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MINIREVIEWS

Laser assisted periodontics: A review of the literature

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Abstract

Over the years, the use of the laser within health field and more particularly dentistry has been increasing and improving. The application of laser in the periodontal treatment takes part of a non-surgical and surgical approaches, is used for the decontamination of periodontal pockets due to its bactericidal effect, and the removal of granulation tissues, inflamed and diseased epithelium lining, bacterial deposits and subgingival calculus. However in spite of all the marketing surrounding, the use of laser highlighting its beneficial effect, the capacity of laser to replace the conventional treatment for chronic periodontitis is still debatable. In fact there is no evidence that any laser system adds substantial clinical value above conventional treatments of chronic periodontitis. Some studies showed a significant positive effect on clinical attachment level gain and probing depth reduction. In the other hand, several articles demonstrated no evidence of the superior effectiveness of laser therapy compared to root planing and scaling. Our aims is to review the literature on the capacity of erbium:Yttrium-aluminum-garnet and neodymium: Yttrium-aluminium-garnet laser to either replace or complete conventional mechanical/surgical periodontal treatments.

Key words: Laser; Review; Scaling and root planning; Erbium:Yttrium-aluminum-garnet; Neodymium:Yttrium-aluminium-garnet; Periodontitis

Core tip: Faced with the increased use of lasers in dentistry, we tried to demystify, in this review, the real benefits and disadvantages of the use of the neodymium:Yttrium-aluminium-garnet and erbium: Yttrium-aluminum-garnet lasers in periodontics. Many trials showed that the use of lasers is an effective and safe method of root planing in periodontal non-surgical treatment of chronic periodontitis. However, due its possible side effects and less effective results when used alone, lead some authors to state that the use of lasers as a replacement of the conventional mechanical treatment is still doubtful.

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INTRODUCTION

Chronic periodontitis is defined as inflammation of the gingiva extending into the adjacent attachment apparatus. The disease is characterized by loss of clinical attachment due to destruction of the periodontal ligament and loss of the adjacent supporting bone[1]. Clinical findings include attachment loss, gingival recession, alveolar bone loss and pocket formation. Although chronic periodontitis is the most common form of destructive periodontal disease in adults, it can occur over a wide range of ages. It usually has slow to moderate rates of progression, but may have periods of rapid progression. Clinical features may include combinations of the following signs and symptoms: Edema, erythema, gingival bleeding upon probing, and/or suppuration[1]. The development of periodontitis appears to be associated with a shift from a predominantly Gram-positive flora to a predominance of anaerobic Gram-negative rods[2].

Several characteristics can be observed in contaminated periodontal pockets. Usually, biofilm deposits, calculus and bacterial endotoxins infiltration into the cementum of root surfaces are reported. Mechanical scaling and root planning with manual and/or ultrasonic instruments represents the initial phase of periodontal non-surgical therapy. However, this therapy is not always effective for complete removal of bacterial and their endotoxins deposits. In fact, complex root anatomy makes access to areas such grooves and furcations difficult[3]. Although systemic and local administration of antibiotics into periodontal pockets is occasionally effective for disinfection, but risk of producing resistant microorganisms limits this approach.

Furthermore, conventional mechanical therapy is often uncomfortable for both patients and operators. Indeed, this time - consuming technique depends on the operator's dexterity. The power and the curette's angulation vary form one operator to another and can give totally different results. In addition, noises and vibrations of ultrasonic instruments are often source of stress and fear in some patients. All these constraints led searchers to explore other therapeutic approach to replace or complete the conventional periodontal mechanical therapy, such as lasers. Recently, the application of laser - assisted treatments for removal of granulation tissues, inflamed and diseased epithelium lining, bacterial deposits and calculus has been proposed as alternative or as adjunctive treatment to the more conventional periodontal mechanical therapy[4].

The word Laser is the acronym for light amplification by stimulated emission of radiation. Lasers can be distinguished from other light sources by their coherence, allowing lasers to be focused to a tight spot[5]. Since Albert Einstein's theory of stimulated emission of electromagnetic radionation and Maiman's first functioning laser using a synthetic ruby crystal in 1960[5], laser research has produced a variety of improved and specialized laser types, optimized for different application such as dentistry. In fact dental lasers are recognized today for their ability to ablate hard and soft tissues, to reduce bacteria counts and even to provide hemostasis of soft tissues during their use with minimal anesthesia[6]. Lasers used in dentistry emit wavelengths between 377 nm and 10.6 μm. The most common types are CO_2, diode, erbium:Yttrium-aluminium-garnet (Er:YAG) and neodymium:Yttrium-aluminium-garnet (Nd:YAG) lasers.

