

USING OF ER:YAG LASER FOR VESTIBULOPLASTY IN THE LOWER JAW

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Abstract

The main aim of this case report was to evaluate the effect of Er:YAG laser-assisted vestibuloplasty and postoperative outcomes of this surgical technique in a patient with inadequate deepness in the oral vestibulum.

In this case we present the use of Er:YAG laser to change the soft tissue attachments in the oral vestibulum of the lower jaw. A 59-year-old patient was referred to the University Department of oral surgery. Intraoral clinical examination showed complete mandibular edentulism with inadequate deepness of vestibulum, sufficient bone height in anterior region and presence of mucosal ligaments. Anterior mandible vestibuloplasty was planned to prepare the patient for prosthetic rehabilitation. The patient was operated on using laser assisted technique for vestibuloplasty with Er:YAG laser (Fotona Fidelis III) to deep the oral vestibulum.

Er:YAG laser-assisted vestibuloplasty is a minimally invasive surgical procedure with no pain and bleeding.

Preprosthetic surgery of the vestibule accomplished with laser beam offers favorable clinical results during and after the operation. Advantages of laser treatment over conventional methods include minimal cellular destruction, tissue swelling and scarring, hemostasis, minimal or no suturing, reduction in surgical time, postoperative pain and discomfort.

Key words: preprosthetic surgery, Er:Yag laser, vestibuloplasty

Introduction

Premature loss of the natural teeth after extraction results in resorption of the alveolar bone. The results of this resorption are accelerated by wearing dentures and tend to affect more commonly the mandible than the maxilla. Successful treatment with removable prosthesis depends on many factors such as adequate bone support covered by adequate soft tissue, without protuberances or sharp ridges, satisfactory buccal, lingual sulci and freni, without muscle fibres or scars. Alveolar resorption results in loss of vestibular depth and in diminished functional surface to overcome lateral forces. Mucosal ligaments have become more important for stabilization of dentures. Preprosthetic surgery involves operation to eliminate lesion or abnormalities of hard and soft tissues of the jaw, so the subsequent placement of prosthetic appliances is successful.

Vestibuloplasty is a surgical procedure wherein the oral vestibule is deepened by chaining the soft tissue attachments on buccal, labial and/or lingual aspects of the residual ridges [1-3]. In the edentulous mandible of a patient with inadequate buccal depth, it is necessary to surgically detach the soft tissue attachments. Traditional surgery has made usage of scalpels, mechanical excision of the muscle attachment from the periosteum, placement of sutures, postoperative discomfort and delayed healing. Conventional vestibuloplasty techniques have been presented in the literature. They are procedures to modify the relationships and level gingival-mucous membrane, as well as the position of the muscle attachments and freni deepening of the vestibule [4].

Multiple techniques have been described such as Kazanjian (supra-periosteal dissection), Clark's, Edlanplasty techniques, etc. Vestibuloplasties with free epithelisation, dermal grafts and free gingival grafts were inaugurated to create the necessary vestibular height needed for a denture [5]. Disadvantages of the traditional technique are exposed wound surface, pain, discomfort, scar contraction, prolonged postoperative healing [6].

When the benefits and risks of alternative treatment modalities are taken into account for this mechanical surgical procedure, minimally invasive laser-assisted soft-tissue excision and ablation seems to be a very attractive technique. With its numerous benefits, the laser has a positive impact on patients and dental team. Er:YAG laser-assisted vestibuloplasty is a minimally invasive surgical

procedure compared to conventional soft tissue surgery. With the addition of the Er:YAG laser, the general dentist is presented with a less stressful and more beneficial treatment protocol for soft tissue excisional procedures than the older continuous wave diode or pulsed CO2 laser [7]. Relative reconstruction of the oral vestibulum height is a surgical procedure that is usually painful and is prone to relapse.

The main aim of this report was to evaluate the effects of a Er:YAG laser-assisted operation technique on postoperative outcome of an edentulous patient, undergoing partial vestibuloplasty.

A Case report

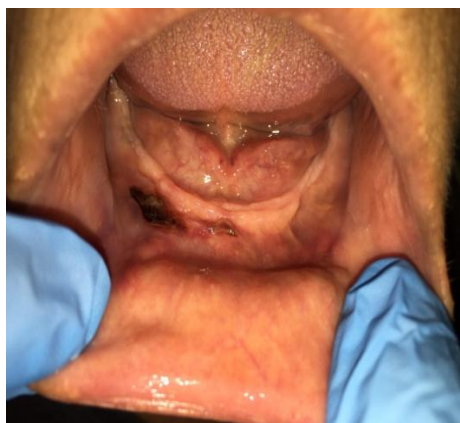
A 59-year-old patient was referred to the University Department of Oral Surgery. Clinical and radiographic examination were done. The intraoral examination showed complete mandibular edentulism with deep vestibulum and sufficient bone height in the anterior region [Picture 1]. Mucosal ligaments were found during clinical examination. Anterior mandible vestibuloplasty was planned, to prepare the patient for prosthetic rehabilitation. The vestibuloplasty was performed by using laser-assisted technique with Er:YAG laser (Fotona Fidelis III), a non-contact hand piece RO2, short pulse mode (SP), pulse energy of 200 mj and frequency of 2Hz, without water and air spray to deep the oral vestibulum. The clinician and the patient took the necessary laser protective safety glasses. After local anesthesia, using 2% scandonest, incision was started from the margin of the attached mucosa of the ridge and ended 2 mm from the bottom of the vestibule [Picture 2]. After superiostal incision, the prepared area was immobile without sutures. Treated area was coagulated by using the VLP mode. The patient was prescribed medications if necessary. Postoperative controls were made one day later [Picture 3], after seven days [Picture 4] and as long as the healing was completed. There was no postoperative pain or discomfort. The left side was treated after three weeks. The same procedure was used [Picture 5 and 6].



