Innovations

Laser assisted new attachment procedure

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Abstract

In dentistry, lasers have been used to treat a number of dental diseases, including the removal of dental caries from the teeth and preparation of the surrounding tooth structure for receiving the restoration, reshaping and refining of the gingiva, removal of microorganisms from root canals, removal of small lesions from the oral cavity, pain relief from canker sores, and investigation of any pathology. In order to remove the infected oral tissues, get rid of the microbes, and clear the gingival collar of plaque, debris, and calculus, Gregg and McCarthy developed the laser-assisted new attachment method (LANAP). Dental professionals are increasingly choosing LANAP as the favoured method for treating gingival diseases as opposed to traditional flap surgery with curettes. By using LANAP, we can achieve a better and more rapid healing process as well as more dependable therapy outcomes. The purpose of this review is to understand the laser assisted new attachment of the period ontium after periodontal therapy.

Key Words *: Laser, New attachment, Intrabony defect, Flap surgery, Healing*

The ultimate aim of the periodontal treatment, is to regenerate the tissues that support the teeth.[1] For patients and dental professionals, the creation of less intrusive yet equally effective therapies has become imperative. Due to subjective and objective fears of pain, swelling, root exposure, and postoperative discomfort, patients frequently do not embrace traditional periodontal surgical procedures.[2] The fundamental process of regeneration is the growth of new bone, cementum, and periodontal ligament. It was found that the Laser assisted new attachment method (LANAP), when performed on human subjects, might trigger the regeneration of the injured periodontal tissues and lead to the appearance of new connective tissue attachments.[2-4] Katuri et.al in his study stated that patients who require regular periodontal therapy and have a pocket depth (PD) of more than 4 mm should consider LANAP.[4] The success of LANAP is fundamentally due to its systematic approach. The technique is often carried out in one or two non-adjacent quadrants.[5-8]

Lanap Protocol

- To properly access the extent of the intrabony defect with a probe, the patient is first given a local anaesthetic that causes a profound anaesthesia.
- To reflect the gingival flap, an optic fibre tip measuring 0.3–0.4 is positioned parallel to the root surface and used to remove the pocket's epithelial lining in a coronal to apical motion.
- The unhealthy pocket lining is removed by the free running, 100 millisecond pulse of the first pass laser or troughing, which wastes energy at a rate of 4 W. The pulse only lasts a little time.
- The root surface's calcified plaque is removed.
- By separating the layers of tissues at the level of the rete pegs and ridges, selective photo the rmolysis removes the diseased, infected, and inflamed epithelium of the pocket while leaving the undamaged connective tissue untouched.
- Antiseptic hemostasis and tissue ablation are produced using laser with the finest precision in varying energy density, pulse duration, and predicted rate of repetition.
- The pocket can be reentered during the second pass with a change in parameters and energy dissipation at 4 W 650 millisecond pulse. As a result, a blood clot made of sticky fibrin is formed, protecting the pocket from debris and promoting the process of internal healing.
- By holding the gingival tissues closely to the root surface and with the formation a solid fibrin clot, the pocket space is sealed off with no use of surgical glue or sutures. For grade II mobile teeth splinting is performed.
- The LANAP protocol must include interferences that are minimised by appropriate occlusal adjustments that reduce traumatic forces while also achieving a balance with long axis forces.[6]

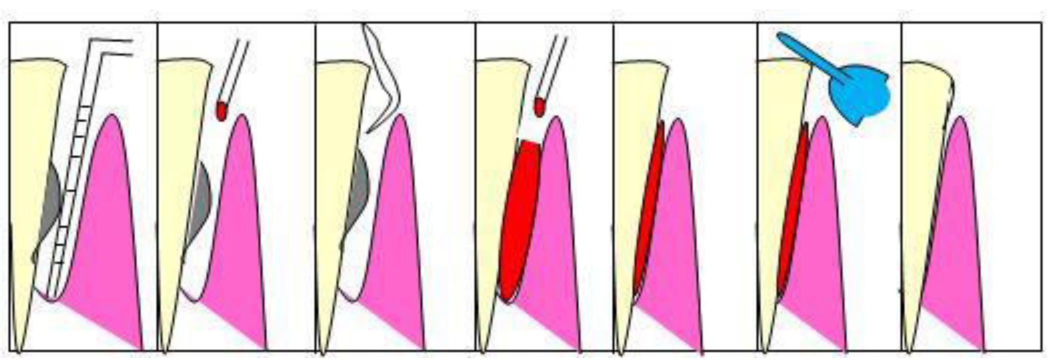

Figure 1 : Lanap Protocol

The benefits of laser therapy for periodontal disease are still up for debate. However, the use of a neodymium: yttrium-aluminum-garnet (Nd: YAG) laser to perform surgical LANAPs has been reported for the treatment of chronic periodontitis[9] and it can probably lead to both new attachment and periodontal regeneration.[10] To ascertain whether LANAP is equal to or better than other conventional therapies, a comparison of LANAP with other randomized controlled studies must be made.[11]

