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Managing Gingival Bleeding for Effective Bonding of Orthodontic Retainers

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Abstract

Patients undergoing long-term orthodontic treatment with fixed appliances often have difficulties in maintaining adequate oral hygiene. As a result of poorly cleaned plaque, gingival inflammation develops, accompanied by bleeding from the marginal gingival tissues. On the other hand, the use of bonded orthodontic retainers requires a certain preparation of the lingual surfaces of the anterior teeth. One of the most common reasons for the debonding of these retainers is poorly cleaned and unpolished tooth surfaces, as well as the inability to dry the field due to abundant gingival bleeding. The aim of the present study was to analyze the effect of ultrasonic cleaning of bacterial plaque with subsequent polishing of the dentition on the reduction or of gingival inflammation, assessed by taking into account the superficial bleeding index (FMBS). It would also be essential to determine a suitable time range for bonding the fixed retainers after ultrasonic cleaning and polishing.

The clinical study included 31 individuals aged 13 to 32 years, divided into two groups, randomly: Group 1 with 15 patients and Group 2 with 16 patients. Patients in Group 1 were recalled after 72 hours for a second FMBS, and patients in Group 2 had a second FMBS after 24 hours. A clinical periodontal examination was performed in all patients and the following parameters were measured: FMPS (Full mouth plaque score) and FMBS (Full mouth bleeding score). The examination was performed with a periodontal probe (UNC-15) on each incisor and canine tooth in the upper and lower jaw, and the presence of dental plaque and gingival bleeding in four places around each tooth was recorded. Each participant received instructions for better personal oral hygiene. All patients underwent a single scaling and polishing procedure on all teeth and the dentition was polished as part of the preparation of the lingual surface of the anterior teeth for better adhesion of orthodontic retainers. We found that in patients from group 1, who were called for a second visit on the third day, FMBS was reduced from 37% to 13% for the maxilla and from 66% to 33% for the mandible, with a strong statistical significance in the reduction of gingival bleeding ($p=0.001$ for the maxilla and $p=0.0001$ for the mandible). Our results show a stronger reduction in gingival bleeding on the third day after cleaning and polishing compared to bleeding on the next day, with this reduction being statistically significant for the maxilla ($p=0.02$).

Keywords: Orthodontic retainer, gingival inflammation, gingival bleeding

Introduction

One of the most commonly used methods of retention after orthodontic treatment is fixed lingual retainers. Removal of dental plaque and polishing of the enamel surface are mandatory parts of the preparation of the adhesive field, creating the conditions necessary for the implementation of the stages of the adhesive

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protocol. In view of the difficulties experienced by patients during orthodontic treatment with fixed appliances to maintain good oral hygiene, gingival inflammation and provoked gingival bleeding can be a serious problem when bonding orthodontic retainers. There are not enough clinical studies aimed at choosing the appropriate moment for bonding orthodontic retainers from the point of view of the periodontal and gingival status of the patient. Bouwsma et al. demonstrated that the combination of supra- and subgingival scaling, polishing, and improved oral hygiene can lead to a reduction in clinical and histological signs of gingival inflammation, as measured by the elimination of gingival bleeding (1). The diagnosis of periodontal and gingival diseases, as well as the results of treatment, are largely based on the establishment of an inflammatory lesion in the periodontal and gingival tissues. Visual signs of inflammation can be used for diagnosis, but interdental tissues are usually inaccessible for direct visual inspection. Objective criteria related to gingival bleeding after stimulation with a periodontal probe and reported in the form of various periodontal indices are considered clinically reliable signs of gingival inflammation and are associated with inflammatory lesions in the gingival connective tissue (2, 3). Many clinical studies have shown that gingival bleeding can be reduced or eliminated with therapy aimed at controlling the bacterial biofilm. Histologically, inflamed and bleeding marginal and interproximal gingiva have been shown to demonstrate significant reduction in the inflammatory lesion after supra- and subgingival ultrasonic cleaning, polishing, and the introduction of good daily personal plaque control (1, 4).

