

## A Review on the Potential Role of Lasers in Oral Medicine

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### Abstract

Lasers at the dental office first gained popularity in the 1990s. Lasers are used as a medical tool or as a blending tool. Laser could be a special source of illumination that includes a higher power and higher quality of beam compared to the opposite lightweight sources. The word 'LASER' isn't a replacement term for science and technology. The introduction of lasers to the medicine field has really given a technological boost to the approach clinicians perform variety of procedures. Soft tissue lasers have become standard among the clinicians because of their potential worth in surgical procedures providing surface sterilization, dry surgical field and raised patient acceptance. Oral premalignant lesions of the rima oris like leukoplakia and erythroplakia stay a diagnostic and treatment challenge. Management of such lesions includes observation, excision, ablation. This article briefly describes the use of lasers in oral medicine .

**Keywords:** Argon Lasers, Lasers, Premalignant Lesions.

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### I. Introduction

LASER is a dictionary for increasing light through radiation exposure. Lasers are large beams produced by radiation emitting from a light source. Lasers are able to increase the brightness of a combination of beams of long, efficient length and large size. Albert's theory of spontaneous and emitted radiation describes three of the lasers' characteristics as follows: monochromatic, i.e. all waves have the same intensity and frequency; coherent, which defines all wavelengths of light into categories related to each other in speed and time; and combined to ensure the uniformity of the waves (low beam splits).

### Laser History

"Heliotherapy" was an ancestral practice followed by the development of action therapy and photomedicine. The 1903 Nobel Prize for Finsen Prize for developing a carbon lamp with lenses and disease filters (especially lupus vulgaris) became a major milestone in the development of medical laser lasers. Leon Goldman, a pioneer in laser medicine, reported on the biology of lasers and recorded the findings of a laser dentist, particularly on the effects of lasers on dental caries, teeth and other tissues since 1963.

In 1917, Albert Einstein laid the groundwork for the invention of this laser and its predecessor, 'Maser,' with the assumption that photoelectric magnification could produce a single frequency, or promote pollution. The name LASER is an acronym for 'Light Amplification by the Stimulated Emission of Radiation' and was first introduced to the public in 1959, in the case of Columbia University graduate Gordon Gould. Theodore Maiman, of Hughes Research Laboratories in Malibu, CA, developed the first active laser, using a combination of helium neon. In 1961, a laser from yttrium crystals - aluminum - garnet treated with 1-3% neodymium (Nd: YAG) was developed. In 1962, argon laser was invented, and the ruby laser became the first medical laser to stabilize retinal ulcers, when used in 1963. In 1964, Patel at Bell Laboratories developed a CO<sub>2</sub> laser. in the field of dentistry.

### Lasers classification

1. Based on active medium

A. It is solid

B. Fluid

C. Gas

2. Based on the Application

- A. Soft tissues
- B. Tissue lasers are strong
- 3. Based on wavelengths
  - Excimer 195-350nm
  - B. Alexandrite 337nm
  - C. Argon 455-515nm
  - D. He-Ne 637nm
  - E. Diode 655-980nm
  - F. Nd: YAG 1064nm
  - G. Ho: YAG 2100nm
  - H. Er, Cr: YSGG 2780nm
  - I. Er: YSGG 2790nm
  - J. Er: YAG 2940nm
  - K. CO2 10600nm

#### **How it works**

The laser contains a power source, an active lasing medium, and two or more mirrors. In a dental laser, light reaches the target tissue with a fiberoptic cable, a blank wave guide, focus lenses, and a cooling system. The Amdt-Schutz system is the basis of action. This means that an increase or decrease in the stimulus in excess of the appropriate dose will result in weakening or no effect. The best effect is created with the best dose. Similarly, the bio-boosting effect of LLLT can be produced by positive dosage exposure to tissues in a way that can interact with it. In addition, LLLT incorporates sub-thermal energy into tissues, which act on the lower part of the cell. The use of LLLT also stimulates various lymphocytes and mast cells that will produce an anti-inflammatory action that causes changes in capillary hydrostatic pressure leading to edema and elimination of inflammatory metabolites. Or it can increase collagen production, the mitotic activity of epithelial cells and fibroblast. In addition, it can produce an analgesic effect by inhibiting nociceptive signals.

