

Evaluating the Efficacy of Diode Laser for the Management of White Lesions of the Oral Cavity**Preet Kanwal Singh Ahluwalia¹, Amaninder Singh², Damandeep Kaur Mander³, Sunny Garg⁴**^{1,2,3,4}Department of Oral and Maxillofacial Surgery, National Dental College and Hospital, Dera Bassi, Punjab 140507, India.**Address for Correspondence:**

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ABSTRACT:

Background: Lasers have evolved in the management of oral soft tissue lesions with significant advantages over other treatment modalities.

Aim: Aim of the present study was to evaluate the efficacy of diode laser for the management of white lesions of the oral cavity by assessing rate of healing, rate of recurrence, pain and swelling postoperatively.

Material & Method: A total of 16 patients were included in the study. The treatment procedure was carried out using a Biolase EPIC-10 diode laser at 940±10nm wavelength and 4W power in contact and continuous mode using 400 micrometer diameter glass fiber as a delivery system under topical anesthesia. The patient was reviewed after 1st day, 3rd day, 5th day and 1st week for evaluation of postoperative pain, edema and healing. Recurrence was reviewed after 1st month, 2nd month and 3rd month.

Result: It was found that the pain was present on day one which decreased subsequently and there was no pain observed on seventh day of treatment, the healing improved subsequently till day seven as compared to healing seen on day one. Swelling was present one day after the surgery, which regressed subsequently till day 7. There was no recurrence observed in any of the patient after 3 months of treatment.

Key words: Biolase EPIC-10 Diode Laser, Precancerous Lesions, Healing, Oral White Lesions, Recurrence.

INTRODUCTION

The oral and maxillofacial region can be affected by a number of benign and locally recurrent lesions. The common ones are leukoplakia, lichen planus and hyperkeratosis. There are various surgical and non surgical means of management of oral white lesions. The common modality being surgical excision that includes conventional surgery using scalpel, laser surgery, cryosurgery and electrosurgery. Lasers have proven superior comparatively due to excellent hemostasis during the procedure, less electrocontractility, minimal damage to surrounding tissues which produces little inflammation and post operative pain. Diode laser is used for soft tissue excisional surgical procedure as its wavelength is well absorbed by soft tissue, providing good hemostasis and effective

cutting of the tissue. The advantages of laser surgery include control of bleeding as a result of sealing of blood vessels, low postoperative pain, reduced tissue scarring, wound contraction, excellent patient acceptance and faster healing.¹

Laser is found advantageous in that minimal or no anesthesia is required and no harm to dental hard tissues is there. Their judicious use does not injure the dental pulp, because of low or no heat production. It can be used around dental implants. Diode lasers have several advantages when compared to scalpel surgeries. They are compact and portable in design with efficient and reliable benefits for use in soft tissue oral surgical procedures. Laser assisted surgeries are easy to perform with less discomfort, minimal or no bleeding due to sealing of capillaries by protein denaturation and

stimulation of clotting factor VII production, shortened healing time with reduced postoperative bleeding and edema. Histologically, laser wounds have been found to contain significantly lower number of myofibroblasts, resulting in less wound contraction and scarring, and ultimately improved healing. Diode laser seems promising in reducing postoperative bleeding and pain in patients needing cosmetic surgeries. They are antimicrobial and remove endotoxins from the root surfaces.²

This study evaluates the effectiveness of soft tissue diode laser in oral white lesions for various factors like postoperative pain, swelling, rate of healing and recurrence rate.

METHODOLOGY

A total of 16 cases which were clinically diagnosed and histopathologically confirmed leukoplakia or hyperkeratosis, were included in the study. The patients were informed about the treatment and informed consent was signed. Patients were selected randomly irrespective of age, sex, creed and socioeconomic status.

SURGICAL TECHNIQUE

The pre-operative assessment was done which included a thorough clinical examination and photographs. Hematological investigations were carried to rule out any systemic disorder. The incisional biopsy of the oral white lesions was carried out and tissue sent for histopathological investigations.(Figure 1) All cases confirmed histopathologically as oral white lesions were included in the study. The treatment procedure was carried out using a Biolase EPIC-10 diode laser (Figure 2) at 940+10nm wavelength and 4W power in contact and continuous mode using 400 micrometer diameter glass fiber as a delivery system under topical anesthesia(Figure 3). Both the patient as well as the operator used laser safety glasses during the time of procedure. The remnants of abraded tissue were removed using sterile gauze dipped in normal saline. The procedure was performed

until desired depth of tissue was achieved and the lesion was totally excised.(Figure 4)

Post surgical topical anesthetic gel was advised for pain for a period of one week. Patient was instructed to apply ice-pack to reduce the postoperative edema.

