

Carious lesions in patients undergoing orthodontic treatment

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Abstract

Objective: To record the newly developing carious lesions in patients receiving fixed orthodontic treatment.

Methods: A descriptive cross sectional study was conducted from January to June 2010. Group A (6 months of treatment) comprised of 45 patients, compared to Group B (12 months of treatment) 45 patients. In both groups no cavitation was present; all carious lesions were filled at the start of orthodontic treatment.

Results: The frequency of caries increased with the time period rise after orthodontic treatment. Patients after 12 month treatment had more carious lesions than at 6 month; caries activity increases in orthodontic patients.

Conclusion: Patient motivation to maintain their oral hygiene with the use of fluoride mouthwashes reduces the amount of carious lesions.

Keywords: Oral hygiene, Orthodontics, Demineralization, Carious, Karachi, Pakistan, Decalcification (JPMA 61: 1176; 2011).

Introduction:

Enamel decalcification is one of the complications of orthodontic treatment.^{1,2} Previous records suggested high prevalence of caries in patients receiving fixed orthodontic treatment, with the cause being difficulty and negligence in oral hygiene maintenance.³ The frequency increases with age and treatment duration. Caries is a reversible multifactorial process of tooth demineralization and remineralization.¹ It's also known as tooth decay or disease where bacterial processes damage hard tooth structure.² These tissues progressively break down, producing dental caries i.e. cavities. Two groups of bacteria are responsible for initiating caries: *Streptococcus mutans* and *Lactobacillus*. If left untreated, the disease can lead to pain, pulp necrosis and tooth loss.

Poor oral hygiene is one of the main problems routinely faced in the orthodontic treatment.⁴ 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 dentrifice could indeed be considered an efficient preventive method to enhance enamel resistance against the cariogenic challenges during orthodontic therapy.³

In orthodontics caries usually occurs on smooth surfaces, affecting 2 to 96% of all orthodontic patients.⁵ 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.³ Maxillary lateral incisors, maxillary canines and mandibular premolars are the most commonly affected teeth.⁶

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.

At every adjustment appointment, it is crucial to inspect the teeth to avoid missing early demineralized spots.⁷ Professional cleaning of teeth is also recommended if patients cannot achieve satisfactory oral hygiene. In severe cases and as a last resort, early removal of the appliance may be required to confine the damage. Any enamel erosion must be recorded prior to commencing treatment and appropriate dietary advice given to minimize further tooth substance loss. Since carbonated drinks and pure juices are the most common causes of erosion, they should be avoided in patients with fixed appliances.⁸

Few investigators in the past have recorded the caries rate after orthodontic treatment.¹ The present study includes patients with caries activity during orthodontic treatment. The aim of the study was to evaluate the orthodontic patients examined at 6 months and 12 months time interval from the start of treatment and to evaluate the frequency of caries.

Patients and Methods

A total of 90 healthy young patients were included in this descriptive cross sectional study at Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences Dow University of Health Sciences Karachi (DIKIOHS DUHS) for the clinical presence of carious lesions in the oral cavity during orthodontic treatment in the time period of January to June 2010 (for 6

months). Informed consent was obtained from every patient.

Selected patients were between 12-25 years, both sexes, and for fixed appliance therapy. Third molars were excluded from the study and all second molars were also banded along with first molars. All patients were evaluated for caries before the start of the treatment; and any carious lesions if present, were filled. Patients with any systemic disease, cyst, clefts or any congenital malformations, generalized dental problems/diseases and patients receiving removable appliance treatment were excluded from the study.

Patients were advised to use medium tufted brushes with usual brushing method. The recommended brushing time was 3-5 minutes, however patients were advised to brush until appliances were clean.

Patients were divided into two groups of 45 each.

Group A was assigned 6 months treatment and Group B: 12 months treatment period.

Patients of both groups were instructed a proper brushing technique before and during the entire treatment period.⁹ The intraoral clinical examination and diagnosis was made by direct visual examination with the help of instruments. No radiographs were used in this study as the diagnosis of initial carious lesions are not visible in them. In

our study extent and severity of carious lesions were not measured, 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

In this study 90 patients were included with the mean age of 17.44 ± 3.073 years and age range of 12 to 25 years. The ratio between male and female was 44:46. Table-1 shows the number of patients recorded with carious lesions in 6 months and in 12 months treatment. Two different groups with 45 patients each, were evaluated at different time intervals. There was a high prevalence of caries in the 12 month group of patients with 33% caries rate in 6 months group and 61% in the 12 months group. The 6 months group had high caries rate in lower right posterior quadrant, in contrast to the 12 month group where the highest caries rate

Table-1: Carious patients presented after 6 months and 12 months into treatment.

