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Original Research

Evaluation of diode laser and ER:YAG laser in the management of Recurrent Aphthous Stomatitis

Monika Tatkundwar[1], Vikram Khare[2], Digamber Sable[3], Mahesh Chavan[4], Pallavi Channe[5], Harshada Inamdar[6]

[1]MDS, Student , [2]Head of the department, [3]Professor, [4,5]Reader, [6]Senior Lecturer,
Department of Oral Medicine And Radiology, Dr. D. Y. Patil Dental College Pimpri, Pune, Maharashtra, India

ABSTRACT:

Aim of the study: The purpose of the study is to compare and evaluate the difference in pain, size and healing time of Recurrent Aphthous Stomatitis (RAS) when treated with diode laser and Er:Yag laser respectively. **Materials and Methodology:** An in-vivo interventional study was carried out in the department of Oral Medicine and Radiology in D.Y. Patil Dental College, Pune, where two groups were created each having sample size of 12 patients, in which Group A comprised of patients undergoing treatment with Diode therapy and Group B with Er:Yag laser. Patients were later provided with evaluation proforma and evaluated on 0^{th}, 1^{st}, 3^{rd}, 5^{th}, 7^{th}, and 15^{th} day and scores were given from 1 to 10 for each respective group. **Results:** In the present study, none of the participant reported complete relief from pain by 7^{th} day, in contrast a complete relief from pain was observed by 15th day. Pain reduction of 5.25 and 7.08 was observed from baseline to 1^{st} day and baseline to 3^{rd} day. The maximum improvement in healing size was noted from 3^{rd} day to 5^{th} day while the minimum was observed from day 0 to day 1 indicating a slow initial action of the laser. **Conclusion:** Our study concluded, that both Diode laser and Er :Yag prove to be promising in reducing pain, decreasing the ulcer size and leading to a complete healing of recurrent aphthous ulcers. Er:Yag laser although provides faster results but it does not produce haemostatic effect as compared to Diode laser. Therefore, Diode laser would be better choice over Er;Yag laser in clinics.

Keywords Recurrent Aphthous Stomatitis, Lasers, Healing**.**

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Corresponding author: Dr .Monika Tatkundwar, MDS, Student Department of Oral Medicine And Radiology, Dr. D. Y. Patil Dental College Pimpri, Pune, Maharashtra, India

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INTRODUCTION

Among all the oral disorders, recurrent aphthous stomatitis (RAS) still remains the commonest disorder of oral cavity.[1] Aphthous ulcers hold 25% of the total ulcers worldwide. In India the count remains on a little lower side with 21% population affected by this ulcer attacks.[2] Females are more than males the reason being, females undergo hormonal changes throughout their life. Hormonal changes induce stress and immunological problems leading to recurrent ulcers.[3] Clinically they are characterized by round, oval or sometimes an asymmetrical shaped ulcer, which is most often covered by a pseudo membrane of greyish to yellowish colour. Like the name suggests, these ulcers tend to attack the oral cavity repeatedly after a certain period of time and hence given 'recurrent' name.[4] The lesion initiates with a distinct clinical sign but without any symptoms like burning sensation. This is followed by a pre-ulcerative phase wherein the lesion appears slight erythematic after which it turns into an ulcerative phase. Once it reaches its peak characteristics a progressing healing is noted and finally there is complete remission of the lesion. The whole process takes around 14days.[5] Though few conditions like immunosuppression, stress, hormonal imbalance, trauma and smoking are linked with this type of ulcer but still there is no evidence regarding the exact aetiology of its repeated occurrence.[6] The only treatment which can be given in such situation is the one which will be directed towards reducing the pain and burning sensation of the ulcers along with healing time. Different treatment modalities listed in the literature are topical anti-inflammatory pastes, topical steroids, systemic medications, vitamin supplementations and cautery use.[7] The benefit using steroids in RAS is that it can be topically applied

directly over the lesion and can be kept in contact for a longer duration of time for possible outcome. Triamcinolone and Clobetasol are the commonest topical corticosteroids used to limit the symptoms of pain and anti-inflammatory action of ulcerative lesions making it comfortable for the patients to consume normal diet.[8] Steroids can also be used in the form of mouth rinse but the action doesn't prove to be superior to topical gel/paste application. Dexamethasone when compared with triamcinolone proved to be equally benificial.[9] Currently the lasers are a good treatment option for RAS. Different lasers have been used and verified for their actions like CO_2 laser, Nd:YAG laser, Diode laser and soft tissue lasers. Each laser has different wavelength and thus varying effect on overall healing process of the ulcer. Various types of lasers are used for some or the other disorders of oral cavity. The low-level laser or the soft tissue laser has been used in trigeminal neuralgia, hypersensitivity of teeth, joint pain or herpes labialis. It is also used to treat aphthous ulcers.[10] Diode laser has been used to treat aphthous stomatitis but as a placebo effect by keeping power off in control groups of many studies. Also it has been noticed that use of Er:Yag laser has proved to be beneficial in treatment of aphthous ulcers.

