Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

A Comparative Study using Electrosurgery and 810nm Diode Laser in Vestibuloplasty

Anagha S Nath[1], Surej Kumar LK[2], Nikhil M Kurien[3]

[1]Junior resident, Department of Oral and Maxillofacial surgery, PMS College of dental science and research, Thiruvananthapuram, Kerala 695028;
[2]MDS FDS RCPS (Glasgow) UK, Professor and Head of the Department, Department of Oral and Maxillofacial surgery, PMS college of dental science and research, Thiruvananthapuram, Kerala 695028;
[3]MDS, Professor, Department of Oral and Maxillofacial surgery, PMS College of dental science and research, Thiruvananthapuram, Kerala 695028

ABSTRACT:
Introduction: Pre-prosthetic comprises both basic procedures and sophisticated techniques of reconstruction and rehabilitation of oral and maxillofacial region. Vestibuloplasty is an excellent surgical technique for deepening oral vestibule by lowering the muscle attachments and in turn increase denture stability. It can be carried out with Conventional scalpel technique, Laser, Electrosurgery etc. **Materials and methods:** Study population included 20 patients who needed prosthetic rehabilitation and were divided into 2 groups: one treated with electrosurgery and one treated with 810nm diode laser surgery. All patients in each group were analysed after procedure with respect to post-operative wound healing and gain in vestibular depth. **Results** Data were collected and analysed statistically on 1st, 3rd, 7th and 14th post-operative day. a comparison was done Laser soft tissue healing showed significant better wound healing. No volumetric difference noted while comparing the gained vestibular depthbetween two groups, there were no significant wound shrinkage. **Conclusion** Electrosurgery can be used as an alternative technique to laser and conventional scalpel technique if used with proper knowledge. The decision regarding which modality to use is up to individual choice of surgeon.
Keywords: Vestibuloplasty, Electrosurgery, Laser.

Received: 04/05/2020 **Modified:** 22/05/2020 **Accepted:** 18/06/2020

Corresponding author: Dr. Anagha S Nath, Junior resident, Department of Oral and Maxillofacial surgery, PMS College of dental science and research, Thiruvananthapuram, Kerala 695028, India

This article may be cited as: Nath AS, LK Surej, Kurien NM. A Comparative Study using Electrosurgery and 810nm Diode Laser in Vestibuloplasty. J Adv Med Dent Scie Res 2020;8(6):101-107.

INTRODUCTION

The greatest challenge when rehabilitating fully edentulous patients is to manufacture a denture to on an alveolar ridge with advanced ridge resorption. Here comes the need and importance of the pre- prosthetic surgery for functional and aesthetic rehabilitation. The preservation of oral vestibular height, width and volume is essential for aesthetic appearance and functional competence. Since the retention, stability and support of denture depends on quality of bone and border seal, every effort should be made to preserve alveolar bone extension.[1]Vestibuloplasty is the pre-prosthetic surgical procedure designed to restore alveolar ridge heights by lowering muscle attachment on the buccal, labial, and lingual aspects of the residual ridges.[2] The first and the foremost aim of Vestibuloplasty is to provide an enlarged area of fixed tissue in the primary denture bearing area. It also attempts to improve the vestibular depth. Common procedures employed in Vestibuloplasty are secondary epithelial Vestibuloplasty, submucosal Vestibuloplasty, and grafting vestibuloplasty.[2]This prosthetic surgical procedure is performed using variety of the instruments like surgical scalpel, electrical scalpel, carbon-di-oxide laser, erbium YAG laser, and neodymium: YG laser and diode laser. The most commonly used instrument is surgical scalpel and the main disadvantage of using scalpel is the patient's fear of excessive bleeding, post-operative pain and swelling. Latest innovations help us to increase patient's compliance and increase patient comfort.[3]Since the introduction of Electrosurgery in early part of the 20th century, it has been widely used as an alternative tool for creating incisions and for

