

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Oral health changes during orthodontic treatment.

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ABSTRACT

The aim of the study was to evaluate orthodontic patients examined at 12 months and 18 months since the start of treatment with fixed orthodontic appliances and to evaluate the frequency of caries. A total of 60 patients undergoing or scheduled for fixed orthodontic treatment were divided into two groups. Patients were divided according to the duration of fixed orthodontic appliance treatment. In the first group, treatment lasted for 12 months, and in the second group 18 months. The frequency of caries increased with duration orthodontic treatment with fixed appliances. There was a high prevalence of caries in the 18-month group of patients (53.3%) compared to 12-month group (36%). The 12-month group had high caries rate in lower right posterior quadrant, in contrast to the 18-month group where the highest caries rate was in lower left posterior quadrant Prophylaxis with topical fluoride application should be implemented: high-fluoride toothpastes, fluoride mouthwashes, gels and varnishes during and after the orthodontic treatment, especially in patients at high risk of caries.

Keywords: carious lesions, fixed orthodontic appliance

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INTRODUCTION

Dental caries is an infectious multifactorial microbiological disease that results in localized dissolution and destruction of calcified tissues of the teeth [1]. The orthodontic treatment can be ascribed to inadequate removal or elimination of plaque and food debris from the restricted areas for clearance due to the appliance [2]. Actually it needs more than the regular practice of brushing to maintain the oral hygiene in orthodontic patients. Majority of patients undergoing orthodontic treatment are adolescents and young adults, which is the generation having a food pattern.

Fixed orthodontic appliances create stagnation areas for plaque and make tooth cleaning difficult. Brackets, arch wires, ligatures, and other orthodontic appliances complicate the use of conventional oral hygiene measures. This often results in significant plaque accumulation around the bracket bases. Demineralization of enamel around brackets can be an extremely rapid process and appears most frequently on the cervical and middle thirds of the buccal surfaces of the maxillary lateral incisors, the mandibular canines, and the first premolars [3]. Demineralized enamel can remineralize after debonding under favorable conditions.

Studies evaluating the relationship between orthodontic treatment and dental caries have shown contradictory results. Some authors [4,5] have reported a positive correlation between orthodontic treatment and the incidence of caries. Others [6,7] have even reported a negative relationship between fixed orthodontic appliances and caries.

The aim of this study was to evaluate the orthodontic patients examined at 12 months and 18 months since the start of treatment with fixed orthodontic appliances and to evaluate the frequency of caries.

MATERIALS AND METHODS

A total of 60 patients undergoing or scheduled for fixed orthodontic treatment were divided into two groups. Patients were divided according to the duration of fixed orthodontic appliance treatment. In the first group, treatment lasted 12 months, and in the second group 18 months. Patients were selected randomly during regular recall visits to the Orthodontic Clinic at the University Dental Clinic Center in Skopje, and all satisfied the following inclusion criteria: healthy systemic and periodontal condition (depth of periodontal pockets ≤ 3 mm) and avoidance of antibiotic therapy and antiseptic mouthwashes during and three months before the study. All patients received precise instructions on oral hygiene regime and exclusion of dietary intake before orthodontic appliance placement and during each recall. In our study extent and severity of carious lesions were not measured, but only the presence of carious lesion in each quadrant was noted. Permanent dentition was examined quadrant wise for carious lesions in both groups.

Upper Anterior Quadrant:	13 -- 23
Upper Right Posterior Quadrant:	14 -- 17
Upper Left Posterior Quadrant:	24 -- 27
Lower Anterior Quadrant:	33 -- 43
Lower Left Posterior Quadrant:	34 -- 37
Lower Right Posterior Quadrant:	44 -- 47

RESULTS

Table 1 and Table 2 show the number of patients with carious lesions at 12 months and 18 months of treatment. Two different groups with 60 patients each were evaluated at different time intervals. There was a high prevalence of caries in the 18-month group of patients (53.3%) compared to 12-month group (36%). The 12-month group had high caries rate in lower right posterior quadrant, in contrast to the 18-month group where the highest caries rate was in lower left posterior quadrant (Table 3 and Table 4). The assessment of oral hygiene habits in orthodontic patients is shown in Table 5. It can be seen that 61.6% of these patients had the habit of brushing the teeth two to three times a day, 78.3% used normal tooth brush, 21.6% used orthodontic brush, whereas only 3% of the orthodontic patients used interdental brush. Among the participants, 86.6% had the habit of rinsing mouth after every meal, and 20% also used mouthwash.

