Nine hundred and seventy nanometer diode laser in the management of gingival hyperplasia following fixed orthodontic treatment

Swaminathan Rajendran¹, Raghunathan Jagannathan², Lakshmi Priya Sridhar³, Thodur Madapusi Balaji⁴, Saranya Varadarajan⁵, B. Bhuvaneswari², Juala Catherine², Vignesh Vikram²

¹Department of Periodontics, Sri Venkateswara Dental College and Hospital, Chennai, Tamil Nadu, India, ²Department of Periodontics, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India, ³Department of Pedodontics and Preventive Dentistry, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India, ⁴Department of Dentistry, Bharathiraja Hospital and Research Institute, Chennai, Tamil Nadu, India, ⁵Department of Oral Pathology and Microbiology, Sri Venkateswara Dental College and Hospital, Chennai, Tamil Nadu, India

Abstract

Aim: This study aims to evaluate the efficacy of diode laser in gingivectomy procedure following fixed orthodontic treatment in terms of post-operative bleeding and pain.

Materials and Methods: A total of 15 patients undergoing fixed orthodontic appliance treatment were recruited for the study. Complete intraoral examination 1 month before the termination of their orthodontic treatment was done and patients were enrolled for the study. A 970 nm diode laser (SIROLaser, SIRONA, Germany) with a 320 μm fiber at 1.2 W power was used to perform a gingivectomy procedure. Post-operative bleeding time was assessed. Visual analog scale (VAS) was used to assess pain during the procedure.

Results: The mean age of the patients was 19 ± 2.3 years. No adverse effects were reported by any of the patients. Only 1 out of the 15 patients experienced mild pain during the procedure and required injecting a local anesthetic agent.

Conclusion: The use of laser for gingivectomy after fixed orthodontic treatment was well accepted by the patient. Future studies employing a split-mouth design to compare laser gingivectomy and other conventional methods will help make laser a part of our day-to-day clinical practice.

Clinical Significance: Laser gingivectomy provides minimal bleeding, clean operative site low pain postoperatively with the added benefit of avoiding injection of local anesthetic agent.

Keywords: Gingivectomy, Laser dentistry, Orthodontic treatment

Introduction

The prevalence of malocclusion and the need for fixed orthodontic therapy among children is very high in India.¹⁴ The effects of fixed orthodontics on the periodontium have been well documented.⁵⁻⁸ The pathologic impact of fixed orthodontic therapy could be attributed to increased plaque accumulation around the brackets, inability to effectively maintain oral hygiene which eventually causes a shift in the oral microbial commensal to a more pathogenic ecosystem.⁹ The studies evaluating oral hygiene status among Indian children in the age range of 5–18 years revealed a high prevalence of gingivitis and periodontitis.¹⁰⁻¹⁴ Some of the common periodontal changes seen after initiation of fixed orthodontics therapy include the development of chronic inflammation (gingivitis), loss of clinical attachment, and inflammatory gingival enlargement and pseudopockets.¹⁵,¹⁶ Gingival hyperplasia could promote further damage to periodontal tissues as it could hinder proper oral hygiene maintenance, causes esthetic, functional problems bleeding from the gingiva. Furthermore, improper oral hygiene and gingival hyperplasia could contribute to compromised orthodontic tooth movement.¹⁷,¹⁸ Gingival hyperplasia will resolve by itself or will respond to nonsurgical periodontal treatment. If the gingival enlargement needs to be surgically managed if it interferes with the movement of the tooth.¹⁹ In recent years, LASER has been used as an effective tool in the surgical management of gingival hyperplasia treatment, as they offer a less invasive surgical approach.²⁰⁻²¹ The present study was undertaken to evaluate the efficacy of diode laser in performing gingivectomy procedures following fixed orthodontic treatment in terms of post-operative bleeding and pain.
Materials and Methods

A total of 50 patients undergoing fixed orthodontic appliance treatment during 2017–2019 were recruited for the study. All patients underwent fixed orthodontic treatment in a private dental clinic by an orthodontist. The study was ethically conducted following the Declaration of Helsinki. Complete intraoral examination 1 month before the termination of their orthodontic treatment was done before enrolment into the study. The selected patients were given proper oral hygiene instructions. The exclusion criteria were as follows: Poor oral hygiene, patients requiring orthognathic surgeries, trismus, systemic diseases or conditions that could affect bleeding and pain perception directly or by medications, and patients requiring alveolar bone contouring along with gingivectomy.

