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A report of laser-assisted modified Widman flap for periodontal regeneration: Clinical and radiographic evaluation

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Abstract

Periodontitis is a relatively common disease. Various therapies have been recommended for its treatment which includes nonsurgical, antimicrobial, and surgical therapy. In recent years lasers have been used for all the three above-mentioned purposes. Lasers have been applied for hard and soft tissue debridement, contouring as well as the bacterial load reduction in the pocket. Here we present a case report of chronic periodontitis treated with the help of a new technique, laser-assisted modified Widman flap (LAMWF). The surgical procedure followed with a 980 nm diode laser has been described. The present case report resulted in significant pocket depth reduction, attachment gain, and radiographic evidence of bone fill. The laser-assisted modified Widman flap provided excellent results without complications and high patient as well as clinician satisfaction.

Keywords: Laser, laser bacterial reduction, modified Widman flap, surgical therapy

Introduction

The ultimate goal of periodontal therapy has been the regeneration of the supporting tissues lost as a consequence of inflammatory periodontal disease. This implies the formation of a new connective tissue attachment, i.e. new cementum with inserting collagen fibers, at previously diseased (denuded) root surfaces and also, preferably, the regrowth of alveolar bone. This new connective tissue attachment can only be achieved when the epithelial migration can be prevented on the treated root surface. Over the years, various modes of therapy have been suggested to avoid this, which includes soft tissue curettage, various types of flap procedures including modified Widman flap, guided tissue regeneration and, more recently lasers.

Gingival curettage has been shown to have no added benefit over routine scaling and root planning which may have been due to the lack of an effective tool for soft tissue debridement.[1] Even modified Widman flap with excision of sulcular lining has been shown to heal by long junctional epithelium rather than connective tissue attachment.[2] In contrast to these conventional treatments, ablating the inflamed lesions and epithelial lining of the soft tissue wall within periodontal pockets with a laser retards epithelial migration and promotes periodontal regeneration. Also, a part of the laser energy scatters and penetrates during irradiation into periodontal pockets which might then stimulate the cells of surrounding tissue, resulting in reduction of the inflammatory conditions, in cell proliferation, and in increased flow of lymph, improving the periodontal tissue attachment and possibly reducing postoperative pain.[3] In addition to this, low intensity laser therapy has also been shown to have an antimicrobial effect which has been termed laser bacterial reduction (LBR).

Here we present a case report where laser therapy has been used in conjunction with modified Widman flap to achieve admirable clinical and radiographic outcomes.

Case Report

A 24 year female patient reported to the outpatient Department of Periodontology and Oral Implantology, M. M. College of Dental Sciences and Research Mullana (Ambala) with chief complaint of bleeding gums since 1 year. Upon clinical examination it was noted that patient was suffering from generalized chronic periodontitis. Non-surgical periodontal therapy was initiated with patient showing fine response to the therapy. Although with the maintenance of satisfactory oral hygiene, the inflammation resolved but residual pockets still existed. Therefore, surgical therapy was recommended and discussed with the patient. The authors decided to use a new technique, laser-assisted modified Widman flap (LAMWF) to which the patient promptly agreed and signed a written consent form for the same. Right mandibular quadrant was selected for the surgery. Periodontal pockets of 12 mm depth distal to mandibular right molar [Figure 1] and 9 mm mesial to mandibular right lateral incisor were present. Intraoral periapical radiographs of right mandibular first molar and mandibular right lateral incisor revealed intrabony defect [Figures 2a and 2b]. In rest of the teeth pocket the depth was 5-6 mm with horizontal bone loss.

Surgical procedure

Following steps were followed.

- The patient was asked for a presurgical rinse with 0.2%

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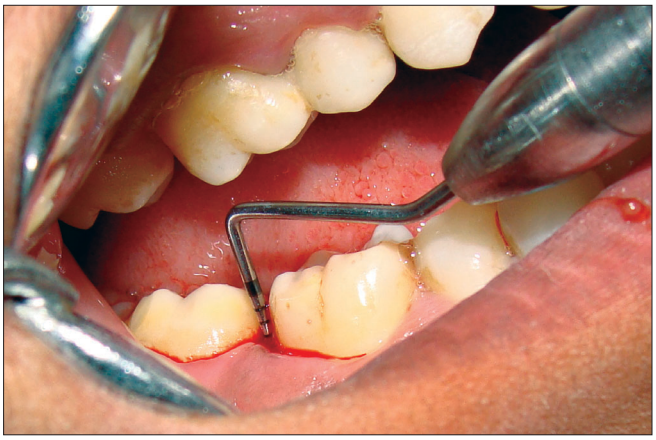

Figure 1: Probing the intrabony defect i.r.t right mandibular first molar

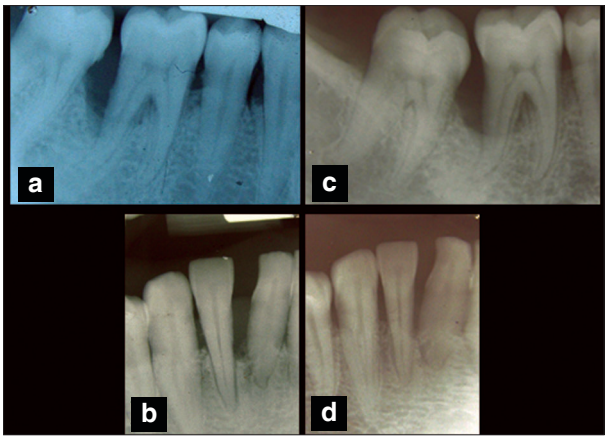

Figure 2: Preoperative and post operative radiographs

chlorhexidine for 1 min. The surgical site was anesthetized with 2% lignocaine containing 1:80,000 adrenaline.