AIM OF THE STUDY

The purpose of the study is to compare and evaluate the difference in pain, size and healing time of Recurrent Aphthous Stomatitis (RAS) when treated with diode laser and Er:Yag laser respectively.

MATERIALS AND METHODOLOGY

An in-vivo interventional study was carried out in the department of Oral Medicine and Radiology in D.Y. Patil Dental College, Pune, where random allocation of samples was done using closed envelope method. Two groups were created each having sample size of 12 patients based on inclusion and exclusion criteria's, in which Group A comprised of patients undergoing treatment with Diode therapy and Group B with Er:Yag laser. (**Table 1**) In Group A, Local anaesthesia (benzocaine gel) was applied and Diode beam having wavelength of 940 nm, at 1.25 Watt was used in continuous and direct contact mode with tissue for 45 seconds for two sessions. In Group B, Er:Yag laser (2940nm) was administered with non – contact mode having parameters of 15 Hz and 35-40 mJ, 0.525-0.6 W without water. The laser energy was defocused above the lesion minimum for 15 seconds and maximum until patient was relived of pain. Patients were later provided with evaluation proforma and evaluated on 0^{th}, 1^{st}, 3^{rd}, 5^{th}, 7^{th}, and 15^{th} day and scores were given from 1 to 10 for each respective group.

RESULTS

The parameters which were assessed were pain intensity, size of the lesion and healing of the aphthous ulcer. The pain intensity was assessed using Visual Analogue Scale (VAS) having a reading from 0 to 10. The lesion size was assessed by via in millimetres and healing was said to be present if lesion has completely vanished. Statistical analysis was carried out where Man-Whitney test was applied to know the statistically significant difference between the groups for pain intensity. Unpaired t test was applied to know the difference between the groups for size of lesion and chi-square test was applied to know if significant difference existed for healing between the groups. The pain in the present study reduced with large difference after receiving laser treatment from day 1 to day 3. There was a reduction of 5.33 was recorded from 0^{th} day to 3^{rd} day and a reduction of 2.42 was recorded from 3^{rd} to 7^{th} day. In the present study, none of the participant reported complete relief from pain by 7^{th} day, in contrast a complete relief from pain was observed by 15th day. In the present study after assessing for pain on 0^{th} day in Er:Yag laser group the mean VAS score was 7.58±1.08. The score reduced to 2.33 on 1st day marking a difference of 5.25 score. A gradual decrease in pain was noted on 1stday and 3rd day with complete cessation of pain by 5th day. A difference of 1.83 and 0.50 was present in pain reduction in this laser group from 1st to 3rd day and 3rd to 5th day respectively. Pain reduction of 5.25 and 7.08 was observed from baseline to 1^{st} day and baseline to 3^{rd} day. (**Table 2**)

Table 1- Inclusion and Exclusion criteria's of the study

Inclusion criteria	Exclusion criteria
• Patients diagnosed with recurrent aphthous stomatitis with age ranging from 18-60 years. • Patients who were willing for treatment and ready to give informed consent.	• Patients with systemic diseases • Lactating or pregnant females • Patient who were receiving or have received chemotherapeutic drugs, Immunomodulators • Patient having other mucosal lesions with minor aphthous ulcers • Patient with major aphthous and herpetiform ulcers. • Patient who were not ready to give informed consent • Patients who have received treatment earlier for recurrent aphthous stomatitis for last 6 months

Table 2- Difference between the pain intensity at different time intervals between the groups.

Time intervals	Groups	N	Mean	P value
Pain Day 0	Diode Group	12	7.83	0.713
	Er:Yag Group	12	7.58	
	Total	24		
Pain Day 1	Diode Group	12	4.83	0.010*
	Er:Yag Group	12	2.33	
	Total	24		
Pain Day 3	Diode Group	12	2.50	0.000*
	Er:Yag Group	12	0.50	
	Total	24		
Pain Day 5	Diode Group	12	1.08	0.005*
	Er:Yag Group	12	0.00	
	Total	24		
Pain Day 7	Diode Group	12	0.08	0.755
	Er:Yag Group	12	0.00	
	Total	24		
Pain Day 15	Diode Group	12	0.00	1.00
	Er:Yag Group	12	0.00	
	Total	24		

*significant with $p<0.05$

Table 3-Difference between sizes of ulcers at various time intervals between the groups.

