

**COMPARATIVE STUDY OF DIODE LASER Vs DIATHERMY IN SOFT TISSUE
SURGICAL PROCEDURES OF ORAL CAVITY**

Abstract

Aims & Objectives: To evaluate wound healing and patient's comfort after oral soft tissue surgical procedures performed by diode laser in comparison with diathermy

Methods: This study includes 20 patients requiring oral soft tissue surgical procedures are randomly categorized into group A and group B of 10 patients each. Group A patients will undergo diathermy and group B patients will undergo laser therapy. Clinical assessment and photographs of patients will be done preoperatively and postoperatively on 1st day, 3rd day, 7th day, 2nd week and 4th week. Evaluation of postoperative bleeding, pain, infection and healing will be carried out.

Results: At the end of the study the assessment of parameters such as bleeding, swelling, wound healing, presence of infection were approximately similar in both the treatment methods to be insignificant, 70% of the patients included in this study under the laser group were very satisfied with the procedure & the pain experience by the patients in the same group was comparatively less, when compared to the diathermy group.

Conclusion: The observations suggest that both the treatment options were effective although laser proves better in terms of minimal bleeding, pain, reduced swelling, faster healing and

patient's comfort. Further research and a longer follow up period is desirable for a definitive conclusion.

INTRODUCTION

The commonly used surgical methods of treating oral soft tissues lesions and oral soft tissue defects are scalpel, diathermy and laser. Each of the above mentioned methods are different from the stand points of homeostasis, healing time, cost of instrument, width of cut, anesthetic required and disagreeable characteristic such as smoke production, odor of burning flesh.

Scalpel dissection is the most commonly established method of treating oral soft lesions and oral soft tissue defects. However this instrument produces excessive bleeding during the procedure and obscures the surgical field, making accurate dissection difficult. Considerable pain and swelling after the surgery are other issues faced. To overcome these complications new technological devices like diathermy and lasers have been introduced.

Cusel in 1847 attempted to destroy a neoplasm with electric current. In 1925 the concept of electrothermy was introduced into American literature, when Ward reported the destruction of malignancies with electrothermy.¹

The surgical application of electricity is based on the principle that when one electrode is large (dispersive electrode) and other is small (active electrode), current is no longer evenly dispersed and results in concentration of current at smaller electrode causing dehydration, warming of the area, coagulation, or tissue destruction by heat depending on the type, size and frequency of the current, size of the electrode and duration of application. The techniques include electrodesiccation, electrocoagulation, electrocautery and electrosurgery.¹

Electrosurgery is used most commonly in maxillofacial surgery by use of monopolar electrodes for surgical incision/excision of soft tissues with advantages like ability to coagulate and provide easy control of haemorrhage.²

Laser is an acronym for Light Amplification by Stimulated Emission of Radiation. Maiman coined the term LASER. Laser is a special light source because in general it has higher power and a better beam quality and coherency in comparison with the other light sources.

Many lasers with different wavelengths have been used in oral and maxillofacial surgery. Diode laser is most commonly used because of its portability, compactness & reduced cost factor when compared to other lasers. Diode is a solid active medium laser with wavelength ranging from 800nm to 980nm manufactured from semiconductor crystals like aluminium, indium, gallium & arsenic. It delivers laser energy fiberoptically in continuous wave and gated pulsed modes for incision, excision, ablation and coagulation. They can be used in the continuous as well as pulsed mode and according to the clinical indication with a contact or non – contact mode.

This study aimed at evaluating wound healing and patient's comfort after oral soft tissue surgical procedures performed by diode laser in comparison with diathermy.

MATERIALS AND METHOD

The study was done in the Department of Oral & Maxillofacial Surgery, Krishnadevaraya College of Dental Sciences & Hospital, Bangalore. 20 patients requiring oral soft tissue surgical procedures were randomly categorized into group A and group B of 10 patients each. Group A patients were undergone laser therapy and group B patients were undergone diathermy. All

patients were informed about the study and consent was taken for the same. Clinical assessment and photographs of patients were done preoperatively.