The use of lasers in periodontal therapy has evolved since a laser for periodontal applications was first introduced in 1985[7,8]. Initially, most articles that advocated the use of lasers for soft tissue surgery were anecdotal. Nowadays, it appears that research in soft tissue applications is increasing exponentially, and the claims of decreased bleeding, swelling, pain, and bacterial populations are being referenced in several publications[6].

Four types of interactions may occur when biological tissue is irradiated with laser light: Reflection, scattering, absorption, or transmission. Basically, the reflection, scattering and transmission decrease, as the absorption increases. The type of interaction that takes place depends on the wavelength of the laser. For most biological tissues, higher absorption occurs in wavelengths with greater absorbance in water. The lasers with greater absorbance in water are the Er:YAG lasers. Erbium radiation is readily absorbed by most tissues, and this translates into less penetration and a shallower layer of laser-affected tissue[9].

Laser irradiation exhibits strong ablation, hemostasis, detoxification and bactericidal effects on the human body. These effects can be useful during periodontal treatment, especially for handling of the soft tissue as well as for the debridement of diseased tissues. Thus laser treatment may serve as an alternative or adjunctive therapy to mechanical approaches, in periodontal therapy. However, the high cost of laser equipment and the lack of reliable clinical research are a significant barrier for the laser utilization by the dentist. Also, each laser has different characteristics because of their different wavelengths. Thus the operator must be aware of the possible risks involved in clinical applications, and precaution must be exercised to minimize these risks when performing laser therapy. The most important precaution in laser surgery is the use of glasses to protect the eyes of the patient, the operator and the assistants. Protection of the tissues surrounding the target is also recommended. Second, thermogenesis during the interaction of the laser with the tissues must be addressed and well controlled[9].

In lasers that exhibit deep-tissue penetration, such as the Nd:YAG, the thermal injury to the pulp tissue and underlying bone tissue can be a concern during treatment. Also, a root surface that has received major thermal damage could render the tissue incompatible for cell attachment and healing. During treatment of hard tissue, the use of water spray can minimizes heat generation by cooling the irradiated area and absorbing excessive laser energy. Therefore, thermal injury must be prevented by using irradiation conditions and techniques that are appropriate for the lasers used. In addition, in periodontal applications, there exists the risk of excessive tissue destruction as a result of direct ablation and the possibility of thermal side effects in periodontal tissues during irradiation of periodontal pockets. Improper use of lasers could cause further destruction of the intact attachment apparatus at the bottom of the pocket wall as well as excessive ablation of root surfaces and the lining of the gingival crevice[4].

Damage of the tooth surface should also be avoided during irradiation with Er:YAG lasers, as the enamel and dentin easily undergo melting, carbonization or ablation by these types of lasers. Thus, in order to use lasers safely in clinical practice, the practitioner should have precise knowledge of the characteristics and effects of each laser system and their performance during application, and should exercise appropriate caution during their use[4].

The aim of this study is to review the literature on the effectiveness of Er:YAG and Nd:YAG lasers in periodontics, as either a complete treatment or as an adjunctive treatment. We performed a review of the recent literature in Pubmed and Mesh databases.

POSITIVE EFFECT

The erbium family of dental lasers consists of two wavelengths with similar but not identical properties. The Er:YAG laser produces a wavelength of 2940 nm and the erbium, chromium: Yttrium-scandium-gallium-garnet laser produces a wavelength of 2780 nm. The erbium family of lasers has been used for cavity preparation and caries removal and has shown promise as a laser system for periodontal treatment approaches on hard tissues. The Er:YAG laser has the most shallow penetration into soft tissue of any dental wavelength and can ablate both soft and hard tissues safely with water irrigation and are applicable to periodontal treatments such as scaling, debridement and bone surgery, and have minimal thermal effect[4].