The patients were reviewed after 1st day, 3rd day, 5th day and 1st week (Figure 5, 6,7,8) for evaluation of postoperative pain, edema and healing. Recurrence was reviewed after 1st month, 2nd month and 3rd month.(Figure-9) The post-operative pain was recorded using Visual Analogue Scale (VAS), swelling was measured arithmetically whereas healing and recurrence were evaluated by using grading criteria.



Figure 1: Incisional Biopsy of the Oral White Lesion



Figure 2: Biolase Epic-10 Diode Laser Unit



Figure 3: Diode Laser Application



Figure 4: Completely Excised Tissue



Figure 5: First Day Follow Up Photograph Of Treated Site



Figure 6: Third Day Follow Up Picture of Treated Site



Figure 7: Fifth Day Follow Up Picture of Treated Site



Figure 8: Seventh Day Follow Up Picture of Treated Site



Figure 9: Three Month Follow Up Picture Of Treated Site Showing No Signs of Recurrence

PARAMETERS FOR POST-OPERATIVE FOLLOW UP

Clinical evaluation was done for:

(a) Postoperative pain was evaluated using VAS (visual analog scale) which is graded from 0-10.3

- 1-2 No postoperative pain
- 3-5 Mild postoperative pain
- 6-7 Moderate postoperative pain
- 8-10 Severe pain

(b) Post operative swelling was evaluated by: The evaluation of facial swelling was done using a horizontal and vertical guide on four reference points: tragus, outer corner of the mouth, outer canthus of the eye and angle of the mandible. The horizontal measurement corresponds to the distance between the corner of the mouth and tragus. The vertical measurement corresponds to the distance between the outer canthus of the eye and angle of the mandible. The arithmetic mean of the measurements determines the facial measure. The percentage change was obtained by formula:

$$\frac{\text{Postoperative value} - \text{Preoperative value}}{\text{Preoperative value}} \times 100$$

(c). Postoperative healing was evaluated by:

Healing

Score	Grade
0	No healing/ very poor healing
1	Poor healing
2	Satisfactory healing
3	Good healing
4	Excellent healing

(d) Postoperative recurrence was evaluated by:

Recurrence

Score	Grade
0	Recurrence
1	No recurrence

RESULTS

The Wilcoxon's signed ranks test and Paired t-test were used to statistically analyze the data collected after laser surgery on day1, day3, day5 and day7 for pain, swelling & healing

and at 1st month, 2nd month and 3rd month for recurrence.

The mean pain scores of white lesions were recorded on day 1, day 3, day 5 and day 7 after the treatment by using diode laser which were then compared. The overall result revealed that treated site was painful on day 1. The pain decreases subsequently and there was no pain observed on 7th day of treatment.

The mean swelling scores of white lesions were recorded on day 1, day 3, day 5 and day 7 after laser surgery which were then compared. Statistically significant difference was observed. It was found that the mean swelling score was maximum on day 1 and swelling regressed subsequently and score was insignificant on day 7.

The mean healing scores of white lesions recorded on day 1, 3, 5 and 7 after the laser excision were compared and statistically highly significant difference was observed. The result signifies that the healing on day one was poor which subsequently improved and till day seven good healing was observed.

There was no recurrence seen in any of the 16 patients treated with diode laser after 3 months.

DISCUSSION

Lasers have been tried and successfully used in many areas of dentistry such as for incisional and excisional biopsy, surgical removal of tongue lesions, red and white lesions, treating potentially malignant disorders of the oral cavity, vesiculobullous lesions, salivary gland pathologies, aphthous and herpetic ulcers treatment and prevention of radiation mucositis, coagulation of bleeding areas, periodontal surgeries, prosthetic and endodontic applications.⁴

The oral cavity can be affected by a number of white lesions these days because of increased use of smoked or smokeless tobacco. The common lesions of the oral cavity are tobacco pouch keratosis, leukoplakia and lichen planus. These premalignant lesions of the oral cavity have potential for malignant transformation. There are various surgical and

non surgical means of treatment for oral white lesions. The surgical modalities include procedures such as conventional surgery using scalpel, electrosurgery, cryosurgery and most recently lasers. Diode laser is a soft tissue laser which can be effectively used as a treatment modality for oral white lesions with no postoperative complications. The advantages of laser surgery includes control of bleeding as a result of sealing of blood vessels, low postoperative pain, reduced tissue scarring, wound contraction, excellent patient acceptance and faster healing.

