

## Gingivectomy by different Techniques - A Comparative Analysis

Research Article

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### Abstract

Gingivectomy is a surgical procedure of excising the unsupported gingival tissue to a level where it is attached and creating a new gingival margin that is apical to the old position. Gingivectomy can be performed using scalpels, electrosurgery and laser. The aim of the research was to compare the different methods of gingivectomy and its influence on post operative healing. Data was collected retrospectively from the patients' records of dental hospitals. The sample included patients who had undergone gingivectomy. The post operative healing was recorded using the healing index. Descriptive statistics, cross-tabulation and chi-squared tests were done using IBM SPSS software version 20.0. From the study it was found that the most commonly preferred technique was laser gingivectomy. Laser gingivectomy showed better postoperative healing. Postoperative complications were common in surgical gingivectomy. It was also found that in laser gingivectomy, predominantly topical local anaesthesia was used. Within the limits of the present study it can be concluded that the most preferred technique for gingivectomy was the laser technique. Laser gingivectomy required less injectable anaesthesia and had better postoperative healing as compared to surgical and electro surgery techniques.

**Keywords:** Laser Gingivectomy; Surgical Gingivectomy; Electro Surgery; Postoperative Complication; Postoperative Healing; Local Anaesthesia.

### Introduction

Gingivectomy is one of the oldest treatment methods for elimination of pockets in patients with periodontitis. Periodontitis is a chronic multifactorial disease characterized by host mediated inflammatory destruction of the periodontal tissue by dysbiotic-plaque biofilm [1-4]. It may not only cause changes in the gingival architecture but also increase the systemic inflammatory burden and oxidative stress with [5-9]. Gingivectomy is done mainly as a part of periodontal treatment and also done for crown lengthening for restorative purpose and as a part of smile designing.

Gingivectomy is a surgical procedure of excising the unsupported gingival tissue to a level where it is attached and creating a new gingival margin that is apical to the old position. While performing a gingivectomy the biological width should not be violated

[10]. The width is important to maintain gingival health and encroaching on it may lead to different consequences such as a gingival recession or gingival rebound [11, 12].

Gingivectomy can be performed through different methods using scalpels, electrosurgery and laser. The conventional surgery, performed by a scalpel is the most common method. However, the long healing time and post surgical high level pain of the treatment may cause patient discomfort [13, 14]. Another important side effect of conventional gingivectomy procedures is the excessive bleeding during the surgery [15]. This bleeding limits the convenience of the surgeon and lowers the success rate of the surgery. Nevertheless, the conventional technique can be performed easily and a precise incision with well defined margins can be given with minimum lateral tissue damage [16].

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Electrosurgery provides excellent haemostasis during surgery but thermal damage to adjacent tissue is one of the drawbacks. Recently laser is used for gingivectomy due to its reduced patient discomfort and better hemostasis, less postoperative pain, better patient acceptance and reduced rate of recurrence [17, 18]. Comparison of diode laser with conventional surgery showed that the patients treated with the laser required less infiltration anaesthesia, presented reduced bleeding during and after surgery, showed rapid postoperative hemostasis, and an improved postoperative comfort [19].

Healing after the gingivectomy procedure is an important factor influencing the success of the treatment. It is known that platelets affect wound healing by integrating complex cascades between their mediators, which include multiple cytokines, transforming growth factors [20] platelet growth factors, and vascular endothelial growth factors [21, 22]. Additionally, activated platelets release many substances that promote tissue repair. Accordingly, the ability of platelets to form fibrin clots has been clinically utilized to promote healing [23, 24]. Influence of various techniques on healing is also important in choosing the method of gingivectomy.

With the knowledge of merits and demerits the aim of the study was to find the preferred gingivectomy method; to evaluate the type and amount of anaesthesia used in various types of gingivectomy and to compare the postoperative healing after various types of gingivectomy.

## Materials And Methods

This was a retrospective study that involved the patients who visited a dental hospital in Chennai from July 2019 to March 2020. Ethical approval was granted by the Institutional Ethical Committee of the university. Data was collected from the 86000 patients' record of digital record management systems from which 393 case records were included based on the inclusion criteria. The inclusion criteria was patients who underwent gingivectomy by different techniques. To minimise bias, all data were included using consecutive sampling techniques. Cross verification was done using preoperative, intra operative and postoperative digital photographs available in the digital record system. Variables such as age, gender, type of gingivectomy technique performed and type and amount of local anaesthesia used in each technique were recorded. To evaluate the postoperative healing, the digital photographs taken one week postoperatively were used. The healing was graded by a single calibrated trained examiner using the healing index described by Mandadi et al. The healing index was categorized into a score of 1-5 with the interpretation as very poor, poor, good, very good, excellent based on the tissue colour, presence of granulation tissue as well as the appearance of the incision margin [25]. Postoperative complications were noted from the one week post operative notes. Healing index was also cross verified with the postoperative notes.