Gingivectomy procedure

A well-trained periodontist evaluated the oral hygiene status of all 50 patients. A topical local anesthetic agent (Precaine gel containing 8% lidocaine and 0.8% dibucaine) was applied to the surgical site. Before the commencement of the procedure and for the duration of the procedure, patients were asked about the tenderness. In case, the patients complained of pain or discomfort 2% lidocaine with 1:100,000 epinephrine were administered as a local infiltration. The endpoint of soft-tissue removal/gingival contouring was collectively judged by the periodontist and the orthodontist. A 970 nm diode laser (SIROLaser, SIRONA, Germany) of 320 μm fiber at 1.2 watt power was used. The laser tip was oriented vertically over the surgical site and in a continuous laser mode; the gingival tissue was excised and contoured. Care was taken to maintain the sulcular depth at a minimum of 2 mm after the gingivectomy. The surgical site was irrigated with normal saline [Figure 1a-c]. Post-operative instructions were given. Patients were instructed to take Tab. Zerodol (Aceclofenac 100 mg) B.D for 2 days postoperatively.

WHO bleeding criteria

Post-operative bleeding assessment was done using the World Health Organization bleeding criteria:

| Grade | Sign                        |
|-------|-----------------------------|
| 0     | Nil Bleeding                |
| 1     | Bleeding under the skin and petechial class |
| 2     | Mild bleed                  |
| 3     | Gross bleed                 |
| 4     | Mortal bleed                |

Pain assessment

A visual analog scale (VAS) was used to assess pain felt by patients. It is an 11-point scale ranging from 0: No pain to 10: Intolerable pain.

Results

A total of 60 fixed orthodontic patients were initially examined to be enrolled in the study. Ten patients were excluded as per the criteria mentioned earlier. The age range of selected patients was 18–23 years. Out of the 50 patients, 25 were male and 25 were female. The mean age of the patients was 19 ± 2.3 years. No adverse effects were reported by any of the patients. Only 1 out of the 50 patients experienced mild pain during the laser procedure and required injecting a local anesthetic agent.

Post-operative bleeding and pain

Bleeding from the gingiva was very minimal during the procedure and after the procedure. Forty-eight out of the 50 patients had Grade 0 or no bleeding and 2 patients had Grade 2 bleeding. About post-surgical pain, VAS = 0 was reported by all 50 patients. None of the patients required immediate postoperative analgesia. Only one patient required analgesic 6 h post the procedure.

Discussion

The observational study was undertaken to assess the efficacy of performing gingivectomy procedures following fixed orthodontic treatment in terms of post-operative bleeding time and pain. Various methods have been employed to perform gingivectomy such as scalps, electrosurgery, chemosurgery, and laser.[16] Laser has several advantages over conventional treatment methods. The incision could be given much accurately and the laser has good penetration capacity in the gingival soft. Laser can induce coagulation of small capillary endings present in the gingiva which could, in turn, aid in achieving adequate hemostasis.[21,28,29] The added benefit is laser it gives a clear operating field and a dry and isolated surgical site which, in turn, helps to get more control and reduction the chance of surgical site infection. This could also contribute to lesser pain perceived postoperatively.[30,31] Various factors influence the outcome following laser therapy including time of exposure, wavelength, and the type of irradiation.[32] Forty-eight out of the total 50 patients were treated only with topical application of the local anesthetic agent. Procaine gel contains 8% lidocaine as an effective fast-acting anesthetic and 0.8% dibucaine as an effective long-lasting anesthetic. The dual-action formula provides fast onset of 30–45 s and a prolonged duration of 30–40 min. This formulation does not contain benzocaine, thereby eliminating the possibility of allergic sensitivity reactions. This observation is similar to other studies that have reported minimal pain perceived by patients undergoing laser soft-tissue procedures.[20,21,33] Furthermore, the minimally invasive laser procedure could have contributed to minimal pain perception.[32,34] VAS was used as a tool to evaluate pain. It is easy to understand and easily represents pain perception.[35,36]
Conclusion

The use of laser for gingivectomy after fixed orthodontic treatment was well accepted by the patient. Future studies employing a split-mouth design to compare laser gingivectomy and other conventional methods will help make laser a part of our day-to-day clinical practice.

