Original Article

Comparison of Anaesthesia use, Posto-perative Healing and complications Across Surgical, Electrosurgical, and Laser Gingivectomy: A Prospective Clinical Study

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ABSTRACT

OBJECTIVE: To compare gingivectomy methods based on the type & amount of anesthesia and healing after various gingival procedures.

METHODOLOGY: In this prospective study data was collected from the OPDs of Bahria University of Health Sciences, and Dow University of Health Sciences, Karachi, from March 2023 to February 2024. 80 patients aged 15-75 years underwent gingivectomy for different background causes were included. Patients with any systemic disease, periodontal disease, terminally ill, alcoholics and individuals on steroids were excluded. The Fisher's exact test was done to establish a relationship between the categorical variables. P-value was set at < 0.05. SPSS V.26 was used for data recording.

RESULTS: Eighty participants revealed that surgical gingivectomy was 61.25% more practiced than electrocautery(31.55%) and laser gingivectomy(7.50%). 63.9% preferred local anesthesia for surgical gingivectomy, 34.7% opted for electrocautery. Furthermore, a combination of topical(83.3%) and local anesthesia(1.4%) was used in laser gingivectomy. 3-5 vials were used in electrocautery, 4 in surgical and 1-3 vials in laser gingivectomy. Postoperative healing was observed in all three techniques. Pain was the most common complaint.

CONCLUSION: Surgical gingivectomy was the most common technique. Laser gingivectomy was suggested to be most feasible, less time consuming and has best hemorrhage control. Maximum vials were used in surgical gingivectomy and least in laser-assisted. It is preferable to select a technique based on the extent of the area of interest, site of involvement, expected postoperative outcomes, biotype of the gingiva and factor of affordability at the patient's end.

KEYWORDS: Laser Gingivectomy technique, Surgical Gingivectomy technique, Electro-Surgery technique, Postoperative Complaints, Gingivectomy Healing, Local Anesthesia.

INTRODUCTION

Periodontitis leads to the formation of periodontal pockets, resorption of bone, mobility of teeth and clinical alteration in muco-gingival architecture. It is intercepted by a process in the periodontal pocket, which is eliminated to cease the pathophysiological cascade. This is done using gingivectomy techniques[1,2]. Scalpels, electro-surgery and laser gingivectomy are widely popular techniques of gingivectomy. However, the conventional implementation for gingival tissue removal is performed with the help of a scalpel and is the most common method[3]. This process aims at eliminating previously diseased tissue of the gingiva with a new margin. The matter of substantial clinical significance is the salvage of biological width[4]. It is indicated for clinical crown augmentation, remodeling of thick margins, removal of hyperplastic tissue caused by a variety of factors, or even removal of supra-bony periodontal pocket[5].

Gingivectomy is usually performed using multiple techniques. Conventionally, with the handheld surgical blade, an electrically powered hand piece called electro-cautery, and the latest techniques involve the use of a laser for the removal of enlarged gingiva. Among all, the most frequently chosen technique is surgical gingivectomy[6]. Commonly associated factor which makes it less popular include duration of healing, Post-operative pain, discomfort[7] and bleeding during surgery[8]. Nevertheless, the ease of performance, achievement of the gingival margin with precision and minimal lateral tissue damage make it favorable among others.

The electro-surgical technique provides meticulous hemostasis; the only drawback associated with this is thermal damage to adjacent tissue[9]. Laser is the latest technique for gingivectomy. It is preferred because of minimum patient discomfort, improved hemostasis,

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greater patient acceptance due to less pain and reduced rate of recurrence[10,11]. Comparative assessment of diode and traditional lasers has determined the utilization of fewer anesthesia vials. In laser-assisted gingivectomy, minimal blood discharge, accelerated rate of healing and least irritability reported by the patient[10]. The most crucial determinant of treatment success is post-treatment healing. Therefore, the effect of various techniques on healing is a vital determinant before selecting the method of gingivectomy. The study aims to compare multiple gingivectomy methods based on the type and amount of anesthesia used and to compare the postoperative healing after various gingival procedures.