mucosal surgeries.[4] The potential benefits of Electro Surgery include unit cost is less when compared to laser, minimized bacterial infection at incision site hemostatic control with better visibility of surgical field less post-operative discomfort, less scar formation reduced chair time and increased operative efficiency, dry and rapid separation of the tissue, and a possible decreased risk of accidental injury caused by scalpel to operative personnel, cutting is consistent, and cuts are made with ease.[5]Practitioners and researchers began to find clinical oral soft tissue uses of medical carbon dioxide and Nd:YAG Lasers.[6] Diode is one of the best alternative to surgical scalpel on oral soft tissues. there is minimal post-operative pain and no sutures are needed.[7,8] While diodes include wavelengths from 800 to 1064 nm, the 810 nm devices are predominately used. There are very few studies that compare the 810nm diode laser and Electro surgery assisted surgeries and those studies have evaluated the post-operative pain and haemostasis in soft tissue surgeries. And hence aim of our study is intended to evaluate and compare the Electro Surgery using Vestibuloplasty with 810 nm diode laser assisted technique in terms of wound healing as well as vestibular height attained.

METHODOLOGY

This Prospective Study was conducted in the Department of Oral and Maxillofacial Surgery, PMS College of Dental Science & Research Centre, Thiruvananthapuram. Total 22 patients between 40 and 75 years, were selected for this study as per inclusion and exclusion criteria. (Table 1) Informed consents were obtained from them prior to the study. Detailed case history of all the patients were recorded using a standardized proforma.Among them, 2 patients didn't report for regular follow up, so we excluded them from our study. 12 patients were allotted randomly on each group (Group 1 – Electrosurgery group, where Picasso diode laser unit was used and Group 2- Laser group where Robin Electrosurgical unit was utilised). All the patients in each group were analysed over a period of 2 years after the procedure with respect to the post-operative wound healing and gained vestibular depth.

SURGICAL PROCEDURE

All patients (10 patients in each group) were randomly selected according to inclusion and exclusion criteria and were allotted to into two group- Electrosurgery group- (ES group) and Laser group (LS group). Pre-operative measurements were taken vertically from lower frenal midline to mandibular right and left canine region for standardization. Pre-operative study models were prepared. Stent was fabricated using clear acrylic.In Electrosurgery group, local anaesthesia (2% lignocaine, 1:200000 adrenaline) was administered with Standard Clark's technique. Using electrosurgical incisional knife (with a cutting power of 35watt) two vertical incisions were given from right and left canine region to desire depth and horizontal incision were given. Supraperiosteal dissection was performed till desired vestibular depth and the flap is sutured to periosteum at desired depth using 4-vicryl suture material. (Figure 1-2) Acrylic stent was placed.In Laser group same procedure were carried out with local anaesthesia (2% lignocaine, 1:200000 adrenaline). Standard Clark's techniques were followed. Using diode Laser of wavelength 810nm with power settings on one watt in continuous wave mode. After giving horizontal and vertical incision supraperiosteal dissection is performed till desired depth. (Figure 3-4) Acrylic stent was placed.Post operatively, patients were given Cap Amoxycillin 500mg thrice daily for 5 days. Tab Diclofenac potassium thrice daily for 5 days. Tab pantoprazole 40mg once daily for five days. The patients were recalled on the 1st, 3rd, 7th& 14th day postoperatively, to assess the healing status & vestibular depth. The wound healing was assessed by means of Landry, Turnbull and Howley healing index [9]& vestibular depth was assessed by using Vernier callipers. (Figure 5-8)

Table 1: Inclusion, exclusion criteria's of the study and the outcome variable expected in the study.

INCLUSION CRITERIA	EXCLUSION CRITERIA	OUTCOME VARIABLE
• Both male and female patients. • Age from 40 to 70 years. • Patients with anterior edentulous lower arch. • Vestibular depth less than 7mm. • Subjects with ASA I and ASA II.	• Mandibular vestibular height greater than 7mm. • 2. When there is minimal alveolar ridge height. • 3. Subjects with ASA III AND ASA IV.	Improved wound healing and adequate vestibular depth.

STASITICAL ANALYSIS:

Mean and Standard deviation for each measurement were calculated and Statistical analysis was done by SPSS version software version 12.0. Comparison of group was done by Mann –Whitney U test.