		Number of Patients in		Total N (%)
		6 month treatment period	12 month treatment period	
Number of patients with or without carious teeth	Non- carious patients	30 (66.7%)	16 (35.6%)	46 (51.5%)
	Less than three carious teeth	15 (33.3%)	22 (48.9%)	37 (41.1%)
	Less than five carious teeth	0 (0%)	6 (13.3%)	6 (6.65%)
	Less than seven carious teeth	0 (0%)	1 (2.2%)	1 (1.1%)
Total		45	45	90

Table-2: Carious teeth after 6 months and 12 months into treatment.

Quadrants	Patients after 6 months into Treatment		Total
	Carious Teeth	Non-carious Teeth	
Upper Anterior Quadrant	1	269	270
Upper Right Posterior Quadrant	3	177	180
Upper Left Posterior Quadrant	4	176	180
Lower Anterior Quadrant	1	269	270
Lower Left Posterior Quadrant	4	176	180
Lower Right Posterior Quadrant	7	173	180

Quadrants	Patients after 12 months into Treatment		Total
	Carious Teeth	Non-carious Teeth	
Upper Anterior Quadrant	0	270	270
Upper Right Posterior Quadrant	5	175	180
Upper Left Posterior Quadrant	14	166	180
Lower Anterior Quadrant	8	262	270
Lower Left Posterior Quadrant	19	161	180
Lower Right Posterior Quadrant	11	169	180

was in lower left posterior quadrant (Table-2).

Discussion

In the present cross sectional descriptive study, incidence of caries increased with time lapses which clearly indicated a rise in the frequency of caries in 6 month and 12 month group of patients in orthodontic treatment. Frequency and progression of caries in patients of both groups were measured in this study. When compared to the result of Chang S.H¹ who checked the carious lesion at the start and end of the treatment and showed involvement of teeth at the end of the treatment.

As noted in our study, the most prevalent site for caries in 6 months treatment group patients was lower right posterior quadrant but in the 12 months group it shifted to lower left posterior quadrant. The reason is that because most patients are right handed, they brush well on the left side. As the time interval increases, caries present in both the quadrants equally if oral hygiene is not maintained. This was observed as 33% carious lesions in 6 months group and 64.44% in 12 months group of patients. The high frequency of carious lesions reported in our study can be attributed to their low socio-economic status. These people take oral hygiene measures for granted. They consume more carbohydrates in their diet which makes them more prone to caries. A rise in caries is also associated with decalcification which starts before the initiation of treatment. The increase in carious lesions during treatment with fixed orthodontic appliances has been confirmed by other investigators as well. Panchez and Mulich¹⁰ 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 months group shows that as the time lapses after orthodontic treatment, patient's motivation towards maintenance of oral hygiene becomes low. This has been proven by many studies.¹¹ During our study, both groups of patients used fluoride toothpastes and mouthwashes during the entire treatment duration as instructed without any difficulty. It was recommended, aiming to promote remineralization and increase enamel resistance during treatment.¹¹ Flossing was not advised, as it tends to break brackets and damage the gingival tissues if improperly utilized.¹²

Most orthodontists agree that patients seeking orthodontic treatment run a high risk of developing caries.¹³ Many publications have addressed this risk in orthodontic patients.¹⁴ Multiple factors have been discussed related to orthodontic treatment, caries development, plaque

accumulation, effect of fluoride, and demineralization.^{15,16} In our study, caries detection after 6 months and 12 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 a fraction 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,¹⁷ 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.

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

Conclusions

Caries and decalcification continue to be a serious problem as shown by high caries rate in our study. The clinician must observe closely the new lesions and the increase of carious lesions in all the teeth evaluated. The new carious lesions should be treated as soon as they are diagnosed. Meticulous caries-prophylactic measures such as professional tooth cleaning and fluoridation continue to be decisive factors in prevention.

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