

A comparative Evaluation of Cold Scalpel, Monopolar Electro Surgery and Soft Tissue Diode Laser in Postoperative Wound Healing of Oral Mucosal Lesions and Conditions Requiring Elective Surgical Intervention

Mayank Singhal*¹, Manoj Goyal², Sanjeev Tomar³, Amit B. Lall⁴,
Anupam Bhardwaj⁵

¹ Associate Professor, Department of Oral and Maxillofacial Surgery,
Santosh Dental College, Santosh Deemed to be University, Uttar Pradesh, India.

² Professor, Department of Oral and Maxillofacial Surgery, Santosh Dental College,
Santosh Deemed to be University, Uttar Pradesh, India.

³ Associate Professor, Department of Oral and Maxillofacial Surgery,
Santosh Dental College, Santosh Deemed to be University, Uttar Pradesh, India.

⁴ Professor and HOD, Department of Oral and Maxillofacial Surgery,
Santosh Dental College, Santosh Deemed to be University, Uttar Pradesh, India.

⁵ Senior Lecturer, Department of Oral and Maxillofacial Surgery, Santosh Dental College,
Santosh Deemed to be University, Uttar Pradesh, India.

Email- ¹ drmayank.omfs@gmail.com

ABSTRACT:

Introduction: In any elective surgical intervention, to gain access for treatment or for excision of the underlying pathology, a wound is created at a preplanned site which should leave minimal scar and must be least conspicuous. The reason for this transition is due to the fact that many procedures can be executed more efficiently and with less morbidity using lasers as compared to a scalpel. Compared to traditional methods and surgical devices such as Electrosurgery, a laser is gentler, more predictable, and often times will not require local anesthetic. **Aims and Objectives:** To evaluate the efficacy and safety of diode lasers in comparison to conventional Electro surgery and scalpel surgeries in treating oral mucosal lesions. To compare the quality of wound healing with each modality **Materials and Methods:** The study was conducted on sixty patients with oral mucosal lesions and conditions requiring elective surgical intervention. In this study, sixty cases were selected randomly and divided into three groups (twenty in each group) to compare wound healing of oral mucosal lesions and conditions requiring surgical intervention through scalpel and soft tissue diode laser. Group A - Surgery was done with Diode Laser. Group B – Surgery was done with scalpel and in. Group C - Surgery was done with Monopolar Electro surgery unit **Results:** According to this study clinical applications of diode laser for the management of oral mucosal lesions and conditions requiring elective surgical intervention was more efficient and safe in comparison to Electrosurgery and conventional scalpel surgeries, and the quality of wound healing was better in surgical lased wounds.

Keywords: Diode laser, scalpel, oral mucosal lesions, soft tissue laser.

INTRODUCTION:

Wound healing is a complicated, interactive and integrated biological process involving cellular & chemotactic activity, along with release of chemical mediators and associated vascular response¹. When there is tissue loss; it is restored by regeneration or cicatrization. Regeneration is the replacement of damaged cells or tissue by tissue similar to the original, re-establishing the function, whereas cicatrization or repair is characterized by the formation of the new connective tissue with substitution of the damaged cells and alteration of the architecture of the tissue².

In any elective surgical intervention, to gain access for treatment or for excision of the underlying pathology, a wound is created at a preplanned site which should leave minimal scar and must be least conspicuous. Hence for all elective surgical interventions, especially the ones over the face and oral mucosa, it is imperative that the scar is as inconspicuous as possible, and the process of wound healing should be uneventful and with minimal postoperative pain & discomfort³. In an attempt to achieve this, the scalpel incisions are conventionally placed along the skin creases wherever possible. Use of scalpel offers the advantages of easy handling and minimal trauma to the surrounding tissues, but some lesions and their location do not allow the surgeon to do so. Similarly, primary wound closure is not possible, and/or desired in quite a few intraoral surgical procedures. These surgeries which require leaving behind a raw wound necessitate a good surface haemostasis, for which conventionally Electrocautery has been used⁴.

In 1926, Dr. Harvey Cushing worked with a physicist named Dr. William T. Bovie, after whom the current Electrocautery instruments are named⁵. Major advantage of electrical surgery is the execution of excision and coagulation with single instrument⁶. Electrocautery when used for cutting or coagulation causes collateral damage and leaves a zone of charred tissues which eventually gets necrosed, and wound heals with lot of scarring. With the advent of lasers in surgery, a lot of these issues appear to have been addressed⁴.