A study by Lembariti et al. examined the effect of a single scaling session, without oral hygiene instructions, on gingival bleeding (5). The authors noted that personal plaque control and regular and frequent ultrasonic cleanings are effective in improving periodontal status and are an indispensable part of comprehensive periodontal treatment. However, in developing countries, due to a shortage of dentists and financial resources, patients receive a single cleaning or scaling at excessively long intervals, often without even instructions for good oral hygiene. The patients studied in this study were Tanzanian adolescents who had not received dental treatment in the past five years. As a result of a single scaling, without improving personal oral hygiene, within the 22-month study period, the authors found a reduction in gingival bleeding, but without statistical significance.

Aim

Of practical interest would be to determine the contribution of personal plaque control in combination with supra- and subgingival scaling and tooth polishing to the elimination of gingival inflammation and bleeding. The aim of the present study is to analyze the relationship between ultrasonic cleaning of dental biofilm, tooth polishing and improvement of personal oral hygiene, on the one hand, and the elimination of gingival inflammation, assessed by reduction of bleeding, as well as to determine a time interval in the end of orthodontic treatment and removal of fixed orthodontic appliances, suitable for bonding of orthodontic retainers, which in turn would lead to a decrease in the frequency of their detachment.

Material and methods

The clinical study included 31 individuals aged 13 to 32 years who met the following inclusion criteria: having undergone and completed orthodontic treatment, for individuals up to and including 17 years of age a parental consent form was required. Exclusion criteria: if antibiotic treatment was performed in the last 3 months, if periodontal treatment was performed in the last 6 months, if antibiotic prophylaxis was needed during oral procedures, including periodontal probing, presence of diabetes or other disease affecting immune status, presence of a severe progressive or uncontrolled somatic disease that would affect participation in the study, as well as pregnancy and breastfeeding.

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A clinical periodontal examination was performed in all patients and the following parameters were measured: FMPS (Full mouth plaque score) FMBS (Full mouth bleeding score). The study was performed with a periodontal probe (UNC-15) on each incisor and canine tooth in the upper and lower jaw, and the presence of dental plaque and gingival bleeding was recorded in four places around each tooth. Each participant received instructions for better personal oral hygiene. All patients underwent a single procedure for removing tartar and plaque (scaling) on all teeth and the dentition was polished as part of the preparation of the lingual surface of the front teeth for better adhesion of orthodontic retainers. Dental calculus, plaque cleaning device (Ultra Piezo Scaler W&H PB-520), AquaCare Single polishing, and abrasion device with a gamma-irradiated fine granules of sodium bicarbonate Proclean Aquacare were used. The patients were divided into two groups, randomly: group 1 with 15 patients and group 2 with 16 patients. Patients in group 1 were recalled after 72 hours for a repeat FMBS, and patients in group 2 had a second FMBS after 24 hours.

Statistical analyses were performed using the Statistics Package for the Social Sciences (SPSS) version 22.0 (SPSS Inc., Chicago, IL).

The study was conducted in accordance with the ethical standards defined in the Declaration of Helsinki of the World Medical Association. The Institutional Review Board of the Medical University of Sofia approved the study protocols, including clinical trials. All subjects signed an informed consent before entering the project and after reading the informed consent letter. All manipulations were performed by a dentist according to the rules of good dental practice. Consent to participate in the medical study could be withdrawn at any time without adverse consequences for the participant.

Results

We found that all patients, from both groups, demonstrated 100% plaque prevalence, which is understandable given the presence of fixed orthodontic appliances and the difficulties they had with daily hygiene care during orthodontic treatment. Regarding gingival bleeding at the initial examination, again in patients from both groups, the results showed the presence of severe gingival inflammation (FMBS mean 45% ±22.314), with the gingiva of the lower teeth being more severely affected than the gingiva of the upper teeth, but without a statistically significant difference (Table 1).

