ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2024; 10(2): 21-23

www.oraljournal.com
Received: 05-02-2024
Accepted: 12-03-2024

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Application of cold lasers in periodontics

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DOI: https://doi.org/10.22271/oral.2024.v10.i2a.1919

Abstract
Dentistry has been completely transformed by lasers since its invention in the 1960s. In the field of dentistry, the use of lasers has led to several wonderful experiences for both patients and doctors. The Low-Level Laser Treatment is developing and is non-invasive that has been applied to a wide range of medical disorders. Patients are using LLLT more frequently, and new applications are being found for it. Even while low-level lasers are being effectively employed in many dental clinics, many practitioners-especially those in dentistry-remain generally unaware of the broad range of applications available to them. As technology continues to progress and improve, lasers will continue to have a significant effect on the dental care in the 21st century, spanning from pediatric and operative dentistry, periodontics to prosthetics and cosmetics and implantology. This review article highlights the importance of cold lasers in periodontics.

Keywords: Blue lasers, cold lasers, Er: YAG, hard tissue, low level laser therapy, periodontics

Introduction
Although teeth whitening may be the only thing that comes to mind when you think of laser dentistry, there is mounting evidences that cold lasers, also known as low level lasers, can be used to treat several far more serious conditions than just tooth discoloration. Hundreds of researches have demonstrated the effectiveness of therapeutic lasers in the treatment of many dental problems. Early in the 1960s, lasers were initially used in medicine, with opthalmology being the first field to employ them for accurate photocoagulation of the retina [1]. Since then, the employment of lasers in a variety of scientific and industrial domains has led to numerous significant advancements in the area.

Fig 1: Teeth cleaning with laser

The word LASER, an acronym for Light Amplification by Stimulated Emission of Radiation, is the name of a device projecting intense radiation of light. The laser device creates a concentrated beam of light that is extremely thin. There are two possible energies: high and low. When the energy output of the laser light is lowered to a low level, it can be used for numerous therapeutic purposes, including tissue healing and repair. "Low Level Laser Therapy" is the term for the use of these incredible light beams to improve health [2].

LLLT uses red-beam or near-infrared lasers with a wavelength between 600-1,000 nanometers (nm) and from 5-500 milliwatts. LLLT emits no heat, sound, or vibration. LLLT acts by photochemical reactions in the cells i.e, photo biomodulation instead of producing a thermal effect [3].
Mester and his associates created the concept of the "cold laser," a type of infrared light with low absorption power in water that is released at a wavelength that is known to increase cellular activity. It uses diode and is used for a number of objectives, such as soft tissue surgery, tissue healing, and the relief of pain, edema, and inflammation [4].

Classification of lasers [5].
Lasers can be classified according to spectrum of light, material used as shown in Table 1 and Table 2 as well as hardness.

Soft tissue lasers
These lasers generally utilize diodes and can heal the tissues, reduce inflammation, edema, and pain. Clinical application includes healing of localized osteitis, healing of aphthous ulcers, reduction of pain, and treatment of gingivitis.

The soft tissue lasers in clinical use includes
- Helium-neon at 632.8 nm (red, visible).
- Gallium- arsenide at 830 nm (infra-red, invisible).

Hard tissue lasers (surgical)
The hard tissue lasers are
- Argon lasers at 488 to 514 nm
- Carbon-dioxide lasers at 10.6 micro-meter
- Neodymium-doped yttrium aluminum garnet at 1.064 micrometer
- Holmiumyttrium-aluminum-garnet at 2.1 micro-meter.
- Erbium, chromium yttrium-slenium-gallium-garnet at 2.78 micro-meter.
- Neodymiumm yttrium-aluminum-perovskite at 1,340 nm.

Fig 2: What are cold lasers

Mester introduced these lasers which are also known as ‘Soft Laser Therapy’ or ‘Low-Level Laser Treatment.’ These are used in soft tissue surgeries include troughing of the gingiva while taking impression, gingivectomy, gingivoplasty, frenectomy, and biopsies of the soft tissues [6] It enters both hard and soft tissues between 3 and 5 mm, and it promotes angiogenesis, fibroblast and keratinocyte motility, and collagen formation [7] Rather than raising the body temperature, they influence the tissue through photobiostimulation. It has been documented that the laser-enhanced biostimulation effect induces intracellular metabolic changes that further accelerate cell division, fibroblast migration, proliferation rate, and matrix synthesis [8].

Non-cold lasers in the field of dentistry
Blue Lasers & Lights
Dental fillings: Bacteria in and around a cavity can be killed by lasers.

Teeth whitening: By heating or activating the whitening solution, the laser's radiation hastens the whitening procedure. With the right gel, IR light can also be used for this.

Light Cure Composites: A lot of dentists fill teeth with these particular composites. UV light is usually used to cure, or harden, these composites. These systems are less constrained because they do not need lasers.

Hot or Surgical Lasers
Muscle attachment: For youngsters who are "tongue tied," a laser-assisted frenectomy is ideal. This calls for a surgical laser that is hot. Surgery discomfort may be lessened with the use of a cold laser.