- The pocket lining was removed with the help of a diode laser (Sirolaser, Sirona Dental Systems, USA) after taking appropriate laser safety measures. The fiberoptic tip of the laser was directed parallel to the root surface and was moved laterally and apically along the lateral pocket wall eventually reaching close to base of pocket [Figure 3]. The laser setting used for this procedure was 4 W in continuous mode.
- The laser settings were rearranged at low energy level of 1.5 W in continuous mode and applied in the sulcus for at least 1 min to achieve laser bacterial reduction in the pocket as well as the connective tissue. The laser tip was kept in continuous movement to prevent charring of connective tissue.
- Crevicular incision was given with a bard parker # 15 blade directed toward the alveolar crest. Full thickness mucoperiosteal flap was raised buccally and lingually. The granulation tissue was removed from the defects by manual debridement and root surfaces were thoroughly planed [Figure 4].
- Inner aspect of the reflected buccal and lingual flap was than subjected to laser application to remove any remaining epithelium.
- After complete debridement the surgical site was sutured with 3-0 silk sutures [Figure 5].
- Post operative instructions were given and patient was asked to report after 1 week for suture removal.

Patient reported to department after 1 week with no complaints of any pain or discomfort. On examination, the operated site had healed well [Figure 6]. The sutures were removed and the patient was kept on recall every month for the next 3 months. Only visual clinical examination was done at first and second month post-operatively. Oral hygiene was reinforced in the patient and supportive periodontal therapy was provided. At 3 months post-operatively, clinical as well as radiographic analysis was done. Gingival and periodontal condition improved without any clinically visible signs of inflammation. Reduction in pocket depth and gain in clinical attachment level was observed. Reduction in probing depth was from 11 mm to 6 mm in relation to distal surface of mandibular first molar and from 9 mm to 2 mm in relation to mesial of lateral incisor. In rest of the sites, the pocket depth reduced to 2-3 mm. Radiographs revealed increased bone fill in relation to intrabony defect of above-mentioned teeth [Figures 2c and 2d].

Discussion

The primary objective of modified Widman flap is not pocket elimination per se, but maximum healing of periodontal pockets with minimum loss of tissues during and after the procedure. This removal of soft tissue allows a close adaptation of deepithelized gingival tissues to the tooth surfaces which promotes reattachment with formation of new cementum. Histological evaluation of the modified Widman flap however demonstrates healing by means of a long, thin junctional epithelium to the depth of the surgical wound, with no gain in connective tissue attachment and no increase in crestal bone height.[2] These observations may be in part because of the faster migration of the epithelial cells on the treated root surface than periodontal ligament cells.

This epithelial migration can be prevented by the use of lasers for removing pocket lining, equivalent to first incision of modified Widman flap. It has been observed that removing the epithelial lining with a laser retards the epithelial downgrowth. Various animal and human studies demonstrate that a laser has the ability to retard the epithelial downgrowth and obtain new clinical attachment with bone fill in previously diseased sites.[4,5]

In the present case report we have used a diode laser. This laser does not interact with dental hard tissues therefore it

Figure 3: Removing the pocket lining with diode laser

Figure 4: Complete debridement done i.r.t right mandibular quardent

Figure 5: Surgical site sutured

Figure 6: One week post operative view

is an excellent soft tissue surgical laser. Kreisler *et al* assessed the periodontal ligament cell attachment to the root surface treated with a 810 nm diode laser and concluded that the diode laser does not have any deleterious effect on the root surface.[6] These findings indicate that the diode laser can be safely used in the periodontal pocket in close proximity of hard tissues. It has been observed that a diode laser also facilitate bacterial elimination from periodontal pockets, resulting in better healing. Moritz *et al*. reported pocket irradiation with a diode laser (805 nm) following scaling which produced considerable bacterial elimination from periodontal pockets especially in terms of Aggregatibacter actinomycetemcomitans.[7]

The advantages of the laser-assisted modified Widman flap are that it delays epithelial migration on root surface and allows intimate postsurgical adaptation of healthy connective tissue to the root surface, thereby enhancing the potential for new attachment. Also, it reduces the bacterial load in the site, retarding the reformation of subgingival biofilm. In addition, it maintains the advantages of originally modified Widman flap of optimal soft tissue coverage of root surfaces, which is both esthetically desirable and amenable to oral hygiene procedures.

Conclusion

Clinical and radiographic results of laser-assisted modified Widman flap as we have observed are very promising. Although, further clinical and histological studies with a larger sample size are required to assess the role of lasers in such type of surgeries and further develop the technique.

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