

CASE REPORT

Excision of Oral Leukoplakia using 970 nm Diode Laser

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ABSTRACT

Oral leukoplakia (OL) is one of the most commonly seen potentially malignant disorders with varied clinical presentations. A wide variety of medical and surgical treatment modalities have been tried for its management with varying successes. Laser ablation of the lesion is considered as one of the treatment modalities. Conventional surgery may be followed by some side effects like scar formation, contraction, and contamination of surgical field. Using high-power laser has some advantages like less pain, swelling, bleeding, ability to decontaminate, thus preventing secondary infection. This article presents a case of leukoplakia in the right buccal mucosa, which was managed using a 6 W diode laser of 970 nm. The healing occurred uneventfully over a period of 1 month postoperatively with minimal patient discomfort. The case establishes the efficacy of diode laser in the management of OL.

Keywords: Ablation, Diode, Laser, Leukoplakia, Potentially malignant disorder.

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INTRODUCTION

Oral leukoplakia is the most frequent potentially malignant disorder of oral mucosa. Although the lesion has been mentioned in clinical reviews since 1969,¹ it was first defined by the World Health Organization in 1978¹ as a white patch or plaque that cannot otherwise be characterized clinically or pathologically as any other disease. In 2007, it was decided that the name leukoplakia should be limited only to a clinical diagnosis defined by exclusion of other white lesions, such as oral lichen planus, white sponge nevus, nicotine stomatitis, leukoedema, etc.² In 2012, van der Waal³ proposed a new definition, which seems more

appropriate as it includes the histological confirmation: "A predominantly white lesion or plaque of questionable behavior having excluded, clinically and histopathologically, any other definable white disease or disorder."³

The annual incidence of OL among subjects >15 years of age was reported as 0.2 to 11.7% in different populations of India.⁴ Its prevalence ranges from 0.2 to 5.2% in the Indian subcontinent,⁵ with a range of malignant transformation reported to be 1 to 20% over 1 to 30 years.⁶ The lesions are usually diagnosed after the age of 40 and are six times more frequent among male smokers compared with nonsmokers.⁷ The most affected age groups were between 60 and 69 years.⁸

There are two major clinical forms of leukoplakia: homogeneous and nonhomogeneous. The homogeneous type has a flat, thin, and smooth surface; the nonhomogeneous form can be speckled (white and red areas, but predominantly white), verrucous, and proliferative verrucous leukoplakia.⁶

Several treatment modalities have been proposed for its treatment including medical management [carotenoids, vitamins A, C, E, lycopene, fenretinide, 13-*cis*-retinoic acid (13-cRA), bleomycin, and photodynamic therapy] as well surgical methods (conventional surgery, surgical stripping, electrocautery, cryotherapy, and lasers). No single treatment modality has been proven successful in preventing recurrences; hence, combined therapy is used.⁹

Laser as such can be classified according to the physical state (Table 1):¹⁰

Diode laser is solid-state laser, available in the wavelength of 850 to 1,064 nm, either in the continuous or pulsed mode. The available wavelengths for dental use range from about 800 nm for the active medium containing aluminum to 980 nm for the active medium composed of

Table 1: Classification of lasers and their physical state

Physical state	Examples
Gas lasers	Argon Carbondioxide
Liquid	Dyes
Solid	Neodymium-doped yttrium aluminum garnet (YAG) Erbium-doped YAG Diode
Semiconductor	Hybrid silicon laser Semiconductor diode laser
Excimers	Excimers

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indium. It has a variety of applications including biopsy, gingivectomy, frenectomy, and photobiomodulation. Semiconductor diode lasers [gallium arsenide gallium-aluminum-arsenide (GaAlAs)] are portable compact surgical units with efficient and reliable benefits.

The diode laser is an excellent soft tissue surgical laser, which allows high levels of laser beam to be absorbed by soft tissues, water, and chromophores, such as melanin and oxyhemoglobin. The chief advantage of the diode lasers is that of a smaller size, portable instrument. Being a contact laser, it allows better control to the surgeon.^{10,11} Less thermal necrosis of adjacent tissues is produced with lasers compared with electrosurgical instruments.