Picture 1. Before therapy



Picture 2. After laser therapy of the right side



Picture 3. First day after treatment



Picture 4. One week after treatment



Picture 5. Laser treatment of the left side



Picture 6. First day after treatment of the left side

Discussion

Unlike surgical techniques, lasers have the advantages of minimal amount of local anesthesia, high accuracy in cutting, less time, better inspection of the wound, valuable hemostasis and also they decrease the necessity of suturing [8,9]. Dental lasers have been approved by the FDA. To deep the oral vestibulum in the lower jaw we recommend the laser-assisted surgical technique for partial vestibuloplasty to assure patients' better postoperative outcome.

Er:YAG laser produces wave length at 2940 nm in the mid-infrared electromagnetic spectrum. Er:YAG has a high absorption peak in the water. Water is the dominant target chromophore for Er:YAG laser energy that allows performing of very narrow layers of thermal mechanical tissue ablation with minimal collateral thermal damage which results in improved healing [10,11]. The photobiology of this wavelength (2940 nm) is unique and has distinct benefits for the practitioners. Er:YAG laser targets the chromophore of water selectively instead of the extracellular matrix of collagen. This produces an instantaneous vaporization of the water to a depth of about 4 nm per pulse [12]. The laser optical energy is converted to local thermal energy, which results in tissue degradation or ablation, accompanied with explosive ejection of degraded cellular components and heated vaporous material [13].

Tomov *et al.*, in a histomorphological study, reported less thermally induced damage with ER:YAG laser in comparison with the diode laser [10]. The photobiology characteristic of Er:YAG laser enables performing soft tissue surgeries with the advantages of decreased thermal damage and increased working time [14]. The healing process after Er:YAG laser surgical procedure is faster, without thermal damages and necrosis [10].

The general practitioners with the addition of the Er:YAG laser, can perform less traumatic and more valuable soft-tissue excisional procedures than formally offered with CO₂ lasers [7]. Kazanjian, Clark's, Corn's and Edlanplasty vestibuloplasty techniques are well-known surgical methods to increase the sulcus depth with reliable degree of success. Their disadvantages are the limited degree of manipulation, the need to suture, postoperative discomfort, swelling, pain, decreased patient satisfaction and failure of the procedure [6,15,16,17]. Er:YAG laser needs less time consuming preparation on vestibular soft tissue. The penetration depth of Er:YAG lasers in 2 mm allows sealing of the small lymphatic vessels, decreasing of postoperative edema, bleeding, pain and discomfort [18]. Bleeding is minimal, and hence an optimal insight of the operation site is obtained [19]. Lasers have bactericidal effect and create asepsis at the wound site.

During the surgical procedures small nerve endings are welded and less susceptible for all kinds of irritations. Sealing of the blood and lymph vessels minimize postoperative swelling, while sealing of the nerve endings reduce pain and discomfort. Lasers improve wound healing through the formation of a layer of protein coagulum that shields the surgical site from microorganisms and friction from masticatory forces [20]. Lasers increase vestibular depth as a result of decreased tissue rebound and less scars are formed in comparison with the conventional technique [21,22]. Er:YAG laser surgery have many advantages over conventional techniques: treatment is painless and comfortable with minimum anesthetic agents, there is no need of sutures and protective barrier.

In the last years some authors when they do vestibuloplasty, they place over the wound A- PRF membrane which has growth factors for better wound healing [23].

Sometime vestibuloplasty can be done by repositioning of the vestibular fold more apically often with concurrent placement of grafts from skin or oral mucosa can effectively increase the usable ridge height and area [24].

Also vestibuloplasty can be done to prevent perimplantitis, but Bryan *et al.* have reported that even though they do vestibuloplasty for having enough vestibular depth for implantation, it didn't reduce the incidence of periimplantitis [25].

The postoperative period in our patient was without pain, with minimum inflammation and scar formation. The next day a fibrin layer was observed and after two weeks partial epithelisation. Four weeks after surgery, prosthesis was made as a final step of prosthetic rehabilitation.

Conclusion

Lasers are considered safe and good alternate option to conventional surgical procedures. Er:YAG laser-assisted vestibuloplasty realized in our patient was a minimally invasive technique with minimal cellular destruction, tissue swelling and scarring, hemostasis, no suturing, reduction in surgical time, postoperative pain and discomfort. Superior wound healing with minimal scarring and successful enhancement of the vestibular depth without contraction resulted in superior aesthetic and functional needs. Therefore, we recommend the laser-assisted surgical technique for partial vestibuloplasty, to assure patient's better postoperative outcome.

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