



Research Article

## COMPARATIVE EVALUATION OF PAIN PERCEPTION USING VISUAL ANALOG SCALE AMONG PATIENTS UNDERGOING GINGIVECTOMY USING LASER VERSUS USING SCALPEL METHOD

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Gingivectomy, Laser, Visual Analogue Scale

### ABSTRACT

**Aim:** The purpose of the study was to compare and evaluate pain perception using visual analog scale among patients undergoing gingivectomy using laser versus using scalpel method

**Materials & Methods:** 20 patients were included in the study and an informed consent was obtained. The patients were randomly selected to receive treatment options and following procedures were done. Group I (n=10) those who underwent gingivectomy by scalpel method Group II (n=10) -those who underwent gingivectomy by laser method All the patients were asked to mark the pain score on vas. Pain score was marked 2 hours after the procedure, the time local anesthetic effect wears off and before patient receives the first dose of analgesics and patient were recalled on the third and seventh day for the same.

**Result:** There was statistically significant difference in both the groups on day 1 and day 3. Patients in the laser group exhibited a reduction in the VAS scores on the 3rd day and the 7th day compared to the scalpel group and they were statistically significant

**Conclusion:** To conclude, the use of 940-nm diode laser in gingivectomy surgery reduces postsurgical pain and bleeding compared to the traditional method of surgery using scalpels.

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### INTRODUCTION

A major role of periodontal therapy is to re-establish anatomical and physiological conditions conducive to long term health and function of periodontium. Hyperplasia and/or overgrowth of the gingiva are rather common and related to a variety of etiologic factors and pathogenic processes, (e.g. dental plaque, mouth breathing, hormonal imbalance, medications).<sup>1</sup>

Gingivectomy is used in the elimination of suprabony periodontal pockets or pockets not extending beyond mucogingival junction. This procedure may be indicated to remove diseased tissue, for prosthetic reasons, to improve esthetics and/or establish normal gingival architecture, and to reduce probing depth of periodontal pockets.<sup>2</sup> Gingivectomy can be done using scalpel method, laser, chemosurgery, electrocautery etc.<sup>3</sup> The conventional surgery performed by a scalpel has been considered the most common method.<sup>4</sup> Scalpel method has following advantages such as: it can be easily performed with precise incision with well-defined margins and the healing is faster with minimal lateral tissue damage.<sup>5</sup> Gingivectomy using laser is gaining popularity. There are different types of lasers which are used like argon, CO<sub>2</sub>, diode, erbium, and pulsed Nd: YAG lasers.<sup>6</sup>

In particular, the diode laser is safe and useful for esthetic periodontal soft-tissue management due to its limited depth of soft tissue penetration compared to other forms of Laser.<sup>7</sup> Diode lasers provide proper hemostasis and prevent damage to the teeth and bone because of their effect range which is limited to soft tissue.<sup>8</sup> They also might improve esthetics while improving soft tissue healing.<sup>9</sup> Edema, less swelling, and faster healing are the advantages of laser usage in soft tissue management.<sup>10</sup>

Most periodontal treatments result in some degree of discomfort. The amount of pain depends upon the technique that has been used. The intensity of pain or discomfort perceived by clinicians differ dramatically between patients. The assessment of pain perception can be made by visual analog scale.<sup>11</sup> The visual analog scale (VAS) is a measurement tool that can be applied to patient's evaluation of treatment and seems to be well suited to assessing the process and outcome of periodontal treatment.<sup>3</sup> The VAS has been shown to be simple to administer, reliable, valid, and has been used to evaluate dental pain. It is a continuous outcome measure consisting of a 100-mm scale from 0 to 100 with low and high end points of no pain and worst pain.<sup>12</sup> There are studies in the literature which assess the pain perception after gingivectomy using laser and scalpel technique in orthodontic patients. Chambers CT *et al* had done a study where he has assessed post-surgical pain level after frenectomy using VAS.

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Frenectomy was done either with conventional or laser technique and the results with laser showed less pain perception than scalpel method.<sup>13, 14</sup> There are previous studies that compare pain perception using VAS scale after gingivectomy procedure in patients who were undergoing orthodontic treatment but limited literature is available in patients who have not undergone orthodontic treatment.