Regarding the use of Electrocautery in the incision and coagulation of soft tissue, some advantages when it was compared with the scalpel technique; among the advantages cited were diminution of surgery time, depletion of blood loss during surgery, and better visibility. However this technique also can cause complications, such as electric burn, increase of postoperative pain, delayed repair, fumes from toxic gases, and electromagnetic interference with other instruments in the area causing deficiency in the operation of implanted cardiac devices or in cochlear implants².

After the development of the first Laser, a ruby laser, in 1960 by **Theodore H. Maima**, medical and dental researchers soon began to study different types of lasers for extra oral and intraoral surgical procedures⁷. Lasers are rapidly becoming the standard of care for many

procedures performed by oral and maxillofacial surgeons. The reason for this transition is due to the fact that many procedures can be executed more efficiently and with less morbidity using lasers as compared to a scalpel and Electrocautery. Diode laser radiation has been utilized for surgical procedures such as incision, vaporization and coagulation, including, in traumatic wounds, application to benign neoplasm, proliferative processes, potentially premalignant lesions, and selective cases of malignant neoplasms².

Laser has been recommended to treat benign oral lesions, such as Fibroma, papillomas, hemangiomas, gingival hyperplasia, aphthous ulcers, mucosal frenula and premalignant lesions such as oral leukoplakias⁷.

The haemostatic nature of the laser is of great value in Oral &Maxillofacial surgery. It allows surgery to be performed more precisely and accurately because of increased visibility of the surgical site. This characteristic is particularly useful in cases of hemangiomas or removal of inflamed epulisfissurata, or any procedure involving incision of the tongue, soft palate, or tonsillar pillars. Decreased postoperative swelling is characteristic of lasers and allows increased safety when performing surgery within the airway and increases the range of surgery that can be performed safely without fear of airway compromise. This effect allows the surgeon to perform many procedures in outpatient facility that previously would have required hospitalization for airway observation, postoperative nursing care, and parenteral pain management. The improvement of tissue healing and scarring is due to a combination of decreased collateral tissue damage, less traumatic surgery, more precise control of the depth of tissue damage, and fewer myofibroblasts in laser wounds. When lasers are used intraorally, wounds generally heal with minimal scar formation and soft, pliable residual tissue. Because of this improved healing (along with the hemostasis), intraoral wounds can often be left unsutured (another distinct advantage). Decreased postoperative pain is often noted with the use of lasers for surgery. The physiology of this effect is still unknown but probably relates to decreased tissue trauma and an alteration of neural transmission. This aspect has enabled surgeons to perform many procedures on an outpatient basis, with patients returning to work within 1 day or even immediately in many cases. Hollow wave-guide technology and fiberoptics make the laser accessible to almost any area in the oral cavity, even those that would be difficult or impossible to reach with other therapeutical modalities^{8, 9, and 10}.

Aims and Objectives:

To evaluate the efficacy and safety of diode lasers in comparison to Electrosurgery and conventional scalpel surgeries in treating oral mucosal lesions. To compare the quality of wound healing with each modality.

Materials and Methods:

The study was conducted on patients with oral mucosal lesions and conditions requiring elective surgical intervention. In this study, Sixty cases were selected randomly and divided

into three groups (twenty in each group) to compare wound healing of oral mucosal lesions and conditions requiring surgical intervention through electrosurgery, scalpel and soft tissue diode laser. In this study, 60 cases were selected randomly and divided into 3 groups (20 in each group) to compare wound healing of oral mucosal lesions and conditions requiring surgical intervention through Electrosurgery, scalpel and soft tissue diode laser. **Group A** – Surgery was done with Electrocautery. **Group B** – Surgery was done with Diode Laser. **Group C** – Surgery was done with scalpel.

Inclusion Criteria was healthy patients requiring surgery of oral lesions between the age group of 12-60 years of both the sexes, Patients with Benign lesions like mucocele, fibroma, epulis and papilloma, etc, requiring excision. Pre-malignant conditions and lesions (lip-shaving, OSMF-band excisions, etc), Patient requiring frenectomies and pre-prosthetic surgeries (Flabby ridge, vestibuloplasty, tongue-tie, etc.) and Adjuvant procedures (Viz-a-viz orthodontic tooth exposure etc).