RESULTS

The study was completed successfully in both Electrosurgery and laser group and the results were statistically analysed between groups. No surgical complication or wound infections encountered during study. In this study 10 patients were included as per the inclusion and exclusion criteria. All these patients were analysed after Vestibuloplasty procedure done by Electrosurgery and 810nm diode laser with respect to soft tissue healing by Landry Turnbull and Howley Healing Index and gained vestibular depth by Vernier callipers.The group 1 was treated with Electrosurgery unit (Table 2) with a cutting power of 35watt continuous power and group 2 with 810nm diode Laser (Table 3). Data were collected and analysed statistically at day 1, 3rd day, 7th day and 14th day for assessing wound healing and gained vestibular depth. Data was expressed in mean and in standard deviation. Analysis of variance (ANOVA) and Mann Whitney U Test were performed as parametric test to compare different variables. For all statistical analysis, two tailed probability of value, $p<0.001$ was considered significant. (Table 4, 5 and 6). Vestibular depth analysis was also carried out on day 1, 3, 7 and 14 with the help of Vernier Callipers. (Table 7)

TABLE 2. Statistical summary of healing with Electrosurgery in DAY 1st, 3rd, 7th and 14th day.

Variables	Day 1	Day 3	Day 7	Day 14
Sample size	10	10	10	10
Lowest value	1.0000	1.0000	1.0000	2.0000
Highest value	1.0000	2.0000	2.0000	3.0000
Arithmetic mean	1.0000	1.7000	1.8000	2.4000
Median	1.0000	1.3544 to 2.0456	1.4984 to 2.1016	2.0306 to 2.7694
95% CI for the median	1.0000 to 1.0000	2.0000	2.0000	2.0000
Variance	-	0.2333	1.4750 to 2.0000	2.0000 to 3.0000
Standard deviation	-	0.4830	0.1778	0.2667

TABLE 3. Statistical summary of healing with diode laser in DAY 1st , 3rd, 7th and day 14th

Variables	Day 1	Day 3	Day 7	Day 14
Sample size	10	10	10	10
Lowest value	1.0000	1.0000	2.0000	3.0000
Highest value	1.0000	2.0000	3.0000	4.0000
Arithmetic mean	1.0000	1.8000	2.7000	3.8000
95% CI for the Arithmetic mean		1.4984 to 2.1016	2.3544 to 3.0456	3.4984 to 4.1016
Median	1.0000	2.0000	3.0000	4.0000
95% CI for the median	1.0000 to 1.0000	1.4750 to 2.0000	2.0000 to 3.0000	3.4750 to 4.0000
		0.1778	0.2333	0.1778
		0.4216	0.4830	0.4216

Table 4. Comparison of soft tissue healing between the time intervals in the Electro surgery group.
ANOVA

Source of variation	**Sum of Squares**	**DF**	**Mean Square**
Between groups (influence factor)	9.8750	3	3.2917
Within groups (other fluctuations)	6.1000	36	0.1694
Total	15.9750	39	
F-ratio	19.426	F-ratio	19.426
Significance level	P < 0.001	Significance level	P < 0.001

Table 5. Comparison of soft tissue healing between the time intervals in the Diode Laser group.
ANOVA

Source of variation	**Sum of Squares**	**DF**	**Mean Square**
Between groups (influence factor)	43.4750	3	14.4917
Within groups (other fluctuations)	5.3000	36	0.1472
Total	48.7750	39	
F-ratio	98.434	F-ratio	98.434
Significance level	P < 0.001	Significance level	P < 0.001