Hence the main aim of this study was to do comparative evaluation of pain perception using VAS among patients undergoing gingivectomy using laser and scalpel method.

## METHODOLOGY

A total of 20 patients were selected from outpatients visiting Department of Periodontology, D.A.P.M.R.V Dental College, Bangalore and an informed consent was obtained. Subjects were selected from those who were advised for gingivectomy procedures. The patients were randomly selected to receive treatment options and following procedures were done.

Group I (n=10) –Those who underwent gingivectomy by scalpel method

Group II (n=10) -Those who underwent gingivectomy by laser method

### Inclusion Criteria

1. Age group should be between 25-45 years
2. Patients of both gender
3. Patients in good systemic health
4. Patients who are undergoing gingivectomy procedures for the following reasons: gingival overgrowth, crown lengthening for restorative purposes, aesthetic purpose.

### Exclusion Criteria

1. Patients with systemic diseases contraindicating routine periodontal surgical procedures
2. Pregnant and lactating patients.
3. Smokers
4. Patients who have not taken analgesics within 24 hours of treatment.
5. Mentally challenged patients.
6. Patients with pocket of > 5mm or requiring periodontal flap procedure in the area of interest.
7. Patient suffering from chronic pain disorders like Myofascial pain dysfunction syndrome (MPDS), Arthralgia etc.

### Treatment procedure

Study groups had equal number of male and female participants. Matching was done with respect to age and gender for both the groups.

All the patients received a professional oral hygiene program with oral hygiene instructions. After two weeks patients were recalled for gingivectomy procedure.

Group A patients underwent gingivectomy using scalpel method. Topical gel was applied and local anesthesia of 2% lidocaine (1:100,000 adrenaline) was given. Scalpel (No15) was used to give external bevel incision and gingival margin

was contoured. Periodontal dressing was placed and analgesics were prescribed.

Whereas Group B patients underwent gingivectomy using laser method. Local anesthesia was given to the area to be operated and patients were treated by diode lasers with 980nm wavelength, 320 micrometer core diameter optic fiber with 0.5 W output power. During gingivectomy, the laser tip was held vertically over the gingival margin. By means of a continuous laser beam, the gingival tissue was removed. Analgesics were given.

### Assessment of pain perception using VAS (Figure 1)

VAS is a straight horizontal line of fixed length, usually 10 cm. The ends are defined as the extreme limits of the parameter to be measured orientated from the left (worst) to the right (best). Using a ruler, the score is determined by measuring the distance (mm) on the 10-cm line between the “no pain” and the patient’s mark, providing a range of scores from 0–10. The patient is asked to indicate a point along the line at the position which they feel represents their perception of their current state. A higher score indicates greater pain intensity. The following cut points on the pain VAS have been recommended: no pain (0), mild pain (1-3cm), moderate pain (4–6 cm), and severe pain (7–10 cm)

All the patients were asked to mark the pain score on VAS. Pain score was marked after 2 hours after the procedure by the time local anesthetic effect wears off and before patient receives the first dose of analgesics and patient were recalled again on the third and seventh day for the same. Collected data were tabulated and analyzed statistically.

## RESULTS

This study was undertaken to comparatively evaluate pain perception using visual analog scale among patients undergoing gingivectomy using laser versus using scalpel method

The groups were as follows

**Group I (N=10)** –Those who underwent gingivectomy by scalpel method.

**Group II (N=10)** -Those who underwent gingivectomy by laser method.

Then Assessment of pain perception using VAS was done The results of the study are as follows and is shown in (Table 1 Graph 1 and 2)

1. Gender distribution (Table 1 Graph 1) - Total 20 patients were selected, of which 10 were male patients (50%) and 10 were female patients (50%)
2. Age distribution (Table 1 Graph 2)- Of the selected 20 patients, mean age distribution of patients was 26- 45 years.