Table 1: The number of patients with carious lesions 12 month treatment period

12 month treatment period		Total N (%)
Number of patients with or without carious teeth	Non carious teeth	18 (60%)
	Less than three carious teeth	11 (36%)
	Less than five carious teeth	1 (3%)
	Less more seven carious teeth	0 (0%)
Total		30

Table 2: The number of patients with carious lesions 18 month treatment period

18 month treatment period		Total N (%)
Number of patients with or without carious teeth	Non carious teeth	10 (33,3 %)
	Less than three carious teeth	16 (53.3 %)
	Less than five carious teeth	3 (10 %)
	Less more seven carious teeth	1 (3%)
Total		30

Table 3: Carious teeth after 12 months into treatment in each quadrant

Quadrant	Carious teeth	Non carious teeth	Total(N)
Upper Anterior Quadrant	1	179	180
Upper Right Posterior Quadrant	2	118	120
Upper Left Posterior Quadrant	3	117	120
Lower Anterior Quadrant	1	179	180
Lower Left Posterior Quadrant	3	117	120
Lower Right Posterior Quadrant	6	114	120

Table 4: Carious teeth after 18 months into treatment in each quadrant

Quadrant	Carious teeth	Non carious teeth	Total(N)
Upper Anterior Quadrant	1	179	180
Upper Right Posterior Quadrant	4	116	120
Upper Left Posterior Quadrant	12	108	120
Lower Anterior Quadrant	6	174	180
Lower Left Posterior Quadrant	16	104	120
Lower Right Posterior Quadrant	9	101	120

Table 5: Distribution of subjects according to oral hygiene habits

Oral hygiene habits		Total (%)
Brushing habit	Once/day	21 (35%)
	2-3 time/day	37 (61.6%)
	Irregular	2 (3.3%)
Type of tooth brush	Normal toothbrush	47(78.3%)
	Orthodontic toothbrush	13 (21.6%)
Additional oral hygiene aids	Interdental brush	2 (3%)
	Regulay use moutwash	12 (20%)
Mouth rinsing habit	Rinse after every meal	52(86.6%)
	Rinse irregularly after meal	8 (13.3%)

DISCUSSION

After removal of bands and brackets at the end of active orthodontic treatment, clinical examinations often identify the presence of lesions, which may range in severity from incipient, non-cavitated to advanced

cavitated, carious lesions. Therefore, patients with fixed appliances must follow very rigid oral hygiene protocols to avoid such side effects.

Some authors suggest that orthodontic treatment with a fixed appliance may be compatible with an increased incidence of caries, and thus orthodontic treatment itself has always been criticized [8,9]. Poor oral hygiene is one of the main problems routinely faced in the orthodontic treatment. Orthodontic appliance creates an environment that provides potential space for bacterial flora. This condition is clinically seen as white spot lesions and cavitations in the most severe cases. It was concluded that fluoride dentifrice could indeed be considered an efficient preventive method to enhance enamel resistance against the cariogenic challenges during orthodontic therapy [10,11].

In orthodontics caries usually occurs on smooth surfaces, affecting 2 to 96% of all orthodontic patients [12]. Increase in caries risk during such treatment is due to several factors; lesions are difficult to locate, lowering of resting pH, increased volume of dental plaque and rapid shift in bacterial flora [13]. Maxillary lateral incisors, maxillary canines and mandibular premolars are the most commonly affected teeth [14]. However, any tooth may be involved and often a number of anterior teeth show demineralization. Different brushing techniques have been advised by orthodontists to maintain oral hygiene, whereas soft brushes advised by some orthodontists lead to plaque deposition around orthodontic appliances.