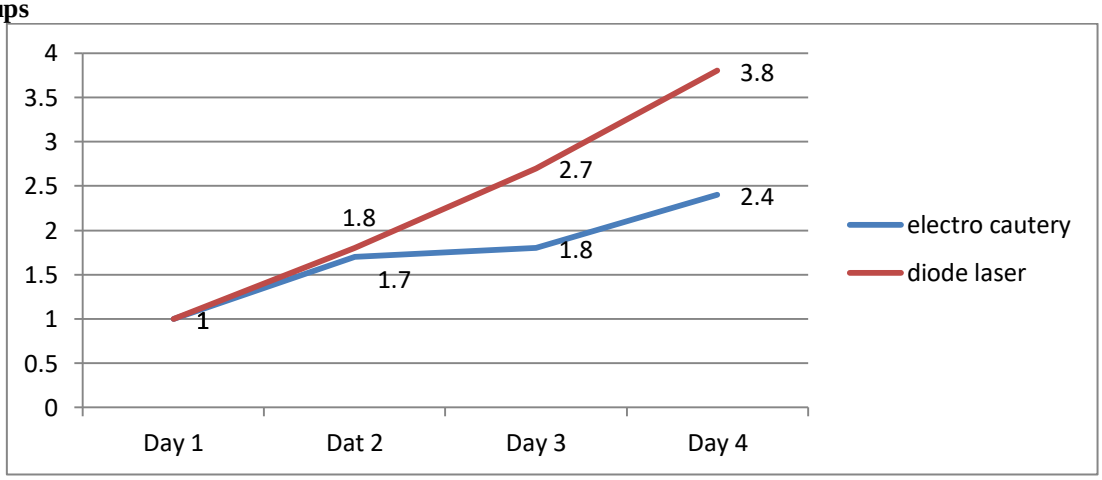
Table 6. Comparison of means between the electro cautery group and diode laser group.

Day	Hodges-Lehmann median difference	95% Confidence interval	Mann-Whitney U	Two-tailed probability
1	0.0000	0.0000 to 0.0000	50.00	
3	0.0000	0.0000 to 1.0000	45.00	P = 0.6147
7	1.0000	0.0000 to 1.0000	12.00	P = 0.0012
14	1.0000	1.0000 to 2.0000	4.00	P = 0.0002

TABLE 7. Statistical summary of vestibular depth in Electrosurgery group on day 1st, 3rd, 7th and 14th.

Variables	Day 1	Day 3	Day 7	Day 14
Sample size	10	10	10	10
Lowest value	9.0000	9.0000	9.0000	8.5000
Highest value	12.0000	12.0000	11.5000	11.5000
Arithmetic mean	10.4500	10.2000	10.1000	10.0500
Median	9.6691 to 11.2309	9.4237 to 10.9763	9.3497 to 10.8503	9.2511 to 10.8489
95% CI for the median	9.2375 to 11.5250	10.0000	10.0000	10.0000
Variance	1.1917	9.2375 to 11.5000	9.0000 to 11.5000	9.0000 to 11.5000
Standard deviation	1.0916	1.1778	1.1000	1.2472

Graph 1. Line diagram showing distribution of the index ELECTROSURGERY and DIODE LASER groups



Graph 2. Line diagram showing the distribution of mean vestibular depth in both groups across various time intervals.

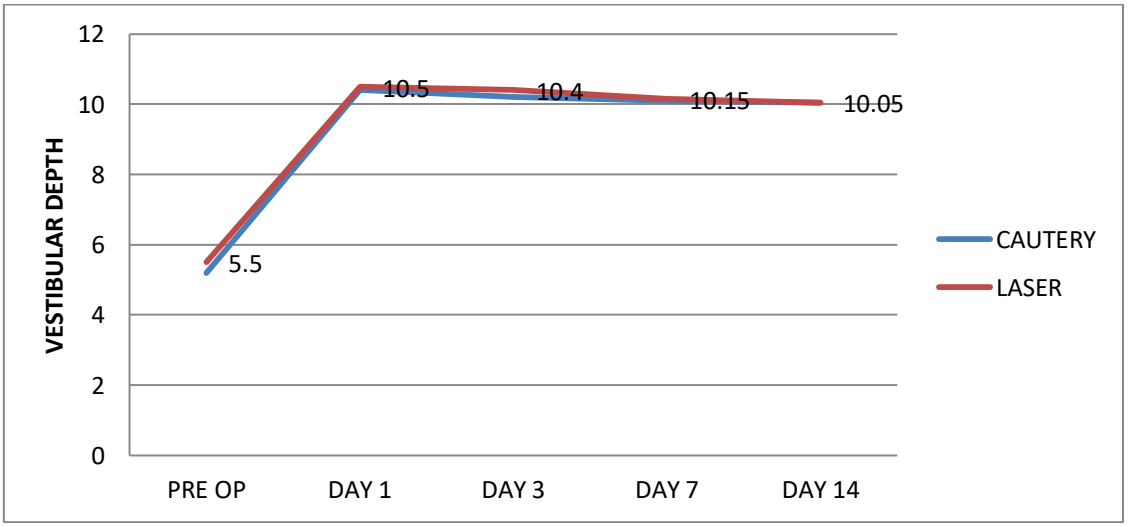


Fig 1- INTRA ORAL PHOTOGRAPH

Fig.2-SURGICAL PROCEDURE OF VESTIBULOPLASTY USING ELECTROSURGERY.