#### **There are different wavelengths that can be separated**

to:

- UV range (ultra-spectrum 400-700 nm)
- IR range (infrared spectrum 700 nm to microwaves spectrum)
- VIS range (visible spectrum 400-700 nm)

#### **Compared to a traditional dental drill, lasers:**

can cause minimal pain in some cases, thus reducing the need for anesthesia.  
It can reduce anxiety in patients who are not feeling well by using a dental drill  
Reduce bleeding and inflammation during the treatment of soft tissues  
It can keep the tooth very healthy during the extraction.

#### **The disadvantages of lasers are:**

Lasers cannot be used on teeth with an existing filling.  
Lasers cannot be used in most conventional dental procedures. For example, lasers have not been used to fill in the gaps between teeth, around old fillings, and large holes that need to be crowned. In addition, lasers will not be used to remove defective crowns or silver fillings, or to prepare dental bridges.  
Traditional exercise may still require the construction of a filling, adjusting the bite, and polishing the filling even with the use of a laser.  
Lasers do not eliminate the need for anesthesia.

#### **Application of lasers in dentistry**

##### **Aphthous ulcers**

Sores are painful and often recurring.  
Laser treatment of aphthous ulcers is another form of temporary pharmacologic treatment. The laser provides relief from pain and inflammation, with the normal healing of this uncomfortable and potential oral ulcer. Lasers when used in modified mode remove the exposed end of the sensor. The wound can be made less resistant to light treatment within 4 minutes or less. Recently Level Low Laser Therapy (LLLTT) has been used. It helps to relieve pain quickly and speeds up wound healing. According to De Souza et al, 75% of patients reported that there was significant relief from pain in the same regimen after laser treatment and the wound was completely

recovered within 4 days. When steroids are used, they taking 5-7 days to reverse, Bladowski et al also found that low-level diode laser used to reduce wound healing time by half compared to traditional medicine. (9,10) It is best to treat aphthous ulcers in the first 48 hours. The 400 micron tip is used for small wounds. Laser mode defocused 5-6mm away from the wound and advanced to the edges 2mm away. Continuous movement from the edges to the center is performed. A period of 15-20 seconds is given between the laser that allows the tissue to cool. Location, wet-covered finger to determine if there is a decrease in the pain you feel. Passes 2 and 3 need to be done to completely reduce pain. After all laser use, the area should be scraped to check for reduced pain.

#### **In Herpes Labialis and Herpetic Gingivostomatitis**

Soft tissue lasers are effective in reducing the effects of herpes virus infection. Laser implants disrupt the function of the virus, slowing the progression of the wound. Herpes labialis has been successfully treated with Nd: YAG lasers.

#### **Wounds and governing conditions**

Low back pain and mild pain associated with laser ablation make it an important tool in the management of previous mucosal lesions. PJ Thomson et al conducted a study to find the effectiveness of CO2 laser surgery in histopathologically proven pre-cancer management in 57 patients. Laser surgery successfully removed 55 pre-skin lesions 11 of which showed dysplasia or more severe neoplasia compared to initial biopsy. Postoperative scar and morbidity was minimal. It was therefore concluded that intensive laser surgery is recommended compared to the preservative treatment of oral cancer to aid in effective treatment, low-grade disease and to establish a clear histological diagnosis.

#### **Leukoplakia**

Leukoplakia is a very common ulcer that kills oral disease. There are a variety of treatments for this ulcer including skin grafts, electro cautery, cryosurgery, laser surgery and medicines. The lesions were removed with a laser and healed by a new healthy epithelium. Small wounds can be treated with a carbon dioxide laser with 3 mm needles. Fausto Chiesa et al (1986) treated 92 leukoplakias with CO2 laser surgery. Felix WK Chu et al (1988) used a CO2 laser to treat 29 patients with leukoplakia and follow-up was performed for 3-10 years. The results have supported CO2 laser with standard treatment modalities with respect to removal of tissue, minor tissue damage, immediate hemostatic effect, good wound healing and effective destruction of abnormal tissue that reduces duplication. -CO2 laser evaporation in 27 cases of lip leukoplakia. It was concluded that selective removal of the affected epithelium with minimal damage to the surrounding structures may be done using CO2 laser evaporation, followed by excellent wound healing and a good effect on performance. Treatment can be performed under local anesthesia for patients. illness and the rate of recurrence is low compared to the rate of recurrence after surgery.

