

A Study of Utility of Diodelaser In The Treatment Of Oral soft Tissue Lesions

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Abstract: This randomized control clinical trial was done on the patients to evaluate the utility of laser in the treatment of various mucosal lesions. A total of 30 patients of either sexes and in age ranging from 20-70 years with various mucosal lesions like surface lesions, exophytic lesions, ulcerative lesions and mucocele were selected. They were divided into four groups which were prepared and treated by Laser therapy using Diode Laser - DC Lase 980nm, 7W. All the subjects in each group were evaluated before, during and after laser therapy for various parameters like pain, bleeding, charring, healing, mouth opening, anxiety, difficulty in eating/drinking and taste alteration. They were followed up at regular interval of 1 week, 2 weeks and 1 month. The results thus obtained were compiled and analyzed which were accelerated wound healing, decreased postoperative discomfort, less thermal necrosis and adequate hemostasis without need for sutures. The procedure was easy, comfortable to patient and operator with reduced operator chair time. Thus Lasers offer many useful clinical applications in the field of oral medicine for the management of patients with different type of oral mucosal lesions.

Keywords: DC Lase, soft tissue lesions, premalignant lesions, mucosal surgery.

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I. Introduction

LASER is an acronym for light amplification by stimulated emission of radiation. Lasers are heat producing devices converting electromagnetic energy into thermal energy. The characteristic of a laser depends on its wavelength (WL), and wavelength affects both the clinical applications and design of laser. The WL used in dentistry generally range from 193 to 10600 nm, representing a broad spectrum from ultraviolet to the far infra-red range.

Since the development of the ruby laser by Maiman in 1960, there has been great interest among dental practitioners to use this tool to make dental treatment more pleasant. In the literature laser has been recommended for the treatment of benign oral lesions like fibroma, haemangioma, papilloma, idiopathic gingival hyperplasia or gingival hyperplasia, aphthous ulcer, mucosal frenula or tongue tie (ankyloglossia), as well as potentially malignant oral lesions such as oral leukoplakia, erythroplakia, lichen planus etc. Some reports on the use of the laser also support the possibility of treating malignant oral diseases in early stages (for example, T1N0 carcinomas) with excisional biopsies. Lasers are also used in dentistry for endodontic and periodontal surgeries.¹

The benefits noted were dry surgical field, better visualization tissue surface sterilization and reduction in bacteremia. There was reduced pain, swelling, edema and scarring with faster healing response. Procedure required less operating time, leading to shorter hospital stay, thus is cost-effective and accepted by the patients.¹

There are some disadvantages too, operations of lasers are highly expensive and require specialized training. Dental instruments mainly used are both side and end cutting; thus, a modification of clinical technique is required. No single wavelength will optimally treat all dental disease. Moreover, they are harmful to eyes and skin.¹

Over the past few decades, the use of lasers among oral and maxillofacial lesions has grown dramatically. Therefore this study was undertaken with the sole aim of determining the utility of diode laser in the treatment of various oral mucosal lesions.

II. Materials And Method

The study was comprised of 30 subjects in the age group of 20-70 years, who were diagnosed for various oral mucosal lesions. The selection of patients was done from those attending the Out Patient Department of Oral Medicine Radiology irrespective of age, sex, race, religion and socio-economic status.

The inclusive criteria was subjects diagnosed for various oral mucosal lesions like oral lichen planus, leukoplakia, recurrent aphthous ulcers, irritational fibroma, mucocele etc. Subjects were selected considering the extent and nature of the oral mucosal lesion and ease of accessibility to treat with laser.

The exclusion criteria was Subjects with extensively large oral mucosal lesions and having potential risk of malignancy and with systemic problems like uncontrolled hypertension, uncontrolled Diabetes and under immune suppressive therapy.

III. Methodology

For this study, 30 subjects with various oral mucosal lesions were selected. For each selected subject, detailed case history and thorough clinical examination was noted down on the proforma. A provisional clinical diagnosis was made after doing radiological and hematological investigations. All the patients were informed in detail about the study in their language and a written consent was obtained. These subjects were randomly divided into 4 groups.