Total of 393 patients were included for the study and case records with incomplete information were excluded for the respective analysis. Thus all 393 were included to find out the most commonly used gingivectomy technique. To compare the type of local anaesthesia used in different techniques, 372 patients were included. To compare the amount of local anaesthesia used between the techniques, 366 patients were included. 53 patients were

included for the analysis of the post operative healing and the postoperative complications. Data was analyzed using IBM SPSS version 20 (IBM Corporation, New York USA). To establish a relationship between the categorical variables, a Chi-square test was used. Descriptive statistics was done to find the difference in the amount of local anaesthesia used and the techniques preferred based on age and gender. Analytical statistics was done to find the relationship between local anaesthesia and type of technique. It was also used to find the significance between the technique/type of local anaesthesia used and the post operative healing and complications.

## Results And Discussion

The overall objective of the present study was to evaluate the most commonly used gingivectomy technique, compare the type and amount of local anaesthesia used in different types of gingivectomy techniques and evaluate and compare the postoperative healing and postoperative complications between the different techniques.

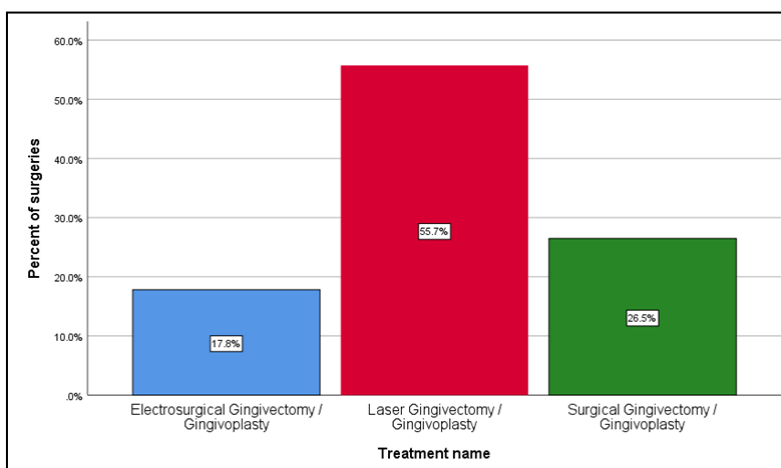
A total of 393 patients with 49% females and 51% males between the age groups 15-78 years were included in the study. The results of the study revealed that among the three types of gingivectomy techniques followed, 55.7% underwent laser gingivectomy, 26.5% underwent surgical gingivectomy and 17.8% underwent electro-surgical gingivectomy. Results revealed that laser gingivectomy was the most preferred technique. (Graph 1).

It was found that laser gingivectomy was more commonly used due to its precise cutting efficiency, reduced bleeding during the procedure. It was also found to be operator friendly [26]. It was also reported that bulky and deep gingival overgrowth can be better treated with electrosurgical gingivectomy but a foul odour was seen.

While analysing the postoperative healing after one week, we observed a variability in the healing index between different gingivectomy techniques. Among all the patients, in electrosurgical gingivectomy 50% had a very good healing index, 10% had good healing index, 40% had poor healing index. In laser gingivectomy 35.7% had a very good healing index, 59% had good healing index, 7.1% had poor healing index and 7.1% had very poor healing index. In surgical gingivectomy 17.2% had a very good healing index, 41.3% had good healing index, 31% had poor healing index and 10.3% had very poor healing index. It is found that the laser gingivectomy had better healing index than the other two techniques. On statistical analysis the difference was found to be significant with the p value <0.01. (Table 1, Graph 2).

In this study it was found that laser gingivectomy recorded a better healing index which was followed by that of electrosurgical gingivectomy. According to Amorim et al., [27] laser gingivectomy and electrosurgical gingivectomy had better postoperative healing. This finding indicates that higher collagen production leads to a better remodelling of the connective tissue and a reduction of the probing depth. The reduction of the probing depth in the early stages of healing is a very positive finding, because it makes it easier for the patient to keep the area clean, allowing better oral hygiene. The interaction of laser wavelength and energy density of the electrocautery will allow simultaneous cutting and coagula-

Graph 1. Bar chart shows the percentage of the different types of gingivectomy techniques performed. X axis represents the type of gingivectomy technique and y axis denotes the percentage of surgeries. It shows that laser gingivectomy (red) is the most preferred technique followed by surgical technique (green) and the least preferred is electro surgery (blue).



