

Laser and its Applications in Periodontology

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Abstract - Periodontal disease is considered a debilitating condition for oral health. If it is not treated, it causes tooth decay. Treatment is essential to maintain the quality of the tooth. Periodontology laser therapy is a new technology of science, accepting this, the science scholars of the subject have introduced this therapy to the world, the main objective of the present research confirms that laser therapy science is a boon of the modern era in the future. Lasers were one of the first devices used for photon therapy in dentistry because of their ability to emit parallel, coherent light beams with monochromatic and synchronous wavelengths.

Keywords: Lasers, Periodontal disease, CO2 Laser, Diode Laser.

I. INTRODUCTION

Laser stands for Light Amplification by Stimulated emission of radiation. it is highly coherent, intense, focused, monochromatic, and collimated beam that is used in Periodontology for the treatment of tissues.

The research of Laser in Periodontology is going on and a sufficient amount of material and is available, new possibilities and treatments are the part of research.

Properties of Laser

Laser light is based upon the phenomenon of Stimulated emission of radiation. In 1960, Theodore Maiman used the Einstein concept of Stimulated emission at Hughes Research Laboratory and first introduced the Laser light which is based upon the Stimulated emission of light.

Laser Consists of three parts :

1.1 Pumping

1.2 Active Medium / Laser Medium

1.3 Optical Resonator

The process of pumping involves the excitation of atoms of laser medium to an excited state and achieving population inversion which is an essential criterion for stimulated emission to take place and as a result, we obtained laser light. A laser medium is also called an optical cavity. The optical cavity is placed between two mirrors. One is a completely reflecting mirror and another is a partially reflecting mirror and laser output is obtained across the partially reflecting mirror.

Both soft tissue and hard tissue have been treated with various types of lasers in periodontology. Lasers based on erbium have been used to treat both soft and hard tissues. Soft tissues have been treated with neodymium-doped Yttrium Aluminum-Garnet (Nd: YAG), carbon dioxide, and semiconductor diode lasers. Cutting, ablating, and incising are all done with laser light.

1.3.1 Laser applications in Periodontology:

- Light from carbon dioxide and erbium family lasers is absorbed in the superficial layers and vaporizes quickly from soft tissue. Deep penetration and increased tissue heating caused by Nd: YAG and Diode lasers result in the formation of thick clot zones on the treated surface. According to Finkbeiner, Argon laser-assisted soft tissue welding and soldering techniques are preferable to the traditional approach to tissue closure. According to studies, gingival tissues' epithelium was removed using carbon dioxide lasers without causing any harm to the underlying tissues.
- Periodontal soft tissue issues are treated with lasers. The Nd: YAG Laser has been used to treat periodontal pockets because it reduces bacteremia and gingival bleeding. With the elimination of the pocket epithelium, laser gives the benefit of post-

surgical results due to its ability to reduce probing depth.

- In order to prevent harm to the roots, the function of carbon dioxide lasers for cleaning root surfaces has been evaluated. In contrast to focused and continuous wave CO₂ lasers. Barone et al. demonstrated that a defocused, pulsed laser is more effective and efficient for generating smooth and clean surfaces. The root surface is damaged and melted by the concentrated, continuous wave. The treatment of periodontal pockets with a laser has a longer history than 7mm of penetration depth, according to research.

- The presented research paper is based on the application of laser, so a ban on its propagation was imposed on ancient people, but keeping in mind its use and treatment, it proved to be a far-reaching result. To reduce bacteria in immune compromised patients, diode lasers are preferred. Patients with aggressive periodontitis to reduce periodontal-pathogenic bacteria by using a 980nm diode laser are checked.

1.3.2 Problem Formulation

During the study of laser in periodontology, it was found that laser is not a regular tool in periodontology. Practitioners are still using the old conventional method for performing different Periodontology procedures such as crown extending etc. Conventional methods involve pain, discomfort, and post-operative complications etc. Lasers are not properly used by practitioners due to a lack of evidence-based research. The proper use of lasers in periodontology is also another challenge as it has hazardous effects by exposing direct laser light to the patient eyes so its proper handling and sufficient amount of knowledge is also required. For this laser safety officers are required which is responsible for proper handling of lasers and different operations.

1.3.3 Research objective

- The study of laser in periodontal.
- The study of laser feature in periodontal.

1.3.4 Research Methodology

Presented research paper qualitative and quantitative methods are used, which is based on secondary data.

- **Analytical**
- **Case studies**

1. Qadri,T., Javed, F.,Johannsen, G. and Gustafsson,A.(2015) Role of Diode Lasers(800-980Nm) as adjuncts to Scaling and Root Planing in the Treatment of Chronic Periodontitis: A Systematic Review.Photomedicine and LaserSurgery,33, 568-575.

Qadri T concluded that for probing depths more than 5 mm, the Diode laser is a better option than SRP(scaling and root planing) alone. However, Chambrone L. and other studies revealed that there is an additional therapeutic benefit when using a diode laser with SRP in non-surgical periodontal treatment for patients with mild to severe gum disease.