Group I: Consisted of 7 patients having oral mucosal surface lesions.

Group II: Consisted of 18 patients having oral mucosal exophytic lesions.

Group III: Consisted of 2 patients having mucocele.

Group IV: Consisted of 3 patients having recurrent aphthous stomatitis.

Methodology

For the subjects in Group I

The patients having oral mucosal surface lesions namely Leukoplakia and Oral Lichen Planus were diagnosed clinically and selected for the study. The complete procedure was explained to patients. Local anesthesia was achieved using 2ml of xylocaine with adrenaline 1:80,000. With the help of diode laser unit (DC Lase 980nm, 7W) at power of 2 Watts and 400 µm flexible fiberoptic delivery system in contact mode, an elliptical margin 0.5 cm away from the border of lesion was created keeping the laser tip perpendicular to the mucosal surface. The margins were pulled away with the help of a toothed forceps and the lesion was excised at the base all over keeping the tip in an oblique direction. The specimen of the lesion thus obtained was collected and sent for histo-pathological examination. The remnants of the lesion were ablated and removed using sterile gauze dipped in saline.

For the subjects in Group II

The patients having oral mucosal exophytic lesions like pyogenic granuloma, irritational fibroma, fibro pyogenic granuloma, papillary hyperplasia and fibrous hyperplasia. Sling suture was passed through the lesion for holding and retracting the lesion, making the base accessible. The lesion was excised completely from its base. Rest procedure was same as Group I.

For the subjects in Group III having mucocele. Removal of the lesions was performed by unroofing it first and completely excising it alongwith gland tissue later on. Rest procedure was same as Group I.

Subjects in Group IV were having recurrent aphthous ulcers and they were treated by Low Level Laser Therapy (LLLT). The application of laser was done in noncontact mode, with the distance of 2-3mm between the laser tip and the surface of ulcer. The laser beam was applied in a continuous circular motion, covering the entire ulcer surface. The cooling interval of 20 sec. was given in between the passes.

All the subjects in each group were evaluated before, during and after laser therapy for various parameters like pain, anxiety, bleeding, charring, healing, mouth opening, difficulty in eating/drinking and taste alteration. Post-operative instructions and medications were given wherever necessary. They were followed up at 1 week, 2 week and 1 month interval (except for Group IV patients who were followed for 1 week only).

Following images shows a case of irritational fibroma treated by Laser.



IV. Results

This study consisted of total 30 subjects with various mucosal lesions like surface lesions, exophytic lesions, mucocele and RAS. They include 18 males (60%) and 12 females (40%). Age range for total subjects was from 20 to 70 years with the mean age of 42.03 (S.D±13.97) years. Among the males age range was from 20 to 70 years with the mean age of 42.5 (S.D±15.65) years and for females age range was from 22 to 60 years with the mean age of 41.25 (S.D±11.6) years as shown in Table 1

SR. NO	SEX	NUMBER	PERCENTAGE	AGE (IN YEARS)		
				MIN	MAX	MEAN (±SD)
1	MALE	18	60%	20	70	42.5(15.65)
2	FEMALE	12	40%	22	60	41.25(11.6)
TOTAL		30	100	20	70	42.03(13.97)

Table 1: Distribution Of Subjects According To Age And Sex

For all the selected subjectsdetailed case history, thorough clinical examination was performed and a clinical diagnosis was made. Radiological and hematological examinations were performed where ever it was necessary. All the subjects were categorised into 4 groups:

Distribution of various lesions included in this study and their frequency and percentage shown in Table 2.

S.No.	Various Groups	No. Of Patients	Percentage (%)
1.	Group I(surface lesions)	7	23
2.	Group II (Exophytic lesions)	18	60
3.	Group III (Mucocele)	2	7
.4.	Group IV(Ulcerative lesions)	3	10
TOTAL		30	100

Table 2: Distribution Of Various Lesions Included In Study

Age range for patients in Group I was 35-70 years, with a mean age of 56.14(S.D± 11.05) years; in Group II it was 20-60 years, with a mean age of 38.2 (S.D±12.37) years, and in Group III patients with mucocele whose agewas 21-34 years, with the mean age of 27.5 (S.D±9.19) and in Group IV it was 32-51 years, with the mean age of 41.5(S.D±9.53). .

