

Laser therapy and oral white soft tissue lesions

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Abstract

Soft tissue lasers are becoming more popular among the dentists, where oral and maxillofacial surgeons started using them in many procedures for example incision, excision, and coagulation of intra-oral soft tissue. Mostly its used in biopsy procedures. Three types of lasers dentists using nowadays such as diode laser, CO2 laser and ND:YAG laser.CO2 laser is the first laser used in dentistry and of course when laser entered the dentistry field it made it enter to another level of knowledge for treatment procedures in laser surgeries due to its correct tissue incision, coagulation and postoperative benefits. Diode laser which is steted on (810 nm and 3 W in a pulse mode) has good results in removing oral lesions its very popular for its small size where its used in minor lesions by excision or vaporization procedures. It has low scar formation, reduction of bleeding and inflammation. But in addition to all these advantages no body is looking to the disadvantages such as more production of divergent laser beam and critical heating problems. The most commonly used is the ND:YAG laser which is used for elimination of the injured tissues. It has smaller thermal damage zones and although it can show in some cases thermal damage but it is distinguished from the safest procedures for biopsy with correct histological evaluation leading to better management.

The Nd:YAG laser has a number of disadvantages where It has the greatest depth of penetration which might cause the tissues under the surface be exposed to laser energy. This will lead to the risk of unwanted collateral damage, especially in the underlying bone or the dental pulp as well as the associated postoperative morbidity. Laser have some disadvantages that are related to the age where it might affect the bone plates in children in the growing phase and of course its a big risk for the fetus in the mother’s uterus that is in target for being affected. It is not prescribed in patients with pacemakers, or used with precaution. Laser should not be used in the uterus region in pregnant women. Shouldn’t be used in epileptic patients or with frequency <800 Hz; Shouldn’t be used in patients with antecedent of arrhythmia or chest pain; Shouldn’t be used on glands, e.g. thyroid gland; Laser therapy should be avoid on tumorous tissues or benign tumors with malignant tendency; Prescription of laser therapy is forbidden in patients with lupus or patients treated with substances sensible to light; Low level lasers, under the title of cold-soft lasers, are used for years in different countries all over the world. The favorable effects of

these lasers such as: Decreasing inflammation and pain, increasing the quality and rapidity of repair, increasing the immunologic system. With all the advantages we have in laser surgeries and the increase in using them we can’t forget about the disadvantages we might face because of them. So, any treatment method or technology should not be looked only from the bright side, but also it has to take into consideration the advantages and disadvantages of every-thing which are used for medical purposes.

Abbreviations: ND:YAG – Neodymium Yttrium Aluminum Garnet (laser) CO2 – Carbon dioxide laser

Keywords: laser, oral lesions, advantages, disadvantages

Introduction

We have a number of white lesions in the oral cavity that are so difficult to distinguish between. White lesions are three groups first one is white surface thickening lesions, second is white surface material lesions and the third is sub surface lesions. In each one we have several lesions we are going to talk about. Soft tissue lasers are becoming more popular among the dentists, where oral and maxillofacial surgeons started using them in many procedures for example incision, excision, and coagulation of intra-oral soft tissue. Mostly its used in biopsy procedures. Three types of lasers dentists using nowadays such as diode laser, CO2 laser and ND:YAG laser.

Table 1. White Soft Tissue Lesions

White surface thickening lesions	White surface material lesions	White subsurface lesions
1. frictional keratosis	1. Chemical burn	1. Gingival cyst in newborn
2. hairy tongue	2. coated tongue	2. Palatal cyst in newborn
3. Cinnamon contact stomatitis	3. Pseudomembranous candidiasis	3. Oral lymphoepithelial cyst
4. Leukoedema		4. Scar formation
5. white sponge nevus		5. Fordyce’s granules
6. smokeless tobacco keratosis		6. Sialolithiasis

Materials:

CO2 laser is the first laser used in dentistry and of course when laser entered the dentistry field it made it enter to another level of knowledge for treatment procedures in laser surgeries due to its correct tissue incision, coagulation and postoperative benefits.

The absorption/penetration depth in water for the LightScalpel CO2 laser wavelength (10,600 nm) is approximately 0.015 mm, which explains the very thin (less than 0.1 mm) thermal damage zone on the margins of the incision in soft tissue.