INCLUSION CRITERIA:

Patients with oral premalignant lesions/conditions, benign oral soft tissue tumors and patients requiring soft tissue surgical procedure.

EXCLUSION CRITERIA:

Pregnancy and medically compromised patients

SURGICAL PROCEDURE

Detailed case history, clinical examination and necessary investigations were performed in standard manner. The surgical site was prepared and draped following standard aseptic technique. The operative site was infiltrated with 2% lignocaine with 1:200000 adrenaline. The area to be treated was marked.

The Surgical procedure was done by using diode laser (970nm \pm 15nm) in group A with optical fiber thickness of 200,320 and 400mm. The power output was kept in the standard range of 1-7 watt on continuous mode and diathermy in group B with Power supply- 50-60 hertz ,Outflow power -70 watts,Frequency-2MHz. Analgesics and antibiotics were prescribed. Patients were checked for bleeding, pain, presence of infection, granulation tissue formation and epithelisation on the subsequent follow-up.

1. Bleeding

It was assessed intra-operatively and post operatively on 1st and 2nd day

Good (2):No bleeding.

Fair (1) : Slight bleeding; requiring no hemostatic agent.

Poor(0) : Bleeding requiring hemostatic agent.

2. Pain

- Pain is recorded every four hourly for first 24 hours and every 8 hourly for next 24 hours. by VISUAL ANALOG SCALE.It consists of 10 cm line with “no pain” at one end and “worst pain” at the other end.

3. Swelling

It was noted on 1st,3rd and 7th post operative day.

0 : no swelling

1 : mild swelling

2 : moderate swelling

3 : severe swelling

4. Granulation tissue

It was noted at the end of 2nd week

Good (2): Entire wound

Fair (1): Nearly entire wound

Poor(0) :Inadequate.

5. Epithelisation:

It was noted at the end of 4th week

Good(2) : Entire wound

Fair (1): Nearly entire wound

Poor (0): Inadequate

4.Presence of infection

Presence or absence of infection was noted on 1st day, 2nd day,7th day of surgery.

0: no infection

1: infection present

5. Patients comfort

Chart 1. It was assessed by questionnaires with scores given to the patient.

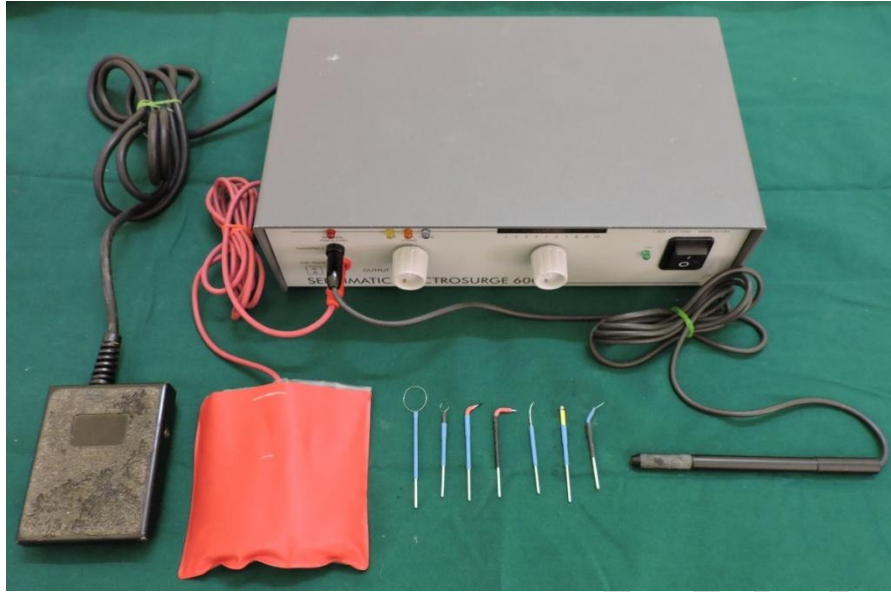
GRADE	PATIENTS SATISFACTION
1	Very satisfied
2	Fairly satisfied
3	Fairly unsatisfied
4	Very unsatisfied