Advantages of Lanap

- Only the damaged tissues are able to selectively and strongly absorb laser radiation, ignoring healthy neighbouring tissues.
- Bactericidal action on pigmented microorganisms.
- The pocket crevice is closed off by a thermal fibrin clot.
- Clot acts as a barrier, limiting epithelium's ability to travel from the coronal to apical region.
- Pluripotent cells from the periodontium are activated, allowing the epithelium to repair from the inside out.
- less invasive procedures and improved patient compliance
- less postoperative discomfort and morbidity
- less prone to become hypersensitive
- more resistant to recession
- Better and faster healing
- Both natural teeth and implants exhibit regrowth of the surrounding tissues.[3,8]

Lasers in the Management of Periodontitis

Al-Falaki et.al in his study stated that the laser assisted new attachment procedure (LANAP) protocol, which uses the Nd:YAG laser, appears to have the potential to promote new attachment and regeneration[12]. The patented LANAP procedure begins with a first pass using the Nd:YAG laser at a setting of 4.0 W, energy density of 1965 mJ/mm2, 100-s pulse duration, and 20 Hz.[13] The first pass is said to kill pigmented bacteria and de-epithelialize the sulcular/pocket epithelium while protecting the underlying connective tissue. Then, using piezo ultrasonic instruments, the teeth are scaled and their roots are planed. The aim of the second pass, which uses a similar output but a 650-s pulse duration and 20 Hz, is to induce a blood clot that, if maintained stable, should serve as the basis for periodontal wound healing.[14]

As a less invasive therapeutic option, LANAP compares favourably to traditional surgical therapy approaches. Studies on the surgical treatment of persistent periodontitis are scarce.[15] Er,Cr:YSGG laser treatment led to a significant reduction in pocket depth and a significant radiographic bone fill in a case series of 46 patients with 79 angular intrabony defects.[16] Although these results are encouraging, the challenge is that there are no controls and periodontal regeneration requires histologic evidence of new pulsed dye laser, cementum, and bone formation.[17] One can only say that the finding is suggestive of radiographic bone fill of the intrabony defects, which is compatible with probable periodontal regeneration, as this has not been proved with this wavelength.[16]

The use of the ER,Cr:YSGG laser versus open-flap debridement was compared in a split-mouth design[17], and it was discovered that the laser-assisted pocket therapy provided comparable clinical attachment level gains with comparable reductions in pocket depth, gingival index, and the sulcular bleeding index.[18] These results were comparable to those obtained when a split-mouth design was compared to three closed techniques, including papilla reflection with SRP and flap closure, diode laser curettage with SRP, and laser-assisted curettage with SRP and laser sealing.[18] All treatments reduced probing depth and bleeding on probing as compared to these open and closed procedures.[19] All closed protocols led to decreased gingival recession, which is consistent with the results of the prior study.[20] The limitation is that the clinician must be properly trained and have enough knowledge with the utilization of laser. Clinical situations have occurred when improper laser management caused irreparable hard and soft tissue damage.[21]

Lasers in the Management of Peri-Implantitis

McCarthy proposed the "Laser-Assisted Peri-Implanttitis Procedure" (LAPIP), a LANAP modification that could be applied to infected implants. Lasers destroy biofilms, cut through inflammatory pocket tissue, and clean the root/implant surface.[22] A durable blood clot is formed to seal the system when the tissue is further decontaminated by a decrease in inflammation and a laser-induced hemostasis.[23] LAPIP promotes bone and tissue regeneration, restores diseased structures to healthy states, and its most admirable quality is that therapy may be carried out without causing harm to the implant.[22,23] There may just need to be one appointment. Since no flap is reflected, it even provides room for potential future treatments.[24] The Perio Lase MVP-7, a Nd:YAG "free-running" pulsed laser, is suggested by the LAPIP protocol for the treatment of periimplantitis.[25,26]

