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The role of 2940 nm Er:YAG laser in exposure of dental implants

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Abstract:

Back ground: Conditioning or ablation of oral tissue using different types of lasers become very familiar; where laser beam in certain parameters for each laser type is delivered directly using the proper hand piece with a suitable fiber optic that can deliver the energy without being damaged.

Materials and Methods: Er:YAG laser at 2940nm used to achieve this study by ablating the oral tissue that covering the implanted fixture in either Maxilla or Mandible , by ablation of this tissue; exposure of the cover screw and the is done in a suitable manner that the removed tissue resembles the gingival former to be placed instead of the cover screw in a procedure of dental Implant. The total number of the patients included in this study was 46 patient. Xive of the Friadent Implant was used; the total number of the fixtures were 60; where 24 fixture were implanted in the maxilla that and 36 fixture were implanted in the mandible.

Results: The results showed that the use at Er:YAG laser in exposing implants was so effective; All the exposed implants were well and the gingival tissue healing was quick and symmetrical with no signs and or symptoms of any infection or irregular tissue.

Conclusion: The use of Er:YAG laser beam 2940 nm can be used in exposing dental implants and prepare a good bed for the gingiva to embrace the gingival former with the least discomfort, bleeding and infection that can accompany the conventional removal of the tissue.

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Introductions

Laser now is increasable used in all the fields of the dental practice. Using of lasers for surgical techniques can produce tissue temperatures effective for reducing bacteria [1] The warming of tissue to more than 60 c^0 will result in protein denaturation and coagulation [2]. which are properties useful in controlled bleeding, the skillful

well trained hand can produce a uniform shape that easily adapt to the gingival former of the fixture.

In this study Er: YAG laser of 2940 am was used to ablate or remove the oral tissue that covers the fixture implanted in the human jaws as a routine work in the dental implants; the Er: YAG laser was also proposed for implant maintain taking advantage of its bactericidal effect, technical simplicity and absence of post-operative pain and edema, [3][4] reports of pain relief mechanisms appear to originate in stimulatory oxidative phosphorylation in mitochondria and through modulating inflammatory responses [5]. The duration of this study was one year where 46 patients included with 60 implants; Xive of Friadent Implants were used; 24 fixture were implanted in the maxilla, and 36 fixture were implanted in the mandible.

The laser beam raises the temperature of the oral tissue leading to what is called “Ablations”, the ablated tissue read to the exposure at the dental implant fixture; the very intended procedure in this study. Figure 1.

Figure 1. Immediately after exposure of implants and placing the gingival formers.

Materials and Methods

Forty six patients attended the Maxillofacial department in Al-Wasity teaching hospital for dental implants. All of them had the dental Implants with the same type which was "XiveFriadent Implants” made in Germany, the patients completed the first stage of implant procedure by implanting the fixture in the jaw with the recommended instructions and parameters of the manufacture. The implants were placed by three different maxillofacial surgeons; twenty four implant placed in maxilla and thirty six one in the mandible. The sixty implants done and the patients were informed to recall after a period of 3-4 months to expose the implants and the cover screw now can be replaced by the suitable gingival former. The patients dismissed for a period at two weeks and scheduled for the impression and then delivery of the final prosthesis. Usually by routine conventional method for exposing the implants is done by the use of a punch or even a scalpel and a blade. In this study the Er:YAG laser was used with parameters of 100 mJ and 25Hz , this done using key 2 of KavoEr:YAG laser made by Germany. The energy delivered to the oral tissue was aided by a water spray to decrease the unfavorable thermal

effects using brush technique and avoiding the fixture. First the texture should be well allocated and fiber optic of the hand piece moved around it till complete ablation of the tissue occur and the cover screw becomes clear and accessible to be unscrewed by the suitable tools.Figure 2 and 3.

Figure 2. Laser device with the recommended parameters.

Figure 3. Different sizes of implant fixtures used.

Results:

The results were hopeful since the beginning, the criteria of benefit of this technique depended upon the findings of:

Pain , Infection , Shape ,Bleeding

Where only few drops of anesthesia used in singleCase; sometimes only topical anesthesia used and for the majority of the patients no anesthesia used at all, this depended upon the patient desire and tolerance of his own with complete dependence on his claim at pain or discomfort sensation. Infection recorded zero as laser beam with its energy played a sterilizing local factor and

thus the possibility of later peri-implantitis much fully decreased.

The tissue removed was well planned since it's possible to remove by ablation only the desired amount of tissue. The bleeding is much less than in conventional ways, the energy applied cause thermal cauterizing effect that block the capillaries but in an acceptable way that no collateral damage happens to the surrounding tissue, the water spray accompanying the beam gives the power of cooling to the tissue. The healing of the tissue runs in a very good manner where it is only a few days for the gum to embrace the gingival former and hugs it well.

The sterility of the field; the small damage to the tissue; the well shape of the removed tissue that simulates the gingival former which planned to place after the removal of the cover screw, and the comfort the patient all together makes the laser a very good choice for the exposure of the implant.Figure 4 and 5.