### List of Tables and Graphs

Age and gender distribution among study subjects (Table 1)

Variable	Category	SCALPEL		LASER		p- value
		Mean	SD	MEAN	SD	
Age	Mean and SD	32.8	4.47	35.60	6.02	0.29 <sup>a</sup>
	Range	26-39		28-45		
	N	%	N	%	p- value	
Sex	Males	5	50%	5	50%	1.00 <sup>b</sup>
	Females	5	50%	5	50%	

- Independent Student t Test
- Chi Square Test

**Intra group comparison**

Comparison of mean VAS Scores b/w diff. time intervals in Scalpel group using Friedman's test followed by Wilcoxon Signed Rank Post hoc Test (Table 2)

Time	N	Mean	SD	Min	Max	P-Value <sup>a</sup>	Sig. Diff	P-Value <sup>b</sup>
Day 1	10	3.30	0.68	2	4		D1 vs D3	0.004*
Day 3	10	0.80	0.79	0	2	<0.001*	D1 vs D7	0.004*
Day 7	10	0.00	0.00	0	0		D3 vs D7	0.02*

a- Independent Student t Test  
b- Chi Square Test

P value <0.05 \* - Statistically Significant

Comparison of mean VAS Scores b/w diff. time intervals in Laser group using Friedman's test followed by Wilcoxon Signed Rank Post hoc Test (Table 3)

Time	N	Mean	SD	Min	Max	P-Value <sup>a</sup>	Sig. Diff	P-Value <sup>b</sup>
Day 1	10	1.10	0.99	0	3		D1 vs D3	0.01*
Day 3	10	0.20	0.42	0	1	0.001*	D1 vs D7	0.02*
Day 7	10	0.00	0.00	0	0		D3 vs D7	0.16

a. Independent Student t Test  
b. Chi Square Test  
P value <0.05 \* - Statistically Significant

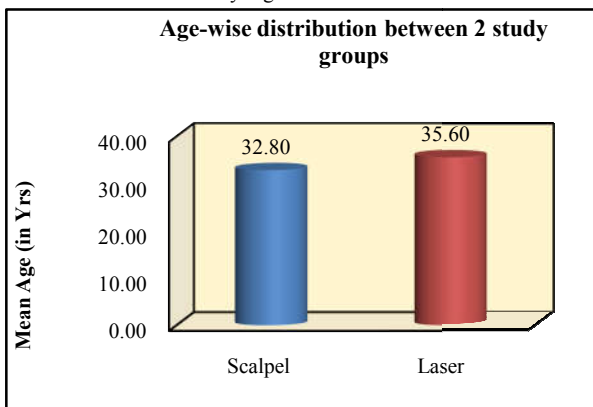
**Inter group comparison**

Comparison of mean VAS Scores between 2 groups at different time intervals using Mann Whitney Test (Table 4)

Time	Groups	N	Mean	SD	Mean Diff	P-Value
Day 1	Scalpel	10	3.30	0.68	2.20	<0.001*
	Laser	10	1.10	0.99		
Day 3	Scalpel	10	0.80	0.79	0.60	0.04*
	Laser	10	0.20	0.42		
Day 7	Scalpel	10	0.00	0.00	0.00	1.00
	Laser	10	0.00	0.00		