Fig. 3- INTRA ORAL PHOTOGRAPH

Fig. 4- SURGICAL PROCEDURE OF VESTIBULOPLASTY WITH LASER

Fig. 5- POST OPERATIVE SOFT TISSUE HEALING ON 14 TH DAY

Fig. 6- POST OPERATIVE MEASUREMENT OF VESTIBULAR HEIGHT ON 14 TH DAY IN MIDLINE REGION

Fig.7- POST OPERATIVE SOFT TISSUE HEALING ON 14 TH DAY

Fig. 8- POST OPERATIVE MEASUREMENT OF VESTIBULAR DEPTH IN MIDLINE

DISCUSSION

The primary goal of surgery is to achieve satisfactory post- operative results in the treatments with no or minimal intra operative complications and acceptable wound healing with optimal patient comfort. Scalpel technique is the golden standard technique; because of its ease of use, inexpensiveness and is a less time consuming process. However, excessive unnecessary cuts or incisions, blood at the site of surgery and impaired operatory site visibility are its disadvantages. Hence it is wise for an operator to use the modern bloodless field surgical technique especially if the equipment is readily available in the operatory. Laser and Electrosurgery has emerged as reliable alternative surgical tool to scalpel.From the results obtained, comparison of soft tissue healing in both laser group and Electrosurgery group were assessed. On the 1st post-operative day there was no significant difference noted in both Electrosurgery group and laser group. On clinical evaluation no difference was observed;

with a wound healing score of Grade 1 in both groups. This showed that in both techniques the initial inflammatory response of the tissue was same. On the 3rd post-operative day, the healing noted was same on the both electrosurgical and laser group with a wound healing score of Grade 2. There were no statistically significant results noted. On the 7th post-operative day, 8 patients in laser group had shown a wound healing score of 3 which is a good healing and 2 patients showed wound healing score of 2. In case of Electrosurgery group, 6 patients had shown a wound healing score of 3 and 4 patients shown a wound healing score of 2 which is a delayed healing compared to healing achieved by laser group in the same time period. It was statistically significant ($p<0.001$).On evaluating the 14th post-operative day, in laser group 8 patients had a wound healing score of 4 which means very good healing and 2 of the patients had a wound healing score of 3. In Electrosurgery group, 7 patients showed good wound healing, with a score of grade 4 and 3 patients showed a wound healing score of 3. This showed a delayed wound healing in Electrosurgery group with that of laser group in the same period. The statistical difference were noted and laser group showed significant results of ($P<0.001$). (Graph 1)In our study only 3 patients showed delay in wound healing when compared to laser. This delayed wound healing in electrosurgery group may be due to the lateral heat damage; power output and frequency, cutting stroke, waveform, selected size and shape. Bashetty *et al* and Sharma *et al* in their comparative study electrosurgical wound healing, they observed and stated that certain factors like adjusting the power output and frequency, cutting stokes, and shape and size of waveform selected.[10,11]Rajesh *et al* reported that wound healing in laser showed delay in healing and this may be due to formation of protein coagulam on wound surface.[12]Our secondary objective of our study is to evaluate the vestibular depth obtained in each group on the 7th and 14th post-operative day using Vernier Calliper. From our observation and statistical analysis, there was not much difference between both Electrosurgery group and Laser group. Intergroup analysis was done and p value of $p>0.001$. (Graph 2) Even though Electrosurgery group showed delay in wound healing in 3 patients but there was no significant reduction noted in obtained vestibular height. This clearly stated that electrosurgical wound showed less contracture of wound. Main advantages of using Electrosurgery, that we noticed during our study, Electrosurgery procedures are less time consuming, provides a bloodless area and a clear view in intraoperative field, with minimum post operative pain, swelling and less scarring and wound contracture. Keeping the cost of Laser in mind, Electro surgery unit cost only a small fraction of the price unit to perform soft tissue surgical procedures. Keeping these points in mind Electrosurgery can be used as an alternative to laser technique.

