

Gingival Conditions Associated with Orthodontic Treatment in Adolescents and Young Adults: An Observational Study

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Abstract: ***Introduction:** Gingival enlargement is excessive growth of the gums, where the inflammatory tissue may be in a limited region, or it may be generalized. Favourable conditions for plaque accumulation and difficulty in performing oral hygiene measures have been associated with poorer periodontal health among orthodontic patients. **Objectives:** To assess the prevalence of gingival enlargement in patients with and without fixed orthodontic appliances and to assess the effect of duration of orthodontic treatment on clinical parameters in patients undergoing fixed orthodontic treatment. **Methodology:** A total of 40 subjects (aged 15-35 years) were divided into 2 groups: patients undergoing orthodontic treatment (Group 1) and patients without fixed orthodontic appliances (Group 2). Clinical examinations included plaque index, gingival index, bleeding on probing, gingival enlargement. Statistical analysis: Chi-square test and Mann Whitney test were used for comparison between clinical parameters and duration of orthodontic treatment. **Result:** Increased gingival inflammation and enlargement were observed in group 1 patients undergoing orthodontic treatment due to poor oral hygiene. Also, greater severity of enlargement was seen with increased treatment duration. **Conclusion:** Duration of orthodontic treatment influenced occurrence of gingival enlargement due to self-neglect of patients causing accumulation of plaque leading to inflammation and bleeding. Sex hormone levels also explain the greater likelihood of younger participants to have gingival enlargement that modulate periodontal tissues to be more sensitive to plaque causing a hyperplastic reaction of the gingiva.*

Keywords: Gingival enlargement; orthodontic treatment; oral hygiene

1. Introduction

The effect of fixed orthodontic appliances on periodontal parameters has been shown in earlier studies. Favourable conditions for plaque accumulation as well as difficulty in performing oral hygiene measures have been associated with poorer periodontal health among orthodontic patients.^[1-5]

Gingival enlargement is excessive growth of the gums where the inflammatory tissue may be in a limited region, or it may be generalized.^[1] Previous studies have assessed the occurrence of gingival enlargement during orthodontic treatment. Eid et al and Zanatta et al found a positive association between the use of fixed orthodontic appliances and gingivitis and GE.^[6, 7] A recent study showed that anterior gingival enlargement promotes a negative impact on oral health-related quality of life of orthodontic patients, which reiterates the need for further investigations on this issue.^[8] Therefore, in this study, we aimed to assess the prevalence of gingival enlargement in patients with and without fixed orthodontic appliances and to assess the effect of duration of orthodontic treatment on clinical parameters in patients undergoing fixed orthodontic treatment.

2. Methodology

Patients, aged between 15-35 years, were recruited from the Out Patient of Department of Periodontology, Faculty of Dental Sciences, Ramaiah University of Applied Sciences, Bangalore. The sample size has been estimated using the **GPower software v. 3.1.9.2**. Considering the effect size to be measured (d) at 80% for Two-tailed hypothesis, power of

the study at 80% and the margin of the error at 10%, 40 patients were divided into 2 groups: patients undergoing orthodontic treatment (Group 1) and patients without fixed orthodontic appliances (Group 2).

To be included in group 2, participants should be using fixed orthodontic appliances for at least 6 months. To be included in group 1, subjects should not be using or have previously used fixed orthodontic appliances. Patients using systemic medication for the treatment of chronic diseases that might interfere with gingival overgrowth were excluded from the sample.

Clinical examinations included assessment of plaque index (Silness and Loe, 1964); Gingival index (Loe and Silness, 1963);^[11] presence/absence of bleeding on probing; and assessment of gingival enlargement (Bokenkamp's classification, 1994).

The degree of gingival enlargement was scored as follows:

Grade 0: No signs of gingival enlargement

Grade I: Enlargement confined to interdental papilla

Grade II: Enlargement involves papilla and marginal gingiva

Grade III: Enlargement covers three quarters or more of the crown.

3. Statistical Analysis

Statistical Package for Social Sciences [SPSS] for Windows, Version 22.0 Released 2013 Armonk, NY: IBM Corp., was used to perform statistical analyses.

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Chi Square Test was used to compare the prevalence of gingival enlargement between 2 groups.

Independent Student t test will be used to compare clinical parameters between 2 groups.

The level of significance will be set at $P < 0.05$.