Exclusion Criteria were subjects having electric pacemaker, Patients with hematological parameters not within normal limits, Patients with concomitant neurological, cardiovascular or any other systemic disease, contraindicating any surgical intervention, Subject on immunosuppressive drugs and Uncontrolled diabetes, patients on anticoagulants/antiplatelets.

Clinical Evaluation:-All the patients were evaluated preoperatively, intraoperatively and postoperatively .in intraoperative phase the criteria which were taken into consideration were, duration of surgery, bleeding, and efficacy to excise the lesion completely. In postoperative phase, patients were evaluated in immediate and delayed phase, in immediate postoperative phase the criteria which were taken into account were pain, swelling and color of wound and in delayed postoperative phase, wound healing, color of wound, scarring and contracture were evaluated.

METHODS:

Medical and Dental history were taken preoperatively. Verbal and written consents were given to all patients and they accepted the treatment. All the procedures in the two groups were done under local anesthesia

(Lidocaine HCL 2% with 1:80,000 Epinephrine) using infiltration technique. A specific data form was made for each patient in the three groups that included personal information, medical history, site and size of the lesion in (mm) by vernier gauge (Dentaurum-Germany), color and consistency of the lesion, amount of local anesthesia administered (ml) , operation time (duration of surgery) from incision to last suture which was measured by, visual analog scale for post-operative pain, the severity of pain was assessed using scale of 0 (no pain) to 10 (un bearable pain) score recorded first and third days post operatively^{11,12,13,14,15}. **Laser Unit:** The laser device used in the study was the EPIC-10(fig.1). It is diode laser emitting 810nm. Maximum out-put power was 10 watt.



Fig. 1: The Laser Device Used In the Study

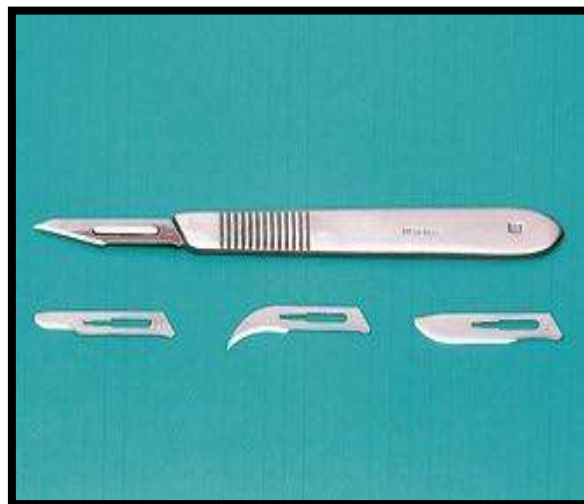


Fig. 2: Surgical Scalpel



Fig. 2: Mono-Bipolar Electro surgery unit

In the scalpel group(Fig. 4), the wound was sutured by 3/0 black silk suture (Silk Braided, Jiannan China) and the suture removed a week after the operation, while in the laser group no sutures were placed .Patients were also given appropriate instructions and recommendations regarding the postoperative recovery period.

Postoperative medications were given to both groups which include a 5-day course of Amoxicillin 250mg orally three times a day, 0.2% Chlorhexidine gluconate mouthwash, Paracetamol 500mg orally three times a day.

Stastical Analysis: The data analyzed statistically using T test- independent sample test to compare the result of parameter changes between the two groups and paired sample test to study the results of parameter changes in each group separately in SPSS (statistical package for social science).

Laser Parameters in the Study: Glass fiber 400 µm diameters, power 2-5 watt at fiber tip, energy 1.8 Joule/sec. Safety measures were taken for surgeon, assistance and patient by wearing the recommended protective goggles.