PHOTOPLATES

Plate 1. ARMAMENTARIUM



LASER

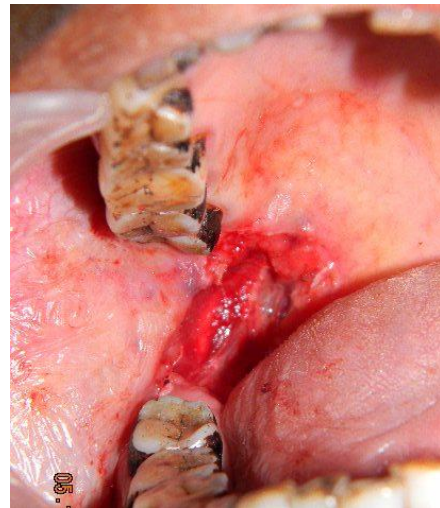


DIATHERMY

Plate 2. **CASES TREATED USING DIATHERMY**



PRE OPERATIVE



INTRA OPERATIVE



**2ND WEEK POST OPERATIVE
(GRANULATION TISSUE)**



**4TH WEEK POST OPERATIVE
(EPITHELISATION)**

Plate 3. CASE TREATED USING DIODE LASER



PRE OPERATIVE



INTRA OPERATIVE



IMMEDIATE POST OPERATIVE



2ND WEEK POST OPERATIVE

(GRANULATION TISSUE)



4TH WEEK POST OPERATIVE

(EPITHELIZATION)

RESULTS AND OBSERVATIONS

Bleeding in laser group was comparatively less than diathermy but it was statistically non significant (Table 1).

Pain was less in laser group when compared to diathermy group on 1st day (every 4 hourly) and 2nd day (every 8 hourly) (Table 2).

Swelling was less in laser group when compared to diathermy group. The statistical values were 4.13 on 1st day, 3.94 on 3rd day and 1.05 on 7th day which was less than the significant value of about 5.991. Hence it was statistically non significant (Table 3).

Signs of healing were noticed much earlier in laser group when compared to diathermy group. Granulation tissue formation and epithelisation was comparatively faster in laser group at the end of the 2nd and 4th week .The statistical value for granulation tissue formation and epithelisation

were 1.25 and 0.27 respectively which Was less than the significant value of about 3.841.hence healing was non significant (Table 4 & 5).

No infection was present in any of the patient in either group except in 1 patient in diathermy group (Table 6).

In laser group 70% of the patients were very satisfied and 30% were fairly satisfied. In diathermy group 30% of the patients were fairly satisfied, 50% were fairly unsatisfied and 20% very unsatisfied. Hence patients comfort was statistically significant (Table 7).

DISCUSSION

The art of surgery demands that we evaluate the risks and benefits of each treatment modality and apply it appropriately to each patient. Scalpel dissection is the most commonly used method for, surgeries. However scalpel produces excessive bleeding intraoperatively and obscures the surgical field, making accurate dissection difficult. Considerable pain and swelling postoperatively are other issues faced. To overcome these complications new devices like diathermy and lasers have been introduced. The present work focuses on two treatment modalities viz. diode laser and diathermy for the oral soft tissue surgical procedures.

BLEEDING AND SWELLING

Bleeding and swelling were comparatively higher with diathery group. Lesser bleeding and swelling in laser group is due to sealing of the small blood vessels and lymphatic vessels as a result of the heat generated and therefore lesser inflammatory response.³⁻⁴ Due to good

hemostasis, suturing after surgery was not necessary (economical advantage), the surgical period was extensively reduced.⁵ Time required for the incision was less with diathermy than with the carbon dioxide laser or scalpel⁶. Same was found in our study.