4. Results

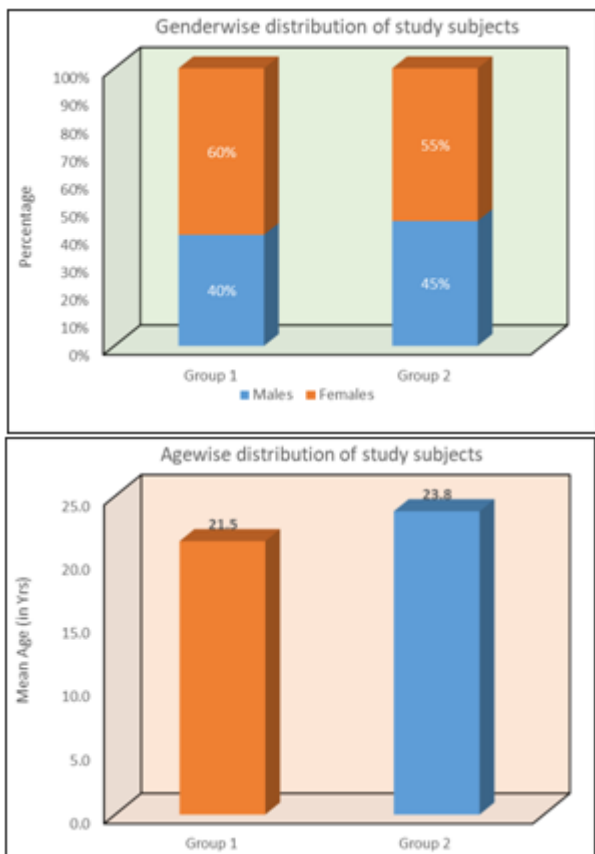


Figure 1: Sociodemographic characteristics of subjects

Figure 1 shows the sample distribution according to sociodemographic characteristics. There was no difference among the groups with regard to age and gender.

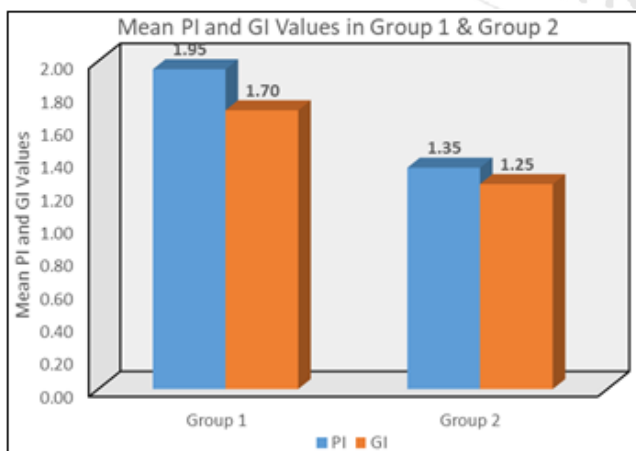


Figure 2: Mean plaque index and gingival index scores

Figure 2 shows the plaque and gingival index scores in group 1 and group 2. We observed statistically significant increase in mean **plaque index and gingival index** scores in *Group 1*.

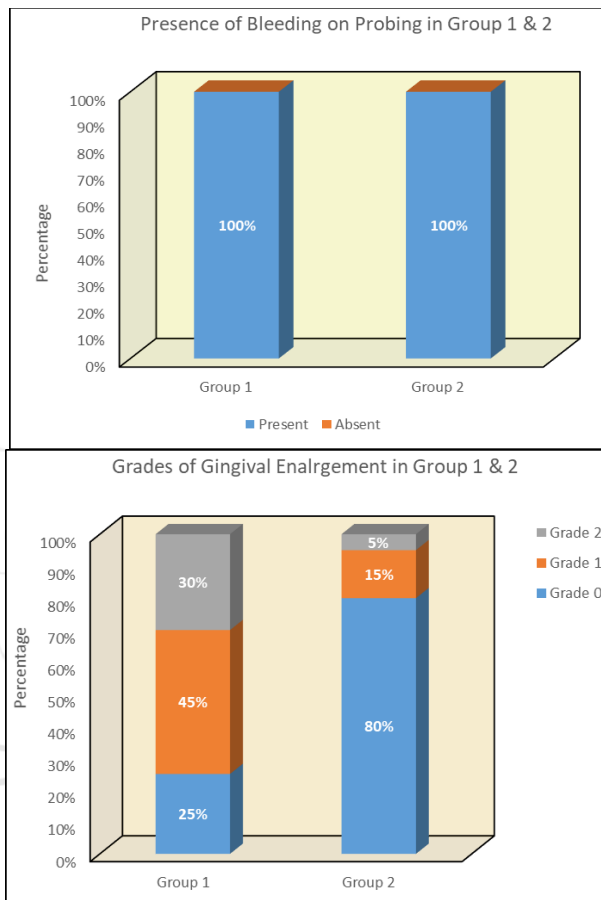


Figure 3: Presence of bleeding on probing and prevalence of gingival enlargement

Statistically significant increase in the prevalence of gingival enlargement was seen in Group 1 in which 75% of the patients showed enlargement of the gingiva whereas only 20% of the individuals in Group 2 showed gingival enlargement. Also, presence of bleeding on probing was found amongst all the patients.