Er:YAG laser seems to be the only laser, used today in dentistry, able to remove calculus and lipopolysaccharides from root surfaces[10]. In fact its wavelengths have the highest absorption in water and hydroxyapatite compared with the diode and Nd:YAG lasers (respectively 10 times and 20000 times greater)[11]. When using the Er:YAG laser, the energy is highly absorbed in water which is then vaporized by thermal effect leading to micro explosions rather than heating the surrounding tissue (resulting in minimal thermal side effects). Theses beneficial properties of the Er:YAG laser and its capacity to ablate both soft and hard tissue led to its approval in 1997 by the Food and Drug Administration in the United States for preparation of dental cavities, for incisions, excisions, vaporization, ablation and hemostasis of soft and hard tissues in the oral cavity[9]. A special optical fiber or a hallow waveguide permit the use of this laser in periodontal pockets.

The Er:YAG can not only be used to remove calculus from root surfaces but also to significantly reduce bacteria load in diseased tissues from root furcations or intrabony pockets. As with other soft tissues lasers, there is a proven bactericidal effect. It can also be used on contact mode to cut or ablate soft tissues with precision with a good hemostasis and almost no need of anesthesia. Because of the potential for possible soft and hard tissue applications, use of this laser has been investigated in periodontal therapy for scaling, root debridement and periodontal and peri-implant surgeries[12].

The Er:YAG laser is capable of easily removing subgingival calculus and root smoothing without a major thermal change of the root surface. The level of calculus removal by this laser seems similar to that of ultrasonic scaling[4]. In fact, in 1994, Aoki *et al*[13] were the first to suggest the use of Er:YAG as an alternative to remove subgingival calculus. The capacity of Er:YAG laser to remove calculus was then examined on human extracted teeth with subgingival calculus. They concluded that the pulsed Er:YAG laser used with irrigation was capable of subgingival calculus removal without damaging the surrounding tissue with an slight increase in temperature during the laser application. Watanabe *et al*[14] showed the safety and usefulness of Er:YAG laser therapy for subgingival calculus removal in nonsurgical pocket therapy. Although some randomized, controlled clinical studies showed improved clinical results following Er:YAG laser irradiation, most failed to show consistently superior and/or additional benefits of the laser therapy. Similar or sometimes better results were obtained with Er:YAG laser therapy than conventional scaling and root planing therapy in terms of reduction of bleeding on probing, pocket depth and improvement of clinical attachment level[15]. In addition, these clinical improvements could be maintained over a 2-year period[16]. Significant clinical improvements were exhibited 6 mo following Er:YAG laser therapy, but they were similar to those obtained using the ultrasonic scaler alone[17]. However, the treatment with the Er:YAG laser resulted in significantly higher pocket depth reduction and clinical attachment level gain at 2 years post-therapy in comparison to treatment with an ultrasonic scaler[18]. One important finding of this study was that at 1 year post-treatment, there was increase of pocket depth and attachment loss in the ultrasonic group, whereas stability of Er:YAG laser-treated pockets was noted until 2 years following treatment[18].

Regarding bacterial reduction no superior reduction in bacterial number was observed following treatment with the Er:YAG laser in comparison to ultrasonic scaling[19]. However, in the same study[19], when the patients perceptions were investigated, ultrasonic scaling was more pleasant than therapy with an Er:YAG laser or hand curet instrument. Furthermore, in a study evaluating treatment of periodontal pockets using an Er:YAG laser, in a periodontal maintenance program, no differences were reported in the microbial profiles between treatment with the Er:YAG laser and ultrasonic scaling, although faster healing (pocket depth reduction and clinical attachment level gain) and less discomfort during treatment were observed in the group treated with the Er:YAG laser[20].

In 2012, a systematic review and a meta analysis, made by Sgolastra *et al*[21], tried to determine the efficacy of Er:YAG, when used as alternative treatment to scaling root planing (SRP) in the treatment of patients with chronic periodontitis. Five random controlled trials, with a total of 85 patients and 3564 sites, were entered in the meta-analysis to investigate clinical attachment level gain, probing depth reduction, and gingival recessions changes in the Er:YAG laser and SRP groups. The meta-analysis revealed no significant differences for any investigated parameter at 6 and 12 mo and concluded that there was no evidence of the superior effectiveness of the Er:YAG laser compared to conventional SRP.

Lopes *et al*[22] in 2008, in a controlled clinical study with twenty-one subjects evaluated clinical and immunological effect on root surfaces irradiated with an Er:YAG laser with or without conventional SRP. The results pointed out that after thirty days both treatments demonstrated significant reductions in gingival indices and probing depth. An increase of the gingival recession was observed in the both groups. No difference in the interleukin IL-1β, was detected among groups and periods.