Various authors had mentioned the use of diode laser in the excision of leukoplakia. In one case report, the authors presented a case of labial leukoplakia, which was ablated using a 7 W diode laser of 810 nm (Picasso dental diode laser; AMD LASERS Indianapolis, Indiana, USA). The healing occurred uneventfully over a period of 3 weeks with minimal patient discomfort. The case establishes its efficacy in management of OL.¹²

In another case report, the authors selected 10 patients having homogeneous leukoplakias, which were diagnosed clinically. The lesion was excised using a 940 nm ezlase™ diode laser (Biolase, Irvine, California, USA). Healing was perfect without any complication within a duration of 1 month. Pain intensity was also mild and absolutely zero on the visual analog scale after 1-month follow-up.¹³

In another study, the authors evaluated the effectiveness of the 810-nm diode laser in the management of patients with OL. Their study revealed that usage of diode laser may indeed be the best choice in the management of OL.¹⁴

CASE REPORT

A male patient aged 53 years visited the outpatient department with the chief complaint of decayed teeth, which was associated with food lodgment in the same

area. On examination of right buccal mucosa, the presence of a mixed red and white lesion was seen on the right buccal mucosa, measuring approximately about 1 × 0.8 cm, extending superiorly at the level of occlusion plane of 44 and 0.8 cm from the retrocommissural area. The margins of the lesion were diffuse. The surface of the lesion appeared wrinkled and surrounding mucosa appeared normal (Fig. 1).

Regional lymph nodes were normal. Patient revealed the habit of cigarette smoking (10/day) for the past 25 years. The provisional diagnosis of speckled leukoplakia in the right buccal mucosa was made. Complete blood investigation was done. Parameters were found to be within the normal range. Incisional biopsy was performed from the right buccal mucosa using local anesthesia, and tissue sample was sent to oral pathology laboratory for histopathological diagnosis. The specimen showed the features of severe epithelial dysplasia in the entire thickness of epithelium. Patient was advised to completely stop the habit of smoking and one capsule of lycopene was prescribed for a month. On the day of laser surgery, a complete protocol for surgical preparation was done. Infiltration of 2% lignocaine 1:200,000 was done around the vicinity of the lesion. Marking was done around the lesion including 0.5 mm of the normal tissue (Fig. 2).

Laser surgery was performed using 6 Watt class IV diode laser (GaAlAs) of 970 nm. The lesion was slowly peeled away as a single piece at the submucosal level (Figs 3 to 4).

No bleeding was encountered during the surgical procedure. The mucosa was immediately flushed with 10 mL of normal saline. Patient was prescribed tab. diclofenac 50 mg for 3 days and cap. amoxicillin 500 mg for 5 days. Follow-up was done after 1 week and a month, and the lesion showed healing progressively (Fig. 5). Patient was also advised to continue the use of one cap. lycopene (SM fibro) for another 1 month.