Clinical Significance

Laser gingivectomy provides minimal bleeding, clean operative site low pain postoperatively with the added benefit of avoiding injection of local anesthetic agent.

Funding

None.

Conflicts of Interest

None.

Informed Consent

The patients consented to the investigation and publication of the study.

References

1. Tak M, Nagarajappa R, Sharda AJ, Asawa K, Tak A, Jalihal S, et al. Prevalence of malocclusion and orthodontic treatment needs among 12-15 years old school children of Udaipur, India. Eur J Dent 2013;7:5045-53.
2. Shivakumar K, Chandy G, Shafiulla M. Severity of malocclusion and orthodontic treatment needs among 12-to 15-year-old school children of davangere district, Karnataka, India. Eur J Dent 2010;4:298-307.
3. Chauhan D, Sachdev V, Chauhan T, Gupta KK. A study of malocclusion and orthodontic treatment needs according to dental aesthetic index among school children of a hilly state of India. J Int Soc Prev Community Dent 2013;3:32-7.
4. Damle D, Dua V, Mangla R, Khanna M. A study of occurrence of malocclusion in 12 and 15 year age group of children in rural and backward areas of haryana, India. J Indian Soc Pedod Prev Dent 2014;32:273-8.
5. Zachrisson S, Zachrisson BU. Gingival condition associated with orthodontic treatment. Angle Orthod 1972;42:26-34.
6. Zachrisson BU, Ainaes L. Periodontal condition in orthodontically treated and untreated individuals. I. Loss of attachment, gingival pocket depth and clinical crown height. Angle Orthod 1973;43:402-11.
7. Sinclair PM, Berry CW, Bennett CL, Israelson N. Changes in gingiva and gingival flora with bonding and banding. Angle Orthod 1987;57:271-8.
8. Krishnan V, Ranjith A, Davidovitch Z, Murphy N. Gingiva and orthodontic treatment. Semin Orthod 2007;13:257-71.
9. Diamanti-Kipioti A, Gusberti FA, Lang NP. Clinical and microbiological effects of fixed orthodontic appliances. J Clin Periodontol 1987;14:326-33.
10. Singh DA. Prevalence of gingivitis and periodontitis among school children in Lucknow region of Uttar Pradesh, India. IOSR J Dent Med Sci 2014;13:21-3.
11. Sherva V, Reddy V, Bhambal A, Agrawal R. Prevalence of gingivitis among children of urban and rural areas of Bhopal district, India. J Clin Diagn Res 2014;8:ZC52-4.
12. Nanaiah KP, Nagarathna DV, Manjunath N. Prevalence of periodontitis among the adolescents aged 15-18 years in Mangalore City: An epidemiological and microbiological study. J Indian Soc Periodontol 2013;17:784-9.
13. Adhikari RB, Karmacharya A, Mallia N, Gurung MB. Prevalence of gingivitis and periodontitis amongst school children: A cross sectional study. Am J Public Health Res 2015;3:80-2.
14. Chauhan D, Chauhan T, Sachdev V, Kirtaniya A. A study of oral hygiene status and prevalence of gingival diseases in 9 and 12-year-old school children of a northern hilly state, India. Int J Health Allied Sci 2012;1:258.
15. Seymour RA, Ellis JS, Thomason JM. Risk factors for drug-induced gingival overgrowth. J Clin Periodontol 2000;27:217-23.
16. Kloeck JS, Pfeifer JS. The effect of orthodontic treatment on the periodontium. Angle Orthod 1974;44:127-34.
17. Palomo L, Palomo J, Bissada N. Salient periodontal issues for the modern biologic orthodontist. Semin Orthod 2008;14:229-45.
18. Camargo PM, Melnick PR, Pirih FQ, Lagos R, Takei HH. Treatment of drug-induced gingival enlargement: Aesthetic and functional considerations. Periodontol 2000 2001;27:131-8.