#### **In Oral lichen planus**

Oral lichen planus is a common mucocutaneous disease. Wilson first described it in 1869. It can be white lines of both countries, papules or plates in the buccal mucosa, tongue and gingivae. Vander Hem et al (2008) treated 21 patients of lichen planus with CO2 laser evaporation during 1973. -2003. During the follow-up period of 1-18 years (mean 8 years) 85% of patients were found to be painless while 15% experienced painful recurrence after treatment. They therefore concluded that in patients in their non-response to topical corticosteroids, CO2 laser evaporation can cause long-term remission of symptoms and may be a cure firstchoice in patients with acute lichen planus problem.

#### **In Oral Submucous fibrosis**

Jawahar R et al - used a diode laser to treat trismus in patients with oral fibrosis. They concluded that Diode laser is a less expensive and different method in group III and IVA group cases where bilateral temporalis myotomy and coronoideotomy are considered the only solution. And this method was less invasive and more suitable for Asians as it required less hospital stay and less follow-up compared to other surgical procedures. that adequate extraction of oral submucous fibrosis can be achieved using the KTP-532 laser extraction procedure, which has serious side effects and satisfactory results. results over a 12-month follow-up.

#### **Erythroplakia**

Erythroplakia can be controlled with the provided surgery and CO2 laser. It is important to abort more widely and not in depth due to the dysplastic nature and in situ.

### **In Actinic cheilitis**

Robert J Stanley, Randall K. Roenik (1988) treated three cases of actinic cheilitis using a CO<sub>2</sub> laser. They concluded that CO<sub>2</sub> laser vaporization was an effective office procedure for the treatment of actinic cheilitis that produced better cosmetic and performance effects especially when compared to conventional vermilionectomy. Also, the disease was minimal and the cost, when performed in preparation for emergency patients was acceptable compared to vermilionectomy.

### **Frictional keratosis**

Frictional keratosis, as the name implies, results from chronic lower extremities that are mechanically taken from the right cheek, improper dentures or sharp dental doors. The wound is white in color with the appearance of a patch. The wound is incurable. These lesions can be treated with soft laser therapy. Small questionable lesions can be removed using a carbon dioxide laser with a 0.2mm diameter surface. It is used in the same way as the elliptical frame around the wound.

### **In Nicotinic Stomatitis**

Nicotinic Stomatitis caused by smoking pipe or smoking. The wound appears as red dots surrounded by a halo of white keratin. These sores are usually empty. If a patient complains of pain, laser treatment is performed as a treatment. Wounds are inspired after multiple punch biopsies. Carbon dioxide laser is used in this case, a continuous mode directly on the surface of the tissue next to the long axis of the wound.

### **Smokeless tobacco causes white sores**

These sores are caused by the chronic use of smokeless tobacco. These lesions are treated with laser carbon dioxide.

### **Verrucous Carcinoma**

Verrucous carcinoma is also a serious ulcer. It is treated with carbon dioxide and Nd: YAG laser contact using an excisional process including a wide-ranging lesion.

### **In Oral Papillomatosis**

It can be treated with a carbon dioxide laser or with Nd: YAG.

### **Salivary Gland Pathologies**

Sialolithiasis is a disease of the salivary glands. Most sialoliths are found in the submandibular gland. Various types of lasers have been used to treat sialolithiasis, including carbon dioxide, diode, and Nd: YAG lasers.

### **In Radiation Mucositis**

Radiation mucositis remains a common complication of high-dose chemoradiotherapy regimens, with complications that can be very dangerous due to weight loss. Soft laser treatment has been found to be effective in reducing oral mucositis lesions and the time of wound healing.

### **Mucocele**

Most patients with this type of ulcer are older and older. The lower lip is the most common site of involvement. It appears to be mucosal inflammation caused by the dome. Laser treatment can be done to remove mucoceles. Mucocele treat and glandular tissue using Laser HF. This laser uses high-frequency technology that helps to cut accurately and reduce the risk of necrosis. Re-use epithelialization takes approximately 2-3 weeks.

### **Pain Relief and Inflammatory Activity**

Soft laser therapy is said to relieve pain due to various etiologies and has an anti-inflammatory role. Soft laser treatment relies on the fact that laser light penetrates into tissues and tissue fluids. Energy can be absorbed when the concentration in the fluid is very high and as a result, it is easily absorbed by the burning and eating tissues. It has been suggested that these forces may promote a number of biologic reactions involved in the healing process.

## **II. Conclusion**

The use of laser therapy in maxillofacial medicine has potential implications for faster and faster healing. The soft tissue laser is a state of the art tool that creates predictable beauty effects within a normal dental practice. Lasers have played a major role in the development of dental clinics in the 21st century and will play a key role in dental surgery in the near future.

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