a- Independent Student t Test  
b- Chi Square Test

P value <0.05 \* - Statistically Significant

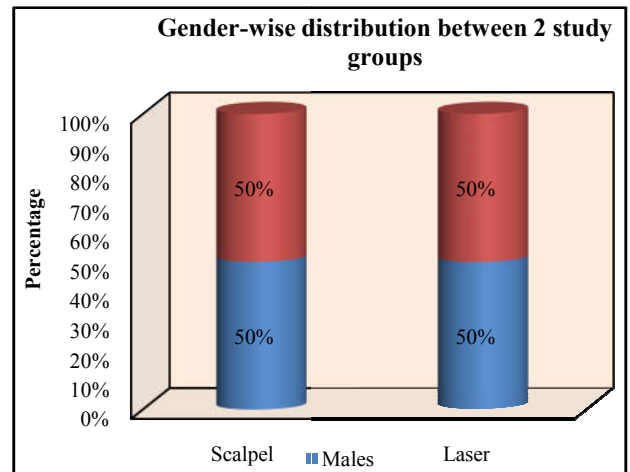


**Graph 1**

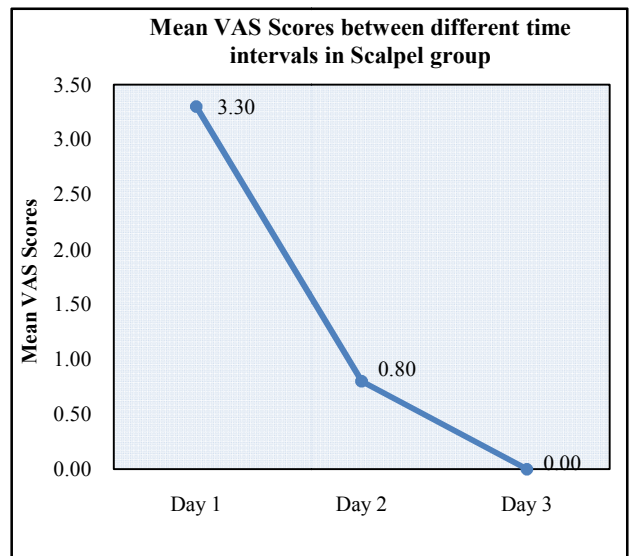
**Intra group Comparison of VAS score**

Group A (Scalpel technique) (Table 2, Graph 3):

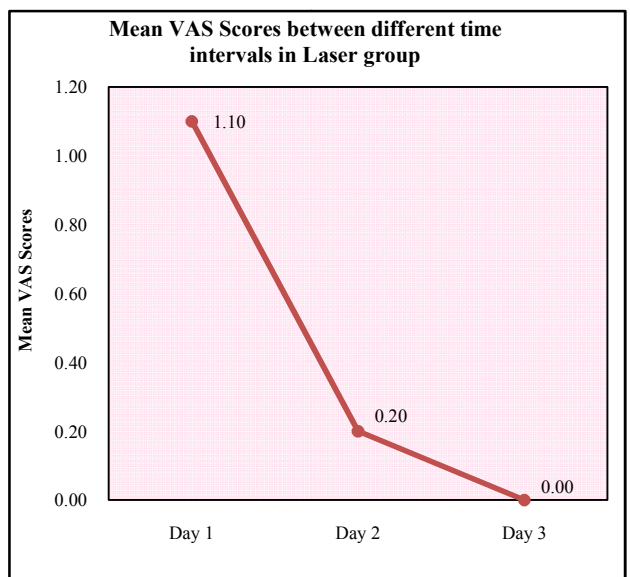
The VAS scores in Group A at 1<sup>st</sup>, 3<sup>rd</sup> and 7<sup>th</sup> day were 3.30± 0.68, 0.80± 0.79 and 0.00 ± 0 respectively. When mean VAS were compared among different time intervals there was statistically significant difference seen. (P value <0.001) When mean VAS scores were compared between day 1 and day 3, day 1 and day 7 and day 3 and day 7 a statistically significant differences were seen. (P value <0.001)



**Graph 2**



**Graph 3**

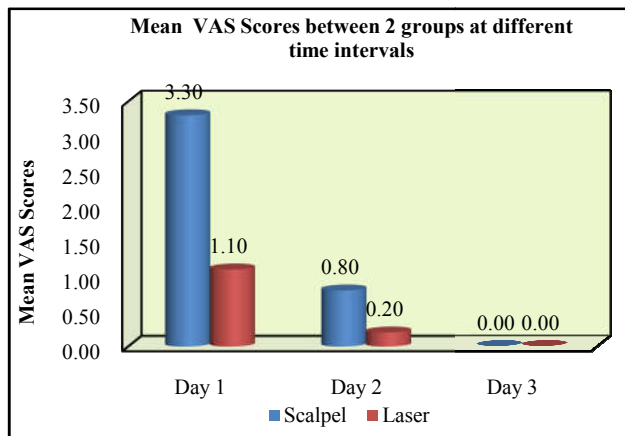


**Graph 4**

Group B (Laser technique) (Table 3 Graph 4):

The VAS scores in Group B at 1<sup>st</sup>, 3<sup>rd</sup> and 7<sup>th</sup> day were 1.10± 0.99, 0.20± 0.42 and 0 respectively. When mean VAS were compared among different time interval there was statistically significant difference seen. (P value <0.001) When mean VAS

scores were compared between day 1 and day 3, day 1 and day 7 a statistically significant differences were seen. However, there was no statistical significant difference seen between Day 3 and Day 7 (p value -0.16).