Table 1. Mean FMBS values in percentages at the first visit

	First and second group	First group mandible	First group maxilla	Second group mandible	Second group maxilla
FMBS % mean	**45 ±22,314**	**66±23,959**	**37±22,541**	**53±22,114**	**32±18,925**

These differences in favor of greater severity on the lower teeth could be explained by the fact that most people find it more difficult to effectively brush the lower teeth, and especially their lingual surfaces, than the upper teeth (1).

The data from the first and second registration of the gingival bleeding index (FMBS) in each group was compared. We found that in the patients in the 1st group, who were called for a second visit on the third day, the FMBS was reduced from 37% to 13% for the maxilla and from 66% to 33% for the mandible, observing a strong statistical significance of the reduction in gingival bleeding (p=0.001 for the maxilla and p=0.0001 for the mandible) (Figure 1).

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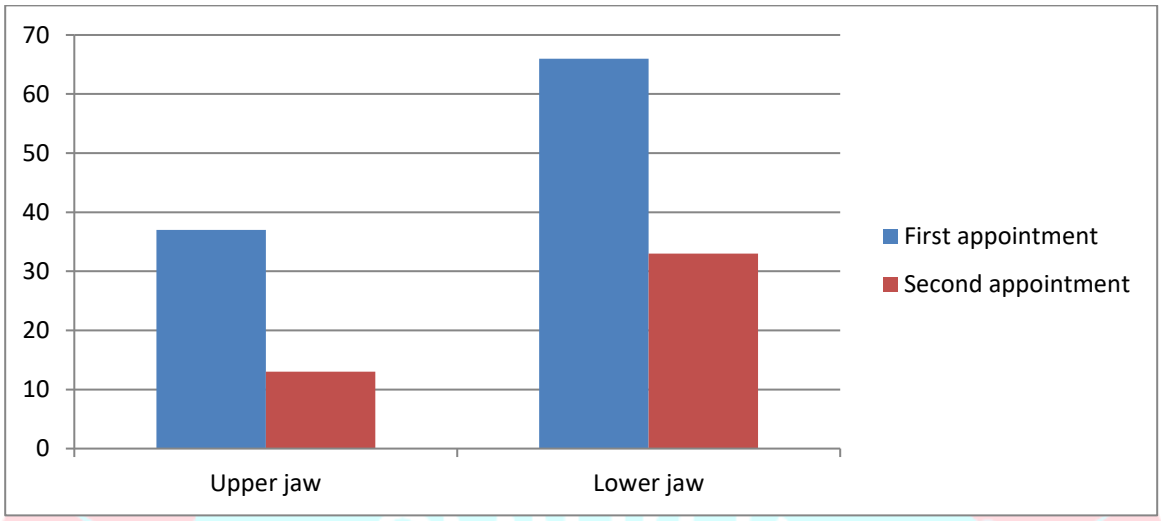

Figure 1. Average FMBS values in percentages in patients from group 1 at the first visit and at the second visit (on the third day) for the upper and lower jaw.

In patients from group 2, we also found a reduction in gingival bleeding from 32% to 26% for the upper jaw and from 53% to 41% for the lower jaw, but without a statistically significant difference (Figure 2).