PAIN

Pain in laser group was comparatively less than diathermy group on 1st day and 2nd day. Pain gradually decreased in laser group but it was higher in diathermy group. Lesser post-operative pain in laser group was due to the formation of protein coagulum on the wound surface, thereby acting as a biological dressing leading to the sealing of the sensory nerves endings.⁷⁻⁸

WOUND HEALING

Wound healing process after laser application was slightly accelerated compared to diathermy application. Sloughing was observed on day 1 in laser group and day 3 in diathermy. Granulation tissue formation was seen at the end of the 2nd week in laser group but in diathermy group formation of granulation tissue was delayed comparatively. The diodes cause less lateral thermal damage, which may result in faster healing with less postoperative pain.⁹ Hence wound healing was rapid in laser group. Similar findings were noted in misir et al study.¹⁰

INFECTION

One of our case treated by diathermy reported back with infection which was relieved by antibiotics and mouth wash. None of the cases in laser group reported with infection. Due to its high temperature, laser beam results in sterile and contamination free wound. Irradiation with

laser facilitates considerable bacterial elimination and this could positively influence the healing.⁷

PATIENTS COMFORT

In laser group 70% of the patients were very satisfied and 30% were fairly satisfied. In diathermy group 30% of the patients were fairly satisfied, 50% were fairly unsatisfied and 20% very unsatisfied. The patient in the laser group were quite pleased with the results as there was no bleeding, sutures, swelling or any post operative discomfort. similar observations were made by Negm Sam.¹¹

Based on the post operative evaluation of patients it can be said that both diode laser and diathermy are effective treatment modalities for oral soft tissue surgical procedures. Although both are effective treatment modalities laser surgery is found to be more advantageous compared to diathermy when measured in terms of parameters like pain and patients comfort.

Both these treatment modalities have their own advantages and disadvantages. This study is based entirely on clinical parameters and cannot be used to make inferences about healing at a finer level. Histological analysis is the best way to assess post operative healing.

Conclusion

A treatment modality is considered ideal when it has no intra-operative or post-operative complications, it should be convenient to use by the operator, provide good patient compliance and it should be cost effective. Both laser and diathermy are effective treatment options for oral

soft tissue surgical procedures and can be performed with relative ease and comfort for the patient. Laser showed reduced pain and excellent patient's compliance which were statistically significant. Although bleeding, swelling and wound healing were not statistically significant, but laser showed good results to certain extent when compared to diathermy. This study tends to favor laser surgery more than diathermy for treatment of oral soft tissues lesions and oral soft tissue defects.

Both these treatment modalities have their own advantages and disadvantages. However continued research at clinical as well as microscopic levels for proper assessment of wound healing along with a large sample size and long follow-up of patients is necessary.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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TABLE – 1: Distribution of Bleeding between treatments

N=20

Bleeding	Laser therapy (n=10)		Diathermy (n=10)		X ² Value
	N	%	N	%	
Good	7	70.0	8	80.0	0.27 ^{NS}
Fair	3	30.0	2	20.0	
Poor	0	0.0	0	0.0	
Total	10	100.0	10	100.0	

NS : Non-Significant ,

X² (0.05,1df) = 3.841

TABLE – 2: Distribution of pain between treatments

N=20

No.	Components	Score Range	Mean Response (%)						't' Test
			Laser therapy (n=10)			Diathermy (n=10)			
			Mean	SD	Mean (%)	Mean	SD	Mean (%)	
	1st Day								
1	4th hr	0-10	4.00	1.9	40.0	5.40	1.6	54.0	1.77 ^{NS}
2	8th hr	0-10	4.00	1.9	40.0	5.40	1.6	54.0	1.77 ^{NS}
3	12th hr	0-10	3.60	1.8	36.0	5.80	1.8	58.0	2.74*
4	16th hr	0-10	3.40	1.3	34.0	5.20	1.9	52.0	2.41*
5	20th hr	0-10	2.80	1.4	28.0	4.40	1.8	44.0	2.19*
6	24th hr	0-10	2.40	1.6	24.0	3.60	0.8	36.0	2.12*
	2nd Day								
7	8th hr	0-10	1.60	0.8	16.0	3.40	1.0	34.0	4.44*

