

Comparison of Effect of Fixed Orthodontic Treatment on Gingival Health between Adolescent and Young Adults.

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Abstract

Background: The relationship between orthodontic treatment and gingival health has been an important topic in many studies. It is very much important to have a maximum oral hygiene before receiving an orthodontic treatment since appliance attached for the fixed orthodontic treatment complicates the maintenance of proper care of mouth and it is directly related with periodontal health.

Aim: To compare the relationship of fixed orthodontic treatment and gingival health between adolescents and young adults.

Material and Methods: In this study 30 patients undergoing fixed orthodontic mechanotherapy were selected. Two groups were divided, group 1 is adolescents group (12-18 years) and group 2 is young adults group (19-32 years). Each group is composed of fifteen patients. Each group had under taken similar treatment (fixed orthodontic treatment with extraction or without extraction). The gingival condition assessment like covering of teeth by visible plaque, visible inflammation, and gingival overgrowth is assessed through Orthodontic plaque index(OPI).

Results: On applying chi square test it was found that there is a significant statistical difference ($p=0.05$) between adolescents and young adults group with respect to OPI score more in adolescents group. This shows that more awareness about oral hygiene is required in adolescent group during fixed orthodontic treatment.

Conclusion: Fixed orthodontic treatment is conducive to dental plaque accumulation and gingival inflammation. In this study, it is demonstrated that adolescents treated with fixed orthodontic treatment experienced more plaque accumulation than young adults having received the identical treatment.

Keywords: Adolescent and young adults, Erythrosine, Fixed orthodontic treatment, Gingival inflammation, Orthodontic plaque index.

Introduction:

During the last decade the number of adults seeking orthodontic treatment has increased significantly.¹ Successful orthodontic treatment lies in correcting occlusion in the best possible manner so as to improve aesthetics and function but without affecting the pre-existing health of teeth and supporting tissues.² Single-tooth anterior cross bites often result in stripping of the attached gingiva of lower incisors, and severe impinging deep bites may lead to destruction of the palatal soft tissues. Orthodontic treatment often can correct these problems, or at least prevent them from progressing.³ Fixed orthodontic treatment is the preferred and most common method for treating malocclusion. Fixed appliances such as brackets, bands or fixed retentions may complicate an optimal oral hygiene and this may result in accumulation of dental plaque and gingival inflammation.⁴ It is very important to have a maximum oral hygiene before receiving an orthodontic treatment because appliance attached for the fixed orthodontic treatment complicates the maintenance of proper care of mouth and it is directly related with periodontal health.⁵ Orthodontic treatment may affect the equilibrium of oral micro-flora and increase bacteria retention.⁶ Furthermore, mechanics

applied in the treatment tends to stimulate the response of gingival soft tissues.⁷ Following the placing of the appliance, clinical effects such as chronic infection, inflammatory hyperplasia, gingival recession, attachment loss or gingival overgrowth can occur.⁷ In addition, most of the studies^{1,8,9} indicate that adults are better than adolescents in removing supra gingival plaques. On the other hand children and adolescents develop gingivitis as a response against the presence of orthodontic appliance, periodontitis rarely progresses. The Orthodontic Plaque Index (OPI) was developed to accommodate the special circumstances in the evaluation of oral hygiene during orthodontic treatment. The OPI visually documents the presence of plaque around the multibracket appliance.¹⁰

The aim of the present study is to find out and assess the relationship between fixed orthodontic treatment and gingival health is same or different among adolescents and young adults.

Materials and methods:

This study was performed by scanning the patients treated by post-graduate students of Department of Orthodontics, at College of Dental Science and Hospital Amargadh, which

included 30 patients. Each group, Adolescents (12-18years, mean age 15.2 ± 1.32) and Young adults (19-32 years, mean age 22.6 ± 3.68) having 15 participants of similar sexes per group. Each group has undergone similar treatments (fixed orthodontic treatment with extraction or non extraction). The inclusion criteria were the malocclusion angle's class I,II, and III. The exclusion criteria were as follows: orthognathic surgery, oral habits, lip and plate cleft, medicine intake, pregnancy, lactation, and medically and psychologically compromised patients. The evaluation of gingival plaque, visible inflammation, gingival recession and gingival overgrowth was made by the applying Orthodontic Plaque Index (OPI).

Fixed Orthodontic Treatment and Oral Hygiene:

All of the subjects were treated with MBT appliances on directly bonded brackets on incisors, canines, and premolars and orthodontic bands cemented with glass-ionomer cement on the first molars. Professional oral cleaning and oral hygiene instructions on tooth brushing with the Bass technique and correct use of interdental cleaning devices were provided for all subjects.