Lesion removal: Using a hot surgical laser, benign tumors can be removed painlessly and without the need for sutures.

Tissue reshaping: A "gummy smile" can be corrected by using lasers to rearrange the gum tissue to reveal healthy enamel.

Various synonyms of cold lasers

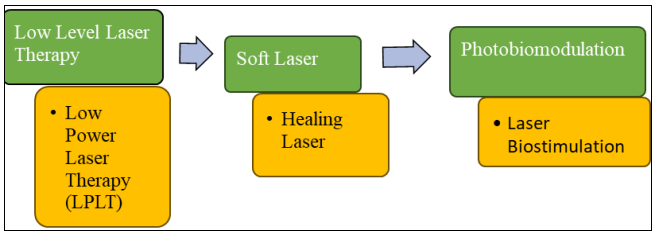
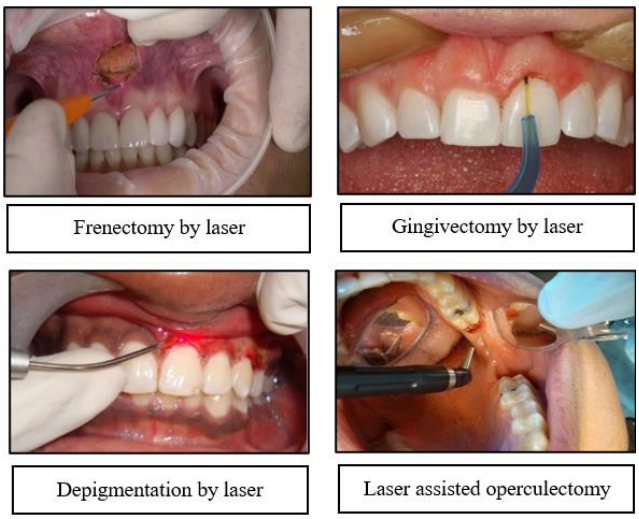


Fig 3: Various Synonyms of Cold Lasers [3]

Application of cold lasers in periodontics
One of the main uses of cold lasers is in soft tissue surgery and treatment. For this procedure, CO2, Nd:YAG, diode, and Er:YAG lasers are typically accepted [9]. The following periodontology procedures that make use of low-level laser therapy are listed [9].



1. Surgical pocket therapy
2. Frenectomy
3. Gingivectomy
4. Soft tissue grafting
5. De-Pigmentation
6. Desensitization
7. Removal of granulation tissue
8. Osseous recontouring
9. Crown lengthening
10. Surgery-implants
11. Peri-Implantitis
12. Operculectomy

Cold lasers are also used in the treatment of hypersensitivity which provides anti-inflammatory, analgesic, and cellular effects. A 780nm diode laser is used at a power of 30m W, or Nd: YAG laser at low power can also be put in application [10]. Er: YAG lasers are utilized in gingival operations for cosmetic contouring. One of the best benefits of using cold laser therapy is that ablation of soft tissue by lasers allows for fine touch and accelerates wound healing [9].

Nd: YAG treatment for periodontal pockets is another use for soft tissue laser therapy. It is found to be safe for removing the sulcular epithelium from the pockets. One benefit of employing LLLT in this treatment is that it protects the connective tissue underneath by triggering carbonization or necrosis [9].

As a result, LLLT has offered several advantageous benefits for the field of periodontics, such as the ability to effectively cure both acute and chronic injuries, lessen pain and inflammation, and serve as the finest substitute for harsh drugs or allergies [11].

Table 1: Classification of Lasers Based on Spectrum of Light

UV Light	100 nm – 400 nm	Not Used in Dentistry
Visible Light	400 nm – 750 nm	Most common used in dentistry (Argon & Diagnodent Laser)
Infrared light	750 nm – 10,000 nm	Most Dental Lasers are in this spectrum

Table 2: Classification Based on Material Used

Gas	Liquid	Solid
Carbon Dioxide	Not yet discovered in clinical use	Diodes, Nd: YAG, Er:YAG, Er: Cr: YSGG, Ho: YAG

Conclusion

The lowered risk, enhanced patient comfort, and painless experience of this technology have led to a strong demand for its use in dental clinics. Periodontal therapy is supplemented by laser therapy. Currently, diode lasers are limited to soft tissue operations. Among the various types of lasers that are available, Er:YAG and Er, Cr: YSGG lasers have characteristics that make them suitable for dental treatment because of their ability to work with both soft and hard tissues with little damage. Not every medical condition that can be treated with low level laser treatment can be fixed surgically. In the medical field, low intensity laser treatment is an alternative to pharmaceutical intervention. LLLT is becoming more and more popular. Its benefits must be realized in our nation so that we can treat patients with the same level of care as those in industrialized nations. To modify treatment protocols, focus should be placed on the research and efficient dosimetry required for therapeutic laser effects.

Conflict of Interest
Not available

Financial Support
Not available

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How to Cite This Article
Dr. Banerjee M, Dr. Meetika, Dr. Gahlot D, Dr. Sharma R, Dr. Kaur S. Application of cold lasers in periodontics. International Journal of Applied Dental Sciences. 2024;10(2):21-23.