S.NO	GROUP	TOTAL	AGE IN YEARS			
			MIN	MAX	MEAN	S.D
1	Group I	7	35	70	56.1	11.05
2	Group II	18	20	60	38.2	12.37
3	Group III	2	21	34	27.5	9.19
4	Group IV	3	32	51	41	9.53

Table 3: Age Distributon In Different Groups

In this study out of 30 subjects, 18 were males and 12 were females. Group I with surface lesions included 5 males (17%) and 2 females (7%); Group II with Exophytic lesions had 11males (37%), and 7 females (23%) and Group III with mucocele included 1 male (3%) and 1 female (3%) and Group IV with RAS included 1 male (3%) and 2 female (7%). Percentage within group was also calculated. In our study, frequency of occurrence of surface and exophytic lesions were more in male patient.

S.NO	Group	Gender		Total	
		Males	Females		
1.	Group I	Count	5	2	7
		% Within in group	71%	29%	
		% Within in gender	28%	17%	
2.	Group II	Count	11	7	18
		% Within in group	61%	39%	
		% Within in gender	61%	58%	
3.	Group III	Count	1	1	2
		% Within in group	50%	50%	
		% Within in gender	5.5%	8%	
4.	Group IV	Count	1	2	3
		% With in group	33%	67%	
		% With in gender	5.5%	17%	

Table 4: Gender Wise Distribution Of Each Group

V. Discussion

During the evaluation, no significant post-operative pain was presented by the patients immediately and during the follow-up period of 1 month, except for one patient who experienced significant pain during the follow-up period and was pain free on last visit at 1 month. This was probably due to deeper excision and subsequent secondary infection which delayed healing and development of pain. These results were consistent with the findings of **Soliman M (2005), Van Der Hem PS et al (2005) and Hazeem I Muhamed et al (2013), Sarkar et al (2015)** made similar observation in their study and found that in-operative and post-operative reduction in pain by laser surgical procedure.

Intra operative and post-operative bleeding was assessed in all patients. Laser procedure was not associated with Intra operative and post-operative bleeding. These findings are in similarity to **Romanose G et al (1999)** who observed lack of bleeding by diode laser. **Soliman et al (2005) and Sarkar et al (2015)** also observed excellent haemostasis in their study on laser treatment in oral leukoplakias.

In Group I, patient's had charring involving both the sites, base as well as periphery during and immediately after the procedure because of high temperature and cause carbonisation of marginal tissues as explained by **Romanose G et al 1999**. Laser transmits energy to the cells causing warming, welding, coagulation, protein denaturation, drying, vaporisation and carbonisation.

The findings of our study are in accordance with studies by **Azma E et al (2013) and Kumar P et al (2015)**.

In this Group, satisfactory healing was observed in all except one patient during the first follow-up visit. One patient with homogenous leukoplakia lesion showed non-satisfactory healing during the first visit, but complete epithelialization was observed at 1 month.

In **Van Der Hem et al (2008) and Sarkar et al (2015)** also observed similar results of complete epithelisation within 3 weeks.

Most of the patients did not have any post-operative restricted mouth opening which was consistent with the study by **Barclay (2004)**. Only one patient presented with complaint of restriction in mouth opening after the procedure which persisted throughout the follow-up period also till 1 month.

Patients in Group I were anxious about the nature of the lesion and the surgical procedure to be undertaken for treatment purpose. During the procedure while performing the incision/ excision some fumes were released from epithelium with the burning smell, which provoked stress in the patients as reported by **Azma et al (2013)**. This anxiety and stress was released subsequently by uneventful healing in most of patients. No significant loss of function in terms of eating or drinking and taste was observed. Similar results were postulated by **Sarkar et al (2015)**.

In Group II during the evaluation of pain, only few patients showed the score between 0 to 3 which indicated minimal pain. This also reduced during the follow up period of 2 weeks to 1 month. These results are in accordance with **Kirschner et al (1999)** and **Rai S et al (2011)** who reported minimal post-operative pain as lasers transiently depolarises nerves.