Orthodontic Plaque Index:

The Orthodontic Plaque Index (OPI) was developed to accommodate the special circumstances to evaluate the oral hygiene during orthodontic treatment. By this index, Not only the plaque accumulation recorded, but the adjacent marginal gingival are also evaluated. This Index enables an estimation of the individual's need for prophylaxis, so that the appropriate preventive measures can be taken. Problematic oral hygiene sites can be pinpointed, and the patient's motivation to perform regular oral hygiene can be increased. It visually documents the presence of plaque around the orthodontic fixed appliance by staining the teeth or surfaces of the tooth with a plaque-disclosing solution (for instance, erythrosine). The evaluation of the index includes only teeth or surfaces that bear an adhesively bonded bracket on the vestibular or oral (lingual/palatal) aspect. Teeth bearing orthodontic bands are not included.

For the clinical application of the OPI, the dentition is divided into six sextants (Table 1, Fig 1).

Table 1: Division of the dentition into sextants

Sextant	Description
First/S1	Maxillary molar and premolar area; first quadrant (17–14)*
Second/S2	Maxillary canine and incisor area; first/second quadrant (13–23)*
Third/S3	Maxillary premolar and molar area; second quadrant (24–27)*
Fourth/S4	Mandibular molar and premolar area; third quadrant (37–34)*
Fifth/S5	Mandibular canine and incisor area; third/fourth quadrant (33–43)*
Sixth/S6	Mandibular premolar and molar area; fourth quadrant (44–47)*

*FDI tooth-numbering system

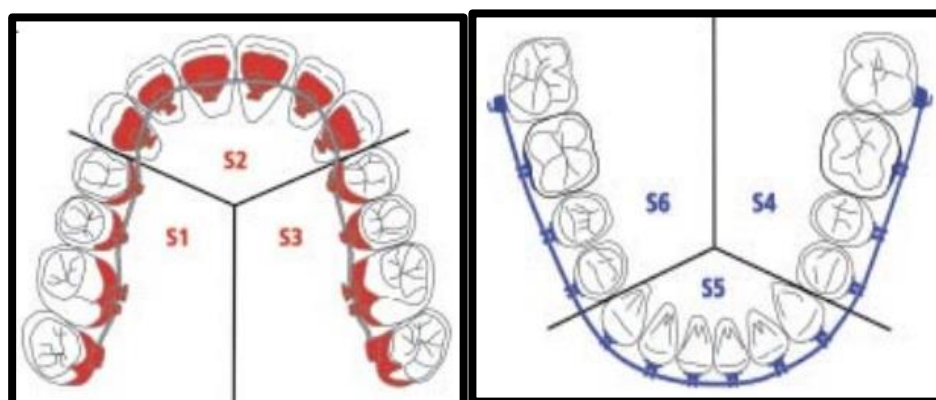


Fig 1: Division of the maxillary and mandibular dentition into sextants.

The status is indicated as a score from 0 to 4. The degree of plaque accumulation on each aspect of the bracket base (mesial, distal,

occlusal/incisal, and cervical) and the condition of the adjacent marginal gingiva are assessed. Score 0 indicates an absence of plaque and

inflammation. Scores 1 to 3 refer to the severity of plaque deposits in the bracket vicinity, and score 4 includes the inflammation status of the gingiva:

0: No plaque deposits on the tooth surfaces surrounding the bracket base

1: Plaque deposits on one tooth surface at the bracket base.













2: Plaque deposits on two tooth surfaces at the bracket base.

3: Plaque deposits on three tooth surfaces at the bracket base.

4: Plaque deposits on all four tooth surfaces at the bracket base and/or marked gingival inflammation.

Teeth bearing orthodontic bands are not included.² Table 2 will illustrate the scores with examples according to the criteria described.

Table 2: OPI scores 0 to 4 with examples for evaluation

OPI score	Example		Description
0			Brackets are plaque-free
1			Isolated plaque islands on one tooth surface at the bracket base
2			Plaque on two tooth surfaces at the bracket base
3			Plaque on three tooth surfaces at the bracket base
4			Plaque on all tooth surfaces at the bracket base
			and/or gingival inflammation

The highest score found per sextant is entered into the sextant

table. In addition, the highest score per sextant represents the score for the

dentition. The highest score of all the sextants determines the current and actual oral hygiene situation and identifies the individual's need for prophylactic treatment (Table 3).

SPSS Base 15.0 (SPSS Inc, Chicago) for Windows was used for statistical Analysis. Chi square test was used to analyze the longitudinal data of the orthodontic plaque index. $P \leq .05$ was chosen as the significance level.