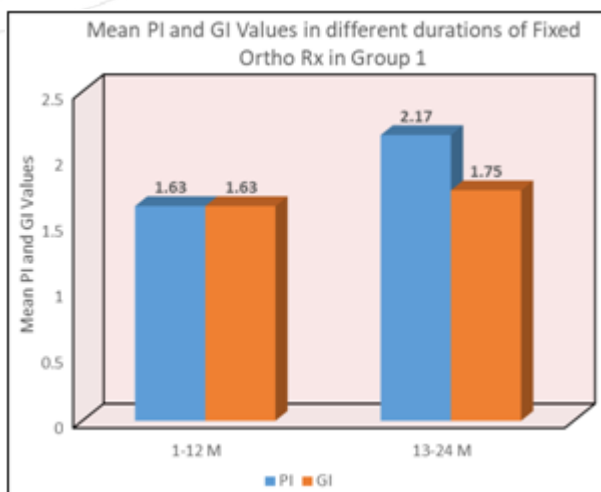


Figure 4: Plaque index and gingival index scores in different durations of orthodontic treatment

Amongst the individuals in group 1, those who had undergone orthodontic treatment for over 1 year had increased mean plaque index and gingival index scores as compared to those who had undergone orthodontic treatment for less than 1 year.



Figure 5: Statistically significant increase in mean plaque index and gingival index scores in Group 1.



Figure 7: Increased severity of gingival enlargement in individuals undergoing orthodontic treatment for a longer duration of time

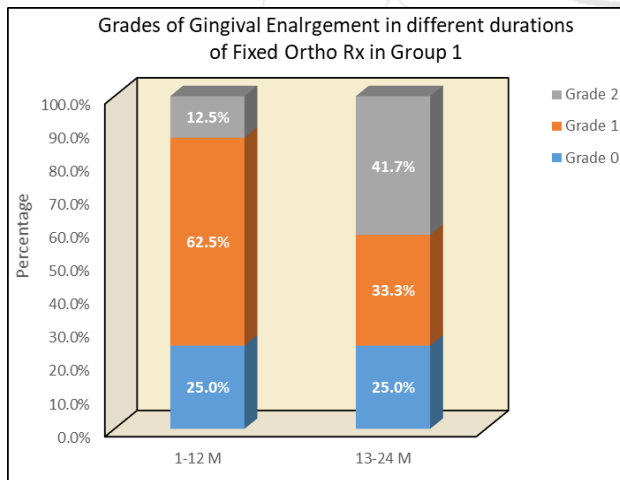


Figure 6: Grades of gingival enlargement in different durations of orthodontic treatment

Increased severity of gingival enlargement was seen in individuals undergoing orthodontic treatment for a longer duration of time. 42% of the patients who had undergone fixed orthodontic treatment for over 1 year had Grade 2 or 3 gingival enlargement whereas only 12% of the individuals who had undergone fixed orthodontic treatment for less than 1 year had Grade 2 gingival enlargement.

5. Discussion

In the present study, an association between gingival enlargement and the use of fixed orthodontic appliances was observed, which was similar to the studies done by Eid et al and Pinto et al.^[6, 7]

We also observed an increased prevalence of gingival enlargement as the length of orthodontic treatment increased which was in accordance with the study by Pinto et al in which the presence of clinically relevant GE was significantly associated with the duration of orthodontic treatment.^[7]

The results of the present study were in contrast with the associations by Zanatta et al. Although Zanatta et al found a significantly higher frequency of gingival enlargement scores 2 and 3 in patients using orthodontic appliances for more than 12 months compared with those using them for 6 to 12 months, no association between the duration of treatment and gingival enlargement was found in the risk assessment analysis.^[8]

Gingival enlargement is characterized as an inflammatory response to the plaque microbiota.^[9, 10] The placement of orthodontic brackets can influence the accumulation of biofilm and the colonization of bacteria; as a result of which the patient becomes more prone to inflammation and bleeding.^[14, 15] Previous studies by Ellis et al, Zachrisson et

al, Levin et al and Polson et al, have shown a high prevalence or extension of gingival inflammation among orthodontic patients that agrees with our findings.^[2, 16, 17, 18]The greater the gingival enlargement, the greater the difficulty to access tooth surfaces, which hinders good oral hygiene resulting in more inflammation and bleeding. This finding may point to a decreasing motivation of orthodontic patients in the performance of oral hygiene measures as treatment time increases.^[18]The findings of the present study support the plaque-related reaction of gingival enlargement caused by the increase in plaque and gingival inflammation over time.

Other causal factors in addition to the inflammatory factor have been proposed to explain the association between orthodontic treatment and gingival enlargement. Gursoy et al and Pazzini et al have suggested that a continuing low dose of nickel released from corrosion of orthodontic appliances may be the causative factor of gingival enlargement in orthodontic patients.^[18, 19]

Another factor that may be associated with the occurrence of gingival enlargement is the hormonal changes associated with puberty. Sexual maturation during puberty is related to increased levels of the steroid sex hormones. As a result, subclinical inflammatory changes may cause periodontal tissues to be more sensitive to small amounts of plaque, leading to a hyperplastic reaction of the gingiva.^[20]This influence of sex hormone levels may explain the greater likelihood of younger participants to have gingival enlargement.

6. Conclusion

This study showed an increasing occurrence of GE as the duration of orthodontic treatment increased. Duration of orthodontic treatment influenced occurrence of gingival enlargement due to self-neglect of patients causing accumulation of plaque leading to inflammation and bleeding. Oral hygiene instructions and motivational activities should target adolescents and young adults undergoing orthodontic treatment.

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