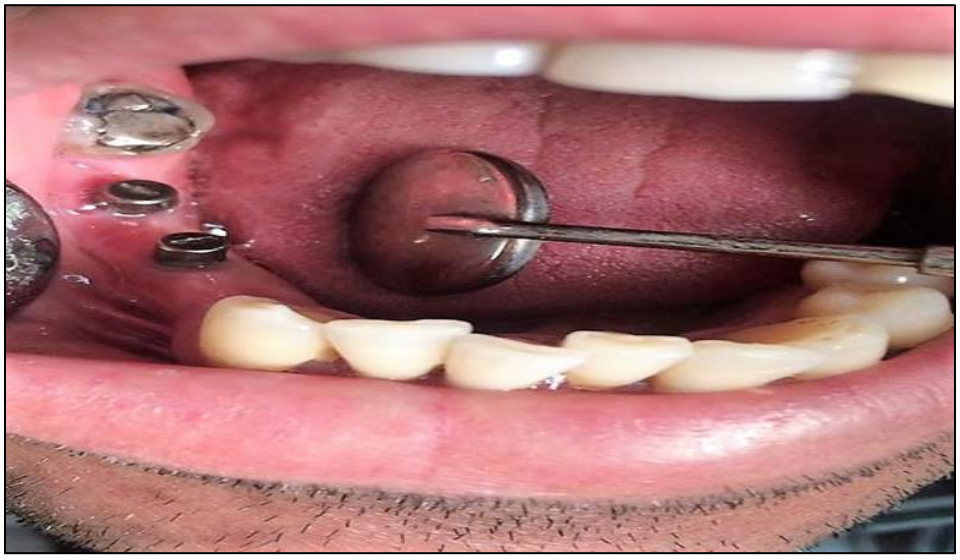

Figure 4. Example of one case after one week showed a good healing

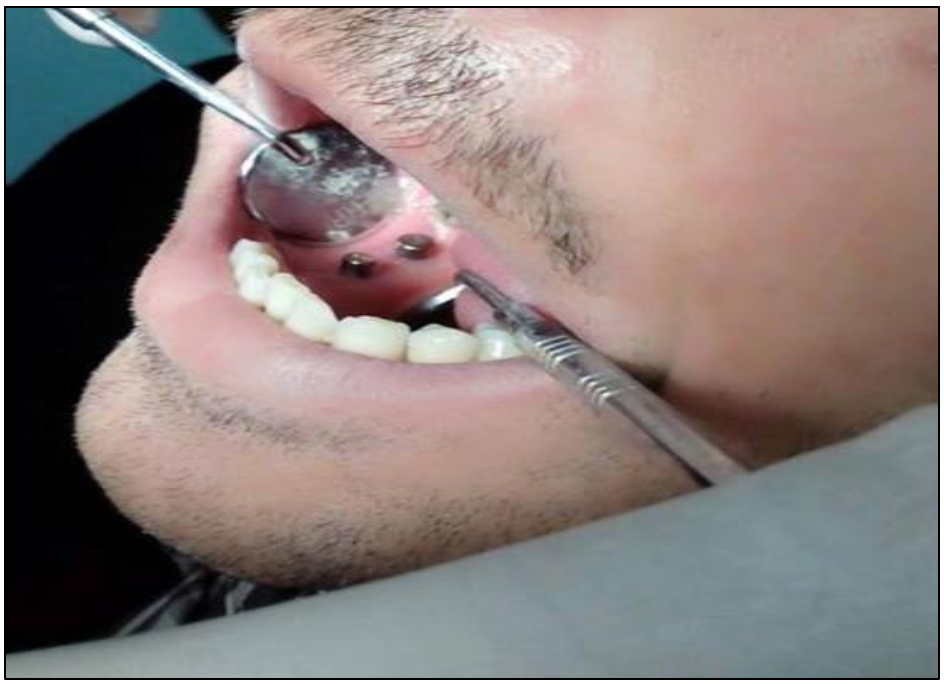

Figure 5. Another case also after one week showed a good healing

Discussion:

The Er: YAG laser of 2940 nm wave length proved it is not only a very good alternative for the conventional methods but superior to them, significantly the laser was able to ablate the oral tissue in a favorable way that nopain, no infection, favorable shape that coincide with the shape of the gingival former thus reducing healing time; and no bleeding; no extensive damage to the surroundings, no suturing needed and so no scheduled appointments to remove it. The Er:YAG laser radiation has been reported to exhibit high bactericidal properties proved by many thesis [6][7]. Er:YAG laser provides coagulations; yet it is limited compared to other types of lasers, coagulation happens when at least two conditions occur: tissue absorption and a controlled heat buildup resulting in coagulation of blood proteins and sealing of small diameter vessels [8][9]. In conventional methods using a punch or a blade, the patient feels uncomfortable by telling him he will undergo another surgery even though it is a very simple, the injection of aesthesia is so bothering while when using laser ablation to expose the fixture, the injection can be avoided in most of the cases as there is only a little sensation that is tolerable, it is only used with very sensitive patients or where there is bone growth over the cover screw and it is very necessary to remove it. Laser energy can aid healing through photo-bio modulation though scattering wave length surrounding tissue adjacent to the treatment site will not receive the maximum energy density providing laser treatment at low energy level where this energy incapable of tissue removal. Stimulation of cellular metabolism known as low-level laser Therapy LLLT [10][11]. or photo bio modulation (PBM) Can beobserved; PBM effect has been shown to stimulate mitochondria enhancing ATP production [12][13], this effect can lead to increased wound healing through increased fibroblast proliferation [14] and collagen formation, increased release of growth factors [15] and pain relief, [16] healing times have been reported to be reduced [17] to many studies concerned about the reduced pain by using later as pain mango plays a great role in patient's desire to have dental care, actually Many associated reputed laser benefits are