Statistical Analysis:

Table 3 Graded assessment of oral hygiene and prophylaxis need

	Score		
	0 and 1	2	3 and 4
Oral hygiene	Very good to good	Mediocre	Inadequate
Prophylaxis need	<ul style="list-style-type: none"> - Remotivation - Maintain recall interval - Local fluoridation 	<ul style="list-style-type: none"> - Remotivation and oral hygiene instruction - Professional tooth cleaning - Maintain recall interval - Local fluoridation 	<ul style="list-style-type: none"> - Remotivation and oral hygiene instruction - professional tooth cleaning - Shorten recall interval - Local fluoridation - If necessary, in-office or home chlorhexidine treatment

Results:

Each group consist of 15 patients, 7 of whom were females and 8 were males. Average age of the adolescents is 15.2 ± 1.32 and

young Adults is 22.6 ± 3.68 (Table 4). The difference of treatment duration between these two groups was not statistically significant ($p=0.42$).

Table 4: Demographic Variables

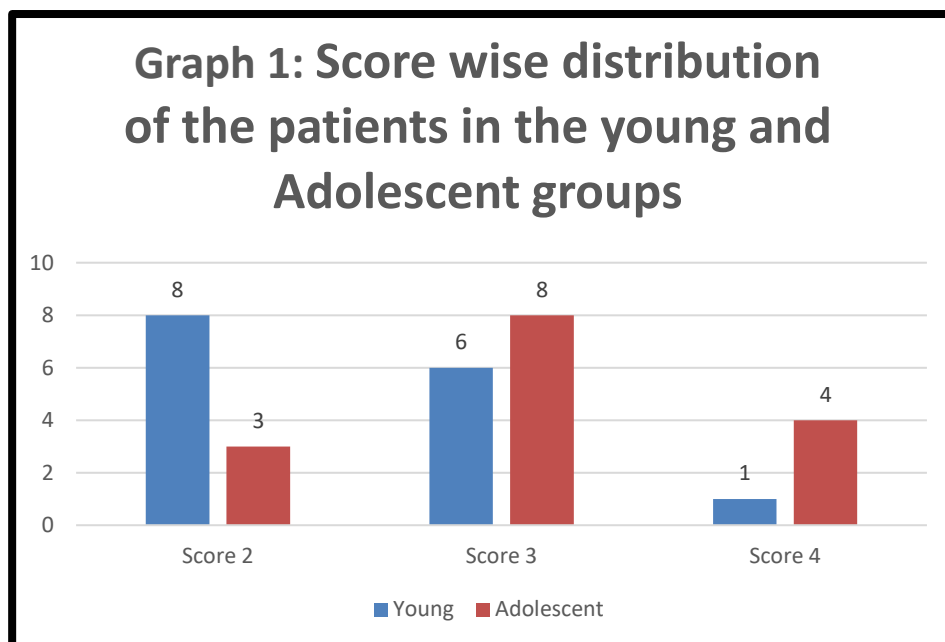
	Adolescent (n=15)	Young (n=15)
Age (year) mean±SD	15.2±1.32	22.6±3.68
Female	7 (53.33%)	7 (53.33%)
Male	8 (46.66%)	8 (46.66%)

No statistically significant difference of age between two groups appeared. Score 0 and 1 is not found in any patient. Score 2 is significantly found in young adults group which is 8 (53.33%) compared with the adolescents group having 3 (20%). Score 3 is significantly found in adolescent

group which is 8 (53.33 %) compared to young adults group having 6 (20%). Score 4 is significantly found in adolescents group which is 4 (26.66%) compared with young adult group having 1 (6.66%) (Table 5) (Graph 1).

Table 5: Score distribution between Adolescents and Young Adults

Oral hygiene	score	Adolescents	Young Adults
Very good to good	score 0	0 (0%)	0 (0%)
	score 1	0 (0%)	0 (0%)
Mediocre	score 2	3 (20%)	8 (53.33%)
Inadequate	score 3	8 (53.33%)	6 (20%)
	score 4	4 (26.66%)	1 (6.66%)



On applying chi square test ($\chi^2=3.58$) it was found that there is a significant statistical difference ($p=0.05$) between adolescents and young adults group with respect to OPI score more in adolescents group. This shows that more awareness about oral hygiene is required in adolescent group during fixed orthodontic treatment.