Diode laser which has the absorption / penetration depth in water for diode laser wavelengths in the 800-1,000 nm range has good results in removing oral lesions its very popular for its small size where its used in minor lesions by excision or vaporization procedures. It has low scar formation, reduction of bleeding and inflammation. But in addition to all these advantages no body is looking to the disadvantages such as more production of divergent laser beam and critical heating problems.

ND:YAG laser which is used for elimination of the injured tissues. It has smaller thermal damage zones and although it can show in some cases thermal damage but it is distinguished from the safest procedures for biopsy with correct histological evaluation leading to better management. wavelengths in the 2,780-2,940 nm range are shown to be energy efficient and spatially accurate for photo-thermal ablation.

Laser have some disadvantages that are related to the age where it might affect the bone plates in children in the growing phase and of course it's a big risk for the fetus in the mother's uterus that is in target for being affected.

Methods:

In the first group of White Surface Thickening Lesions are:

Frictional keratosis: it is a white patch due to hyper plastic hyper keratotic epithelium induced by trauma for example cheek biting, sharp tooth, sharp denture, bad habits. They are homogeneous white, flat lesions of the attached gingiva, asymptomatic. These lesions can be treated with soft laser therapy. Small questionable lesions can be excised by using carbon dioxide laser with a 0.2mm spot size. It is applied perpendicular to the elliptical outline around the lesion.

Leukoedema is a benign white lesion of the oral mucosa for the etiology tobacco is the main cause. The clinical manifestation is an asymptomatic and is Veil-like appearance, bilateral, of the buccal mucosa. Leukoedema treatment is by advising the patients to quit smoking if possible. Usually it is unknown if the lesion will heal or go without a scar formation. But when having problems with cosmetic appearance the CO2 laser treatment is affective.

White spongy nevus is a rare benign condition affecting keratin. It appears as asymptomatic diffuse soft uneven thick the superficial layer of the epithelium, which characteristically has no definite boundary and may affect any part of the mouth. Histology shows hyper plastic epithelium with gross intraepithelial edema. Usually noticed in second decade of life although developmental in origin.

Invasive therapies such as CO2 and Nd:YAG laser vaporization have also been attempted with disappointing results.

Hairy tongue is a coated or hairy aspect of the dorsal surface of the tongue. the term hairy tongue when the height of the papillae is more than 3 mm. In general, the terms coated and hairy tongue are used as synonyms. The clinical manifestation The coating of the dorsal surface may vary in color from yellowish-brown to black and sometimes even white (black tongue, white tongue). Patients may complain of discomfort or a faulty taste. Co2 laser is used if non of the treatments where affective.

Cinnamon stomatitis is an allergic reaction to cinnamon where it is used as a flavoring agent like in gums, candies, and oral health-care products. Patients present with tender or painful burning mucosa mostly in the area of buccal mucosa, diffuse gingival lesions, or chapped lips. This pain helps to distinguish cinnamon stomatitis from other red and white lesions that occur in the oral cavity. Laser treatments—Nd:YAG can be used to shorten course.

Smokeless tobacco keratosis is a condition that causes thick white patches to form on skin in your mouth. Your skin may also be wrinkled or look like leather. The patches form where you hold smokeless tobacco in your mouth. Clinical aspects : in anterior mandible vestibule - posterior vestibule- white - granular or wrinkled .These lesion are treated by carbon dioxide laser.

The second group – White Surface Material Lesions:

Chemical burn: is when people miss use chemicals resulting in lesions in the oral cavity the chemical burn is localized or widespread, thick, rough, hyperkeratotic plaques with superficial white corrugated or cratered appearance with or without ulceration; this epithelium sloughs leaving red painful surface, erythematous erosions or ulcers and tender to pain. Low level laser therapy (LLL) is a form of phototherapy that involves the application of low power monochromatic and coherent light to injuries and lesions. It has been used successfully to induce burns.

Coated tongue is an abnormal increase in tongue coating is due to local environmental changes represented by mouth breathing, febrile illnesses (dehydration, poor oral hygiene and decreased salivary flow), Drugs like antibiotics ,stomach disease lack of function and/or changes in the oral flora. The clinical manifestations are increase in the thickness of keratin on the dorsal tongue and it may vary in color from white to brown-black, non-adherent coating.

