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Complex laser-assisted management of drug-induced gingival hyperplasia

Authors: **Prof. Dr. Mihail Tanev, Prof. Dr. Georgi Tomov, Prof. Dr. Jyuhn H. Ke2**

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ABSTRACT: Drug-induced gingival overgrowth or enlargement manifests as abnormal growth of the gingiva due to an adverse drug reaction (ADR) in patients treated with anticonvulsants, immunosuppressants, and calcium channel blockers. As gingival enlargement develops, it can impair the normal oral hygiene practice, interfere with mastication and can lower the aesthetic profile of the dentition. Although this condition seems to vary between affected patients both in scope and severity, recent advance of dental technology has the potential to offer complex management of these cases. The following case report presents a treatment plan employing the benefits of different laser modalities.

KEYWORDS: gingival hyperplasia, laser-assisted treatment, gingivectomy, photodynamic therapy

INTRODUCTION:

Drug-induced gingival overgrowth or enlargement occurs as a part of the systemic therapy of some non-dental conditions. (1) It occurs as an adverse effect following administration of drugs such as calcium channel blockers, anticonvulsants, specific immunosuppressants etc. (1) The existence of specific oral and extra oral factors namely; age, genetic predisposition, presence of pre-existing plaque, and gingival inflammation determine the interaction between the drugs and gingival tissue, however the gingival response in patients can vary in severity and scope. Drug-induced gingival overgrowth impairs proper hygiene habits, lowers the aesthetic profile of the dentition and creates suitable environment for further plaque formation and aggravation of pre-existing periodontal disease.

To date, there has not been enough data and research which could consolidate the challenging management of affected patients. There is a clear need of development of new and reproducible clinical treatment protocols, committed to the recent advance of dental technology. The aim of this case report is to demonstrate a comprehensive treatment protocol of drug-induced gingival overgrowth employing different treatment modalities.

CASE PRESENTATION:

A female, 57-year-old patient was referred to the Laser Center in the Faculty of Dental Medicine, Medical University – Plovdiv with complaints of the unaesthetic appearance of her gums in the mandibular anterior region, along with occasional bleeding when brushing and overall difficult oral hygiene in the region. After obtaining written consent for diagnostics and treatment, a thorough dental history was taken. The patient revealed she suffers from hypertonia (high blood pressure) which is treated with a calcium channel blocker (Amlodipine) for more than 5 years. The rest of the medical history was non-contributory.

The periodontal assessment of the patient revealed firm and nodular attached gingiva in the anterior mandibular region covering over ½ of the clinical crowns with clinical signs of inflammation – redness, bleeding upon gentle probing, visible loss of stippling and rolling of the free gingival margin. Its position was estimated coronally from the CEJ (cement-enamel junction). Consecutively, periodontal charting was performed, presenting pocket probing depths around 6 mm in the anterior mandibular region and 4-5 mm in the rest of the dentition.

▲ **Figure 1. Preoperative view of soft tissues and PPD estimating with CP-15 probe. Radiographic evaluation of the mandibular anterior region, showing approx. 2 mm of attachment loss, subgingival calculus and carious lesions.**

The radiographic examination of the dentition revealed initial periodontal involvement with clinical attachment loss of around 2 mm throughout. Based on the collected diagnostic data, the observed pocketing in the anterior mandibular region was deemed pseudopocketing, classified as grade 2 in the modified index system of Angelopoulos & Goaz, 1972.

Grade	Hyperplasia	Size	Tooth coverage
0	No	Normal	No
1	Minimal	<2 mm	Cervical third or less
2	Moderate	2-4 mm	Middle third
3	Severe	>4 mm	More than 2/3rd

Table 1. Degree of gingival hyperplasia according to modified index by Angelopoulos & Goaz, 1972

The active treatment protocol continued by devising a treatment plan consisting of two distinct phases - initial periodontal therapy and corrective periodontal therapy. The initial treatment consisted of thorough scaling and root planing, both with ultrasonic devices and manual instrumentation. The patient's oral hygiene habits were discussed and chlorhexidine 0,12% solution was prescribed. After two weeks, the patient was recalled for the corrective treatment. The corrective protocol involved three procedures, scheduled one week apart.

Procedure 1 – Er:YAG laser-assisted gingivectomy & gingivoplasty (2940nm)

The gingivectomy followed a standard surgical protocol – local anesthesia was infiltrated, then the bleeding points were marked with a Crane-Kaplan forceps. The gingivectomy was performed 1,5 mm apically from the bleeding points in with a beveled at 45o continuous excision. The excision was performed with Syneron LiteTouchTM Er:YAG laser at 2940 nm wavelength. A chisel type tip was used with high water cooling at energy level of 300 mJ/18Hz in contact mode. The consequent gingivoplasty consisted of beveling and smoothening the excised margin achieving festooned knife-edge gingival contour. The gingivoplasty was performed with a 1,3 x 19 mm laser tip, at 200 mJ/15Hz in non-contact mode with high water cooling. Upon finishing the procedure, a periodontal dressing was placed (PeriPacTM) and the patient was given instructions for post-op care.