Clinical Evaluation Scores

Table 1 – table showing clinical evaluation criteria and score

Evaluation	Score			
Intraoperative				
Duration of surgery	Less than 30 min = 1	30 - 45 min = 2	45 min to 1 hr	More than 1 hr
Bleeding	None = 1	Slight = 2	Moderate = 3	Severe = 4
Efficacy to excise the lesion completely	Very efficient = 1	Efficient = 2	Not efficient = 3	Can Not be performed = 4
Postoperative				
Pain(VAS)	None = 0-10	Slight = 11-40	Moderate = 41-70	Severe = 71-100
Color of wound	Improvement = 1	Slight improvement = 2	No change = 3	Deterioration = 4
Swelling	Not Present = 1	Mild = 2	Moderate = 3	Severe = 4
Wound Margins	Complete epithelialization = 1	Incomplete epithelialization = 2	Ulcer = 3	Tissue defect or necrosis = 4
Wound Surface	Complete epithelialization = 1	Incomplete epithelialization = 2	Ulcer = 3	Tissue defect or necrosis = 4
Scarring	None = 1	Mild = 2	Moderate = 3	Severe = 4
Contracture	None = 1	Mild = 2	Moderate = 3	Severe = 4

RESULTS:

In this study, 60 cases were selected, which were randomly allocated to one of the three groups (20 in each group) to compare wound healing of oral mucosal lesions and conditions requiring surgical intervention through scalpel, Electrosurgery, and soft tissue diode laser. In **Group A** surgery was done using Electrosurgery, for **Group B** soft tissue diode laser was used, while for **Group C** conventional scalpel was used. Patients included in this study were 37 (61.7%) males and 23 (38.3%) females. Total number of patients (60) selected in this study fall in different age groups of 10-30 years (51.7%), 31-51 years (43.3%), 52-72 years (5%). In this study various sites for surgery among the total patient was noted. The most common site of various oral mucosal lesions were **buccal/labial** mucosa (43.3%) followed by **upper & lower lip**(30%), **gingiva** (18.4%), and **tongue**(8.3%).

The comparison of **duration of surgery** was done among all 3 groups, using the **Chi-square test**.

Table 2 – showing comparison of duration of surgery was done among all two groups

Duration	Groups			Total	P-value
	Electrocautery	Laser	Scalpel		
Less than 30 min	18 90.0%	12 60.0%	2 10.0%	32 53.3%	0.000*
30 - 45 min	1 5.0%	6 40.0%	15 75.0%	24 40.0%	
45 min to 1 hr	0 .0%	0 .0%	3 15.0%	3 5.0%	
More than 1 hr	1 5.0%	0 .0%	0 .0%	1 1.7%	
Total	20 100.0%	20 100.0%	20 100.0%	60 100.0%	

There was a **significant ($p < 0.05$) difference** between the 3 groups. 90% cases of Electrosurgery, 60% cases of diode laser and 10% cases of scalpel completed in less than 30 minutes. 5% cases of Electrosurgery, 40% cases of diode laser and 75% cases of scalpel completed within 30-45 minutes (**Table No.2**).

Results showed that amongst all 3 groups, cases done with Electrosurgery took less time than laser, while cases done with scalpel took longest time.

The comparison of **bleeding (intraoperative)** was done among all 3 groups using the **Chi-square test**. There was a **significant ($p < 0.05$) difference** between the 3 groups. **No bleeding** was seen in 65% cases of Electrosurgery, 70% cases of diode laser and 0% cases of scalpel. **Slight bleeding** was seen in 35% cases of Electrosurgery, 20% cases of diode laser and 0%

cases of scalpel. **Moderate bleeding** was seen in 0% cases of Electrosurgery, 10% cases of laser and 95% cases of scalpel (**Table No.3**).

Table 3 – showing comparison of bleeding during surgery among all 3 groups

Bleeding	Groups			Total	P-value
	Electrocautery	Laser	Scalpel		
None	13	14	0	27	0.000*
	65.0%	70.0%	0%	45.0%	
Slight	7	4	0	11	
	35.0%	20.0%	0%	18.3%	
Moderate	0	2	19	21	
	0%	10.0%	95.0%	35.0%	
Severe	0	0	1	1	
	0%	0%	5.0%	1.7%	
Total	20	20	20	60	
	100.0%	100.0%	100.0%	100.0%	

Results showed, amongst all 3 groups laser cases showed **less bleeding** intraoperatively in comparison to electrocautery, while scalpel cases showed more bleeding amongst all the three groups.

The comparison of **efficacy to excise completely** was done among electrocautery, laser and scalpel groups using the **Chi-square test**. There was a **significant ($p < 0.05$) difference** between the 3 groups. 90% cases of Electrosurgery, 80% cases of diode laser and 40% cases of scalpel were **very efficient** in excision. 10% cases of Electrosurgery, 20% cases of diode laser and 55% cases of scalpel were **efficient** in excision. Results showed, amongst all 3 groups, cases done with Electrosurgery were more efficient than laser, while cases done with scalpel were least efficient amongst all the three groups.