Treatment is brushing the tongue and adequate hydration. For stubborn elongated papillae, a doctor can remove them using carbon dioxide laser burning, which simultaneously cuts and seals the papillae.

Pseudo membranous candidiasis: The *pseudomembranous* is characterized by white plaques that can be easily wiped off from the mucosal surface this type mainly occurs on the buccal mucosa and the tongue. Symptoms may consist of a burning sensation and an abnormal taste.

C. albicans plays big role in candidiasis Local predisposing factors may be poor oral hygiene, dry mouth, topical use of corticosteroids for example in the form of inhalers, smoking, and irradiation of the head and neck. Systemic predisposing factors consist of immunodeficiencies), diabetes mellitus, malnutrition, hematologic disorders such as leukemia, and prolonged use of antibiotics. Stomatitis is treated with low-power semiconductor diode laser.

The third group – White Subsurface Lesions.

Scar formation: resulting abnormal proliferations of tissue resulting from excess collagen production during healing, the development of new tissue over a recovering wound no treatment required and for scar revision if cosmetic concern or if restricts function it is possible that low level laser diode therapy effects on wound healing depend not only on the total dose of irradiation but also on the irradiation time and the irradiation mode.

Fordyce granules: its small, yellow-white, multifocal papules; discretely separated or forming relatively large plaques, asymptomatic Histopathology of Fordyce normal sebaceous glands without hair follicles and no treatment is required. The most common location is bilateral buccal mucosa, retromolar pad and upper lip vermilion. CO2 super pulsed laser can be considered a safe and effective treatment for patients with Fordyce spots, offering excellent cosmetic results.

Oral lymphoepithelial Cyst: The develop within benign lymphoid aggregates in the oral or pharyngeal mucosa, developmental cystic lesion, sometimes forming a crypt like in the tonsils, also referred – “oral tonsil. Clinical manifestation is solitary or multiple, painless, yellowish, circumscribed swelling, submucosal nodules (in diameter >0.5) white nodule with superficial fine vascular pattern; usually non-tender. most common location of it is Posterior lateral and ventral tongue, floor of mouth, soft palate and mucosa of the pharyngeal tonsil treatment is surgical excision. Diode laser is used in this case if no results from other treatments.

Sialolithiasis: the clinical manifestation is solitary, hard, pinkish white nodule; pain and swelling prior to and during meals, when salivation increases. Usually floor

of mouth within Wharton’s duct, most commonly are found in the submandibular or the parotid glands. Diagnosis is made based on characteristic history, with occlusal or panoramic radiograph assess; Small stones may go undetected radiographically, holmium: YAG laser under sialoendoscopic guidance for sialolithiasis of Wharton's duct.

Conclusion:

There are several types of white lesions that need different types of treatment and some of them even don’t need treatment but laser therapy is used for more than one reason including therapeutic effects, surgical treatment and most importantly in cosmetic cases. That’s why the use of laser is increasing in all fields especially in dentistry with good results.

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ლაზერული თერაპია და პირის ღრუს ლორწოვანის თეთრი რბილი ქსოვილის დაზიანება

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საქართველოს უნივერსიტეტი, ჯანმრთელობის მეცნიერებების სკოლა, სტომატოლოგიის დეპარტამენტი, 1სტუდენტი, სტომატოლოგიის ინგლისურენოვანი პროგრამა; 2ხელმძღვანელი, მედიცინის აკადემიური დოქტორი, პროფესორი

რეზიუმე

რბილი ქსოვილების ლაზერი უფრო მეტი პოპულარობით სარგებლობს სტომატოლოგებში, სადაც პირის ღრუსა და ყბა-სახის ქირურგიების მიერ გამოიყენება ბევრ პროცედურაში, მაგალითად, ინტრაორალური ქსოვილების ინციზიური, ექსცეზიური და კოაგულაციური პროცედურების დროს, ძირითადად გამოიყენება ბიოფსიისას. დღესდღეობით სტომატოლოგიაში სამი სახის ლაზერი გამოიყენება: დიოდური ლაზერი, CO2 ლაზერი და ND: YAG ლაზერი.