METHODOLOGY

This prospective study was carried out from March 2023 to February 2024, and Data were collected from Bahria University Dental College and Dow University of Health Sciences. However, a gingivectomy was performed at the Bahria University of Health Sciences, Karachi, by a single operator. The Institutional Ethical Committee of Bahria University Health Sciences granted ethical approval (ERC 66/2022). Eighty gingivectomy procedures were performed using a consecutive sampling technique. Sample size was calculated using OpenEpi. Version 3.1 using a previous study[31]. A self-administered questionnaire, involving questions related to the type of gingivectomy (surgical gingivectomy, electrocautery, laser assisted gingivectomy), type of anesthesia (topical anesthesia, injectable anesthesia, combination), quantity of anesthesia (1, 2, 3, 4, 5 cartridges) and the postoperative complaints pain (Yes/ No), ulcer (Yes/ No), open gingival embrasure (Yes/No), bleeding(Yes/ No) and none) were used.

This comprehensive questionnaire was made in light of the previous study[31]. Those who agreed to be part of the study signed their consent, followed by a detailed periodontal examination and charting. After gingivectomy, the healing index proposed by Landry RG 1988[12] was used, where the scores 1-5 with the interpretation as very poor, poor, good, very good, excellent based on the tissue color, presence of granulation tissue, as well as the appearance of the incision margin were applied. Healing was observed two weeks after the surgery, while postoperative complaints were noted one week after surgery. All the procedures were performed and evaluated by a single, pre-calibrated operator at BUHSCK to avoid assessment variations during the procedures, reduce bias and improve raters' reliability. Hence, ensured consistency and reliability in scoring across the groups. Patients aged 15 –75 years; genders (male, female) indicating need for gingivectomy for different background causes like; periodontal disease related conditions, drug induced enlargements, systemic condition associated gingival over growths, Function imparing causes like gingival enlargements that interferes with normal speech, mastication and oral hygiene, restorative factors, prothesis induced enlargements, aesthetic indications and other factors like tumors, pseudopockets, contour disturbances and sometimes for facilitating dental cleaning, were included in the study. On the other hand, patients with established systemic disease, generalized periodontal disease, terminally ill, alcoholics, individuals with inadequate keratinized tissue, intrabony pockets indicating flap surgery instead of gingivectomy, those who were experiencing acute infections, poor oral hygiene compliance and individuals on steroids were excluded.

Statistical Analysis: SPSS V-26.0 was applied for statistics, the Fisher's exact test was done to establish a relationship between the categorical variables and for group comparison, linear regression analysis was used, and a significant P-value was set at < 0.05. Descriptive statistics were done to find the difference in the amount of local anesthesia used and the techniques preferred based on age and gender. Analytical statistics were done to see the relationship between local anesthesia and the type of technique, as well as to assess the significance of the relationship between the technique and the type of local anesthesia used and the post-operative healing and complications.

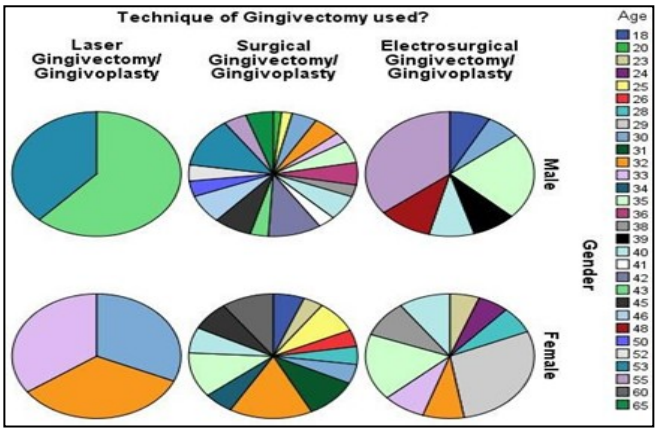
Table I: Characteristics of subjects and types of technique showing demographic and baseline clinical parameters for each group (n= 80)

