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Original Research

Association of Periodontal Health with Orthodontic Appliances among Indian Patients

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Abstract:

Background: To assess the association of periodontal status of the patients with and without orthodontic treatment.

Materials and Methods: This cross-sectional study was conducted among 520 patients (220 undergoing orthodontic procedure and 300 non-orthodontic patients). Periodontal health status was assessed using community periodontal index and loss of attachment. Data were analyzed using SPSS version 16 and level of significance used was 5% level.

Result: Overall mean number of segments for bleeding component (Score 1) was 0.86 ± 0.708, that of calculus (Score 2) 0.30 ± 0.460, for shallow pockets (4-5 mm) (Score 3) 0.33 ± 0.744 and for deep pockets (6 mm or more) (Score 4) 0.38 ± 0.476. Patients with orthodontic appliances had poor periodontal status than the non-orthodontic patients ($P < 0.05$).

Conclusion: Patients undergoing orthodontic treatment have increased the level of periodontal status as it leads to more retention of food debris. Hence, these patients should be motivated to maintain good oral hygiene.

Key Words: Community periodontal index, loss of attachment, orthodontic treatment, periodontal diseases

Introduction

Orthodontic procedure has dual impact on periodontal status, which may be sometimes very significant in increasing the periodontal health, and may sometimes be harmful procedure that can be followed by periodontal problems as: Gingival recessions, loss of attachment, and the formation of gingival pockets.[1]

Fixed orthodontic braces may impair plaque removal, and affect gingival health.[2] Gingivitis may develop in orthodontic patients who do not follow proper oral hygiene practices.[3] As bands, brackets, elastics, and ligature wires support the accumulation of microbial flora and food deposits. In time, the plaque accumulation around the orthodontic braces may cause periodontal disease as well as dental caries.[4]

Orthodontic treatment produces a local change in the oral environment, with changes in the composition of bacterial plaque and consequently the development of gingivitis.[5]

The oral cavity is colonized by natural microflora, which is relatively stable in individuals and the composition of which is the result of a long-term relationship between the microorganisms and the host. This balance can easily be disrupted by the action of numerous external and internal factors. Microorganisms play a significant role in the development of many pathological states in the oral cavity; they participate in the origin of dental caries and periodontal disease.[6] According to a currently accepted hypothesis, periodontitis is an infectious disease of bacterial origin induced by microorganisms present in the dental plaque. Its development, however, is affected by many endo- and exogenous factors and their mutual interactions, which decide about the response of the periodontal tissues to this primary infectious stimulation.

Further orthodontic appliance also creates additional retention surfaces and spaces for adhering of microorganisms and growth of biofilm, i.e. an organized structure of microorganisms in mutually supporting colonies.

However, very little information is available on the microbiological changes that these periodontal tissues experience during orthodontic treatment. So, this study was planned to know the association between periodontitis with orthodontic appliances to evaluate the clinical parameters of gingivitis and periodontitis response to orthodontic therapy.

Materials and Methods

This is epidemiological study was done to know the association between periodontal health with orthodontic procedure between the age group of 16-24 years. A control group of similar age group was selected for comparison of similar age group. Around 220 patients were selected from the Department of Orthodontics for study group. Similarly, 300 controls were selected for comparison from other departments excluding

orthodontics and periodontology. Also, patients in both the groups who were uncooperative and having deciduous dentition were excluded.

Before the commencement of the study, a pilot study was conducted among a group of 20 patients to ensure the level of validity and degree of repeatability (Cronbach alpha = 0.80). All the study participants were informed about the purpose of this study. Official permission and informed consent were obtained from the Institute.

Methodology

Survey proforma was prepared using WHO Oral Health Assessment Form (1997).[7] Clinical examination was done in the Department of Orthodontics for the study group and other Departments except Periodontology and Orthodontics for the control group. The instruments used were mouth mirror and community periodontal index (CPI) of treatment needs probe, which was used to determine pocket depth and loss of attachment (LOA). It took around 5-6 min to examine each subject.

Statistical analysis

The Statistical software namely SPSS version 16.0 was used for the analysis of the data. Student's *t*-test and ANOVA test were used to find the significance of the difference among different groups regarding periodontal diseases at $P < 0.05$.

Results

520 patients were evaluated in this study with a range 16-25 years. The ratio between orthodontic patients (study group) and non-orthodontic patients (control group) was 220:300.

Overall mean number of segments for bleeding component (Score 1) was 0.86 ± 0.708, that of calculus (Score 2) 0.30 ± 0.460, for shallow pockets (4-5 mm) (Score 3) 0.33 ± 0.744 and for deep pockets (6 mm or more) (Score 4) 0.38 ± 0.476. Significant differences among different age groups were found in the case of calculus and pocket (6 mm or more) in which condition of periodontal disease was getting worse with age (Table 1).

LOA was rarely observed among the subjects only LOA of 4-5 mm was seen, and it was rising with age, but the results were not significant (Table 2).

It was found in this study that patients with orthodontic appliances (study group) had poor periodontal status as the scores of calculus, pocket (4-5 mm) and pocket (6 mm or more) were higher than the non-orthodontic patients ($P < 0.05$). But, the bleeding on probing status was higher in non-orthodontic patients (Table 3).

Table 1: Distribution of periodontal disease among orthodontic (study) and non-orthodontic patients (control).