In spite of the lack of well-controlled clinical trial with high level of evidence, and all the contradictory results in the literature, the American Academy of Periodontology state in 2011 that: "Erbium lasers show the greatest potential for effective root debridement (SRP)"[23]. At a low energy level, the Er:YAG laser had shown a bactericidal effect against periodontopathic bacteria in addition to its capacity to remove toxins present in the root cementum such as lipopolysaccharides[24-26].

For optimal tissue regeneration and successful surgical procedure, the root surface and the bone defect should be debrided and decontaminated. Lasers in periodontics had shown effective results in debriding intrabony defect and furcation areas where mechanical conventional instruments are less effective. In addition, many studies showed that Er:YAG laser application is effective and easy to use in root surface debridement and granulation tissue removal during surgical procedures[4,9].

Sculean *et al*[27] reported that the Er:YAG laser is an effective and safe method with significant clinical improvement six months after a treatment of periodontal intrabony defect with access flap surgery. Gaspirc and Skaleric[28] compared, in a long term clinical outcome, the conventional method using the modified widman flap to Er:YAG laser assisted flap surgery. Significant reduction of pocket depth and a gain of clinical attachment level were found in the laser group at 6-36 mo after surgery. Therefore, application of the Er:YAG laser for surgical degranulation is a promising approach, and its effectiveness and safety have been demonstrated clinically[4,9].

Furthermore, Schwarz *et al*[29] demonstrated in an animal study that Er:YAG lasers also seems to induce new cementum formation. Thus, laser treatment in periodontal pockets may promote more periodontal tissue regeneration than conventional mechanical treatment.

On other hand, the Nd:YAG laser typically emit light with a wavelength of 1064 nm, in the infrared light and is theoretically not absorbed by hard tissues such as cement and dentin. It affects merely soft tissues like gingiva and pocket epithelial lining. Nd:YAG lasers operate in both pulsed and continuous mode and is delivered through a fiber optic tip. The Nd:YAG is commonly used in gingivectomy, gingivoplasty, frenectomies, operculum removal and biopsies procedures[5]. It can be used in a contact or a noncontact mode and is useful for soft tissue surgery. Due to the characteristics of penetration and thermogenesis, the Nd:YAG laser produces a relatively thick coagulation layer on the lased soft tissue surface, and thereby shows strong hemostasis[6]. The Nd:YAG laser is very effective for ablation of potentially hemorrhagic soft tissue. Some studies had shown also a reduction in postoperative pain because of its minimal deep thermal damage[4]. The strong affinity for chromophores in pigmented tissues theoretically makes the Nd:YAG useful in eliminating pigmented bacteria found in periodontal diseases[6], however still no clear in the literature if black pigmented bacteria's as *porphyromonas gingivalis* actually express a pigmented phenotype when colonizing the periodontal pocket or the gingival tissues. Several studies demonstrated the decontamination effect and the inactivation of the endotoxins in the contaminated root surface treated by Nd:YAG lasers[4,9]. However, this laser capacity to replace conventional SRP treatment for chronic periodontitis is still debatable, also the Nd:YAG laser seems to be ineffective for calculus removal when a clinically suitable energy is used[30].

Moreover, in comparison to conventional mechanical instruments, lasers seem to be more effective for complete curettage of soft tissue. In fact, Gold and Vilardi[31] demonstrated the safe application of the Nd:YAG laser for removal of the pocket-lining epithelium in periodontal pockets with no negative effects as necrosis or carbonization of the underlying connective tissue *in vivo*[31]. Yukna *et al*[32] advocated the use of Nd:YAG laser in a laser-assisted new attachment procedure (LANAP) to remove the diseased soft tissue on the inner gingival surface of periodontal pockets. The authors reported that this procedure is associated with cementum-mediated new connective tissue attachment and apparent periodontal regeneration on previously diseased root surfaces in humans. The utilization of this protocol among the dental community seems to be increasing, with several case reports studies clear showing the potential of the technique, however more well controlled and independent studies are need to validate those claims.