Variable	Laser Gingivectomy (n=6)(7.5%)	Surgical Gingivectomy (n=49)(61.3%)	Electrosurgical Gingivectomy (n=25)(31.3%)	Total (N=80)	p-value*
Age (years)	35.2±9.8 (18–50)	36.9±10.6 (18–65)	37.0±10.3 (20–60)	36.7±10.4	0.88
Gender(N)(%)					
Male	3 (50.0)	28 (57.1)	14 (56.0)	45 (56.3)	0.72
Female	3 (50.0)	21 (42.9)	11 (44.0)	35 (43.8)	
Baseline Clinical Parameters					
Plaque Index (Mean ± SD)	1.2±0.3	1.3±0.4	1.2±0.3	1.3±0.4	0.64
Gingival Index (Mean ± SD)	1.5±0.4	1.6±0.5	1.5±0.4	1.6±0.5	0.70
Pocket Depth (mm)	3.2±0.5	3.3±0.6	3.2±0.6	3.3±0.6	0.82

RESULTS

Demographic Description: This study intended to compare multiple techniques that are under practice by the clinicians for the gingivectomy procedure, the amount and type of local anesthesia used, and the quantity required for the procedure and also observed the postoperative healing and complications associated with each type. **Table I** indicate a total number of 80 participants, 35(43.8%) females and 45 (56.3%) males, aged between 18 and 65 years, with a mean age of 36.70±SD 10.43, who were part of the study. Among all gingivectomies, 7.5% laser-assisted, 31.3% electro-surgically aided, and 61.3% were conventional surgical procedures.

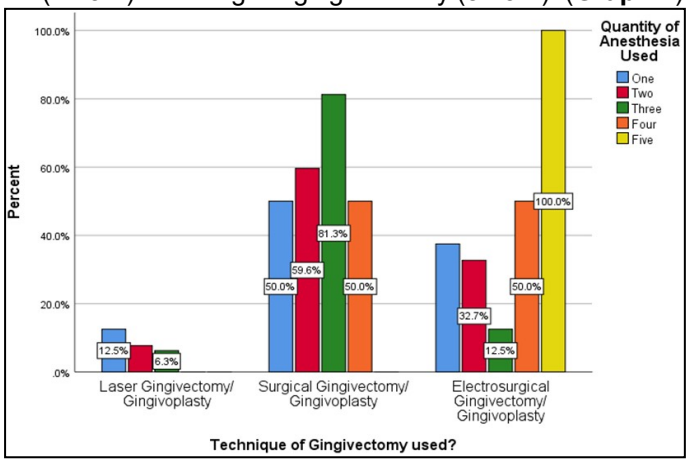
Type of Gingivectomy Techniques: Graph 1 represents that the most commonly opted gingivectomy technique performed was surgical gingivectomy in different age groups.



Graph 1: Age-wise distribution of different gingivectomy techniques. Color denotation on the Y-axis represents age-wise distribution among males and females

Statistically, 61.25% of surgical gingivectomy, followed by 31.25% electrosurgical technique and least preferred was laser gingivectomy (7.5%).

Type and Quantity of Anesthesia: The Type of anesthesia and its quantity are associated with pain-free surgical sessions. Among three different gingivectomy techniques, topical short/long-acting anesthesia of 83.3% was used in laser gingivectomy, 16.7% in surgical gingivectomy, while none was used in the electro-cautery assisted technique. A combination of anesthesia, topically and injectable, was used only in 2 subjects undergoing surgical/ conventional gingivectomy. At the same time, 1.4% of injectable vials of anaesthetics were used in laser gingivectomy, 34.7% in electro-cautery patients and 63.9% in surgically assisted gingivectomy. It was observed that the combination of anesthesia was the mode of choice for a pain-free surgery among of three techniques. Another finding was that the laser technique required the fewest number of combinations and injectable anesthesia. However, the majority of cases were done using a topical type of anesthesia followed by an injectable one. Therefore, a statistically significant relation was observed between the type of anesthesia and different techniques of gingivectomy, for which Fisher's exact test was used, as shown in **Table II**. A statistically significant relationship between the type of anesthesia and the technique of gingivectomy used was observed. The study showed that the least amount of local anesthesia vials were used for laser gingivectomy, and topical anesthesia served the purpose well for it. Predominantly, topical local anesthesia alone was used in laser gingivectomy (83.3%) and (1.4%) local injection. Whereas, in surgery, all three types of anesthesia, namely, topical/ short acting (16.7%), anesthesia via local injection (63.9%) and a combination of local injection + topical application (100%) were used. In electro-surgery, 34.7% local injection was used. Statistically significant difference was seen in the type of LA usage between different gingivectomy techniques ($p<0.05$). A maximum of five vials were reportedly used in the electrosurgical approach alone. However, four were used partially (50%) in electro surgery and (50%) in surgical gingivectomy. Similarly, three vials were used mainly in cases which underwent electrosurgical (12.5%) and surgical gingivectomy (81.3%). (**Graph 2**)



