



Efficacy of Diode Laser for the Management of Potentially Malignant Disorders

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Abstract

Introduction: Laser dentistry is a one of the upcoming advanced treatment modality for oral mucosal lesions. Diode laser is a soft tissue laser that has found much acceptance in all branches of dentistry. Available compact size and feasibility has render diode laser an enhanced tool for today's clinical practice. The aim of this study is to determine the efficacy and safety of diode laser for the management of white lesions such as oral leukoplakia (OL) and oral lichen planus (OLP).

Methods: The study was conducted by using diode laser 980 nm on 10 patients with white lesions (5 OL and 5 OLP) aged between 35 to 65 years.

Results: Of the 10 patients (5 OL and 5 OLP), 3 patients (30%) complained of moderate pain and 7 patients (70%) complained of mild pain, for first 3 days after laser irradiation, and pain disappeared at end of first week. There was no recurrence of the lesion during the 6-month follow up.

Conclusion: Diode lasers provide acceptable clinical improvement of potentially malignant lesions with minimal side effects. It can be considered one of the best alternative treatment modality for oral mucosal lesions.

Keywords: Diode laser; Malignant disorders; Laser in dentistry

Introduction

The term Laser stands for 'light amplification by stimulated emission of radiation'.¹ In 1962, Goldman was the first person to use the laser in dentistry.² Since then, lasers evolved for surgical management of oral soft tissue lesions with significant advantages compared to other treatment modalities.² The diode laser is an active solid semiconductor laser which converts electrical energy into light energy by using elements like, gallium, arsenide, aluminum, and indium.³ The light energy from the diode laser with a specific wave length (810-980 nm) is greatly absorbed by the soft tissues than the hard tissues (teeth and bones),⁴ so diode lasers are preferred for the management of oral soft tissue lesions. The penetration depth is based on wavelength ie, from 2 mm to 3 mm, and the mode of delivery is fibro-optically with a hand piece in pulse and continuous modes.¹

The cutting efficacy of diode laser is more optically than thermally, which facilitates clean cutting and coagulation with less charring.¹ In addition, it provides good hemostasis and effective cutting of tissues. The advantages of diode laser include greater precision, a relatively bloodless

surgical and postsurgical course, sterilization of the surgical area, minimal swelling and scarring, coagulation, vaporization, minimal cutting with less postsurgical pain.^{5,6} The present study was undertaken to determine the efficacy and safety of diode lasers in the management of potentially malignant lesions (oral leukoplakia [OL] and oral lichen planus [OLP]).

Methods

Following approval of the study by the ethics committee, informed consent was obtained from the study subjects. 10 patients (5 OL and 5 OLP) aged between 35 to 65 years with histopathologically diagnosed OL and OLP were included for the study. Patients using any medication for these conditions were asked to discontinue 30 days before laser therapy.

Procedure

The site was infiltrated with local anesthesia. The protective measures were taken before procedure. The lesion was ablated with Sirona 980 nm diode laser (Figures 1 and 2) at 4 W, in contact and continuous mode using a 400 µm di-



Figure 1. Equipment of Sirona Diode Laser.



Figure 2. Irradiation With Diode Laser on Right Buccal Mucosa.

ameter glass fiber as the delivery system. Remnants of the abraded tissue were removed using sterile gauze dipped in saline and the procedure was continued until desired depth of the tissue was achieved. Postsurgical topical anesthetic gel was advised for pain and instructed to apply cold pack to prevent edema. Patients were reviewed on the third day, 1, 2 and 4 weeks after the surgery; postoperative pain was evaluated using visual analog scale (VAS),⁷ which was graded 0 to 10 according to the following:

- 1 to 2 — no postoperative pain
- 3 to 5 — mild postoperative pain
- 6 to 7 — moderate postoperative pain
- 8 to 10 — severe postoperative pain

Results

Of the 10 patients (5 OL and 5 OLP), three patients (30%) complained of moderate pain and 7 patients (70%) complained of mild pain (Table 1) in the first 3 days, and pain disappeared by first week (Figures 3, 4 and 5). During the 6-month follow up there was no recurrence of the lesion and no scar formation.

Discussion

According to World Health Organization (WHO), OL is defined as “a white patch or plaque that cannot be char-

Table 1. VAS Score of Postoperative Pain

	3 days	1 week	2 weeks	4 weeks
Pain	- M MO S			
No. of patients	- 7 3	- 10 - -	- 10 - -	- 10 - -

Abbreviation: VAS, visual analog scale.

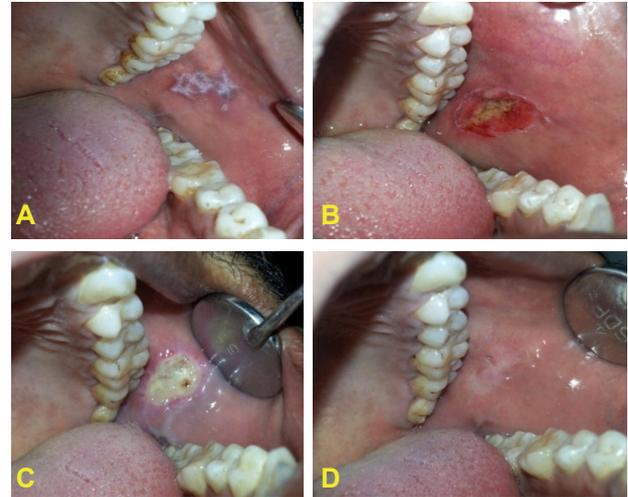


Figure 3. (A) Preoperative view of reticular lichen planus on left buccal mucosa. (B) Immediate post-operative view of treated area. (C) View of one week postoperative. (D) View of 6-week postoperative.