The inter-group comparison of **pain** was done at immediately, at 3rd day, at 1st week, at 2nd week and at 4th week among Electrosurgery, laser and scalpel groups using the **Bonferroni Multiple Comparisons test**. There was a **significant ($p < 0.05$) difference** between laser and scalpel at immediate post-operative interval and in between Electrosurgery laser and scalpel at 3rd day postoperatively (**Table No.4**). Results showed, amongst all 3 groups laser cases showed **less pain** postoperatively in comparison to Electrosurgery and scalpel.

The comparison of **colour of wound** was done at immediately, at 3rd day, at 1st week, at 2nd week and at 4th week among electrocautery, laser and scalpel groups using the **Chi-square test**. There was a **significant ($p < 0.05$) difference** between the 3 groups at 1st week and at 2nd week. Results showed, **deterioration** was seen in all 3 groups immediately. **Improvement**

in the colour of wound was faster in laser group in comparison of other groups at 1st and 2nd week.

The comparison of **swelling (Table 5)** was done at immediately, at 3rd day, at 1st

Table 4 – Showing comparison of pain done using the bonferroni multiple comparisons test.

Pain		Mean Difference	P-value	
Immediately	Electrocautery	Laser	2.00	0.291
		Scalpel	-2.00	0.291
	Laser	Electrocautery	-2.00	0.291
		Scalpel	-4.00	0.004*
3 rd day	Electrocautery	Laser	13.50	0.000*
		Scalpel	-15.00	0.000*
	Laser	Electrocautery	-13.50	0.000*
		Scalpel	-28.50	0.000*
1 st wk	Electrocautery	Laser	2.00	0.421
		Scalpel	-13.00	0.000*
	Laser	Electrocautery	-2.00	0.421
		Scalpel	-15.00	0.000*
2 nd wk	Electrocautery	Laser	0	1.000
		Scalpel	-1.50	0.086
	Laser	Electrocautery	0	1.000
		Scalpel	-1.50	0.086
4 th wk	Electrocautery	Laser	0	1.000
		Scalpel	-0.250	0.677
	Laser	Electrocautery	0	1.000
		Scalpel	-0.250	0.677

week, at 2nd week and at 4th week among Electrosurgery, laser and scalpel groups using the **Chi-square test**. There was a **significant ($p < 0.05$) difference** between the 3 groups immediate post-operatively, at 3rd day, at 1st week and at 2nd week. Results showed **immediatepostoperative** swelling was **not present** in 14(70%) of laser cases, **mild swelling** was seen in 15(75%) cases of Electrosurgery cases while **moderate swelling** was seen in 20(100%) cases of scalpel cases. 3rd day swelling was **not present** in 17(85%) cases of laser cases, **mild swelling** was seen in 20(100%) cases of electrocautery cases while **moderate swelling** was seen in 19(95%) cases of scalpel cases. After 1st week swelling was **not present** in 18(90%) cases of laser cases, **mild swelling** was seen in 11(55%) cases of Electrosurgery cases and 19(95%) cases of scalpel cases. Swelling was **not present** in 100% cases of Electrosurgery and laser and 15(75%) cases of scalpel after 2nd week. Laser cases showed very less swelling postoperatively in comparison of other groups and the difference was significant.

Table 5 – Showing comparison of postoperative swelling.

Pain		Mean Difference	P-value	
Immediately	Electrocautery	Laser	2.00	0.291
		Scalpel	-2.00	0.291
	Laser	Electrocautery	-2.00	0.291
		Scalpel	-4.00	0.004*
3 rd day	Electrocautery	Laser	13.50	0.000*
		Scalpel	-15.00	0.000*
	Laser	Electrocautery	-13.50	0.000*
		Scalpel	-28.50	0.000*
1 st wk	Electrocautery	Laser	2.00	0.421
		Scalpel	-13.00	0.000*
	Laser	Electrocautery	-2.00	0.421
		Scalpel	-15.00	0.000*
2 nd wk	Electrocautery	Laser	0	1.000
		Scalpel	-1.50	0.086
	Laser	Electrocautery	0	1.000
		Scalpel	-1.50	0.086
4 th wk	Electrocautery	Laser	0	1.000
		Scalpel	-0.250	0.677
	Laser	Electrocautery	0	1.000
		Scalpel	-0.250	0.677