Graph 2: Bar graph with the error bars shows the three comparisons of the amount of local anaesthetic vials. The X-axis shows the different types of gingivectomy techniques, and the Y-axis denotes the amount of Local anaesthetic vial used in each method.

Post-operative healing: The study results showed that conventional surgical technique was by far the most preferred by clinicians in Karachi because of its post-operative wound healing, cost-effectiveness and meticulous improvement in clinical parameters. Statistical results showed Laser-assisted gingivectomy to be the best one when wound healing is a prime concern. Statistical calculation showed that Laser-assisted gingivectomy presented the best healing scores, followed by electrocautery and surgical gingivectomy. These results were found to be coherent with a significant p-value when Fisher's test was applied to assess the healing index score among

different types of techniques. 19% of cases presented excellent wound healing in the surgical gingivectomy group; this is attributed to manual dexterity and the smart shape of the incising edge of the blades, which was observed to be lacking in other cutting edges.

Nevertheless, other techniques like laser-assisted gingivectomy had an excellent healing index in 50.1% subjects, out of all (49) cases, which underwent surgical gingivectomy; 18.4% (9) presented good healing. In comparison, 40.8% (20) had outstanding healing scores. At the same time, 2% (1) had a poor index of healing (**Table II**).

Post-operative complaints: Post-gingivectomy complications were also assessed in the follow-up session. Most commonly reported postoperative complications were pain and bleeding. 18 (69.2%) subjects felt pain after surgical gingivectomy, though a similar number of subjects had no complaint in the follow-up visit. Bleeding was observed in 9 (69.2%) individuals, and opened gingival embrasures were seen in 3 participants, while only one presented with ulcers. Moreover, among those who experienced electro-cautery-assisted gingivectomy, 13 (37.1%) had no complaint at all. While 6 (23.1%) expressed a sensation of pain, 4% complained about bleeding. Lastly, only 2 (7.7%) had pain sensation after laser gingivectomy, as shown in **Table II**.

Statistically, post-operative complications and different techniques of gingivectomy were not significant. This may be attributed to the small proportion of the laser gingivectomy technique and the electro-cautery-assisted technique. Conclusively, the results of this study have shown the popularity of scalpel blade-assisted gingivectomy as compared to other techniques due to the significant difference of cost that is associated with these techniques. Regarding the type of anesthesia, only topical application works well for the laser-assisted technique because this technique gives a better outcome if the area of interest requires less tissue penetration, as with the electro-cautery technique. Wound healing scores were

Table II: Comparison of the local anesthesia, topical anesthesia & local injectable anesthesia as used in surgical & electro-surgical gingivectomy. Laser gingivectomy had a better healing index. Pain and bleeding were common complaints

Treatment Name	Type of Anesthesia Used				Fisher's exact test		
	Topical/ Short-Acting	Anesthesia with Injection	Anesthesia with Injection and Topical	Total 80	Value	df	Exact sig. (2-sided)
Surgical Gingivectomy	1	46	2	49	25.798	4	0
	16.70%	63.90%	100.00%	61.30%			
Electrosurgical Gingivectomy	0	25	0	25			
	0.00%	34.70%	0.00%	31.30%			
Laser Gingivectomy	5	1	0	6			
	83.30%	1.40%	0.00%	7.50%			
Total	100%	100%	100%	100%			

Treatment Name	Healing Index					Fischer Exact Test		
	Poor	Good	Very Good	Excellent	Total	Value	df	Exact sig. (2-sided)
Surgical Gingivectomy	1	9	20	19	49	29.264	3	0
	2.00%	18.40%	40.80%	38.80%	100.00%			
Electrosurgical Gingivectomy	0	3	11	11	25			
	0.00%	12.00%	44.00%	44.00%	100.00%			
Laser Gingivectomy	0	1	2	3	6			
	0%	16.60%	33.30%	50.10%	100%			