8	16th hr	0-10	1.00	1.1	10.0	2.40	1.3	24.0	2.69*
9	24th hr	0-10	0.40	0.8	4.0	1.80	1.1	18.0	3.13*

*Significant at 5% level, NS: Non-significant, $t(0.05, 18df) = 2.101$

TABLE – 3: Distribution of swelling between treatments

N=10+10

Swelling level	Respondents (%)					
	1st day		3rd day		7th day	
	Laser therapy	Diathermy	Laser therapy	Diathermy	Laser therapy	Diathermy
No	90.0	50.0	90.0	50.0	100.0	90.0
Mild	10.0	30.0	10.0	40.0	0.0	10.0
Moderate	0.0	20.0	0.0	10.0	0.0	0.0
X ² -Value	4.13 ^{NS}		3.94 ^{NS}		1.05 ^{NS}	

NS : Non-Significant, $X^2(0.05, 2df) = 5.991$

TABLE – 4: Distribution of Granulation tissue formation between treatments

N=20

Granulation tissue	Laser therapy (n=10)		Diathermy (n=10)		X ² Value
	N	%	N	%	
Good	9	90.0	7	70.0	1.25 ^{NS}
Fair	1	10.0	3	30.0	
Poor	0	0.0	0	0.0	
Total	10	100.0	10	100.0	

NS : Non-Significant , $X^2(0.05, 1df) = 3.841$

TABLE – 5: Distribution of Epithelisation between treatments

N=20

Epithelisation	Laser therapy (n=10)		Diathermy (n=10)		X ² Value
	N	%	N	%	
Good	8	80.0	7	70.0	0.27 ^{NS}
Fair	2	20.0	3	30.0	
Poor	0	0.0	0	0.0	
Total	10	100.0	10	100.0	

NS : Non-Significant ,

X² (0.05,1df) = 3.841

TABLE – 6: Distribution of Presence of infection between treatments

N=10+10

Infection	Respondents (%)					
	1st day		3rd day		7th day	
	Laser therapy	Diathermy	Laser therapy	Diathermy	Laser therapy	Diathermy
No	100.0	90.0	100.0	100.0	100.0	100.0
Present	0.0	10.0	0.0	0.0	0.0	0.0
X ² -Value	1.05 ^{NS}		0.00 ^{NS}		0.00 ^{NS}	

NS : Non-Significant,

X² (0.05,1df) = 3.841

TABLE – 7: Distribution of Patients comfort between treatments

N=20

Patients comfort	Laser therapy (n=10)		diathermy (n=10)		X ² Value
	N	%	N	%	
Very satisfied	7	70.0	0	0.0	

Fairly satisfied	3	30.0	3	30.0	14.00*
Fairly unsatisfied	0	0.0	5	50.0	
Very unsatisfied	0	0.0	2	20.0	
Total	10	100.0	10	100.0	