The comparison of **wound margin** was done at immediately, at 3rd day, at 1st week, at 2nd week and at 4th week among Electrocautery, Laser and Scalpel groups using the **Chi-square test**. There was a **significant (p<0.05) difference** between the 3 groups at 1st week and at 2nd week (**Table No.6**). After 2nd week wound margins were **completely epithelialized** in 3(15%) cases of Electrosurgery, 20(100%) cases of laser and 15(75%) cases of scalpel. Results showed that wound margins completely epithelialized faster in laser cases in comparison of scalpel while Electrosurgery showed slowest epithelialization amongst all.

Table 6 – Showing comparison of wound margins postoperative.

Efficacy to Excise Completely	Groups			Total	P-value
	Electrocautery	Laser	Scalpel		
Very efficient	18	16	8	42	0.008*
	90.0%	80.0%	40.0%	70.0%	
Efficient	2	4	11	17	
	10.0%	20.0%	55.0%	28.3%	
Not efficient	0	0	1	1	
	.0%	.0%	5.0%	1.7%	
Total	20	20	20	60	
	100.0%	100.0%	100.0%	100.0%	

The comparison of **wound surface** was done at immediately, at 3rd day, at 1st week, at 2nd week and at 4th week among Electrosurgery, laser and scalpel groups using the **Chi-square test**. There was a **significant ($p < 0.05$) difference** between the 3 groups at 1st week and at 2nd week. After 2nd week wound surface was **completely epithelialized** in 3(15%) cases of Electrosurgery, 20(100%) cases of laser and 15(75%) cases of scalpel. Results showed wound surface completely epithelialized faster in laser cases in comparison of scalpel while Electrosurgery showed slowest epithelialization amongst all. The comparison of **scarring** was done at 3rd day, at 1st week, at 2nd week and at 4th week among Electrosurgery, laser and scalpel groups using the **Chi-square test**. There was a **significant ($p < 0.05$) difference** between the 3 groups at 3rd day, at 1st week, at 2nd week and at 4th week. After 2nd week, **no scarring** was seen in 13(65%) cases of Electrosurgery, 20(100%) cases of laser and 0(0%) cases of scalpel, **mild scarring** was seen in 2(90%) cases of scalpel. Results showed scarring was very less in laser cases in comparison of Electrosurgery while scalpel showed scarring in most of the cases.

DISCUSSION:

This study was conducted on patients with oral mucosal lesions and conditions requiring elective surgical intervention

In this study the cases we included:

- a) Benign lesions like mucocele, fibroma, euplis and papilloma, etc, requiring excision
- b) Pre-malignant conditions and lesions (lip-shaving, OSMF-band excisions, etc.).
- c) Patient requiring frenectomies and pre-prosthetic surgeries (Flabby ridge, vestibuloplasty, tongue-tie, etc.)
- d) Adjuvant procedures (Viz-a-viz Orthodontic tooth exposure etc.)

In our study, the incidence of oral mucosal lesions and conditions requiring surgical intervention were more in males 37(61.7%) in comparison to females 23(38.3%), which is similar to the study done by **MeritaBardhoshiet al 2014¹⁷**, 60 patients (32 males and 28 females) were treated. On comparing the duration of surgery in 3 groups; Electrosurgery, diode laser and conventional scalpel in which we found Electrosurgery took less time in comparison to both laser and scalpel. **Laurence J. Walsh 2010²⁰**, **Wael S Shalawe et al 2012¹⁸**, compared duration of surgery in between two groups, laser and scalpel in which they found laser took less time in comparison to conventional scalpel.