CONCLUSION

To conclude from our results, Electrosurgery can be used as an alternative to conventional scalpel technique and Laser. When a comparison is done between Electrosurgery and Laser, Electrosurgery group showed good healing with better patient compliances; Even though some cases showed delayed wound healing. This delay in wound healing may be due to the due to lack of knowledge and skill in using Electrosurgery. The wound healing of Electrosurgery varies depending on the power output, frequency of electrosurgical unit, the size and shape of the waveform selection, condition of the soft tissue and depth of the incision. If those factors are controlled there will be no significant difference can be noted between electrosurgical wound and that of laser wound. The decision regarding which modality to use is up to individual choice of surgeons. Keeping cost of laser unit in mind, electrosurgical unit cost only a small fraction of the price of laser unit to perform soft tissue surgical procedures. The decision regarding which modality to use is up to individual choice. No study is complete without understanding its drawback. Our study has its own demerits as it was a short-term study with follow up of only 14 days which feels insufficient for the long term effect of vestibular depth we also felt our sample size was very less to establish on a large population.

Acknowledgement:

I would like to thank Prof. Dr.Surejkumar L K, Guide Professor, Head of Department, Department of Oral and Maxillofacial surgery and Dr Nikhil M Kurien, Professor, Department of Oral and Maxillofacial surgery, PMS college of Dental Science and research for encouraging me to take up this research and for supporting me during the course of this study.

REFERENCES

1. Devaki VN, Balu K, Ramesh SB, Arvind RJ. Pre-prosthetic surgery: Mandible. Journal of pharmacy & bioallied sciences. 2012 Aug;4(Suppl 2): S414.
2. Chari H, Shaik KV. Preprosthetic Surgery: Review of Literature. IJSS. 2016 Sep;3(4):10.
3. Bhuskute MV, Shet RG. Preprosthetic surgery: An adjunct to complete denture therapy. Journal of the International Clinical Dental Research Organization. 2019 Jan 1;11(1):49.
4. de Carvalho Bezerra SM, de Andrade Lima E, de Andrade Lima MM, Jardim MM. Electrosurgery for Cosmetic Procedures. Chemical and Physical Procedures. 2017:1-7.
5. Funde S, Baburaj MD, Pimpale SK. Comparison between laser, electrocautery and scalpel in the treatment of drug-induced gingival overgrowth: A case report. IJSS Case Reports and Reviews. 2015 Mar;1(10):27-30.
6. Jawad MM, AbdulQader ST, Zaidan BB, Zaidan AA, AbdulQader IT, Naji AW. An overview: laser applications in dentistry. Int J Pharmacol. 2011 Feb 15;7(2):189-97.
7. Butchibabu K, Koppolu P, Mishra A, Pandey R, Swapna LA, Uppada UK. Evaluation of patient

perceptions after labial frenectomy procedure: A comparison of diode laser and scalpel techniques. European Journal of General Dentistry. 2014 May 1;3(2):129.
8. Ishikawa I, Aoki A, Takasaki AA, Mizutani K, Sasaki KM, Izumi Y. Application of lasers in periodontics: true innovation or myth?. Periodontology 2000. 2009 Jun;50(1):90-126.
9. Landry RG, Turnbull RS, Howley T. Effectiveness of Benzydiamine HCL in the treatment of periodontal post-surgical patients. Res clinic Forums. 1988;10:105-18.
10. Bashetty K, Nadig G, Kapoor S. Electrosurgery in aesthetic and restorative dentistry: A literature review and case reports. Journal of conservative dentistry: JCD. 2009 Oct;12(4):139.
11. Raghavan R, Shajahan PA, Koruthu A, Sukumar B, Nair A, Divakar KP. Second stage surgery: a clinical report comparing efficacy of laser and electrocautery. Int J Dent Res. 2014;2(1):26-8.
12. Sharma N, Sachdeva SD. A comparative study of electrosurgery and scalpel surgery. Heal Talk. 2012;5(1):36-8.