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ORIGINAL ARTICLE

# Gingival Enlargement in Orthodontic Patients: Effect of Treatment Duration

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## ABSTRACT

**Objectives:** To evaluate the effect of the duration of fixed orthodontic treatment on gingival enlargement (GE) in patients.
**Study Design:** A cross-sectional study
**Place and Duration:** Department of Orthodontics in Frontier Medical and Dental College from June 2021 – December 2021.
**Methodology:** A total of 260 patients aged 10-30 years were enrolled. All the patients were divided into 4 groups: G0, G1, G2 and G3. A predesigned questionnaire was used to collect data. Clinical examinations were performed by an examiner.
**Results:** There was a total of 260 patients with 107 male and 153 female participants. Increasing means of plaque, gingivitis, and GE in G0, G1, and G2 were found. No significant differences were observed between G2 and G3.
**Conclusion:** With increasing the duration of orthodontic treatment, the incidence of GE also increased.
**Keywords:** Gingival enlargement, fixed orthodontic treatment

## INTRODUCTION

Globally, the incidence of oral diseases has increased, with dental caries being the most prevailing [(1)]. These oral diseases have high impact on general health [(2)]. Gingival enlargement (GE), also known as gingival hyperplasia, is characterized by an abnormal overgrowth of gingival tissues. The mechanism of GE during orthodontic treatment is not fully understood [(3)]. It is most common disease of gum. Its diagnosis is challenging for the clinician because of the varied presentations (4). It has been stated that orthodontic treatment may be associated with a reduction in periodontal health (5). Plaque immobility as well as difficulty in carrying out normal oral hygiene measures have been associated with worsening of periodontal health among orthodontic patients (6).

It has been stated that during the use of fixed orthodontic appliances, gingival changes do not cause everlasting aggression to periodontal support tissues.

Occurrence of GE during orthodontic treatment has been reported in many studies. Eid et al [(7)] and Zanatta et al [(5)] stated in their studies that there is positive association between the use of fixed orthodontic appliances and GE. By the use of fixed orthodontic appliance, the plaque preservation in patients increases, that leads to gingival enlargement GE. Most of orthodontic treatments are performed on adolescents, because at this stage patients tend to be less compliant with treatment and less attending to oral hygiene actions (8). As a result, adolescents have higher chances of GE as compared to adults (9). According to WHO (2010) at the age of 15 years 48.7% patients have gingivitis (9).

There is need of further investigation that previous studies show negative impacts on quality of life of orthodontic patients. Therefore, in this study, we aimed to evaluate the effect of the duration of fixed orthodontic treatment on GE.

## MATERIALS AND METHODS

In this cross-sectional study, a total of 260 patients were studied at the department of Orthodontics in Frontier Medical and Dental College. The sample size was 260 keeping the 20% proportion, 95% confidence interval and power of 80% using WHO sample size calculator. Duration of the study was 6 months (June 2021 – December 2021). Patients were recruited by non-probability consecutive sampling technique. Those patients who were undergoing fixed orthodontic treatment, Age group 10-30 years and both genders were included. The exclusion criteria were those patients who need traction of impacted teeth and wide relocation of teeth lingually or buccally, with congenital abnormality, or systemic illness, patients using systemic medication for the treatment of chronic diseases that might interfere with gingival overgrowth, required chemoprophylaxis before clinical examination and non-consenting patients. According to the inclusion criteria total of 260 patients were undergoing fixed orthodontic treatment were enrolled in our study. All the patients were diagnosed and treated here in our setup. Approval was obtained from the hospitals ethical committee before starting the study. All patients were divided into four groups. G0 (control), including candidates for corrective orthodontic treatment, examined previously for fixed appliances; G1, patients undergoing fixed orthodontic treatment for 1 month; G2, patients undergoing fixed orthodontic treatment for 3 months; and G3, patients undergoing fixed orthodontic treatment for 6 months. Besides control group patients, all the remaining patients used fixed orthodontic appliances. Conventional metal brackets, straight wire technique, orthodontic arches fixed with simple elastic ligatures, leveling of the teeth were performed. A predesign questionnaire was used to collect the data. By using the SPSS version 21.0, all the collected data were analyzed. Descriptive statistics was used to calculate mean + standard deviation for quantitative variables i.e., age. Frequency and percentages were presented for the qualitative variable i.e., gender, mother education, family income, tooth brushing and dental flossing. The chi-square test was used to compare G0, G1, G2, and G3 according to age, sex, mother's education, tooth brushing frequency, and use of dental floss, keeping the significance level as P value ≤ 0.05. All results were presented in form of tables and graphs.