The earliest clinical studies regarding the application of lasers in the nonsurgical pocket treatment of periodontitis began in the early 1990s using an Nd:YAG laser. However, clinical applications of lasers in periodontal pockets began with the development of flexible optical fiber. Many clinical studies reported a strong bactericidal effect of Nd:YAG lasers in periodontal pocket. But the superiority of lasers in root planing compared to conventional therapy is till hard to prove[33]. Neill and Mellonig[34] demonstrated, in their double blinded randomized clinical study, that the use of Nd:YAG as an adjunctive treatment to conventional scaling and root planing led to a significant improvement in gingival index and bleeding on probing. But no differences in attachment level were found. In addition, greater results were found when Nd:YAG laser treatments were followed by mechanical treatments six weeks later compared to the reverse. Moreover, adding local Minocycline to Nd:YAG laser irradiation showed good improvement in pocket depth reduction, attachment gain and reduction of periodontopathic bacteria in comparison witch laser treatment alone[35].

In 2013, Qadri *et al*[30], tried to assess through a short term prospective study the effect of water-cooled pulsed Nd:YAG laser used as an adjunct to SRP compared to treatment with the laser alone. Thirty-nine patients were then equally divided into three groups. The first group received Nd:YAG laser treatments. The second group was treated with SRP alone and the third group Nd:YAG laser application immediately after SRP. Results showed a significant decrease of the probing pocket depth, gingival index and gingival crevicular fluid in group 3 compared to groups 1 and 2, in the one-week and three-month follow up. SRP treatment combined to a single application of water-cooled Nd:YAG seems to be more effective in treating periodontal inflammatory conditions. In fact, SRP mechanically disrupt the subgingival biofilm and remove calculus, whereas Nd:YAG laser therapy significantly reduces periodontopahtogenic bacteria. Furthermore, Tseng and Liew[36] suggested that the use of SRP after Nd:YAG laser treatment may be more efficient in removing root deposition.

Traumas from laser treatment are not well documented in the literature unlike ultrasonic and manual instrumentations. For this reason, Dilsiz and Sevinc[37] evaluated and compared the immediate effect of trauma after non-surgical periodontal treatment with ultrasonic and Nd:YAG laser. The study included 144 sites selected from 24 chronic periodontitis patients. Plaque index, probing depth and probing attachment level (PAL) were assessed before and 7 d after treatments. The results showed an immediate PAL loss of 0.68 mm after periodontal treatment with ultrasonic treatment, whereas, the Nd:YAG laser treatment caused no PAL loss and seems to reduce significantly the trauma from instrumentation. However, some studies report that the use of dry laser irradiation lead a significant increase in thermal energy delivered, and can cause tissue damage[38]. Water coolant associated to laser seems to reduce these negative thermal effects[39].

Recently data from a multi-center, prospective, longitudinal, clinical trial comparing four different treatments for periodontitis, the LANAP protocol utilizing pulsed-Nd:YAG laser; flap surgery using the Modified Widman technique (MWF); SRP; and coronal debridement. The authors found no statistical treatment differences between SRP, MWF, and LANAP with the exception of less post-treatment patient discomfort with LANAP compared to MWF. In addition there was greater reduction in bleeding in the LANAP™ quadrant than in the other three at both 6 and 12 mo[40].

Finally, Sjöström and Friskopp[41] observed, in their split-mouth study, an increase of 15% in the debridement time needed. The authors claim also a significant decrease in local anesthesia needed, a haemostatic effect, and less postoperative pain and swelling reported by patients.

NEGATIF EFFECT

Variation in experimental design, in laser parameters and a lack of proper controls make studies difficult to compare. In consequence, some authors suggest the use of lasers as a replacement of the conventional mechanical treatments whereas others are much more skeptical. Another problem that arises from this lack of standardized protocols is the possibility of potential negative and yet unknown effects caused by the incorrect use of the laser.

Because of its ablative capacity on mineralized tissues, some *in vitro* studies showed residual rough root surfaces after treatment with the possibility of heat cracking and cratering. Moghare Abed *et al*[42] in 2007, compared the effectiveness of subgingival scaling and root planing with Er:YAG laser and hand instrumentation *in vitro*. Their results indicated a degree of roughness in all of the laser group samples. However, very long pulses (750-1000 μs) of the Er:YAG laser left a smoother surface, in addition to its greater capacity to remove calculus. They then proposed to decrease the energy to less than 22.6 mJ at the finishing stage to obtain a complete smooth surface. The use of water coolant with laser irradiation prevents thermal side effects without compromising its efficiency. Root surfaces irradiated by Er:YAG laser combined with water coolant presented minimal affected layer with no cracks or major changes in root cementum and dentin structure which can be observed after Nd:YAG irradiation[43-45]. Indeed characteristic micro irregularities and structures[44] were reported on the root surface treated by Er:YAG laser. This micro structured surface appears to be incompatible with cell attachment[46]. In contrary, some *in vitro* studies reported that Er:YAG irradiation, at a proper energy level, seems to leave a favorable surface for fibroblast attachment compared to conventional mechanical scaling and root planing[47,48].