In our study **No bleeding** was seen in 65% cases of Electrosurgery, 70% cases of diode laser and 0% cases of scalpel. **Slight bleeding** was seen in 35% cases of Electrosurgery 20% cases of diode laser and 0% cases of scalpel. Results showed, amongst all 3 groups laser cases showed less bleeding intraoperatively in comparison to Electrosurgery and scalpel. According to **SushmaLagdive et al 2009**, **Laurence J. Walsh 2010²⁰**, **MeritaBardhoshiet**

al 2014¹⁷, in comparison to scalpel, bleeding is very less in diode laser surgeries. According to SushmaLagdive et al 2009¹⁶, in diode laser cases blood vessels in the surrounding tissue up to a diameter of 0.5 mm are sealed; thus, the primary advantage was hemostasis and a relatively dry operating field. In our study efficacy to excise the lesion completely was slightly better in Electrosurgery in comparison to laser and was very efficient to completely excise the lesion in comparison to scalpel. 90% cases of Electrosurgery, 80% cases of diode laser and 40% cases of scalpel were **very efficient** in excision. According to SushmaLagdive et al 2009¹⁶, Laurence J. Walsh 2010²⁰, efficacy to excise the lesion completely was better in laser than scalpel. In our study pain was evaluated by VAS scale. Laser cases showed less pain postoperatively in comparison to Electrosurgery and scalpel. There was a significant difference in between Electrosurgery, laser and scalpel at 3rd day and 1st week postoperatively. According to SushmaLagdive et al 2009¹⁶, Laurence J. Walsh 2010²⁰, Wael S Shalawe et al 2012¹⁸, MeritaBardhoshiet al 2014¹⁷, sites operated with scalpel blade patients complained of moderate pain and severe pain on VAS. In contrast, sites treated with diode laser were rated as slightly or not painful. In our study color of wound in laser cases showed faster **Improvement** in comparison to other groups at 1st and 2nd week. According to SushmaLagdive et al 2009¹⁶, the healing period of scalpel wounds is shorter than with diode laser. In our study laser cases showed no swelling postoperatively in comparison of other groups. Results showed **immediate postoperative** swelling was **not present** in 70% of laser cases; **mild swelling** was seen in 75% cases of Electrosurgery cases while **moderate swelling** was seen in 100% cases of scalpel cases. After 1st week swelling was **not present** in 90% cases of laser cases, **mild swelling** was seen in 55% cases of Electrosurgery and 95% cases of scalpel. Swelling was **not present** in 100% cases of Electrosurgery and laser and 75% cases of scalpel after 2nd week. According to Merita Bardhoshiet al 2014¹⁷, none of the patients treated with laser reported swelling. On the other hand, patients treated with scalpel group referred swelling first week postoperatively after the surgical excision. In our study wound margins and wound surface completely epithelialized faster in laser cases in comparison to scalpel cases while Electrosurgery cases showed slowest epithelialization amongst all. According to Laurence J. Walsh 2010²⁰, SushmaLagdive et al 2009¹⁶, the healing period of scalpel wounds is shorter than with diode laser. However, scalpel surgery causes unpleasant bleeding during and after the operation and it is necessary to cover the exposed lamina propria with a periodontal pack for 7-10 days. The diode laser causes minimal damage to the periosteum and bone under the gingiva being treated, and it has the unique property of being able to remove a thin layer of epithelium cleanly. Although healing of laser wounds are slower than healing of scalpel wounds, a sterile inflammatory reaction occurs after lasering.

In our study, after 2nd week, **no scarring** was seen in 65% cases of Electrosurgery 100% cases of laser and 0% cases of scalpel, **mild scarring** was seen in 90% cases of scalpel. Results showed scarring was not present in laser cases in comparison to electrosurgery cases, while scalpel cases showed scarring in most of the cases. According to MeritaBardhoshiet

al 2014¹⁷, in all patients treated with diode laser, scar formation was not observed. On the other hand in all patients treated with conventional blade surgery scar formation were observed at the site of the performed excision. In our study, after 4th week, **no contracture** was seen in 10% cases of Electrosurgery 95% cases of laser and 0% cases of scalpel, **mild contracture** was seen in 90% cases of Electrosurgery and 65% cases of scalpel. Results showed wound contracture was not present in laser cases in comparison to Electrosurgery cases, while scalpel cases showed wound contracture in most of the cases. According to **Fry TL et al 1980²¹**, Wound contracture, an inherent part of wound healing, is reportedly minimal or clinically in apparent with laser excision.

CONCLUSION:

According to this study clinical applications of diode laser for the management of oral mucosal lesions and conditions requiring elective surgical intervention was more efficient and safe in comparison to Electrosurgery and conventional scalpel surgeries, and the quality of wound healing was better in surgical lased wounds. Lastly, a larger study sample is required to comment more precisely on the effect of diode laser, Electrosurgery and scalpel surgeries to compare efficacy and postoperative wound healing of oral mucosal lesions and conditions requiring elective surgical intervention.