▼ **Figure 2. Performance of gingivectomy with Er:YAG laser; View of the excised soft tissue; Immediate postoperative view of the treated area; Placement of periodontal dressing.**

Procedure 2 – Antibacterial photodynamic therapy with diode laser (810 nm)

After two weeks the epithelization process is finalized uneventfully but sings of inflammation are still visible so antibacterial photodynamic therapy was performed. The antibacterial photodynamic therapy is a novel approach in the supplementary periodontal treatment. It consists of application of a specific dye in periodontal pockets, which, when activated with a specific light wavelength dissipates into reactive oxygen species (ROS). In the periodontal pockets, ROS have high cytotoxicity against most of the periodontal flora. Antibacterial photodynamic therapy (aPDT) is a local non-thermal, non-invasive therapy, bearing many beneficial effects. For this case, the aPDT was performed with indocyianine green dye (EmunDoTM) mixed ex tempore, activated with Syneron 810 nm Diode laser. Indocyianine green is a fluorescent dye with absorption spectrum between 750-850 nm wavelength, hence 810 nm diode laser is deemed its optimal light activation. When activated, indocyianine green is highly toxic to most of the anaerobic periodontal flora. The photodynamic activation was performed three times of 20 seconds per tooth.

Figure 3. Postoperative view of the soft tissues after 14 days

Figure 4. Application of indocyanine green dye. Light activation of the dye with 810 nm diode laser.

Procedure 3 – Er:YAG laser-assisted cavity preparation and composite obturation

However, after soft tissue contouring, many carious and non-carious lesions were evident, acting as plaque-retentive factors. The teeth were prepared for obturation with Syneron LiteTouchTM Er:YAG Laser with 1,0 x 17 mm tip, at 200 mJ/20 Hz with water cooling in a non-contact mode. Laser preparation of tooth structure is vastly more conservative and effective due to the water absorption peak of the Er:YAG wavelength. After preparation, the cavities were obturated following a standard adhesive protocol with nanofilled composite (GC, Gaenial AnteriorTM).

Figure 5. Er:YAG laser-assisted tooth structure preparation for adhesive obturation; Postoperative result at 3 weeks.

DISCUSSION:

Drug-induced gingival hyperplasia is a soft tissue condition often requiring complex approach of treatment. [2] Most commonly, the enlarged gingival tissue presents suitable environment for growth of pathogenic periodontal flora and impairs oral hygiene efficacy, thus aggravating a preexisting periodontal condition. In some cases the drug-tissue interaction cannot be avoided or substituted with another medicament, which ultimately creates a therapeutic challenge. Surgical excision of the hyperplastic tissue (gingivectomy) is the procedure of choice in the treatment plan.[2] Implementation of laser-assisted protocols in both the surgical and supplementary treatment provide a wide array of advantages over the standard procedures. [3]

In the soft tissue surgical phase - Er:YAG lasers provide high cutting efficacy with minimal to no thermal damage to the tissue, improved healing and better post-op comfort for the patient. [3]

Erbium doped lasers allow usage in non-contact mode along with water cooling, thus improving the view field of the operator. Er:YAG laser systems have highest absorption peak in water molecules, thus rendering them as one of the most sophisticated surgical systems for soft tissue interventions. This is well presented in the secondary surgical procedure - the gingivoplasty. Gingivoplasty is the surgical recreation of thin, scalloped, knife-edge contour of the gingival tissue. Traditionally, this is performed with a diamond bur which causes thermal (frictional) and mechanical trauma to the soft tissue. [4] With Er:YAG laser systems gingivoplasty is performed in a non-contact minimally invasive fashion with no thermal or mechanical trauma to the soft tissue. (4) The achieved contour is much more delicate and provides faster healing. Er:YAG lasers are the only system suitable for hard tissue preparation, again due to their water molecule absorption peak. Er:YAG-laser assisted tooth preparation is minimally invasive, non-contact process providing no smear layer on the hard tooth structure, thus improving the adhesive protocol of obturation.

Antibacterial photodynamic therapy is a novel approach in supplementary periodontal treatment. [5] It relies on the photoactive properties of some dyes, which when activated (through specific light wavelength) release an array of reactive oxygen species (ROS). Reactive oxygen species, in turn, have highly specific cytotoxic effects on the bacterial cells. The photochemical reaction in its essence is purely oxidative, thus creating oxidative stress on bacterial membranes. Antibacterial photodynamic therapy is a local, non-thermal and non-invasive supplement to the standard protocols of non-surgical periodontal treatment. [5] The high selectivity of this method depends on two main factors: photoactive dye and light source. Lasers are especially suitable for photodynamic therapy, as they provide monochromatic, coherent light beam with fixed wavelength. In this case, indocyanine green was selected for its proven efficacy against Gram-negative anaerobic flora (predominant in periodontal pockets). As the dye's highest absorbtion peak ranges between 750 - 850 nm, an 810nm diode laser was selected as light source for the photodynamic reaction.

Figure 6. Periodontal status at 6 months.

Complex laser-assisted treatment plan for drug-induced gingival hyperplasia offers a plethora of benefits outcome-wise, but inadequate knowledge of laser light-tissue interaction and the optical properties of some structures and substances in the oral cavity can limit the clinician's scope of treatment with laser light.

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Georgi Tomov graduated Medical University of Plovdiv, Bulgaria with Summa cum laude for his Master degree on Dental Medicine. In 2009 after defense of a doctoral thesis, he acquired PhD degree. He has two specialities - endodontics (2008) and periodontology (2019) In 2012 Georgi Tomov is promoted for head of Oral Pathology Division and director of the Laser Center in the Faculty of Dental Medicine, Plovdiv. Currently Prof. Tomov is a President elect of Bulgarian Dental Laser Society, member of the Executive Board of ISLD (International Society for Laser Dentistry) and active lecturer on laser dentistry in Europe and Asia.
The scientific interests and clinical practice of Prof. Tomov are focused on endodontics, periodontology, oral pathology and lasers applications in dentistry. Prof. Tomov is an author of over 30 full-text publications in specialized dental journals and a co-author in textbooks on oral medicine and laser dentistry for dental students.