## RESULTS

All of 260 enrolled patients completed the study. Out of total patients, 107 were male and 153 were female. Age wise distribution were analyzed as 59 patients were in age range 10-15 years, 102 patients were in age range 16-20 years, 99 patients were in age range < 30 years. The patient's distribution according to group, sociodemographic characteristics, and oral hygiene habits were shown in table 1. There was no difference found among groups regarding gender, mother's education and tooth brushing. Increased duration of orthodontic treatment reduced the use of dental floss. Our results show that the plaque, gingival and Seymour indexes based on orthodontic treatment duration. We found out increasing means from G0 to G1 and G2. No significant difference was found between G2 and G3. The presence of clinically relevant GE was significantly associated with the duration of orthodontic treatment (table 2-3).

Table 1: Distribution of patients according to sociodemographic characteristics, oral hygiene habits, and duration of orthodontic treatment.

| Variable | G0 | G1 | G2 | G3 | Total | P-Value |
|---|---|---|---|---|---|---|
| AGE (year) | | | | | | |
| 10-15 | 15 | 18 | 17 | 9 | 59 | 0.37 |
| 16-20 | 28 | 21 | 22 | 31 | 102 | |
| <30 | 22 | 26 | 26 | 25 | 99 | |
| Gender | | | | | | |
| Male | 30 | 33 | 29 | 15 | 107 | 0.007 |
| Female | 35 | 32 | 36 | 50 | 153 | |
| Mother education | | | | | | |
| Primary | 25 | 24 | 38 | 16 | 103 | 0.00 |
| High | 29 | 20 | 20 | 24 | 93 | |
| University | 11 | 21 | 7 | 25 | 64 | |
| Family income | | | | | | |
| <30000 | 50 | 35 | 32 | 34 | 151 | 0.005 |
| >30000 | 15 | 30 | 33 | 31 | 109 | |
| Tooth brushing | | | | | | |
| <2 time/day | 38 | 48 | 41 | 35 | 162 | 0.10 |
| <2 time/day | 27 | 17 | 24 | 30 | 98 | |
| Dental flossing | | | | | | |
| No | 21 | 14 | 21 | 23 | 79 | 0.03 |
| Not daily | 24 | 32 | 31 | 29 | 116 | |
| Daily | 20 | 19 | 13 | 13 | 65 | |
| Total | 65 | 65 | 65 | 65 | 260 | |

Post-operative neurological outcome in term of improvement among 95 patients was analyzed as 62% patients had improvement in neurological outcome while 38% patients didn't had improvement in neurological outcome (Table 1). Stratification of Post-operative neurological outcome in term of improvement with respect to gender and age is given in table 2 and 3.

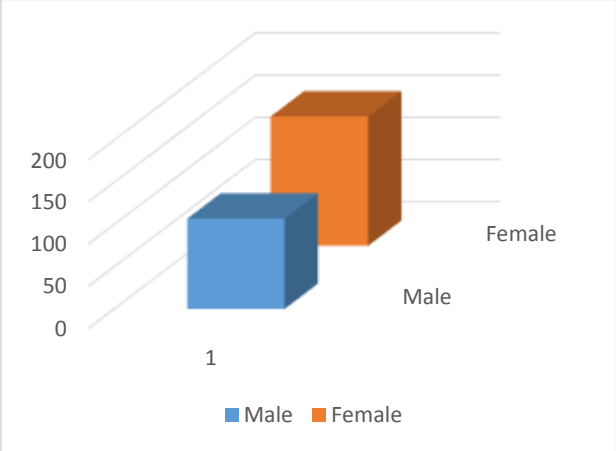


Fig 1: Bar graph showing gender distribution.