REFERENCES:

1. **Warkaa M. Al-Wattar, Bashar H. Abdullah, Ali S. Mahmmod**, Irradiation effect of 780-805nm diode laser on wound healing in mice, 2013; 25:1.
2. **Aline Rose CantarelliMorosolli et al**, Healing process after surgical treatment with scalpel, electrocautery and laser radiation: histomorphologic and histomorphometric analysis, Laser Med Sci, 2010; 25:93-100.
3. **David J. Coleman et al**, Love & Bailey's Surgical Textbook, Wounds, tissue repair and scars, 1998; 20-23.
4. **Nader N Massarweh, Ned Cosgriff, Douglas P Slakey**, Electrosurgery: History, Principles and Current and Future Uses, 2006; 202:3.
5. **Ketan R. Bulsara, Sunny Shukla, Shahid M. Nimjee**, History of bipolar coagulation, Springer-Verlag, 2005.
6. **KripaJohar et al**, Fundamentals of Laser Dentistry, Lasers in Oral and Maxillofacial Surgery, 2011; 107-08.
7. **Valerie G. A. Suter¹, Hans JorgAltermatt, PedramSendi, Gerald Mettraux and Michael M. Bornstein**, CO₂ and diode laser for excisional biopsies of oral mucosal lesions, SchweizMonatsschrZahnmed, 2010; 120:8.

8. **DraganaGabricPanduric et al**, A Textbook of Advanced Oral and Maxillofacial Surgery, Application of Diode Laser in Oral and Maxillofacial Surgery 2013; 341-376.
9. Pogrel M.A., Yen CK, Hansen L.S., A comparison of laser, liquid nitrogen, and scalpel wounds in healing, 1990; 269-73.
10. **Reshma J Abraham, Arathy S Lankupalli**, Laser Management Of Introral Soft Tissue Lesions- A Review Of Literature, IOSR Journal of Dental and Medical Sciences, 2014; 13:59-64.
11. **Mona Soliman, Ahmed E.L., Kharbotly and Ali Saafan**, Management of oral lichen planus using diode laser (980nm), Egyptian Dermatology Online Journal, 2005;1:3.
12. **Awooda E. M., Osman B, Adia A. Yahia**, Use of Diode Laser (810) nm In Frenectomy, Sudan JMS, 2007;2:1.
13. **Mehmet Ozdogan et al**, Scalpel Versus Electrocautery Dissections: The effect on wound complications and pro-inflammatory cytokine levels in wound fluid, Turk J Med Sci, 2008; 38 (2):111-116.
14. **Bogdan V. Crisan et al**, Laser Treatment in Oral and Maxillofacial Hemangioma and Vascular Malformations. TMJ, 2010; 60:1.
15. **SushmaLagdive, YogeshDoshi, P. P. Marawar (2009)**Management of Gingival Hyperpigmentation Using Surgical Blade and Diode Laser Therapy, J Oral Laser Applications, 2009; 9:41-47.
16. **SushmaLagdive, YogeshDoshi, P. P. Marawar (2009)**Management of Gingival Hyperpigmentation Using Surgical Blade and Diode Laser Therapy, J Oral Laser Applications, 2009; 9:41-47.
17. **MeritaBardhoshi et al**, Treatment Of Vascular Lesion Of Lip With 980nm Diode Laser Compared With Conventional Method, European Scientific Journal, 2014;10:3.
18. **Wael S Shalawe, Zaid A. Ibrahim, Ali D. Sulaiman**, Clinical Comparison between Diode Laser and Scalpel Incisions in Oral Soft Tissue Biopsy, Al – Rafidain Dent J, 2012;12:2.
19. **Ramandeep Singh Gambhir et al**, The prevalence of oral mucosal lesions in the patients visiting a dental school in Northern India in relation to sex, site and distribution: A retrospective study, J ClinExp Dent, 2011;3:10-7.
20. **Professor Laurence J. Walsh**. Maximising gingival aesthetics using lasers, Australasian Dental Practice, 2010.

21. **Fry TL, Gerbe RW, Botros SB, Fischer ND.**, Effects of laser, scalpel, and electro-surgical excision on wound contracture and graft "take".*PlastReconstr Surg.*1980;65:729-31.