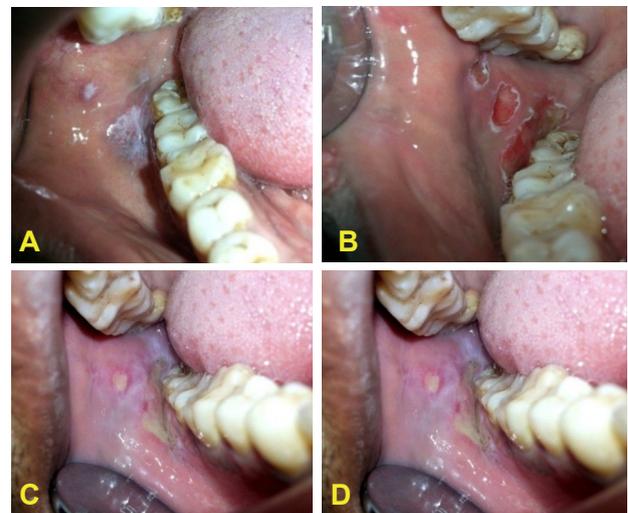


Figure 4. (A) Preoperative view of reticular lichen planus on right buccal mucosa. (B) Immediate postoperative view of treated area. (C) View of one week postoperative. (D) View of 6-week postoperative.

acterized clinically or pathologically as any other disease” and which is not associated with any other physical or chemical causative agent except the use of tobacco.⁸ It is the most common potentially malignant lesion of the oral mucosa. This may be due to prolonged use of tobacco-related habits. It usually affects persons older than 40 years



Figure 5. (A) Preoperative view of homogenous leukoplakia on lower lip. (B) Immediate postoperative view of treated area. (C) View of 1-week postoperative. (D) View of 6-week postoperative.

of age. It most commonly affects the lips, buccal mucosa, tongue, gingiva and floor of the mouth.⁹ It is global prevalence varies from 0.5% to 3.4% and malignant transformation ranges between 0.17% to 17.5%.¹⁰

Treatment of Leukoplakia includes noninvasive methods (carotenoids, vitamins A, C & K, fenretinide, bleomycin, and photodynamic therapy) as well as invasive methods (conventional surgery, electrocautery, cryosurgery, and lasers).¹¹ Conservative management of OL has failed to prevent malignant transformation and achieve recurrence free treatment according to many studies.^{12,13}

OLP is a chronic immunologic inflammatory mucocutaneous disorder. OLP is classified as reticular, papular, plaque-like, atrophic, erosive, or bullous types. Burning sensation and pain is associated with atrophic and erosive forms. OLP is reported to be prevalent about 1%-18.2%.¹² Erosive form has got the increased probability of malignant transformation due to exposure of deeper epithelial layers to oral carcinogens.¹⁴ Topical and systemic steroids have been the hallmark for management of OLP. Their hazards, side effects and contra-indications are well known.¹⁵

Various treatment modalities like topical or systemic medication, provide prolong treatment, side effects and patient dependency. To overcome these drawbacks an alternative advanced laser therapy is used, which is safe, easy, faster and not patient dependent.

Different types of laser therapies like CO₂ laser, pulsed diode laser at 904 nm which emits infrared rays, and low dose excimer laser at 308 nm which emits UV-B rays have been tried for oral mucosal lesions. All types of laser cause protein denaturation of keratinocytes in superficial epithelium. But diode laser destroys the underlying connective tissue along with the epithelium.¹⁶

The protein denaturation causes blanching of the surgical site, which decreases pain by acting as a dressing layer, and enhance healing with less risk of secondary infection.¹⁵ So diode lasers can be used as an advanced alternative

treatment modality for oral mucosal lesions with good prognosis.

The results in our study were consistent with studies conducted by Raval et al,¹ Tatu et al,¹¹ Mahdavi et al,¹⁷ and Soliman et al.¹⁵ Tatu et al,¹¹ conducted a study by using diode laser on labial leukoplakia, which showed uneven healing over a period of 3-week with minimal patient discomfort. Soliman et al¹⁵ observed recurrence of OLP in only 3 patients out of 25 over period of 6-month follow up following the use of diode laser.

The results in our study were contrast with studies conducted by Passeron et al,¹⁸ Trehan and Taylor,¹⁹ Kollner et al.²⁰ Passeron et al¹⁸ conducted a study using 308 nm-excimer lasers to treat erosive OLP in four patients with previous treatment failures, where 12 sessions were attended during 6 weeks, one patient showed partial remission, 2 were resistant to treatment and the other patient showed exacerbation of the lesion.

The present study was conducted on patients, without any previous treatment of the lesion, while in the above-mentioned studies, refractory cases were considered with different wavelengths (308 nm) compared to the present study (980 nm). The 308-nm excimer laser emits ultraviolet B (UV-B) rays with less tissue penetration (less than 0.3 mm) compared to 980-nm red light laser, has deeper penetration into the tissues with less inflammation and pain with good healing.¹⁴ The above reasons might be responsible for better outcome of the present study. Diode lasers can be considered one of the best alternative treatment modality for oral mucosal lesions like OL, and OLP with minimal side effects and with good patient acceptance.

Conclusion

Diode lasers provide acceptable clinical improvement of potentially malignant lesions with minimal side effects. The early intervention with lasers prevents malignant transformation as it is an easy, fast and safe technique and provides psychological satisfaction to the patients who suffered from prolong treatment modalities and their side effects.

Conflict of Interest

The authors have no conflict of interest to declare.

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