reduced pain and discomfort after surgery [18] . The Energy used in this study was 100 mj and 25 HZ pulse frequency; these at parameters were found to be the best to give the desired effect i.e; well cutting with fine and clean edge with no collateral damage below this energy the cutting will be slow and in a very low energy, the cutting will take a long time that is not worthy to use the laser and patient will complain and feel uncomfortable.

Conclusion: The use of Er:YAG laser beam 2940 nm can be used in exposing dental implants and prepare a good bed for the gingiva to embrace the gingival former with the least discomfort, bleeding and infection that can accompany the conventional removal of the tissue.

References

1.Rusell Ap. Lethal effects of heat on bacterial Physiology and structure. Sciprog 2003;36(1-2):115-137.

2.Knappe V, Frank F, Rohde E. Principles of lasers and biophotonic effects, photomed lager surgery; 22(5):411-417.

3. Mason ML.Using the laser for implant maintenance. Dent today 1992;11:74-75.

4. Matarasso S. Quaremba G. Coraggio F Vaia E Cafiero C. Lang NP. Maintenance of implants: an in vitro study of titanium implant surface modifications subsequent to the application of different prophylaxis procedure. Clin oral implants Res. 1996;7:64-72.

5. Walsh LJ, Goharkhay K, Verheyen P, Moritz A: Low level laser therapy (LLLT); in Moritz A: Oral laser application. Quintessence books, 2006; pp 521-539

6. Kreisler M , Kohener W, Mannello C et al. Bactericidal effects of the Er: YAG lasers on dental implant surfaces: an in vitro study. J Periodontal 2002;73:1292-1298.

7. Ando Y, Aoki A, Watanabe H, Ishikawa I. Bactericidal effect of erbium YAG laser on periodontopathic bacteria. Lasers Surg Med1996;19(2):190-200.

8. Black JF, Wade N, Barton JK. Mechanistic comparison of bloodundergoing laser photo-coagulation at 532 and 1064 nm. Laser sur Med 2005; 36(2), 155-165.

9.Glenn TN, Rastegars, Jacques SL. Finite elements analysisof temperature controlled coagulation in laser irradiatedtissue. IEEE Trans Biomed Eng 1996; 43(1):79-87.

10. Ohshiro T, Calderhead Ra. Development of lowreactive-level laser therapy and it's present status. J Clin Laser Med Surg 1991; 9(4): 267-275.

11. Eells JT, Margaret T T Wong-Riley, James VerHoeve, Michele Henry, Ellen V Buchman, Mary P Kane, Lisa J Gould, Rina Das, Marti Jett, Brian D Hodgson, David Margolis, Harry T Whelan. Mitochondrial signal transduction in accelerated wound and retinal healing by near-infrared light therapy. Mitochondrion 2004;4(5-6):559-567.

12. Ross G, Ross A. Low level lasers in dentistry, Gen Dent 2008;56 (7) 629-634.

13. Karu T. Ten Lectures on Basic Science of Laser Phototherapy.Grängesberg, Sweden: Prima Books, 2007.

14.Folwaczny M, Mchl A, Aggstaller H, Hickel R. Antimicrobial effects of 2.94 micromEr:YAG laser radiation on root surfaces: an in vitro study. J Clin periodontal 2002;29(1):73-78.

15.Hamblin MR, Demidova TN. Mechanisms of low level light therapy in : Hamblin MR. Wayanat RW, Andres J, editors [Mechanism for low-light therapy]. January 22 and 24, 2006 SaN Jos, Calif. proc. SPIE 6140. Bellingham, Wash:SPIE the international society for optical Engineering 2006:614001-1-614001-2.

16. Kotlow L. Photobiomodulation lasers and children’s dentalcare. J Laser Dent 2009; 17(3):125-130.

17. Neiburger EJ. The effects of low-power lasers onintracoral wound healing NX. State Dent J 1995;61(13):40-43.

18. Haytac MC, Ozcelik O. Evaluation of patient perceptions after frenctomy operations: A comparison of carbon dioxide laser and scalpel techniques. J periodontal 2006;77 (11):1815-1819.