Graph 5

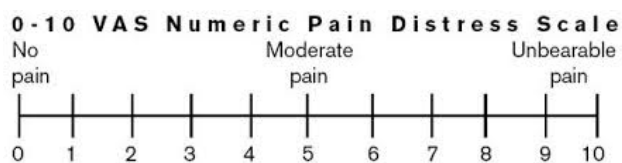


Figure 1



Figure 2 Gingivectomy Instruments



Figure 3 Pre-Operative Pic



Figure 4 Bleeding Points Marked



Figure 5 Post-Operative Pic

Group II (Laser Method)



Figure 6 Diode Laser



Figure 7 Diode Laser And Instruments



Figure 8 Pre-Operativepic



Figure 9 Passing Diode Laser On 14





Figure 10 Pre Operative PIC



Figure 11 Laser Gingivectomy



Figure 12 Post Operative PIC

Inter group comparison of group A and B (Table 4, Graph 5):

The mean VAS scores on day 1 between group 1 and group 2 were  $3.30 \pm 0.68$  and  $1.10 \pm 0.99$ , day 3 were  $0.80 \pm 0.79$  and  $0.20 \pm 0.42$  and day 7 it was 0 respectively. There was statistically significant difference on day 1 and day 3. However, there was no statistical significant difference on day 7. (p value 1.00)

## DISCUSSION

To improve the quality of pain management and to evaluate new pain management techniques, pain must be measured, the results analyzed, and changes assessed for clinical significance. It is the latter task, the assessment of clinical significance, that poses the biggest challenge. Because of its characteristics of practicality, reproducibility, sensitivity to treatment effects, and ease of analysis, the method commonly used for measuring pain is the VAS.<sup>1</sup>

Gingivectomy can be performed by different means such as scalpels, electrosurgery, chemosurgery, and laser. The conventional surgery performed by a small scalpel has been considered the most common method.<sup>1-3</sup>

However, the long healing time and postsurgical high level pain of this treatment may cause patient discomfort with conventional gingivectomy procedures.

Gingivectomy can be performed easily with or without anesthesia with diode laser.<sup>4</sup> Diode lasers can provide hemostasis, less postoperative pain and swelling reduce the

infection risk, and may improve aesthetics and accelerate recovery time while soft tissue healing. Laser therapy provides patient acceptance.<sup>5</sup>

Diode laser is a near infrared type laser which with a wavelength ranging from 800 nm to 980 nm.<sup>4</sup> All laser wavelengths are suitable for gingivectomy procedure but it is always important to use the correct wavelength for the specific tissue biotype. 810 nm diode lasers have a very gentle incision procedure in soft tissue with cutting depth 2-6 mm.<sup>6</sup> Diode laser have a very good surgical and hemostatic action on soft tissues following frenectomies, crown lengthening and recontouring of gingival enlargement.<sup>7-9</sup>

Deciding whether to do a conventional gingivectomy by scalpel or to use laser depends on many factors, in our study we compared between the two methods.<sup>10</sup>

Pain is one of the most important and common postoperative complications, that may cause intolerance on the patient for the surgical quality.<sup>11</sup> Pain is a personal and subjective experience, influenced by cultural learning and by psychological variables. Because it is quite complex, measuring it does not always show high agreement. To measure pain, a numerical scale of self-classification, a scale of observation of behavior or of physiological responses is needed (Katz & Melzack, 1999). Pain control, so important in dental procedures, is another beneficial effect of using laser therapy.

There are various scales which are used for assessing pain in the field of dentistry such as<sup>12</sup> Visual Analogue Scales (VAS), Heft-Parker visual analog scale (HPS), Verbal rating scale (VRS), Numerical rating Scale (NRS), Faces Pain Scale (FPS), Wong-Baker Faces Pain Rating Scale (WBS), Full Cup Test (FCT).

The VAS is the most common scale to evaluate postoperative pain. The VAS scale comprised of a 10cm scale with "0" indicated as "no" and 10 representing "plenty". The two end points on the pain scale represented "no pain" on the left and "plenty of pain" on the right side. The discomfort scale was represented by "no discomfort" on the left and "plenty of discomfort" on the right. Patients were instructed to make a vertical mark between these two end points on the pain as well as the discomfort scale separately on the 3rd, 7th and the 10th days.