Discussion:

Orthodontic treatment in patients wearing multibracket appliances introduce additional plaque retention sites on tooth surfaces, thus encouraging proliferation of cariogenic bacteria and periodontopathic microorganisms. This leads to chronic hyper plastic gingivitis, white spot lesions, decalcification, and cavity

formation. Therefore, it is important to ensure a high standard of oral hygiene in these patients to extend the long-term benefits of orthodontic therapy.² There was a significant increase in visual plaque, plaque index and gingival plaque index during the first 3 months of appliance placement.⁴ Adolescents have certainly been shown to suffer worse gingivitis than adults during orthodontic treatment. Interceptive treatment such as the correction of lower incisors in crossbite has been found to improve periodontal health. Orthodontically induced gingivitis especially the young, seems to be of little consequence in that it will resolve after orthodontic treatment in the healthy plaque free mouth.¹¹ Mostly young patients are referred for orthodontic treatment and they often

suffer from plaque related gingivitis. Obvious signs of periodontal disease in adults are a hindrance to being referred for orthodontic treatment.¹²

Most of children developed moderate generalized gingivitis during the orthodontic therapy.⁷ Study which compares the relationship between fixed orthodontic treatment and gingival health among adolescents and young adults pointed out that each group experienced an increase in visible plaque values during treatment but the increase in plaque was statistically significant only for adolescents.⁵ The results of the study demonstrated that adolescents treated with fixed orthodontic treatment experienced more plaque accumulation than young adults having received the identical treatment.⁵ The increase in the visible inflammation values were significant for both groups, however, the increase of the adolescents was found greater.

Patients undergoing orthodontic treatment were having high plaque index, gingival bleeding index and ortho plaque index scores therefore, educating and motivating these individuals remains the main focus point for achieving optimal oral hygiene results.¹³ The researchers associated this situation with factors such that the young adults are more willing to receive orthodontic treatment and

maintain good oral hygiene awareness due to more concern for esthetic correction and oral hygiene maintenance than adolescents. Other factors associated with this research is that the adolescents with increasing hormone levels related with pubertal development cause a surge in gingival inflammation.⁵

Conclusion:

The result of this study demonstrated that adolescents treated with fixed orthodontic treatment experienced more plaque accumulation than young adults having received the identical treatment. This shows that more awareness about oral hygiene is required in adolescent group during fixed orthodontic treatment.

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Conflicts of interest: There are no conflicts of interest.

References:

1. Boyd RL, Leggott PJ, Quinn RS, Eakle WS, Chambers D. Periodontal implications of orthodontic treatment in adults with reduced or normal periodontal tissues versus those of adolescents. *Am J Orthod Dentofacial Orthop* 1989;96:191-199.
2. Singla S, Gupta P, Lehl G, Talwar M. Effects of Reinforced Oral Hygiene Instruction Program with and Without Professional Tooth Cleaning on Plaque Control and Gingival Health of Orthodontic Patients Wearing Multibracket Appliances. *Journal of Indian Orthodontic Society* 2019;53:272-277.
3. Bollen A, Cunha-Cruz J, Bakko DW, Huang JH, Hujoel PP. The effects of orthodontic therapy on periodontal health: A systematic review of controlled evidence. *J Am Dent Assoc* 2008;139:413-422.
4. Liu H, Sun J, Dong Y, Lu H, Zhou H, Hansen F, Song X. Periodontal health and relative quantity of subgingival *Porphyromonas gingivalis* during orthodontic treatment. *Angle Orthod.* 2011;81:609-615.
5. Karacaoglu F, Gazioglu C, Akkaya S, Akkaya M. Are the Effects of Fixed Orthodontic Treatment on Gingival Health Similar in Adolescents and Young Adults? *Journal of Biomedical Sciences* 2016;6:1-5.
6. Ristic M, Vlahovic Svabic M, Sasic M, Zelic O. Clinical and microbiological effects of fixed orthodontic appliances on periodontal tissues in adolescents. *Orthod Craniofacial Res.* 2007;10:187–195.
7. Zachrisson S, Zachrisson BU. Gingival condition associated with orthodontic treatment. *Angle Orthod.* 1972;42:26-34.
8. Zachrisson BU, Alnaes L. Periodontal condition in orthodontically treated and untreated individuals. I. Loss of attachment, gingival pocket depth and clinical crown height. *Angle Orthod* 1973;43:402-411.
9. Boyd RL. Longitudinal evaluation of a system for self-monitoring plaque control effectiveness in orthodontic patients. *J Clin Periodontol* 1983;10:380-388.
10. Beberhold K, Sachse-Kulp A, Schwestka-Polly R, Horneckerand E, Ziebolz D. The Orthodontic Plaque Index: an oral hygiene index for patients with multibracket appliances. *Orthodontics* 2012;13:94-99.
11. Willmot D. Orthodontic Treatment and the Compromised Periodontal Patient. *Eur J Dent.* 2008; 2:1-2.
12. Nasir N, Ali S, Bashir U, Ullah A. Effect of orthodontic treatment on periodontal

- health. Pakistan Oral & Dental Journal
2011;31:111-114.
13. Mahindra RK, Suryawanshi GR, Doshi
UH. Effects of fixed orthodontic

treatment on gingival health: An
observational study. International
Journal of Applied Dental Sciences
2017;3:156-161.

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