Time intervals	Groups	N	Mean	t-value	P value
Size on Day 0	Diode Group	12	0.74	2.04	0.530
	Er:Yag Group	12	0.56		
	Total	24			
Size on Day 1	Diode Group	12	0.55	1.56	0.133
	Er:Yag Group	12	0.41		
	Total	24			
Size on Day 3	Diode Group	12	0.38	1.49	0.148
	Er:Yag Group	12	0.21		
	Total	24			
Size on Day 5	Diode Group	12	0.00	0.00	1.00
	Er:Yag Group	12	0.00		
	Total	24			
Size on Day 7	Diode Group	12	0.08	0.00	1.00
	Er:Yag Group	12	0.00		
	Total	24			
Size on Day 15	Diode Group	12	0.00	0.00	1.00
	Er:Yag Group	12	0.00		
	Total	24			

*significant with $p<0.05$

It was also observed that the size of the lesion on 0^{th} day was 0.56mm in Diode laser group. The size reduced to 5.55 on day 1 building a difference of 0.01mm. This decrease was very minor. The lesion size further decreased to 0.38mm on day 3 marking a difference of 0.17 from 1^{st} to 3^{rd} day. Following this a noteworthy change were observed from day 3 to day 5 with difference of 0.38mm. The size of the lesion came to 0mm by the end of 5 days. The study represented that the initial action of the diode laser was slow leading to minor changes in size in the initial phase after which an appreciable change was noted. The maximum improvement in healing size was noted from 3^{rd} day to 5^{th} day while the minimum was observed from day 0 to day 1 indicating a slow initial action of the laser. (**Table 3**)

DISCUSSION

When it comes to healing of aphthous ulcers there is a high chance of recurrence in them even after complete healing. In the present study, though healing was initiated post Diode laser therapy but the complete healing occurred by 5^{th} day. Till then there was initial epithelialization occurring. On 5th day, all the patient with ulcers showed complete healing. Alike results were reported by De Souza TO et al study in which the healing was observed in only 40% of the patients by 5^{th} day while in the present study 100% patients presented complete healing of recurrent aphthous ulcers. About 66.8% of the patients had completed healing by this time moreover, by 9^{th} day all the patients treated with low level laser showed 100% healing.[11] Overall, it was found that the low-level laser therapy was very effective in controlling pain of

the patients at lesion site. Moreover, the reduction in the laser group at different time interval was also significantly more. Many studies also stated that the low-level lasers are effective for pain in recurrent aphthous ulcer patients. The only difference exists is due to different wavelengths of the laser and their intensities. When the other group of recurrent aphthous stomatitis patients received Er:YAG laser therapy which is a high intensity laser, the results were observed to be better than diode laser therapy. Er:YAG laser comes from Erbium family of lasers which are used for soft tissue as well as hard tissue application for different lesions in oral cavity. The wavelengths of this laser family are highly absorbed by the Erbium organic and inorganic matter like bone, collagen and water within the tissues. In contrast to this, diode lasers penetrate deeper into the tissues compared to Erbium family lasers thus resulting in dissimilar appearance clinically regarding shaving/planning of the tissues. The Erbium laser penetrates to about 200-400 μs deep and 5-40 μm wide over the exposed area with a minimum damage of 5 μm due to thermal intensity. The present study represented that the initial action of the Erbium laser was slow in healing of ulcer leading to minor changes in size in the initial phase after which an appreciable change was noted. The maximum improvement in healing size was noted from 3rd day to 5th day while the minimum was observed from day 0 to day 1 indicating a slow action of the laser for its onset. Yilmaz SK et al too reported that there was a significant reduction in the size of the lesion occurred due to denture trauma after exposing it to Erbium laser.[11] In the present study, in Er:YAG laser treated group, around 41.6% patients presented with complete healing of aphthous lesions on day 3. By the end of 5th day all the patients showed 100% healing. Overall, the results of the study indicate that there does not exists a difference in diode laser therapy with that of Er:YAG laser therapy. Both the lasers provide a faster relief from pain and reduces lesion size by providing a healing action. Over the time the action of both the lasers appear to be same. Thus, both the lasers can be used as it reduces pain and discomfort of the patients and provides them with a quick effect and relief from pain reduction in ulcer size and thus facilitate proper intake of food without compromising the overall quality of life though temporarily. But while choosing the laser one fact should not be overlooked that the penetration depth of Er:YAG laser is immensely diverse than the diode laser. Diode laser presents with a tissue penetration of 500μm or greater thus, damage to the tissue due to thermal intensity is more in diode as compared to Er:YAG laser.

CONCLUSION

It can be assessed from the study, that diode laser and Er :YAG both prove to be promising in reducing pain, decreasing the ulcer size and leading to a complete healing of recurrent aphthous ulcers. Er:Yag laser although provides faster results but it does not produce haemostatic effect but diode laser provides haemostatic effect ,also light in weight compact and portable machine and cost effective. It does not require highly qualified expertise. Thus, diode laser would be better choice over Er;Yag laser in clinics.

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