For evaluation of bleeding in this group, it was observed that 10 cases were associated with oozing during the surgical procedure and only one patient showed active bleeding which was easily arrested by charring of bleeding points. The results of our study were in accordance with those by **Azma et al (2013) and Pai J et al (2014)** who observed that hemostasis occurred on surface of wound after laser radiations.

Charring was observed either at base or at the periphery of the wound created after excision which vanished during follow-up. Charring occur with laser if sufficient power density and exposure duration are provided as proposed by **Hsin M. et al (2005) and Azma et al (2013)**.

Rapid healing was observed within few days this finding was consistent with those reported by **Rai et al (2011), Akabulut et al (2013) and Azma E et al (2013)**.

No patient reported any restriction in mouth opening during the follow-up period. **Kirschner et al (1999)** and **Jaferzadeh H et al (2006)** reported that laser excision is well tolerated by patients with no adverse effects.

No significant difficulty in eating reported by any of the patients except for patients having lesion on the lateral border of tongue. May be this difficulty was due to the post-operative wounds created on the tongue and active participation of tongue is required for mastication and swallowing. **Jaferzadeh H et al (2006) and Rai et al (2011)** also reported good patient acceptance after laser surgery.

None of the patients reported any symptoms of taste alteration during the study. These results are in agreement with those reported by **Azma et al (2013)**.

In Group III none of the patients reported significant pain, bleeding and charring after laser excision of the mucocele. Similar findings were reported by **White et al (1991), Pick (1993), Gold (1994) and Saverio (2008), Balsam S et al (2012), Hsin M C et al (2005), Akman H (2010) and Azma E et al (2013)**

Excellent healing was observed. Similar results were reported by **Ishii J et al (2003), Van Der Ham et al (2008) and Sarkar et al (2015)**.

Patients were anxious during surgery but subsequent visits showed minimal anxiety. Similar observations were made by **Azma et al (2013)**.

Mild to moderate difficulty in eating was reported during the first week post operatively which disappeared completely during the following visits. The results of study were in accordance with **Jaferzadeh H et al (2006)** and **Rai et al (2011)** who reported good patient acceptance after laser surgery.

In Group IV total 3 patients having RAS were treated by laser therapy in non-contact mode.

In all 3 patients significant pain was present pre-operatively as evident from pain score VAS scale 5 and/or 6. No pain was felt by any patient during the procedure. Considerable reduction in pain was reported immediately after the procedure by all 3 patients which disappeared completely at 1 week. The results of our study were similar to **Khadami et al (2009)**, **De Souza et al (2010)** and **Abraham et al**. The thermal necrosis created by tissue vaporisation cause sealing of the ends of the sensory nerves, decrease their ability to transmit stimuli reported by **White et al (1991)**, **Pick (1993)**, **Gold (1994)** and **Balsam S et al (2012)**.

All the patients showed satisfactory to good healing during follow-up period. These findings are consistent with earlier studies done by **Rai et al (2011)** and **Azma et al (2013)**.

There was significant difficulty reported in eating or drinking by patients pre operatively, which minimized after laser therapy and was indicated by the response obtained at first week. The results of study were in accordance with **Albrektson M et al (2014)**.

Patients were anxious before and during the procedure shown by ALI score but anxiety score became 0 after the procedure and patients were comfortable. These results are inconsistent with those reported by **Azma et al (2013)**.

VI. Conclusion

Laser technology has made rapid progress over the past few decades. Because of its many advantages, it has been widely used in the field of oral medicine. Soft-tissue laser is a state-of-the-art tool that allows treating various oral mucosal pathologies.

This clinical trial was done on the patients to evaluate the utility of laser in the treatment of various mucosal lesions.

The postoperative results obtained were; adequate hemostasis without need for sutures, reduced operator chair time, decontaminating and bactericidal properties, accelerated wound healing, less discomfort, less thermal necrosis of adjacent tissues thus reduced need for antibiotics. Immediate pain relief and inflammation observed with aphthous ulcers.

Hence, Lasers offer many useful clinical applications in the field of oral medicine for the management of patients with different type of oral mucosal lesions.

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