Treatment Name	Post-Operative Complaint					Fischer Exact Test		
	Pain	Ulcer	Nil	Open Gingival Embrasures	Bleeding	Total	Value	df	P-value
Surgical Gingivectomy	18	1	18	3	9	**49**	6.383	8	0.578
	69.20%	33.30%	51.40%	100.00%	69.20%	61.30%			
Electrosurgical Gingivectomy	6	2	13	0	4	25			
	23.10%	66.70%	37.10%	0.00%	30.80%	31.30%			
Laser Gingivectomy	2	0	4	0	0	6			
	7.70%	0.00%	11.40%	0.00%	0.00%	7.50%			
Total	100%	100%	100%	100%	100%	100%			

best among subjects who underwent the laser gingivectomy technique, followed by electro-cautery and surgical technique. However, an incomparable number of participants undergoing each technique could be the reason. Post-operative complications were least in the laser technique compared to others. The results of electro-cautery were also good. However, the surgical technique presented variable types of post-operative complications. It is essential to know that the maximum number of subjects who underwent this technique could also be the possibility of this finding.

DISCUSSION

Our study aimed to compare and analyze the different techniques used for gingivectomy, to compare the type and amount of local anesthesia used for various kinds of gingivectomy techniques and evaluate the postoperative healing and complaints between the different techniques to understand which technique is most commonly practiced in Karachi. and factors behind the selection of a specific technique with respect to the attributes mentioned above were also explored.

Among different methods, the scalpel blade-assisted gingivectomy was found to be the most common technique chosen, followed by the electrosurgical approach. At the same time, laser gingivectomy is the least practiced. These trends pose extreme dissimilar trends to the global practice[14].

Surgical gingivectomy was preferred due to cost effectiveness at clinician and patient's end, the majority of clinicians have expertise in this technique and developed manual dexterity over time and are happy with results. However, comparative remarks were given by the ones who had shifted to other techniques, suggesting that laser is the most delicate, decent and innovative tool where light is amplified by stimulated radiation emission (LASER). It is used to provide the best blood control during surgery, controlled incision, minimal recurrence and provides better aesthetics.

A study done by Gopal L 2024[15] found similar findings to this study; they performed a comparative study on the assessment of wound healing. They found a negligible difference between probing depth and gingival health after surgery. In contrast, teeth with deeper probing depths responded better with Scalpel and blade gingivectomy instead of laser; other studies that support these results are also referenced below. However, lasers showed healing in a short time with increased patients' comfort in this study, and similar findings were obtained in studies done by Chhabrani A 2024[16] and Ahmed S 2024[17]. These studies have also shown meticulous wound healing[17] results with minimum utilization of anesthetics[18], analgesics[18] and minor post-operative complaints were obtained from other studies[20]. Significant findings of these studies stated that laser gingivectomy provides better post-operative comfort, hemorrhage control and less pain. Moreover, the complete healing process after gingivectomy follows the path of secondary intention for absolute epithelialization and connective tissue maturation. This process is accentuated by laser therapy. However, scalpel-assisted gingivectomy provides the best clinical outcomes in complex clinical scenarios and postoperative healing after a month showed similar results in all three types of gingivectomy techniques, which favors the surgical approach favored by clinicians in Karachi.

For Electro-cautery, Mihai LL 2024[21], explained the wound healing accuracy with the elector-surgical approach. Especially where abnormal extents of enlargement are involved with suspected profuse bleeding, its haemostatic property is dependent on its output power, which is difficult to expertise as it varies with the thickness of tissue to be cauterized. Only an experienced clinician can handle this tool well to achieve the best benefit like less hemorrhage[22], improved wound healing as over ablation can lead to tissue necrosis as stated by Orozco J 2023 [23] and less amount of anesthesia is required for electro-surgically assisted gingivectomy and photo bio-modulation therapy as compare to surgical gingivectomy as observed in this study and by Biswas S et al.[24]. Hence, electro-cautery is an indispensable tool of present era. Its benefits can be effectively utilized if cautiously handled to maintain the accuracy and precision of the tool. Its use is wisely implicated upon the required clinical outcomes, and therefore, it is not ideal for all types of gingival enlargements based on different etiologies.