CO2 ლაზერი პირველი გამოიყენეს სტომატოლოგიაში, რამაც საჭირო გახადა ქირურგიული მკურნალობის ცოდნის სხვა დონის შექმნა - ჭრილობის, მისი კოაგულაციისა და პოსტოპერაციული შედეგების შესახებ. დიოდის ლაზერი (810 ნმ და 3 ვ პულსის რეჟიმში), რომლითაც მიიღწევა კარგი შედეგები, გამოიყენება ძალიან მცირე ზომის დაზიანებებისათვის, ექსცეზიური და ვაპორიზაციის პროცედურებისათვის. მისი გამოყენების შედეგად აღინიშნება შედარებით მცირე ნაწიბურების ფორმირება, სისხლდენისა და ანთების შემცირება. მაგრამ ყველა ამ უპირატესობასთან ერთად, არ არის შესწავლილი სხეულზე ისეთი უარყოფითი მხარეების მოქმედება, როგორცაა განსხვავებული ლაზერის სხივი და კრიტიკული გაცხელების პრობლემები.

ყველაზე ხშირად გამოიყენებაში არის ND: YAG ლაზერი: დაზიანებული ქსოვილების მოსაშორებლად. მას აქვს მცირე თერმული დაზიანების ზონები, ნაჩვენებია მცირე ზომის თერმული დაზიანებების მკურნალობისას, ბიოფსიის პროცედურის უსაფრთხო ჩატარებისას, ჰისტოლოგიური შეფასებითი თვლვება სწორ მენეჯმენტად.

Nd: YAG ლაზერის აქვს არაერთი უარყოფითი მხარე, მას აქვს შეღწევადობის საკმაო სიღრმე, რითაც შეიძლება ლაზერულ ზემოქმედებას დაექვემდებაროს ზედაპირქვეშა ქსოვილები. ამან შეიძლება გამოიწვიოს ქვეშეშებარე ძვლის ან კბილის პულპის კოლატერალური დაზიანებები და მასთან დაკავშირებულ პოსტოპერაციული ავადობა. ლაზერს აქვს გარკვეული ნაკლოვანებები, რომლებიც დაკავშირებულია ასაკთან, სადაც ის გავლენას ახდენს ბავშვებში ძვლის ფირფიტებზე ზრდის ფაზაში და, რა თქმა უნდა, მისი დიდი რისკი დაკავშირებულია ფეხმძიმობისას ნაყოფისთვის დაზიანებასთან.

მისი გამოყენება არ არის პაციენტებში პეისმეიკერით, არ უნდა იყოს გამოყენებული ორსულ ქალებში საშვილოსნოს მიმდებარე ზონებში. არ უნდა იქნეს გამოყენებული ეპილეფსიური პაციენტებში ან <800 Hz მეტი სიხშირით; არ უნდა იქნას გამოყენებული არითმიის ან გულმკერდის ტკივილის მქონე პაციენტებში; არ უნდა იქნას გამოყენებული ჯირკვლების სამკურნალოდ, მაგ. ფარისებრი ჯირკვალი; ლაზერული თერაპია თავიდან უნდა იქნას აცილებული სიმსივნის საწინააღმდეგო პრეპარატების ან ავთვისებიანი სიმსივნეების ტენდენციისას.

ლაზერული თერაპიის დანიშვნა აკრძალულია წითელი მგლურის მქონე პაციენტებში ან პაციენტებში, რომლებიც მკურნალობენ სინათლისადმი მგრძობიარე ნივთიერებებით; დაბალი დონის ლაზერები (ცივი-რბილი ლაზერების სახელწოდებით), წლებია გამოიყენება სხვადასხვა ქვეყნაში. ამ ლაზერების დადებითი ეფექტია: ანთების და ტკივილის შემცირება, აღდგენის ხარისხის და იმუნური სისტემის გაზრდა.

დასკვნა: ქირურგიაში ლაზეროთერაპიის გამოყენებისას, ყველა უპირატესობასთან ერთად არ უნდა დავივიწყოთ უარყოფითი მხარეებიც. ასე რომ, ნებისმიერი მკურნალობის მეთოდი ან ტექნოლოგია არ უნდა განიხილებოდეს მხოლოდ დადებითი ეფექტების მხრიდან, არამედ უნდა შეფასდეს ყველა უპირატესობა და უარყოფითი მხარეები, რომლებიც გამოიყენება სამედიცინო მიზნებისთვის.