19. vanarsdall RL. Periodontal problems associated with orthodontic treatment. Am Acad Pedod 2016;3:154-7.
20. Fornaini C, Rocca JP, Bertrand MF, Merigo E, Nannour S, Vescovi P. Nd: YAG and diode laser in the surgical management of soft tissues related to orthodontic treatment. Photomed Laser Surg 2007;25:381-92.
21. Kravitz ND, Kusnoto B. Soft-tissue lasers in orthodontics: An...
overview. Am J Orthod Dentofacial Orthop 2008;133:S110-4.
22. Sarver DM, Yanosky M. Principles of cosmetic dentistry in orthodontics: Part 2. Soft tissue laser technology and cosmetic gingival contouring. Am J Orthod Dentofacial Orthop 2005;127:85-90.
23. Aoki A, Sasaki KM, Watanabe H, Ishikawa I. Lasers in nonsurgical periodontal therapy. Periodontol 2000 2000;36:59-97.
24. Goharkhay K, Moritz A, Wilder-Smith P, Schoop U, Kluger W, Jakolitsch S, et al. Effects on oral soft tissue produced by a diode laser in vitro. Lasers Surg Med 1999;25:401-6.
25. Mavrogiannis M, Ellis JS, Seymour RA, Thomason JM. The efficacy of three different surgical techniques in the management of drug-induced gingival overgrowth. J Clin Periodontol 2006;33:677-82.
26. Matthews DC. Seeing the Light—the truth about soft tissue lasers and nonsurgical periodontal therapy. J Can Dent Assoc 2010;76:a30.
27. Webert K, Cook RJ, Sigouin CS, Rebulla P, Heddle NM. The risk of bleeding in thrombocytopenic patients with acute myeloid leukemia. Haematologica 2006;91:1530-7.
28. Yagüe-García J, España-Tost AJ, Berini-Aytés L, Gay-Escoda C. Treatment of oral mucocele-scalpel versus CO₂ laser. Med Oral Patol Oral Cir Bucal 2009;14:e469-74.
29. English J, Akyalcin S, Peltomaki T, Litschel K. Soft-Tissue Diode Laser Surgery in Orthodontics. St. Louis, Missouri: Mosby's Orthodontic Review, Elsevier Health Sciences; 2014. p. 368.
30. Stübinger S, Saldamli B, Jürgens P, Ghazal G, Zeilhofer HF. Soft tissue surgery with the diode laser-theoretical and clinical aspects. Schweiz Monatsschr Zahnmed 2006;116:812-20.
31. D’Arcangelo C, Di Maio FN, Prosperi GD, Conte E, Baldi M, Caputi S. A preliminary study of healing of diode laser versus scalpel incisions in rat oral tissue: A comparison of clinical, histological, and immunohistochemical results. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;103:764-73.
32. Cobb CM. Lasers in periodontics: A review of the literature. J Periodontol 2006;77:545-64.
33. Ize-Iyamu IN, Saheeb BD, Edetanlen BE. Comparing the 810nm diode laser with conventional surgery in orthodontic soft tissue procedures. Ghana Med J 2013;47:107-11.
34. Kafas P, Stavrianos C, Jerjes W, Upile T, Vourvachis M, Theodoridis M, et al. Upper-lip laser frenectomy without infiltrated anaesthesia in a paediatric patient: A case report. Cases J 2009;2:7138.
35. Erdinç AM, Dinçer B. Perception of pain during orthodontic treatment with fixed appliances. Eur J Orthod 2004;26:79-85.
36. Rakhshan H, Rakhshan V. Pain and discomfort perceived during the initial stage of active fixed orthodontic treatment. Saudi Dent J 2015;27:81-7.

How to cite this article: Rajendran S, Jagannathan R, Sridhar LP, Balaji TM, Varadarajan S, Bhuvaneswari B, Catherine J, Vikram V. Nine hundred and seventy nanometer diode laser in the management of gingival hyperplasia following fixed orthodontic treatment. J Oral Dis Markers 2020;4(1):20-23.