Graph 2. Bar chart shows the healing index of three different gingivectomy techniques. X-axis shows the various grades of healing index and Y-axis denotes the percentage of surgeries. This shows that overall laser gingivectomy had better healing index followed by electro-surgery. Statistically significant difference was found in the healing index between different gingivectomy techniques. (p value <0.0001)

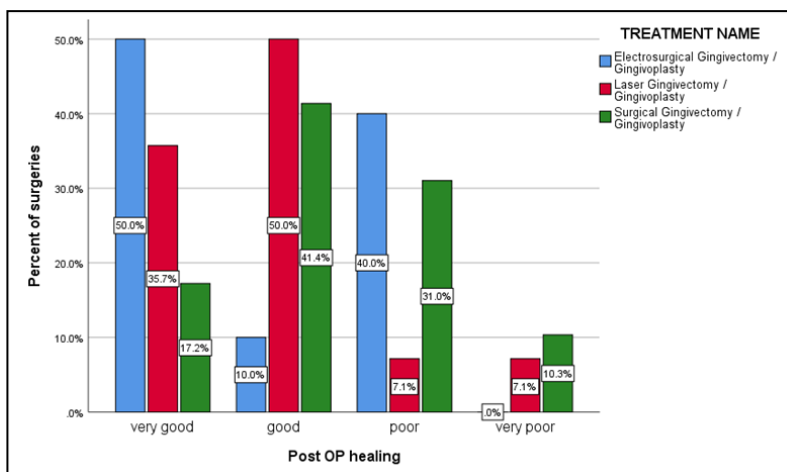


Table 1. Comparison of healing index between the gingivectomy techniques. This shows that laser gingivectomy had better healing index. There was a significant difference in healing index between different gingivectomy techniques. (p<0.0001).

| Treatment name               | HEALING INDEX |              |            |             | Total      | Pearson chi square test |    |                                  |
|------------------------------|---------------|--------------|------------|-------------|------------|-------------------------|----|----------------------------------|
|                              | Very good     | Good         | Poor       | Very poor   |            | Value                   | df | Asymptotic significance(2-sided) |
| Electrosurgical Gingivectomy | 5<br>50%      | 1<br>10%     | 4<br>40%   | 0<br>0      | 10<br>100% |                         |    |                                  |
| Laser Gingivectomy           | 5<br>35.70%   | 7<br>59%     | 1<br>7.10% | 1<br>7.10%  | 14<br>100% | 38.66                   | 8  | 0.000                            |
| Surgical Gingivectomy        | 5<br>17.20%   | 12<br>41.30% | 9<br>31%   | 3<br>10.30% | 29<br>100% |                         |    |                                  |
| Total                        | 15            | 20           | 14         | 4           | 53         |                         |    |                                  |

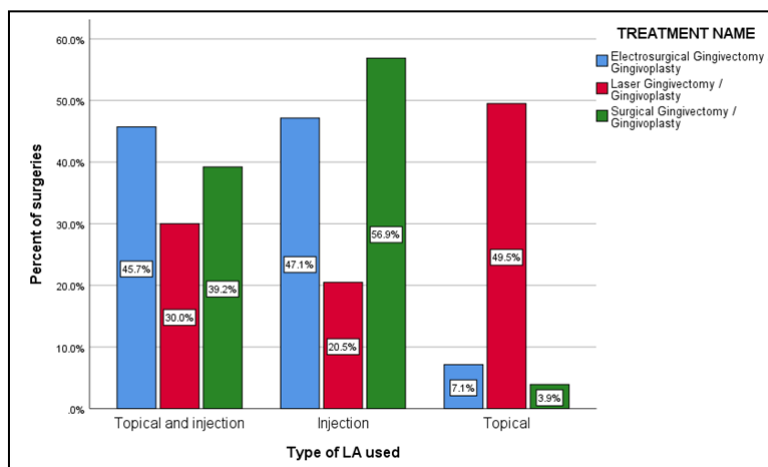
tion of tissue in lasers and electro surgical gingivectomy. The electrocautery achieves much lower temperatures, therefore, it does not cause carbonization of all the tissues removed, which does not cause any cell disruption at the lesion margins, promoting new cell formation. There was a significant relationship between the type of gingivectomy and the healing index, p<0.01.