*Significant at 5% level ,

$$X^2 (0.05, 3df) = 7.815$$

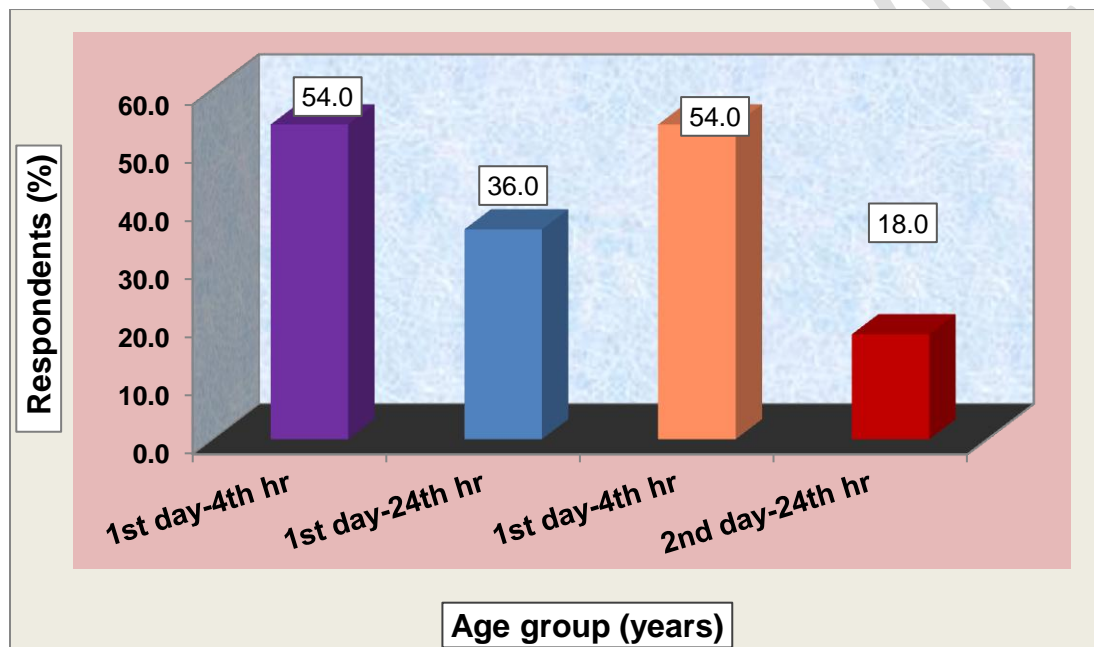


Figure.1: Distribution of Respondents by Age

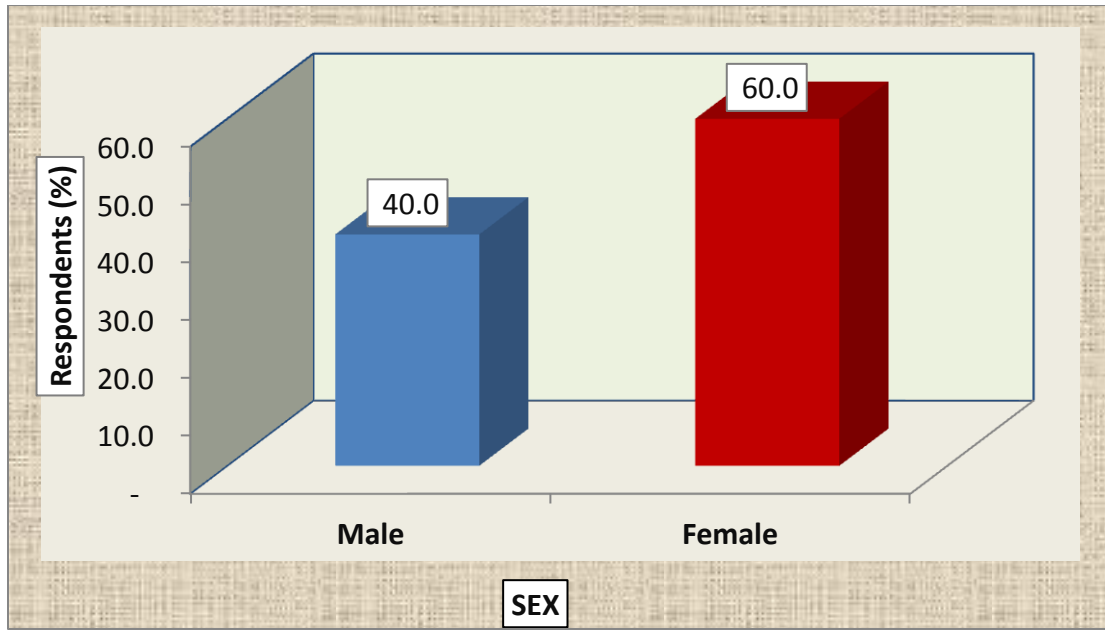


Figure.2:Distribution of Respondents by Sex

UNDER PEER REVIEW