

A Noval Approach to the Treatment of Proliferative Verrucous Leukoplakia – A Case Report of Laser Therapy

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Abstract: *Technology is rapidly growing in today's world and the advent of lasers has proved to be an innovative tool in various fields of dentistry. Nowadays soft tissue lasers are widely used among clinicians for various procedures. Likewise, smoking has become a growing trend especially among the youth paving way to oral mucosal lesions commonly, leukoplakia. The improvement in therapeutics have gained patient confidence for assuring better healing and cure of the lesions through these procedures.*

Keywords: *Diode Lasers, Laser, Leukoplakia, Proliferative Verrucous Leukoplakia, Soft Tissue Laser*

I. Introduction

Laser first discovered by Townes and Schawlow is an acronym for Light Amplification for Stimulated Emission of Radiation [1]. It was used in dentistry for the first time in 1964 by Sognnaes and Stern who used Ruby laser to vaporize enamel dentin [3]. The applications of lasers in various fields are characteristic of its wavelength and the range of wavelength used in medicine and dentistry is 193 – 10600 nm.

Soft tissue lasers which stimulate the cellular activity have gained popularity among dentists for various surgical procedures mainly because of their capability to produce a bloodless field, surface sterilization and high quality patient acceptance [2]. This article is aimed at providing an insight into the different types of soft tissue lasers and its application for the treatment of a potentially malignant disorder.

We are supporting the above data with a case report of a patient with proliferative verrucous leukoplakia on whom laser treatment was being performed followed by satisfactory healing.

II. Case Report

A 23 year old male patient came to our department of Oral medicine with a chief complaint of a white patch on the right buccal mucosa. Patient has been noticing this lesion since the last one year. There is no pain or burning sensation to hot and spicy food associated with the lesion. Personal history revealed that he is a chronic smoker for the past 5 years consuming around 2 packs of cigarettes per day. There is no other relevant medical history or drug allergy.

On extraoral examination, there were no palpable lymph nodes, no TMJ abnormalities and no gross facial asymmetries.

On intraoral examination, there was presence of a white patch [Figure -1] of approximate size 5x2 cm on the right buccal mucosa extending anteroposteriorly 1 cm from the corner of the mouth backwards till the third molar region. Superioinferiorly it extends 1cm from the upper vestibule to 1 cm of the lower vestibule. Mild proliferative changes are seen near the corner of the mouth with a mud cracked appearance in the other areas of the lesion. Adjacent to this there is also a small lesion of approximate size 0.5x0.5 cm present on the gingival of 47 [Figure- 2]. On palpation, all inspectory findings were confirmed with the presence of a white nonscrapable lesion with rough surface and raised ill defined borders merging with the adjacent mucosa. It was non tender. On hard tissue examination there was presence of calculus and stains. Ellis class II fracture was seen in relation to 12 and class I caries were present on 16, 46, 47, 48.

Toluidine blue staining [Figure – 3] was being done and the patient was advised for biopsy after an antifungal therapy. With the above findings a provisional diagnosis of proliferative verrucous leukoplakia was

given and a differential diagnosis of hypertrophic candidiasis. The histopathological report came as severe dysplasia. Laser surgery using diode laser was being performed.

III. Discussion

Lasers are heat producing devices by converting the electromagnetic energy to thermal energy. Photo ablation is being used here where the overlying tissue is removed by vaporization superheating of the tissue fluids, coagulation or homeostasis [2]. The lasers used in the field of Oral Medicine are Hard and soft lasers.

The current soft lasers in clinical use are the [3], Helium-neon (He-N) at 632.8 nm, Gallium-arsenide (Ga-As) at 830 nm. The above are collectively termed as Diode Lasers which is used for soft tissue surgeries, periodontal surgery, bleaching, Photodynamic therapy [4]. Hard lasers which can be used both in hard and soft tissues are - Carbon dioxide lasers – This is commonly used for soft tissue surgeries with a wavelength of 10600nm. Since it is readily absorbed by water it does not penetrate too deep into the tissues without prolonged use. It is used in removal of surface lesions, resurfacing the skin and for the removal of sialoliths.

