

**GEORGE EMIL PALADE UNIVERSITY OF MEDICINE, PHARMACY, SCIENCE, AND TECHNOLOGY OF
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SCHOOL OF DOCTORAL STUDIES**

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SUMMARY OF THE DOCTORAL THESIS

The increasing frequency of dento-maxillary anomalies determines an increased presence of patients in the orthodontic service, fixed orthodontic appliances being increasingly requested by adolescents and adults, and mobile orthodontic appliances for younger children. Painful sensation accompanied by discomfort is the most common side effect of orthodontic treatment. The aesthetic aspect related to the visibility of the orthodontic appliances in smile and speech are added to these, as well as some side effects related to gingival recession, gingival hyperplasia, root resorption and traumatic injuries of the soft parts.

The general part of the thesis includes 3 chapters. In the first chapter, "The structure of the superficial periodontium", the macroscopic and microscopic structure of the superficial periodontium is described, with emphasis on the clinical aspects of the healthy gum and on the aesthetic elements. Gum health is one of the fundamental goals when developing the treatment plan. In addition to a correct alignment of the teeth, the success of the treatment involves reporting a number of factors such as: gingival phenotype, zenith position, position of the GAL line.

Chapter 2 of the general part, "Orthodontic treatment", describes the components of fixed orthodontic appliances, as well as the biomechanical principles of tooth movement. Although fixed orthodontic therapy offers many advantages, one cannot neglect the adverse aspects that appear as a result of certain types of dental displacements, such as gingival recession. These soft tissue changes are presented in the third chapter of the general part: "Mucogingival changes consecutive to orthodontic treatment": recession, hyperplasia, absence of keratinized tissue.

The motivation of the research is presented in the second part, "Personal contributions"

Chapter number 1: Clinical Study on the Perception of Patients with Orthodontic Appliances Regarding the Periodontal Change

The orthodontic treatment helps in reestablishing a functional occlusion, improving the aesthetics and functionality of the dento-facial complex. A correct alignment of the teeth, through the correction of some dental or skeletal anomalies, enhances the possibilities of dental hygiene, thus reducing the risk of periodontal affections. Nevertheless, the presence of orthodontic appliances in the oral cavity may reduce the efficacy of the means of oral hygiene by creating retentive areas for food, thus producing damages at the level of the marginal periodontium. **The aim** of the study is to evaluate the oral hygiene practices for patients in the course of fixed orthodontic therapy and to identify the changes that appeared at the level of the marginal periodontium caused by the orthodontic appliances.

Material and methods: A questionnaire with 20 questions was distributed to a number of 129 patients undergoing the active phase of orthodontic. **Results:** The majority of patients surveyed are aware of the means

of dental hygiene and practice a daily brushing, associated with auxiliary means. The iatrogenic effects of the fixed therapy are represented by gingival recession, gingival overgrowth and bleeding during brushing but these were visible only in the case of a small number of patients.

Chapter number 2: Evaluation of IL1 β and IL6 Gingival Crevicular Fluid Levels during the Early Phase of Orthodontic Tooth Movement in Adolescents and Young Adults

The crevicular fluid analysis represents a useful diagnosis tool, which can be of great interest both in the periodontal disease and orthodontic therapy, with the help of which the noninvasive cellular metabolic activity can be analyzed. **The aim** of the study is the comparative investigation of inflammatory mediators such as the cytokines in clinically healthy adolescents and young adults during the acute phase of orthodontic treatment.

Material and methods: Gingival crevicular fluid was collected from 20 patients (aged between 11 and 28) undergoing orthodontic treatment. Measurements were taken before (T0) and 24 h after orthodontic forces were activated (T1). IL1 β and IL 6 were analyzed using Elisa tests. **Results:** Between the two time periods there was a significant raise both in the crevicular fluid rate (0.57 μ L at T0 vs. 0.95 μ L at T1, $p = 0.001$) and in IL1 β levels (15.67 pg/ μ L at T0 vs. 27.94 pg/ μ L at T1, $p = 0.009$). We were able to identify IL6 only in a third of the sites. Our results indicate higher levels of IL1 β in adolescents than in young adults before and after the initiation of the orthodontic treatment. In adolescents, the mean value for IL1 β raised from 22.77 pg/ μ L at T0 to 42.96 pg/ μ L at T1, while in the age group represented by young adults, the concentration of IL1 β raised from 11.28 pg/ μ L at T0 to 17.93 pg/ μ L at T0. Adolescents had a statistically significant higher level of IL1 β 24 h before ($p = 0.031$) and after the initiation of orthodontic treatment ($p = 0.006$).

Chapter number 3: Therapeutic Options for Gingival Recession Following Fixed Orthodontic Therapy

The orthodontic treatment is a favoring factor for the appearance of gingival recession. **The aim** of this study is to compare periodontal clinical parameters in patients with gingival recession following fixed orthodontic therapy, treated through two different surgery techniques: free gingival graft (FGG) and connective tissue graft associated with coronary advanced flap (CTG+CAF).

Material and Methods: The study is comprised of 12 patients, with ages between 17 and 55 years, that have previously undertaken fixed orthodontic treatment, following which gingival recession areas have resulted. The total number of gingival recessions was 44, 23 of which were treated through free gingival grafts (FGG – with a mean recession of 3.04 ± 0.2 mm) and 21 through epithelial-connective grafts with a coronary advanced flap (CTG + CAF – with a mean recession of 3.24 ± 0.24 mm). 6 months following the intervention, both lots obtained a reduction in the gingival recession ($p = 0.002$). For the FGG treated patients, the mean coverage was 1.39 mm and for the CTG+CAF group the mean coverage was 2.60 mm. 6 months post-intervention, a statistically significant keratinization level was obtained for FGG treated patients (5.20 ± 0.42), as compared to the CTG+CAF patients group (3.21 ± 0.32 mm)

General conclusions:

1. The orthodontic therapy of adult patients will start after the evaluation of the periodontal status, while for patients that have suffered from periodontal issues, an anti-inflammatory therapy and a new evaluation of periodontal indices (plaque index, bleeding on probing, CAL) is recommended before application of the fixed orthodontic appliances.
2. The iatrogenic effects of the fixed therapy for adult patients are represented by the gingival recession, bleeding during brushing and hyperplasia, but these were only present for a small number of patients
3. The fixed orthodontic treatment for adults must be instituted only after the rigorous evaluation of the marginal periodontium, with a close orthodontist – periodontist collaboration, and by avoiding the jiggling-like movements (that overstress the mucogingival junction).

4. The crevicular fluid volume increased 24 h after the initiation of the orthodontic treatment as well as the level of IL1 β .

5. The GFC levels of IL1 β 24 h after the activation of the orthodontic treatment varied between adolescents and young adults suggesting different tissue responses in the two groups. Thus, initial tooth movement in adolescents occurs more rapidly than in young adults

6. In regard to the degree of coverage of the gingival recession, the lot of patients treated through CTG+CAF obtained superior results to the group treated with FGG.

7. The connective tissue graft is capable to induce the keratinization of adjacent epithelium, but in a lower extent compared to the FGG.