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The present study was done to evaluate the role of diode laser in the management of oral white lesion such as leukoplakia or hyperkeratosis. A total of 16 patients which were clinically diagnosed and histopathologically confirmed leukoplakia or hyperkeratosis were included in the study. Lesions were excised with EPIC-10 Biolase diode laser at 940+10 nm wavelength at 4W power in contact and continuous mode using 400 micrometer diameter glass fiber as a delivery system under topical anesthesia. Effectiveness of diode laser was evaluated on the basis of four criteria's; pain, healing, swelling and recurrence. Pain, healing and swelling were evaluated on 1st day, 3rd day,

5th day and 7th day after the laser surgery. The recurrence was evaluated on 1st month, 2nd month and 3rd month after the laser surgery.

Pain

The mean pain scores of white lesions were recorded on day 1, day 3, day 5 and day 7 after the treatment by using diode laser which were then compared. The overall result revealed that white lesions were more painful on day 1. The pain decreases subsequently and there was no pain observed on 7th day of treatment.

In accordance to the study conducted by Nilesh et al. (2011), in which 10 patients suffering from leukoplakia and lichen planus were included and were treated using diode laser. The study concluded that out of 10 patients, only 2 patients complained of moderate pain during first 3 days and the pain disappeared at the end of week.⁵

Healing

The mean healing scores of white lesions recorded on day 1, 3, 5 and 7 after the laser excision were compared and statistically highly significant difference was observed. The result signifies that the healing on day one was poor which subsequently improved and till day seven good healing was observed because of the biological effects of the laser on wound which includes decrease in inflammatory cells, increased fibroblast proliferation, angiogenesis stimulation, formation of granulation tissue and increased collagen synthesis.

This was in accordance to the study conducted by Bagga et al. (2017) to compare the efficacy of diode laser versus scalpel and compare the clinical healing and histopathological changes postoperatively. Ablation of leukoplakia was performed using 860nm diode laser and excision was performed using scalpel. Patients were evaluated at interval of 7 days, 3 week, 6 months, 9 months. As a result it was found that laser ablation provide better patient compliance, faster healing with no scar formation.

Another study by Sarkar (2015) conducted a study on 5 patients having oral leukoplakia. In all the patients, the lesions were treated with

diode laser. Patients were assessed individually for pain and bleeding during and after the procedure. As a result it was seen that diode laser caused minimal to no pain, good healing with no postoperative complications and excellent hemostasis.⁶

Swelling

The mean swelling scores of white lesions were recorded on day 1, day 3, day 5 and day 7 after laser surgery which were then compared. Statistically significant difference was observed. It was found that the mean swelling score was maximum on day 1 and swelling regressed subsequently and was insignificant on day 7.

The study conducted by Azma et al in 2013 concluded that diode laser provides relatively bloodless surgery and minimal swelling as diode laser seals the lymphatic vessels which results in less edema.⁷

Recurrence

Frequency and percentage of recurrence scores of white lesions on 1st month, 2nd month, 3rd month after laser surgery were evaluated. It was observed that there was no recurrence seen in any of the 16 patients treated with diode laser after 3 months. All types of laser destroy the superficial epithelium containing the target keratinocytes by protein denaturation. A deeper penetrating beam like the diode laser destroys the underlying connective tissue the inflammatory component along the epithelium.

In accordance to the study conducted by Kende et al. (2011) who presented a case report on patient with white non scrapable patch over tongue and excisional biopsy with 2 mm wide margin was done using diode laser and tissue sent for histopathological evaluation. As a result it was found that there is reduction in operative and postoperative blood loss, postoperative discomfort and minimal problems in histopathological evaluations. No recurrence was seen with 6 months of follow up.⁸

Another study conducted by Vatsal (2016) on 10 patients with oral leukoplakia who treated these lesions with diode laser. Postoperatively

bleeding, pain, healing and recurrence were observed. As a result it was found that there was no recurrence of the lesions in one year follow up.⁹

CONCLUSION

Diode laser is effective in reducing pain intraoperatively as well as postoperatively. Lesions were successfully treated without any signs of recurrence. Advantages of diode laser includes acceptance by the patient, an absence of bleeding intra and postoperatively as it causes sealing of the blood vessels, no need of anesthesia, less postoperative edema due to sealing of lymphatic vessels and less scarring due to reduction in myofibroblasts and faster healing.

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