In spite of the potential for root surface damage during the process of calculus removal since the Er:

YAG is a hard tissue laser and the operator would not be able to visualize what is being lased, clinical data on attachment level changes when compared to SRP alone are conflicting. Some studies show slight benefit while others find no benefit. Further study is needed to determine if Er:YAG laser-assisted SRP has a real beneficial effect.

As for the Er:YAG, side negative effects as surface pitting, cracks, carbonization and melting were reported even when the Nd:YAG irradiation was parallel to the root surface[49]. Nevertheless, these alterations seem to be reversible. In fact additional root treatment such as polishing and root planing can restore root surface biocompatibility, essential for fibroblast attachment[50,51]. In addition, because of its capacity to penetrate deeply tissues, the Nd:YAG lasers can induce irreversible intrapulpal thermal damages. However the application of proper protocols seems compensate the potential harmful potential of those lasers and new researches testing different protocols are need to validate the safety and effectiveness of the utilization of Nd:YAG in periodontal treatment.

Thus, many studies tried to determine the Nd:YAG laser place in all therapeutic options in periodontics. When used alone in the nonsurgical treatment of periodontal pockets, the Nd:YAG laser showed less effectiveness for root debridement compared to conventional root planing and scaling. The use of Nd:YAG laser was then suggested as an adjunctive therapy following conventional mechanical therapy in the non surgical treatment of periodontitis.

CLINICAL RECOMMENDATION

While many trials demonstrated that the use of the laser is an effective and safe method of root planing in periodontal non-surgical treatment of chronic periodontitis. It is important to determine the place of lasers in all our treatment options.

It is clear that the use of lasers in periodontics appears to significantly reduce the intensity of pain experienced by the patient during treatment compared to conventional treatment[40,52]. The laser allows the use of less local anesthesia and a better collaboration by the patient[53], thereby facilitating the achievement of the therapeutic goals.

However in view of the results obtained in different clinical and *in vitro* studies found in the literature, it is difficult to conclude of the effectiveness or the superiority of lasers in root planing compared to conventional therapy. Indeed, some authors showed better clinical results when using laser alone[13] while others report no real benefit[21]. Clinical trial with high level of evidence is still needed to determine if the use of laser in the periodontal treatment may one day replace conventional surfacing and root planing.

Furthermore some authors claim the safe handling of this tool, always well tolerated and without damage to the surrounding tissue[39,54]. The use of lasers leaves also a slightly porous surface in favor of fibrin attachment, thus improving the fixation of the blood clot[4]. Other *in vitro* studies, however, mention the presence of a thermal effect on the surrounding tissue in addition to cracks on root surfaces, observed microscopically, weakening then the surrounding tissue[11,52,53].

In addition, some studies were focused on the use of laser as adjuvant to conventional treatment of chronic periodontitis. The clinical trial of Qadri *et al*[39] in 2010 has shown in short and long term, a significant positive effect of lasers coupled to manual and ultrasonic instruments. While other authors, such as Slot *et al*[5], had found no improvement compared to conventional therapy. It is again difficult to demonstrate a real benefit to the use of the laser as an adjunct to manual instruments and ultrasonic.

Finally the use of laser is part of a non-surgical treatment of periodontal disease process, that must respect very specific steps, including the assessment of the patient's medical status, periodontal diagnosis and the development of a treatment plan, patient information and the collection of informed consent, application processing procedures such patient education (oral hygiene, fight against risk factors including tobacco and stress, taking additional charge of systemic diseases such as diabetes) and patient follow-up.

CONCLUSION

Despite of all the potential beneficial effect of lasers in periodontics, the ability to replace or even add on to our conventional periodontal treatment is still doubtful. Further studies are needed to determine laser effectiveness for root scaling and planing, calculus removal, bacterial decontamination and specially, randomized clinical trials performed by independent researches are essential to demonstrated the real role that lasers can play in the management of ours periodontal patients.

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