Periodontal disease	Groups	No	Mean	Standard deviation	*P* value
Bleeding	Study	220	0.74	0.651	0.922
	Control	300	0.95	0.735	
Calculus	Study	220	0.42	0.495	0.001
	Control	300	0.34	0.476	
Pocket (4-5 mm)	Study	220	0.70	0.956	0.000
	control	300	0.18	0.573	
Pocket (6 mm or more)	Study	220	0.42	0.495	0.001
	Control	300	0.34	0.476	

Table 2: Distribution of LOA among orthodontic (study) and non-orthodontic patients (control).

LOA	Groups	No	Mean	Standard deviation	*P* value
Normal	Study	220	3.22	1.207	0.000
	Control	300	4.50	1.074	0.000
4-5 mm	Study	220	2.79	1.354	0.000
	Control	300	1.50	1.154	0.000

LOA: Loss of attachment

Table 3: Distribution of periodontal disease among study subjects according to age.

Periodontal disease	Age groups (years)	No	Mean	Standard deviation	*F* value	*P* value
Bleeding	16-18	131	0.87	0.709	0.884	0.414
	19-21	200	0.79	0.725		
	22-24	189	0.90	0.688		
	Total	520	0.86	0.708		
Calculus	16-18	131	0.30	0.491	3.867	0.022
	19-21	200	0.40	0.497		
	22-24	189	0.44	0.460		
	Total	520	0.38	0.485		
Pocket (4-5 mm)	16-18	131	0.47	0.853	1.395	0.249
	19-21	200	0.33	0.744		
	22-24	189	0.42	0.819		
	Total	520	0.40	0.801		
Pocket (6 mm or more)	16-18	131	0.35	0.476	3.902	0.016
	19-21	200	0.37	0.465		
	22-24	189	0.47	0.423		
	Total	520	0.38	0.476		

When the results of LOA were compared according to orthodontic appliances, it was observed that LOA of 4-6 mm was more commonly seen among the study subjects than controls (Table 4).

Discussion

The role of microorganisms in the etiology of periodontal diseases has been discussed in the literature since years. First, *Actinobacillus* actinomycetemcomitans was found in localised aggressive juvenile periodontitis.[6] Lately, it was also proved in the so-called adult forms of destructive periodontitis and was found to have a number of serotypes, some of them incurring in the healthy periodontium.

Table 4: Distribution of LOA among study subjects according to age.

LOA	Age groups (years)	No	Mean	Standard deviation	Standard error	*F* value	*P* value
Normal	16-18	131	4.05	1.129	0.099	0.283	0.754
	19-21	200	3.96	1.297	0.092		
	22-24	189	3.94	1.388	0.101		
	Total	520	3.97	1.290	0.057		
4-5 mm	16-18	131	1.95	1.129	0.099	0.215	0.763
	19-21	200	2.05	1.297	0.092		
	22-24	189	2.06	1.388	0.101		
	Total	520	2.03	1.290	0.057		

LOA: Loss of attachment

Zadeh *et al*. suggested that the destruction of the periodontium induced by *Actinobacillus* actinomycetemcomitans is caused by the interaction between this pathogen and immune response of the host.[8] Its presence may be considered a risk factor for the development of periodontopathies.

It is generally recommended that orthodontics be preceded by periodontal therapy based on the belief that orthodontics in the presence of inflammation can lead to rapid and irreversible breakdown of the periodontium.[9]

In the present study, patients receiving orthodontic treatment showed an increase in CPI as well as LOA. Naranjo *et al*. also reported that brackets influenced the ecological environment leads to retention of food particles.[10] Similarly Ristic *et al*. found increase in microbiological parameters in 3 months time after the fixed appliance was placed.[11]

The accumulation of plaque on orthodontic brackets causes difficulty for patients to maintain their oral hygiene and leads to increase in pocket depth and worsens the periodontal status. These results were in agreement with the results from other studies.[12]

Zachrisson and Zachrisson reported an increase in probing depth and a slight LOA around teeth of patients who underwent orthodontic treatment with fixed orthodontic appliances.[13] Plaque is the primary etiological agent in almost all periodontal and gingival diseases. Orthodontic patients present a challenge to the proper removal of plaque from the oral cavity. In the initial stages of plaque Gram-positive rods and cocci started appearing on the teeth and gingival surfaces. With time, these organisms are replaced by Gram-negative and anaerobic organisms, which may initiate a periodontal disease.[12]

When moving teeth orthodontically, the entire periodontal attachment apparatus including the osseous structure, periodontal ligament and the soft tissue components moves together with the tooth.[14] Studies have also shown that moving teeth into adjacent osseous defects, orthodontic extrusion with and without fiberotomy and labial tipping of anterior teeth can be successfully accomplished without jeopardizing the periodontal support in the presence of adequate plaque control.[15]

Furthermore studies are needed in order to disclose the exact tissue changes that take place during different phases of orthodontic procedure. Periodontal status in patients undergoing orthodontic treatment should be monitored very carefully. Removable and fixed orthodontic appliances impede correct periodontal hygiene, resulting in more plaque accumulation, inflammation, and bleeding. Therefore, appropriate oral hygiene methods and instruments should be used to control plaque. Powered and interdental toothbrushes and special types of floss have been shown to improve plaque control in orthodontic patients.[16]

Conclusion

Patients undergoing orthodontic procedure showed negative effects on the periodontal tissues than their counterparts, but there were few cases of LOA. So, patient motivation regarding oral hygiene and regular scaling are essential elements for successful orthodontic result.

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