Bijur *et al.* found that the VAS was a highly reliable tool for assessing acute pain in adults.<sup>13</sup> Garra *et al.* demonstrated that the VAS was also more informative and relatively sensitive to changes in pain, compare to other ordinal scales.<sup>14</sup>



Our present clinical study was to evaluate pain perception using visual analog scale among patients undergoing gingivectomy using laser versus using scalpel method Various lasers such as Nd: YAG, Er, Cr: YSGG, Er: YAG and diodes have been used for gingivectomy. There are few studies in the literature which assess the pain perception after gingivectomy using laser and scalpel technique in orthodontic patients. There was another study in which frenectomy was done using conventional technique and carbon dioxide laser. The

postsurgical pain level was recorded using visual analog scales. The results with laser showed less pain perception than scalpel method.<sup>13,14</sup>

There are previous studies that compare pain perception using VAS scale after gingivectomy procedure in orthodontic patients but limited literature is available in non-orthodontic patients. Hence the main aim of our study is to do comparative evaluation of pain perception using VAS among patients undergoing gingivectomy using laser and scalpel method.

Various lasers with specific wavelengths were used for soft tissue and hard tissue crown lengthening procedures. We preferred a diode laser considering them to be compact and cost effective and owing to the fact that these lasers have a better penetration depth with better absorption for melanin and hemoglobin with relatively better hemostasis compared to other lasers. Other advantages of the laser over scalpel include a reduced edema due to the sealing of lymphatic vessels and less wound contraction as well as scarring (Vescovi *et al.*, 2010).<sup>21</sup>

A total of 20 patients were enrolled for this study, of which 10 were male patients and 10 were female patients. Of the selected 20 patients, mean age distribution of patients was 26-45 years. Hence, in this study, patients with similar age groups were considered to avoid bias.

Beaudette *et al* demonstrated statistically significant difference in pain perception in older individuals experiencing decreased pain perception. Age is one of the biological factors that has been discussed as important for pain experience. Elderly people are usually more tolerant to pain. The reason for higher pain threshold in elderly subjects may be the consequence of biological phenomenon of tissue changes such as reduced vascularity, fatty degeneration of bone tissue, and secondary dentine formation.<sup>15</sup>

This study assessed to comparatively evaluate pain perception using visual analog scale among patients undergoing gingivectomy using laser versus using scalpel method on the 1<sup>st</sup>, 3<sup>rd</sup> and 7<sup>th</sup> day.

Comparing both the laser and the scalpel techniques, indeed both the techniques resulted in sufficient removal of the gingival tissue with adequate exposure of the tooth structure. Patients in the laser group had minimal bleeding which permitted better visualization of the operative area and better assessment of the necessary tooth structure to be exposed whereas the scalpel wound resulted in unpleasant bleeding with poor visualization of the operative area. Our findings were in accordance with Lagdive SB *et al.* (2010).<sup>19</sup>

In Laser gingivectomy we found that the pain post-operatively was less compared to the pain in conventional gingivectomy this could be attributed to the fact that laser aids in the deposition of a protein coagulum which acts as a biological dressing sealing the sensory nerves and making the wound sterile with less inflammation, reduced bacteremia and pain according to the studies in the literature.<sup>17,18</sup>

A VAS scale was used to assess the patient perceptions for pain and discomfort between both the groups. Patients in the laser group exhibited a reduction in the VAS scores on the 3<sup>rd</sup> day and the 7<sup>th</sup> day compared to the scalpel group primarily because lasers deposit a protein coagulum sealing the sensory

nerves leading to a reduction in inflammation (Hoopingarner, 2008).<sup>20</sup>

Patients in laser group showed lesser VAS score at 3<sup>rd</sup> and 7<sup>th</sup> day compared to scalpel group due to the deposition of a protein coagulum which acts as a biological dressing sealing the sensory nerves.

## CONCLUSION

To conclude the use of 940-nm diode laser in gingivectomy surgery reduce postsurgical pain and bleeding compared to the traditional method of surgery using scalpels. Laser-assisted surgery might also reduce the need for suturing and patients' demand for analgesics. There is a clinically significant difference in pain perception following surgery and in parameters during early healing which are not seen in the later stages of healing.

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