lasers have the closest salubrious effect as the high power lasers. The only major noticeable difference is the marginal aggregate of heat produced.[6]

c) **Low Power**: The mechanism of action of the low power laser is way different than high power and intermediate power laser. With power lesser than 250 megawatts, it causes a photo-bio-chemical reaction which results into desirable accomplishment without heat cultivation.

APPLICATIONS OF LASER

a) **Laser in Detection Of Caries:** Laser induced fluorescence have emerged as a favorable alternative for accurate and timely diagnosis of caries. Even though the approach is novel and yet to be thoroughly approved, it has shown exceptional results.[7] One of the vital advantages associated with the technique is the safety and ease of use associated with it. With a wide range of applications, the laser induced fluorescence can distinguish calculus, plaque as well as the primary biofilm.[8] Practical application of the technique was undertaken by Mr.Hibst, who reported that a wavelength of 400-490nm is associated with high emissions of fluorescence which could aid in delineating the sound tooth structure from a carious tooth structure. [9]

b) **Laser in Oral Leukoplakia:** Oral leukoplakia is a pre-cancerous lesion which leads to oral cancer in about 4% of the patients. It is highly imperative that

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the lesion needs to be treated as soon as the diagnosis is made. This could be clinched using surgical approach in the form of excision with a scalpel. Other options involve the use of cryosurgery and electrocautery. The most unprecedented proposition involves the use of CO_2 laser which provides a chance for expeditious healing and precision cutting. However, a considerable hurdle associated with the use of the laser is that the specimen cannot be obtained for a histological examination. [10]

c) **Laser in Oral Lichen Planus:** With a dubious etiology, oral lichen planus is a chronic white lesion observed in the oral mucosa. The disease is usually auto-immune in nature, affecting oral cavity with systemic symptoms too. The pathognomy of the disease is bilateral white striations in the oral mucosa referred to as the Wickham's striae. Use of low-level laser treatment has been advocated for treatment of mucocutaneous lesions, especially for lichen planus. Success using laser was demonstrated by Trehan et al. by utilizing 310nm laser wavelength.[11] No remissions and neither any adverse side effects were recorded on follow-up.

d) **Laser in Oral Submucous Fibrosis:** A pathology categorized by the consumption of betel quid and areca nuts, is characterized by the edema and inflammation followed by fibrous bands at multiple locations in the oral cavity, resulting in restricted mouth opening.[12] The laser has been effective over a period of time in the treatment of oral submucous fibrosis as it leads to precision cutting of bands with fewer chances of recurrence. Moreover, healing rate is better than conventional surgical approach leading to fewer post-operative complaints. With a very narrow range of cutting, there is absolutely no damage to the surrounding or the underlying tissues.[13]

e) **Laser in Oral Aphthous Stomatitis:** Amongst one of the highly painful oral conditions, oral aphthous stomatitis is characterized by the presence of painful oral ulcers with a strong history of recurrence.[14] Low-level laser treatment has proved to be extremely potent considering instant relief of pain as well as subsequent reduction of the size of the ulcers. A study done using the diode laser has shown remarkable improvement when used with less than 1 megawatts power and a wavelength of 810nm.[15]

f) **Laser In Sialolithiasis:** A very common pathology associated with the salivary glands is the presence of the salivary stone. With a high predilection in the submandibular gland owing to the tenacity of the saliva and the tortuous path, salivary stones accumulate either in the gland or the duct.[16] Numerous varieties of lasers have been used to treat sialolithiasis; some of them include CO_2, Nd: YAG and Ho: YAG. Diode laser has shown promising results due to its better absorption by the oxy-hemoglobin. Due to its decreased and controlled penetration, it is safer when compared to other alternatives. Also the capability to clot the blood and precision cutting adds to its advantages.[17]

Table 2: Application of LASER
Laser In Detection Of Caries
Laser In Oral Leukoplakia
Laser In Oral Lichen Planus
Laser In Oral Submucous Fibrosis
Laser In Oral Aphthous Stomatitis
Laser In Sialolithiasis

CONCLUSION

A desideratum for the furtherance of the technology to aid in diagnosis and treatment is indispensable. Laser have shown to be very promising in a short phase of time. The laser provides cheaper and a more precise alternative which would enhance the discipline of less invasive surgeries. The laser treatment covers a wide array of oral pathologies and hence the clinician should be well-trained to use it to the best interest of the patient. A more comprehensive research and trials with laser technology would decide the future of the medical procedures.

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