The use of laser to treat peri-implantitis is becoming more common. 6th European Workshop on Er:YAG has been used for implant surface cleansing in period ontology, the surgical management of peri-implantitis.[27] In a dog study, surface decontamination of experimental peri-implantitis was compared with closed- and open approach debridement using the Er:YAG laser, an ultrasonic scaler, or plastic curettes, as well as local metronidazole gel application.[28] The authors found both open-flap submerged approaches (Er:YAG and ultrasonic scaling) resulted in higher clinical attachment gain (bone implant contact), with the laser therapy having a higher degree of reosseointegration.[29]

The CO2 laser was used to clean implant surfaces, but results being not significant.[30,31] The CO2 laser was then employed to clean implant surfaces together with bone augmentation in a case series of 15 patients with failed implants in adjuct to placement of autogenous bone or xenogenic bone covered with collagen membrane[31] and after 27 months follow up clinical and radiographic evaluation showed that the peri-implant bony defects had almost entirely filled up with bone.[31,32] Although the experimental results of Er:YAG are promising, the use of this laser in two clinical trials found the healing response to be not very significant , and the clinical improvements were minimal.[33]

Although the experimental findings of Er:YAG are encouraging, further in vitro investigation defined the optimal Er:YAG laser parameters for debridement of implant surfaces without damaging the implant surface.[34]This shows that factors other than the technique employed for surface debridement and disinfection may have an impact on the long-term stability of clinical outcomes.[35] A soft laser was successfully used in a case report to clean the implant surface before autogenous bone and an expanded polytetra fluoroethylene (ePTFE) membrane were used to repair the defect. However, this method has not been further researched.[35] Lastly, a laser-photodynamic method for treating peri-implantitis in 15 patients with IMZ implants (cylindrical titanium plasma sprayed) has been reported.[36]

Aggregatibacter actinomycetemcomitans, P. gingivalis, and P. inter media all showed a considerable decline, but total eradication was not accomplished.[37] Laser therapy is being used to better understand the biologic background of peri-implant bone regeneration, reosseointegration, and peri-implantitis reversal. Platelet-derived growth factor (PDGF), basic fibroblast growth factor (bFGF),[38] insulin-like growth factor 1 (IGF-1), and bone morphogenic protein 2 (BMP-2) are growth and differentiation factors that are linked to tissue healing and regeneration.[39] Crevicular fluid analysis of patients and osteoblasts in cell culture treated with laser therapy shows an increase in the levels of these cytokines. On the other hand, proinflammatory cytokines linked to tissue damage and inflammation including interleukin-1, tumour necrosis factor (TNF), and reduced levels of metalloproteinases[40]. It is possible that the biologic mediators induced by lasers have characteristics that facilitate tissue repair and regeneration because of the combination of an increase in reparative associated growth and differentiation factors and a decrease in proinflammatory cytokines.[40]

Complications and Risks of Laser Therapy

The primary disadvantage of laser therapy is the potential for unintended tissue damage, as lasers can easily generate excessive temperatures. Extreme temperatures of 60°C (140°F) cause tissue necrosis, while exposure to bone at temperatures below 47°C (116.6°F) can cause cellular damage and osseous resorption.[35] Overexposure to laser energy has been linked to complications, reports of tissue damage, and periodontium destruction.[36] Understanding the mechanics and technique of the laser is crucial to minimising tissue damage and preventing these undesirable effects. Once the information has been mastered, it is essential to decide on the intended laser application and how it will be employed.[37]

Conclusion

Better visualisation of cutting, patient acceptance, wound detoxification, less invasive surgical access, and minimal wound contraction with less scarring are just a few potential benefits of using laser therapy.[38,39] Although these laser applications hold promise, many still need more well-designed, controlled research to validate their effectiveness.[40] The literature has found many positive results for the use of lasers in the management of periodontal and other dental conditions. Case reports and case series predominate the literature in terms of quality. There aren't many carefully planned, randomised clinical trials. The number of various lasers in use and the range of settings and testing processes for each laser further muddle the situation.[37] The field of periodontics lacks lasers that have undergone sufficient research to offer use parameters that are predictable due to the lack of consistency between studies. Therefore, there are still many unanswered questions regarding the use of lasers in the treatment of periodontal or peri-implant disease.[38] As with all professions, technology is continually improving thanks to new research, giving clinicians access to improved tools, medications, and methods for providing better patient care. Periodontal therapy may eventually incorporate lasers, but more study is still needed to determine the requirements for clinical success of laser therapy.[39] Clinicians thinking in using laser therapy should be aware of what is already known, comprehend the proper use parameters, and get the necessary training to be proficient with the laser of interest.[40]

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