We also compared the type of local anaesthesia used in these three gingivectomy techniques. In electro-surgical gingivectomy and surgical gingivectomy, the types of anaesthesia used were either injections or injections along with topical anaesthesia, whereas in laser gingivectomy nearly 50% of cases were done only with topical local anaesthesia. A significant relationship was found between the type of local anaesthesia used and the gingivectomy technique,

**Table 2.** Comparison of the local anaesthesia usage between different gingivectomy techniques. It was found that predominantly topical local anaesthesia was used in laser gingivectomy whereas in surgical and electro-surgical techniques mostly injection was used. There was a significant difference in type of LA between different gingivectomy techniques. (p<0.0001)

| Treatment name               | Type of local anaesthesia used |              |                       | Total       | Pearson chi square test |    |                         |
|------------------------------|--------------------------------|--------------|-----------------------|-------------|-------------------------|----|-------------------------|
|                              | Topical                        | Injection    | Topical and Injection |             | Value                   | df | Asymptotic significance |
|                              |                                |              |                       |             |                         |    | (2-sided)               |
| Electrosurgical Gingivectomy | 5<br>7.10%                     | 33<br>47.10% | 32<br>45.70%          | 70<br>100%  | 95.19                   | 4  | 0                       |
| Laser Gingivectomy           | 99<br>49.50%                   | 41<br>20.50% | 60<br>30%             | 200<br>100% |                         |    |                         |
| Surgical Gingivectomy        | 4<br>3.90%                     | 58<br>56.80% | 40<br>39.20%          | 102<br>100% |                         |    |                         |
| Total                        | 132                            | 132          | 108                   | 372         |                         |    |                         |

**Graph 3.** Bar chart shows the type of local anaesthesia used in three different gingivectomy techniques. X-axis shows the type of Local Anaesthesia used in each technique and Y-axis denotes the percentage of surgeries. Predominantly topical local anaesthesia alone was used in laser gingivectomy (red) whereas in surgical (green) and electro-surgery (blue) injection or injection along with the topical were used. On statistical analysis with chi square test, significant difference was seen in type of LA usage between different gingivectomy techniques. (p <0.0001).



p<0.01. (Table 2, Graph 3). In this study we observed that topical local anaesthesia was predominantly used in laser gingivectomy.

It was also found that less amount of local anaesthetic was used in electro-surgical gingivectomy compared to surgical gingivectomy. The difference between the groups for anaesthesia requirements was found to be statistically significant. In the study by Oncu et al [28] topical anaesthesia was used in 70% of the patients undergoing laser gingivectomy. However, all the patients in the conventional group wanted extra infiltrated anaesthesia. This is because of the less intra operative pain, reduced swelling, discomfort, excellent haemostasis and accelerated recovery time. There was less tissue sticking to the cautery tip in the electro-surgical technique and only superficial ablation of the tissue was done. Thus, less amount of local anaesthesia was required [29].

On comparison of the amount of local anaesthetic usage between three techniques, the surgical gingivectomy technique showed higher usage of anaesthetic vials with the mean value of 1.2 ± 0.003, followed by the electro-surgical technique with the mean value 1 ± 0.005 and the laser gingivectomy technique with the least mean value of 0.6 ± 0.002. On statistical analysis using the

One way ANOVA test, the difference was found to be significant (p value=0.000) (Table 3 and Graph 4).

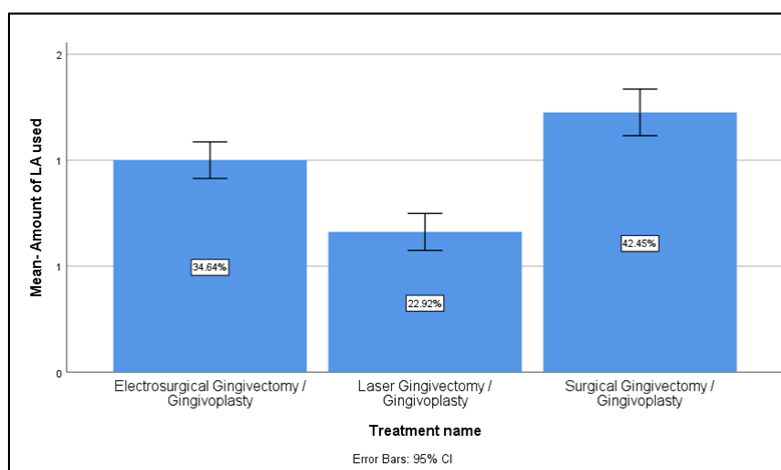
The study showed that less amount of local anaesthetic vials were used in laser gingivectomy compared to the other techniques. This is because of the photo ablation effect which will increase the lymphatic flow and reduce the stress of the tissue which will lower the pain values [30]. On comparison with surgical technique, electro-surgery also required less amount of local anaesthetic vials even though it was more than laser technique. In electro-surgical gingivectomy, rapid cell vaporization with loss of intracellular fluid, chemical mediators and denaturation of intracellular substance and protein is seen resulting in a less intense local inflammatory response and consequently less pain and oedema. Therefore, less amount of local anaesthesia is required to perform laser surgery as well as electro-surgical gingivectomy in comparison to scalpel surgery [10, 31].