Nd:YAG Lasers – This is also a soft tissue laser usually used for removing tattoos and certain pigmented lesions, bone and cartilage ablation and for hair removal [1]. These are also used for minor periodontal surgeries [4]. Ho:YAG Lasers – Used for foreign body removal and for arthroscopic and soft tissue surgeries. Er:YAG Lasers – Used for hard tissue procedures, skin resurfacing [2] and cavity preparations [4]. Argon Lasers – Used for pigmented lesions and vascular anomalies like port wine stains as it can be readily absorbed by hemoglobin and melanin [1]. These can also be used for plastic surgeries [4].

The laser absorption by the tissue is mainly based on the exposure time and the power density. If a laser can be passed through the tissue then there are only minimal thermal changes. The depth of penetration is based on the type of the tissue and the wavelength of the laser [1]. But if the laser cannot be passed through the tissues then there is absorption taking place with increased thermal changes. Each tissue has its own specific absorption properties and based on its composition and chromophores that are present (hemoglobin, water, melanin and protein), a particular wavelength is selected. Chromophores are those substances present in the target tissue that has the ability to attract the laser photon. This absorption of the specific wavelength by the chromophore is based on the efficacy of the laser treatment and this is termed as laser-tissue interaction [1]. CO₂, Er-YAG lasers are absorbed by water causing a minimal depth of penetration and fast heating, resulting in effective removal of perverted soft and hard tissue [4]. Thick hyperkeratotic tissues have less water content [1].

Laser Capture Micro dissection (LCM) is an ideal method for the extraction of cells from specimens in which the exact morphology of both the captured cells and the surrounding tissue are preserved. When LCM is combined with immunohistochemical staining techniques, more accurate microdissection of cellular subsets can be obtained. This technique variably helps in early detection of oral squamous cell carcinoma by detecting the biomarkers and establishing protein fingerprint models [4]. Low Level Laser Therapy (LLLT) has been effectively used in pain during orthodontic therapy, acceleration of healing process in wounds, reduction of bacterial load in ulcerative conditions like aphthous ulcer, infections etc. [4].

Leukoplakia a white lesion [5] is considered as a potentially malignant disorder by the WHO. It is "defined as a white patch or plaque which cannot be characterized clinically or pathologically as any other disease". The most common cause is tobacco smoking. Most common sites of occurrence are the buccal mucosa and the tongue [5]. Initially these are small sized white plaques which enlarge if the habit continues. Ideally leukoplakia is leathery on palpation but verrucous leukoplakias have an irregular surface because of its exophytic and proliferative nature.

Verrucous leukoplakias are early phases of oral squamous cell carcinomas in 70% cases which is a cause of high morbidity and mortality worldwide [6]. These lesions can be treated by oral medications, surgical excision, electrocautery, cryosurgery or laser excision [2]. But the use of these symptom free devices gained acceptance among clinicians because of the ease of its use as well as among patients for its quality assurance.

Lasers are also utilized for withdrawing histopathological samples which can also be done with a scalpel. Diode lasers are used for excision of such thickened hyperkeratotic lesions with a 3-4 mm margin [3]. Minimal mechanical trauma was provided and better and rapid healing by early regeneration of new epithelium was noticed. Uninvited suture placement can also be avoided compared to other treatment modalities. This modality is also patient friendly as the operating time is reduced and it is symptom free, less edema formation and also prevents scarring. The use of multiple medications after the surgical management can also be avoided. Diffuse lesions with a possibility to cause oral cancer cannot be managed by excision and lasers are used in a defocused mode to produce a cross hatched pattern [2].

In our case, we had used Diode laser for the surgical excision of the lesion [Figure – 4]. Initially the patient was on follow-up for a month after which he had gone abroad. After almost 6 months patient had send us a photograph of the laser treated site as per our advice as he was not able to continue the follow-up in our institution and it revealed a content prognosis [Figure - 5].

IV. Conclusion

Hence laser technology is a thrilling advance which is now well established in our field of oral medicine mainly because of the patient comfort and the numerous benefits. Their rapid progresses compel us for more exploration into this gadget in the upcoming years and thus revolutionize our diagnosis and treatment.

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Figure – 1 A white lesion present on the right buccal mucosa



Figure – 2 Presence of a small white patch on the gingival of 47



Figure – 3 Toluidine blue staining



Figure – 4 site of lesion immediately after laser therapy



Figure – 5 site of the laser treated area after 6 months