Fig. 1: Leukoplakia on the right buccal mucosa



Fig. 2: Marking was done around the lesion

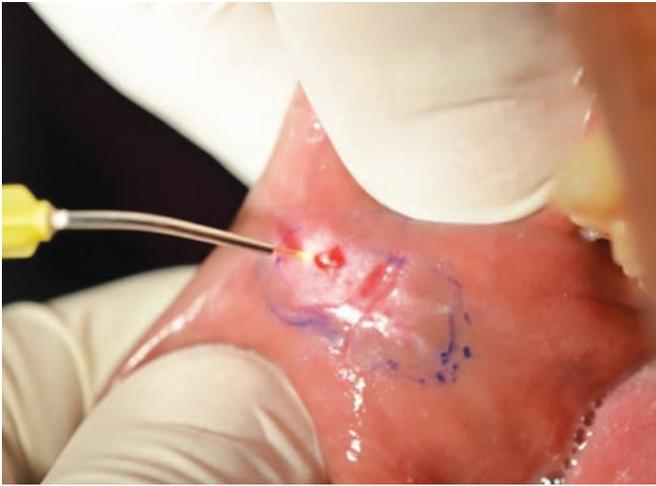


Fig. 3: Laser excision of the lesion



Fig. 5: One month postoperative view showing healing phase of the initial lesion

DISCUSSION

Leukoplakia, a potentially malignant disorder, has various clinical appearances. Therefore, proper management protocol should be followed to prevent malignant transformation. Several studies have investigated the management of OL with the use of nutritional supplements. The management protocol should be based upon the results obtained in biopsy reports, i.e., depends upon the grade of dysplasia; however, local factors (trauma) and habits are to be managed. Management of leukoplakia should also depend upon the size and the location of the lesion. Both nonsurgical and surgical methods have been applied with varying success. In nonsurgical methods, antioxidants play a vital role in the healing of early stages of the lesion. Antioxidants many times act as an adjunctive aid in treatment of dysplastic lesions. However, research in humans has not demonstrated convincingly that taking antioxidants supplements can help reduce the risk of developing cancer. In addition, there is longer duration of treatment with antioxidant



Figs 4A and B: Laser excision performed using 970 nm soft tissue diode laser

therapy. The 13-cRA or vitamin A has always been the treatment of choice for many practitioners. A randomized controlled trial was carried out at MD Anderson Hospital in Houston, in which the authors did a follow-up of 44 patients with OLs, who were treated with 1 to 2 mg/kg/day of 13-cRA for 3 months; 32, nearly 67%, of the patients had more than a 50% reduction in lesion size, but 79% experienced a variety of side effects.¹⁵

Surgical treatment can be conventional excision, cold knife surgical excision as well as laser surgery, but will not prevent all premalignant lesions from undergoing malignant transformation, which can be explained by the genetic defects even in the normal appearing mucosa surrounding the excised lesion (field cancerization). More than one extralesional site may be involved, which can lead to recurrence and malignant transformation.⁶

In a study, the authors evaluated the use of three surgical treatment modalities, namely cryosurgery, diode, and CO₂ laser surgery on 30 selected patients in terms of healing outcomes on the day of surgery and first and second week postoperatively; recurrence at the end of 18 months was assessed. The result of the study showed statistically significant differences ($p > 0.05$) for evaluation parameters like pain, edema, and scar. The parameters

like infection, recurrence, and bleeding showed no statistical significance. Pain was significantly higher in the CO₂ laser surgery group as compared with the diode laser group. There was no recurrence observed at the end of the 6 months follow-up period in all the three study groups. The authors concluded that all three surgical modalities used in this study were effective for treatment of OL, and the overall summation of the results of the study showed that laser therapy (CO₂ and diode) seems to offer better clinically significant results than cryotherapy.¹⁶

It has been mentioned that diode laser with wavelengths ranging from 810 to 980 nm in a continuous or pulsed mode can be used as a possible method of soft tissue surgery in the oral cavity.^{17,18} The major advantages mentioned in the literature for the use of CO₂ and diode lasers are minimal postoperative swelling and scarring, improved wound healing, and decreased postoperative pain and swelling due to transfer of high laser energy to the lesional site, resulting in minimal tissue damage.¹⁹ In case of conventional surgical procedures, damage to the small lymphatic vessels is the cause of postoperative swelling. But laser beam seals such vessels, thus removing the cause of inflammation.²⁰

There are no contraindications specifically for laser surgery, except when surgical proficiency and safety are compromised. However, there are certain disadvantages like higher cost required to purchase equipment, implement technology, and invest in required education.

CONCLUSION

Diode laser is used for soft tissue procedures and the wavelength is well absorbed by soft tissue, providing good hemostasis and effective in cutting of the tissue. The 970 nm diode lasers are safe and can be effectively used as a treatment modality for OL, without any complication. However, close follow-up of the lesion must be done at regular intervals in larger lesions with ill-defined margins. Lastly, studies should be done on a large cohort of patients to determine the efficacy of the diode laser in the management of OL.

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