2. Theodoro. L.H. and Garcia, V.G.(2015) Surgical and Non Surgical Treatment of Periodontal Diseases. In: Freitas,P.M. and Simoes,A.,Eds.,Lasers in Dentistry: A Guide for Clinical Practice, Wiley Blackwell, Hoboken,153-158.

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Agoob Elfergany M et al revealed that Erbium family lasers have an advantage over dental calculus removal in terms of topography and root surface roughness, according to research by Agoob Elfergany M et al. Additionally, they discovered that Erbium lasers combined with SRP are a more effective way clean dirt from Root surfaces since it has a negligible thermal effect.

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3. A. Berakdar, M., Georg, T., and Becker, J. (2003) Clinical Evaluation of an Er: YAG Laser Combined with Scaling and Root Planning for Non Surgical Periodontal Treatment: A Controlled, Prospective Clinical Study. *Journal of Clinical Periodontology*,30,26-34. <https://doi.org/10.1034/j.1600-051X.2003.300105>.

Theodoro LH et al., Ting CC et al., and Oliveria GJ et al. have found that Erbium family lasers are the most Pertinent lasers for the treatment of dental calculus and soft tissue removal operations.

4. Fekrazad, Reza. Moharrami, Mohammad. Chiniforush, Nasim.(2018). The Esthetic Crown Lengthening by Er;Cr:YSGG laser: A Case Series. *J Lasers Med Sci*. 2018Autumn;9(4):283–287. Published online 2018 Sep 17.doi: 10.15171/jlms.2018.50.
Retrieved by URL :<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6499554/> date :14/06/2023,Time: 04:00 pm

Fekrazad R (2018) carried out a study using Er;Cr:YSGG to extend closed flap crown and found that there is no need for sutures and this laser is appropriate for both soft tissue and bone surgery as it causes less pain, less bleeding, lesser post-operative problems, fast healing time as compared to conventional procedures.

5. Jae Sung Ahn, Anjin Park. Development of Three-Dimensional Dental Scanning Apparatus Using Structured Illumination, *J Evol Med Dent Sci*.2017;3(1):321-342

According to a study by Prasad R et al.(2018), lasers have an added advantage over scalpels in functional crown extending procedures because they offer benefits like quick hemostasis ,little discomfort, and immediate placement of the restoration. As a result, it is a different, useful tool that has an advantage over the conventional scalpel-based crow extending procedure in that it causes less pain. A Diode laser can be employed in particular since it has a lower depth of penetration than other types of lasers.



6. Bakutra G,Shankarapillai R,Mathur L,Manohar B.Gingival melanin depigmentation by 810 nm diode laser, *IntJ Health Sci (Qassim)* 2017; 11(2):51–58.

A 940 nm diode laser with an energy density of 4J/cm² was demonstrated to be a useful tool by Kohale BR (2018) ,as it can reduce post operativ epain and suffering and promote wound healing. Due of how it affects patient comfort, certain laser application techniques are needed before it can be widely used in periodontology. Additional evidence-based studies of surgical procedures should be conducted in order to ascertain the effect of lasers on wound healing and patient response.



7. Dhafer S. Alasmari, An insight into gingival de pigmentation techniques: The pros and cons, *Int J Health Sci* 2018; 12(5):84–89.

S. Pohlhaus (2018). Dental lasers are used during gingivectomy surgery. For periodontal, cosmetic, and restorative objectives, the gingiva can be precisely cut using a range of laser wavelengths. After laser dental surgery, patients recover quickly, their wounds heal quickly, and they require little to no sutures. Understanding Nd: YAG and CO₂ lasers is necessary to prevent collateral harm. Shallow thermal effect and little penetration are characteristics of erbium-pulsed lasers. Erbium and tissue interact to provide a remarkable post-operative course that involves the cold-cutting effect.

II. CONCLUSION

The benefits of laser therapy may include pain relief, reduced inflammation and swelling, accelerated tissue repair, cell growth, wound healing, improved blood flow, decreased scar formation, shorter recovery times after surgery, fewer sutures, less tissue shrinkage and depigmentation, instant sterilization, simple ablation, hemostasis, detoxification effect, coagulation, plaque and calculus removal, bactericidal effect, and periodontal treatment. Due to these elements, Laser Periodontology may be the ideal method to accomplish the goal of its major application in each practical sector. In periodontics, erbium group lasers appear to be the technique of choice. In addition to the cost, the drawbacks of laser therapy also include technological challenges, safety worries, and evidence-based research.

Scope of research

1. It is strongly advised to wear glasses during laser treatments to protect the eyes of the patient, operator, and assistants as well as the tissues near the operation site.
2. It is necessary to shield the patient's eye, throat, and other delicate oral tissue from the laser during the procedure.

III. REFERENCES

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