Surgically assisted gingivectomy is the preferred technique compared to any other techniques that require heavy-duty armamentarium and financial constraints in developing countries. Dalal Am 2024[25] expressed good wound healing and clinical outcomes after surgical gingivectomy compared to other techniques as experienced in this study. In this study, the majority of participants consented to undergo surgical gingivectomy. The results were statistically significant for wound healing and anesthetic vial utilization but not with the post-operative complication, among which bleeding, pain and open gingival embrasure were common. However, a significant number of subjects had no complaint after surgical gingivectomy; also, findings of Koerniadi MM et al[26], Sobouti F 2024[19] and Sharma S 2024[27] are consistent with this study. Surgical gingivectomy serves best in a thick biotype of gingiva[28] and is contraindicated in a thin biotype because in that case, the probability of gingival recession increases[29].

Generally, no absolute technique could be considered the best of all. Each type has its own advantages and

disadvantages. The selection of technique relies on the objective and desired future outcomes. However, a combination of methods may also be required in a single clinical scenario. Hence, no technique is good, bad or worse; its selection is done based on outcomes needed. As observed in this study, surgical gingivectomy was most preferred by the clinician and patient. Data has revealed that underdeveloped countries are facing serious technology challenges; despite having extremely skilled clinicians and a highly qualified workforce in dental faculty, they are inclined to choose conventional methods of gingivectomy. On probing the details from clinicians, the most common reasons elicited were the cost of these modern gadgets and the esthetic outcomes of the conventional gingivectomy procedure. In addition, short-acting topical anesthesia was predominantly used in laser-assisted gingivectomy, proving this approach is less excruciating compared to others when the level of comfort is considered during the surgery, which is consistent with other studies[29,30]. This is most likely due to the photoablation effect that enhances the lymphatic flow and reduces stress in the tissue of interest; consequently, less pain is felt by the patient. Likewise, in electro-surgical gingivectomy, immediate cell vaporization due to rapid chemical loss causes denaturation of each cell in a short span, producing minimal pain sensation and oedema in the tissue. Therefore, in laser-assisted gingivectomy, fewer anesthetic agents were used compared to conventional scalpel and blade gingivectomy, as explained by Rahimnejad M et al[31]. Electro-cautery can be employed, with hemorrhage control as the prime concern, and esthetics is not mandatory to achieve. Hence, our study revealed that the utility of the electro-cautery-assisted approach lay midway (31.25%) between laser-based and conventional surgical gingivectomy.

However, laser-assisted gingivectomy would be the technique of choice for apprehensive patients, differently able individuals, those who have a committed daily schedule and can spare short chair time, where intra-operative bleeding, good optical vision in the surgical field and a pain-free session are of prime importance, can be conveniently subjected to this technique, but cost is not a problem.

CONCLUSION

Surgical gingivectomy was commonly the preferred approach due to its overwhelming advantages of restoring natural post-operative soft tissue architecture, a suitable technique for any size of lesion, cost effectiveness and less technique sensitive though needs expertise and manual dexterity of the clinician. While Laser gingivectomy was most comfortable in performance, less time consuming, provides the best hemorrhage control, but is the most expensive to afford and is not very useful for large-sized lesions. Electrocautery is an appropriate technique which provides optimal blood control and a convenient surgical experience. Regarding anesthesia, the combination technique was the method of choice for a pain-free surgery among the three techniques. Based on the findings of our study, preference of technique should be on the following factors: extent of the area of interest, site of involvement, expected postoperative outcomes, biotype of the gingiva and factor of affordability at the patient's end.

Strengths and Limitations: This study elucidates different gingivectomy techniques most commonly practiced in Karachi. Details of various aspects of each technique are observed and discussed in detail. There was no loss to follow in this study. Identified future knowledge gaps. It is recommended to evaluate each technique with a large sample size and long-term follow-ups, as this would give a better understanding of each technique. The limitations of the study include a small sample size, as the dentist's difficulties in performing each technique were not assessed. Only the short-term gingival wound healing was evaluated. Long-term complications were also not analyzed in this study.