The postoperative complications between three techniques were also analysed. Overall the percentage of complications was very less. Among the three methods, 13.7% of cases with postoperative complications as ulcers were reported by surgical gingivectomy

**Table 3.** Comparison of mean of local anaesthesia vials usage between three techniques. Less amount of local anaesthetic was used in laser Gingivectomy followed by electro surgery. . There was a significant difference in the amount of LA used between differentgingivectomy technique (p value<0.001).

| Treatment name               | Amount of Local Anaesthesia used |          | 95% Credible Interval |             | ANOVA |         |              |
|------------------------------|----------------------------------|----------|-----------------------|-------------|-------|---------|--------------|
|                              | Mean                             | Variance | Lower bound           | Upper bound | df    | p value | Bayes factor |
| Electrosurgical gingivectomy | 1                                | 0.005    | 0.863                 | 1.137       | 22.56 | 0       | 2.48E+11     |
| Laser gingivectomy           | 0.662                            | 0.002    | 0.583                 | 0.741       |       |         |              |
| Surgical gingivectomy        | 1.225                            | 0.003    | 1.115                 | 1.336       |       |         |              |

**Graph 4.** Bar graph with the error bars shows the comparison of the amount of local anaesthetic vials usage between three techniques. X-axis shows the different types of gingivectomy technique and Y-axis denotes the amount of Local Anaesthetic vial used in each technique. The error bars denote the confidence interval at 95%. It was observed that there was a difference in local anaesthetic vial usage between three techniques. Laser gingivectomy shows significantly less amount of LA vial usage than the other two techniques.(p value <0.0001).



**Table 4.** Comparison of the postoperative complications between three techniques. 13.7% of cases in surgical gingivectomy had complication. Chi squared test comparing the postoperative complications between threegingivectomy techniques revealed Significantly more complications for surgical gingivectomy than other techniques (p<0.0001).

| Treatment name               | Postoperative complications |        | Total | Pearson chi square test |    |                                   |
|------------------------------|-----------------------------|--------|-------|-------------------------|----|-----------------------------------|
|                              | Nil                         | Ulcer  |       | Value                   | Df | Asymptotic significance (2 sided) |
| Electrosurgical Gingivectomy | 10                          | 0      | 10    | 3.58                    | 2  | 0                                 |
|                              | 100%                        | 0      | 100%  |                         |    |                                   |
| Laser Gingivectomy           | 14                          | 0      | 14    |                         |    |                                   |
|                              | 100%                        | 0      | 100%  |                         |    |                                   |
| Surgical Gingivectomy        | 25                          | 4      | 29    |                         |    |                                   |
|                              | 86.20%                      | 13.70% | 100%  |                         |    |                                   |
| Total                        | 49                          | 4      | 53    |                         |    |                                   |

alone. No complications were reported in other two techniques (Table 4). On statistical analysis the variability in the postoperative complication between the three techniques was significant.

According to the present study, surgical gingivectomy had postoperative complications in the form of ulcers. In the study by Rafiuddin et al., [32] the most common postoperative complications caused by surgical gingivectomy were open gingival embrasures and root resorption. The completed electromagnetic cycle of the

instrument helps in reducing the potential for postoperative infection.

The limitations of the study was that since it was a retrospective study based on case records the pain experienced by the patient for each gingivectomy technique was not studied. Dentist difficulties in performing each technique were not assessed. Since different gingivectomy sites were studied, there is a limitation in knowing the preference of the technique. Only the short term

gingival wound healing (one week postoperatively) was assessed and long term healing and complications were not analysed in the study. The large sample size of this study to a certain extent could minimise the influence of these limitations. Moreover this study evaluated the three major techniques used for gingivectomy not only in the healing aspect but also in the amount and types of local anaesthetic usage which gives a comprehensive comparison. The results of the study favours laser technique for gingivectomy. Future long term controlled trials are needed to validate our results.

## Conclusion

Within the limits of the present study it can be concluded that the most commonly preferred technique for gingivectomy was the laser technique. Laser gingivectomy had better postoperative healing and it required less injectable anaesthesia.

## Authors Contributions

First author (Keerthana R) performed the analysis, and interpretation and wrote the manuscript. Second author (Sheeja S. Varghese) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Third author (Manjari Chaudhary) participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

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