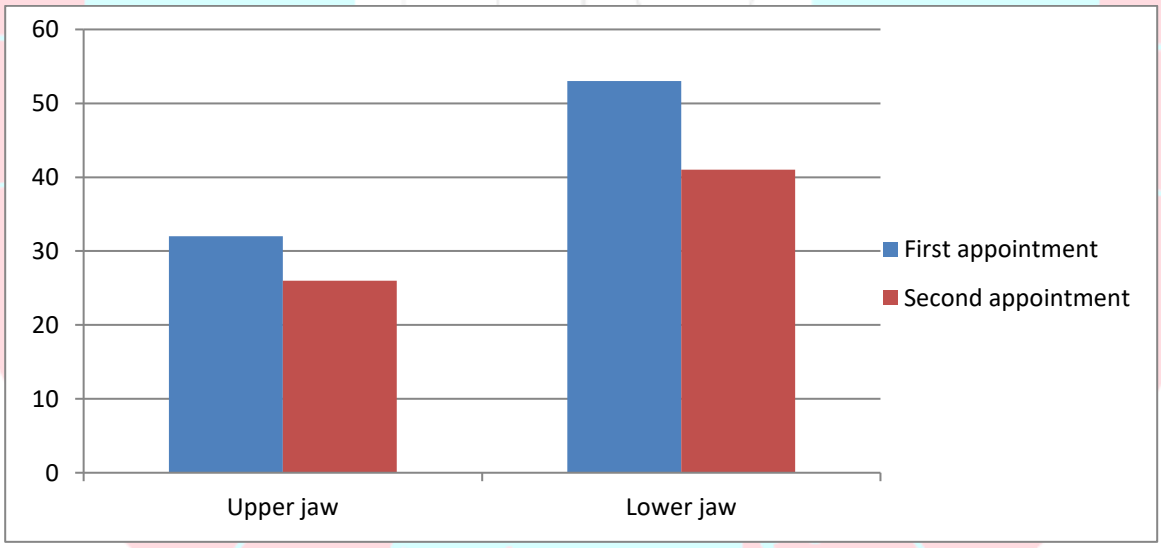

Figure 2. Average FMBS values in percentages in patients from group 2 at the first visit and at the second visit (after 24 hours) for the upper and lower jaw.

Our results show a stronger reduction in gingival bleeding on the third day after cleaning and polishing compared to bleeding on the next day, and for the upper jaw this reduction is statistically significant (p=0.02). The explanation for these facts is related to the easier cleaning of the maxillary teeth at home, as well as the longer healing time after removal of the etiological factor, such as dental biofilm.

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Discussion

The results of our study demonstrate a significant reduction in gingival inflammation, assessed by the FMBS bleeding index, after ultrasonic cleaning and polishing of the teeth with sodium bicarbonate. Zanatta et al. investigated the effect of supra- and subgingival scaling and polishing and found that these procedures significantly contribute to the reduction of plaque formation and gingival bleeding over an experimental period of three weeks. Their results also show a statistically significant difference in the presence of visible plaque and calculus between polished and unpolished teeth, with the lack of polishing leading to increased plaque formation, calculus accumulation and gingival bleeding (6). Smooth, polished tooth surfaces make plaque retention more difficult, and less calculus acting as a plaque-retentive factor is beneficial for healing of the gingival inflammation (6,7).

Creating clean, smooth tooth surfaces, supra- and subgingivally, is essential for both eliminating gingival inflammation and bleeding and for the successful fixation of orthodontic retainers. Many studies have shown that the combination of scaling and polishing is effective in achieving this goal (8,9). These procedures are safe and well-tolerated by the patient, and the risk of emphysema and soft tissue injury from sodium bicarbonate polishing is minimized. There is also a water-air polishing powder based on the amino acid glycine, which is also intended for subgingival polishing of root surfaces (8,10). Sodium bicarbonate polishing alone can remove dental biofilm, both supragingivally and subgingivally, in a shorter time and less aggressively than scaling, but it is not able to remove calculus. The combination of scaling and sodium bicarbonate polishing contributes to the elimination of gingival inflammation and the reduction of bleeding, both from the marginal gingiva and from the bottom of the sulcus, by significantly reducing the bacterial load in the oral environment. The control of microorganisms and plaque in a young, immature state is a prerequisite for the initiation of a healing process in the soft tissues (10,11,12).

Conclusion

The reduction of gingival bleeding after cleaning and polishing of the teeth established by the use an ultrasonic scaler and sodium bicarbonate polishing device as a mandatory part of the protocol for preparing the lingual surfaces of the anterior teeth for fixation of orthodontic retainers. The strong statistical significance we have established of the reduction in gingival bleeding on the third day after the initial cleaning and polishing gives enough evidence to recommend that the bonding of the orthodontic retainers should be done within this period.

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