Ethical permission: Bahria University of Health Sciences, Karachi, Pakistan, ERC approval letter No. 66/2022.

Conflict of Interest: No conflicts of interest.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Tanwir F: Conceptualization, Proofreading Manuscript
Bibi T: Manuscript writing, Data collection and interpretation
Kumar C: Proof-reading, Critical Revisions
Ghandhi D: Proof-reading, Critical Revisions
Naz A: Data entry, discussion
Faheem F: Statistical Analysis
Naqvi K: Critical revision

REFERENCES

1. Susilahati NL, Ramadhany EP, Laksana VA. Gingivectomy using scalpel as a management of gingival enlargement in patient under orthodontic treatment. World J Adv Res Rev. 2023; 18(3): 1509-17. doi: https://doi.org/10.30574/wjarr.2023.18.3.1243
2. Shirbhate U, Bajaj P, Solanki D, Dare S, Sarangi S, Solanki DR. Management of Orthodontic-Induced Gingival Enlargement: A Case

Report. Cureus. 2023 Oct 25; 15(10): e47660. doi: 10.7759/cureus.47660
3. Diwan B, Shirbhate U, Bajaj P, Reche A, Pahade A. Conventional Scalpel and Diode Laser Approach for the Management of Traumatic Fibroma. Cureus. 2023 Oct 27; 15(10): e47810. doi: 10.7759/cureus.47810.
4. Dym H, Halpern LR, Ogle OE, editors. Oral and maxillofacial surgery, medicine, and pathology for the clinician. John Wiley & Sons; 2023 May 3.
5. Garcia□Valenzuela FS, Chambrone L. Effects of the GingivalStat approach on early gingival margin remodeling following esthetic clinical crown lengthening: A case series. J Esthet Restor Dent. 2024 Jan; 36(1): 135-43. doi: 10.1111/ jerd.13161.
6. Ramesh A, Vellayappan R, Ravi S, Gurumoorthy K. Esthetic lip repositioning: A cosmetic approach for correction of gummy smile - A case series. J Indian Soc Periodontol. 2019 May-Jun; 23(3): 290 -294. doi: 10.4103/jisp.jisp_548_18.
7. Abesi F, Derikvand N. Efficacy of Low-Level Laser Therapy in Wound Healing and Pain Reduction After Gingivectomy: A Systematic Review and Meta-analysis. J Lasers Med Sci. 2023; 14: e17. doi: 10.34172/jlms.2023.17.
8. Kotb SH. Management of Gingival Hyperpigmentation by scalpel surgery and Bur abrasion. (Case Report). Authorea. July 20, 2022. doi: 10.22541/au.165828140.07418107/v1.
9. Ashry A, Khamis MM, Abdelhamid AM, Segaan LG. Lip repositioning and guided gingivectomy combined treatment for excessive gingival display by using 940-nm diode laser: a case report. L D S. 2023 Mar; 7(1): 25-31.
10. Borzabadi-Farahani A. Laser use in muco-gingival surgical orthodontics. Lasers Dent Curr Concepts. 2024 Jan 9: 379-98.
11. Arapostathis K, Velonis D, Chala M. Laser-assisted pediatric dentistry. Lasers DentCurr Concepts. 2024 Jan 9: 339-376.
12. Landry RG, Turnbull RS, Howley T. Effectiveness of benzydamine HC1 in the treatment of periodontal post-surgical patients. Res Clin Forums 1988; 10: 105–18.
13. Yakout BK, Kamel FR, Khadr MA, Heikal LA, El-Kimary GI. Efficacy of hyaluronic acid gel and photobiomodulation therapy on wound healing after surgical gingivectomy: a randomized controlled clinical trial. BMC Oral Health. 2023 Oct 27; 23(1): 805.
14. Meghana IS, Bhat AR, Bhandary R, Thomas B. Potential of lasers in the realm of aesthetic dentistry: A narrative review. J Health All Sci India. 2023 Jul; 13(03): 313-22.
15. Gopal L, Palwankar P, Dhalla N. The Efficacy of Low-Level Laser Therapy on the Healing of Oral Wounds: A Systematic Review. Cureus. 2024 Oct 4; 16(10): e70832.
16. Chhabrani A, Avinash BS, Bharadwaj RS, Gupta M. Laser light: Illuminating the path to enhanced periodontal care. Photodiagnosis and Photodynamic Therapy (PD-PDT). 2024 Apr 1; 46: 104036.
17. Ahmed S, Alghamdi RJ, Basuhail S, Basuhail HM. Applications And Effectiveness Of Lasers In Periodontology. A Narrative Review. J Res Admin. 2024 Jan 14; 6(1).
18. Altuhafy M, Baig V, Jabr L, Khan J. The efficacy of photobiomodulation on dental injection pain: a systematic review of randomized clinical trials. J Dent Anesth Pain Med. 2024 Jun; 24(3): 145-159.
19. Sobouti F, Savasari AM, Aryana M, Hakimiha N, Dadgar S. Maxillary labial frenectomy: a randomized, controlled comparative study of two blue (445 nm) and infrared (980 nm) diode lasers versus surgical scalpel. BMC Oral Health. 2024; 24(1): 843.
20. Poornima R. Comparison of Two Different Techniques to Achieve Gingival Depigmentation: A Case Series with 6-months Follow-up. Clin Dent. 2024 Mar 1; 18(3)
21. Mihai LL, Parlatescu I, Calin A, Burcea A. Gingival overgrowth approached using recent mechanical and laser technologies: A case report. Exp Ther Med. 2024 Jan; 27(2): 84.
22. Diwan V, Chauhan MR, Tembhurne J, Gangurde A, Wani H, Danane S. Comparative evaluation of the effect of impregnated retraction cord versus laser on gingival attachment level and pain perception following retraction for subgingival margins-A prospective, split-mouth, controlled, clinical study. J Indian Prosthodont. Soc. 2024 Apr 1; 24(2): 136-43.
23. Orozco J, Rico D, Barrios L, Hoyos V, Blanco P. Histological artifacts associated with laser and electroscalpel gingivectomy: Case series. Biomed. 2023 Sep; 43(3): 315-322.
24. Biswas S, Padma R, Kumar V, Beldar A, Chandra D, Lal H. A Comparative Evaluation of Gingival Depigmentation by Scalpel versus Diode Laser versus Electrosurgery: A Clinical In vivo Study. Indian J Dent Sci. 2024 Jan 1; 16(1): 6-10.
25. Dalal AM, Oza RR, Shirbhate U, Gurav T. Conventional Gingivectomy Procedure in the Management of Orthodontic-Induced Gingival Overgrowth: A Case Report. Cureus. 2024 Jul 15; 16(7): e64556.
26. Koerniadi MM, Tadjoedin FM, Hutomo DI, Tadjoedin ES, Rizal MI, Sulijaya B. Bibliometric Network Analysis and Visualization of Research Trends in Gingivectomy. Clin Cosmet Investig Dent. 2024 Jun 10; 16: 209-218.
27. Sharma S, Tomar N, Rana N, Kaushik M.