In the present cross-sectional descriptive study, incidence of caries increased with time which clearly indicated a rise in the frequency of caries in 12-month and 18-month group of patients in orthodontic treatment. Frequency and progression of caries in patients of both groups were measured in this study. The most prevalent site for caries in 12-month treatment group was lower right posterior quadrant, but in 18-month group it shifted to lower left posterior quadrant. The explanation might be in the fact that most patients are right-handed, and they brush well the left side. As the time interval increases, caries is equally present in both quadrants if oral hygiene is not maintained. This was confirmed by 36% carious lesions in 12-month group and 53.3% in 18-month group of patients. The increase in carious lesions during treatment with fixed orthodontic appliances has been confirmed by other investigators as well. Pancherz and Mulich [15] examined 108 patients for carious lesions before and after orthodontic treatment. They detected new or increased number of carious lesions in 29.4% of the teeth examined. This study reveals the importance of oral hygiene maintenance by the patient and the dentist. The increased frequency of carious lesions in 12-month group shows that after orthodontic treatment, patient's motivation towards maintenance of oral hygiene is diminished. This has been proven by many studies, too [16]. Both groups of our patients used fluoride toothpastes and mouthwashes during the entire treatment as instructed without any difficulty. This recommendation was aimed at promotion of remineralization and increase of enamel resistance during treatment.

The most important prophylactic measure to prevent the occurrence of caries in orthodontic patients is implementing a good oral hygiene regimen. Good oral hygiene is thus more important in orthodontic patients treated with fixed appliances than in non-treated individuals. Mechanical plaque control by proper tooth brushing is of paramount importance. A modification of the standard toothbrush, use of disclosing solutions, and use of floss can help patients in attaining good oral hygiene. Use of a power toothbrush or daily water irrigation in combination with manual tooth brushing may be a more effective method in reducing plaque accumulation than manual tooth brushing alone [17]. Zabokova [18] in her study concluded that improvement of oral hygiene was detected in the group where preventive treatment with Fluorogal was implemented revealing a statistically significant difference between medium values of the simplified oral hygiene index (OHI-S) before and after orthodontic treatment, which was not the case with control group. This finding might be a result of the way of maintenance of oral hygiene (adequate and not adequate oral hygiene). The subjects treated with dental cream (GC Tooth Mousse) had significantly decreased oral hygiene index at the end of orthodontic treatment (1.49) in comparison with the beginning of the treatment, where the average monthly value of the index of oral hygiene was 1.55. Besides oral hygiene at home, professional prophylactic cleaning is designed to reduce the bacterial load, enhance the efficacy of brushing and facilitate cleaning by the patient. Professional tooth cleaning two or three times a year maintains a healthy mouth and reduces the risk and number of teeth with caries. It allows proper cleaning of the areas that are hard for the patient to brush. The coronal surfaces can be polished using fluoridated pastes of progressively finer particle size, and elastomer polishing cups or brushes, to impede the mechanical retention of bacteria [19].

Most orthodontists agree that patients seeking orthodontic treatment run a high risk of developing caries [20]. Many publications have addressed this risk in orthodontic patients. Multiple factors have been discussed related to orthodontic treatment, caries development, plaque accumulation, effect of fluoride, and demineralization [21].

In our study, caries detection after 12 months and 18 months post-orthodontic treatment was a cause for concern. These results confirm that, even when taking into account subjective evaluation of the risk of caries in the indication for fitting fixed orthodontic appliances and with regular instructions in how to improve oral hygiene status, there is a continued risk of initiating or even increasing enamel demineralization during treatment with fixed orthodontic appliances. Only some of the patients we examined showed evidence of an unchanging status in all teeth. New or more numerous carious lesions were noted in all of the teeth examined. This value is markedly above that obtained by Zimmer, who calculated the frequency of white spot carious lesions in 160 patients undergoing treatment with various prophylaxis regimes. The proportion of teeth showing new carious lesions was between 9.8% and 0.3%, depending on the intensity of the prophylactic measures [22].

CONCLUSION

The responsibility of specialists in pediatric and preventive dentistry is to minimize the risk of patients having decalcification as a consequence of orthodontic treatment by educating and motivating patients for excellent oral hygiene practice.

Prophylaxis with topical fluoride application should be implemented: high-fluoride toothpastes, fluoride mouthwashes, gels and varnishes during and after the orthodontic treatment, especially in patients at high risk of caries.

In summary, it is important to reaffirm that patient compliance with regard to tooth brushing and prophylactic fluoridation are the most important factors in preventing the development of carious lesions during treatment with a fixed orthodontic appliance.

The incidence of carious lesions during treatment is in agreement with more frequent teeth cleaning and greater intensity of fluoridation. Our results emphasize the need for good instructions, motivation, and control of patient's oral hygiene measures during treatment with fixed appliances.

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