Comprehensive Review On Gingival Enlargement And Its Management. Educational Administration: Theory and Practice (EATP). 2024 May 30; 30(5): 13373-11377. doi: https://doi.org/10.53555/kuey.v30i5.4910
28. Abd Elghany MH. Periodontal Surgery and Operative Dentistry. EC Dental Science. 2021; 20: 11-7
29. Sari R, Anggraeni D. Prevention of Post-Gingivectomy Gingival Recession in Fixed Orthodontic Patients with Gingival Enlargement: A Case Report. KnE Medicine. 2022 Apr 25: 282-93.
30. Bansal A, Irom U, Sree Sudha TY, Krishna Sasanka KS. Significant Risk Medical Devices–Dental. Insignificant and Nonsignificant Risk Medical Devices. 2024 Aug 1 (pp. 109-150). Cham: Springer Nature Switzerland.
31. Rahimnejad M, Makkar H, Dal-Fabbro R, Malda J, Sriram G, Bottino MC. Biofabrication Strategies for Oral Soft Tissue Regeneration. Adv Healthcare Materials. 2024 July; 13(18): e2304537.
32. Varghese SS. Gingivectomy by different Techniques-a comparative analysis. Int J Dent Oral Sci. 2019; 6(8): 11-6. doi: 10.19070/2377-8075-SI02-08003.