Table 2: Relationship between clinically relevant gingival enlargement and duration of orthodontic treatment (n=260).

| Clinically relevant gingival enlargement | | | |
|---|---|---|---|
| Variable | Present | Absent | P-Value |
| G0 | 0 | 65 | 0.000 |
| G1 | 20 | 45 | |
| G2 | 29 | 36 | |
| G3 | 23 | 42 | |
| Total | 72 | 188 | |

Chi square test was applied in which P value was 0.000.

Table 3: Plaque index, gingival index, and Seymour index according to the duration of orthodontic treatment.

| Variable | Plaque index | Gingival index | Seymour index |
|---|---|---|---|
| G0 | 0.1917±0.1225 | 0.1917±0.1225 | 0.76±0.133 |
| G1 | 0.3226±0.059 | 0.3366±0.059 | 17.71±1.35 |
| G2 | 0.5158±0.0894 | 0.5175±0.88 | 26.35±26.3 |
| G3 | 0.5551±0.0672 | 0.5289±0.079 | 27.29±1.48 |

Statistically significant differ ences among categories (P \ 0.05; Wald test).

## DISCUSSION

Fixed orthodontic appliances is associated with high plaque formation due to the difficulty in teeth cleaning. This plaque can lead to a number of oral diseases such as the occurrence of GE and white spots etc. Before the use of fixed orthodontic appliances, the patients were educated to maintain a good standard of oral hygiene in order to stop plaque formation during the treatment period.

In this study we aim to evaluate the effect of the duration of fixed orthodontic treatment on GE in patients. The time under fixed orthodontic treatment influenced the extension of GE, with more severe manifestations among patients using orthodontic appliances for extended periods of time. In the studies of Eid et al [7] and Zanatta et al [5] an association has been found between the use of fixed orthodontic appliances and GE. In our study we also found an association between GE and orthodontic treatment time duration. Adolescent's patients have higher levels of plaque buildups and higher rates of GE. Adolescence is considered as a transitional period between childhood and adulthood which is 10 to 19 years of age according to WHO criteria.

This sectional study was done to measure GE in patients of different age groups undergoing fixed orthodontic therapy. Majority of the patients in our study belonged to the age group of 16-20 years followed by <30-year age group. Our study is supported by Hossam A Eid et al. [7] Adolescents have higher risks of GE compared to adults.

In our study most of the patients undergoing fixed orthodontics appliances and having GE were female. Mother education is also a risk factor and, in this study, it was showed that among the groups the P-Value was significant. Same results were also found for family income in this study. The results regarding Dental flossing among all groups were insignificant in this study. The patients who practiced teeth brushing and dental flossing >3 times daily have very minor chances of GE. On the other hand, those who brushed and flossed only once daily had the high chances of GE. Statistically insignificant differences were observed in GE and the frequency of tooth brushing ($p<0.1$) and significant differences were observed in GE and frequency of flossing, $p<0.03$) respectively. Statistically significant differences were observed in GE and the frequency of brushing and flossing in a study performed by Hossam A Eid et al. (7)

Oral hygiene awareness, improved brushing and flossing decreased the plaque preservation and improve the gingival health during treatment with fixed orthodontic appliances (10).

In our study, <20% of the patients undergoing orthodontic treatment for 2 or 3 years reported daily use of dental floss. This finding may point to a decreasing motivation of orthodontic patients in the performance of interproximal cleanliness as treatment time increases. Boyd et al, (11) stated that better oral hygiene awareness in adults participants has been credited to their better assurance towards orthodontic treatment because their decision for treatment is not influenced by external influences. In our study we found out increasing means from G0 to G1 and G2. No significant difference was found between G2 and G3. Also, the presence of clinically relevant GE was significantly associated with the duration of orthodontic treatment. This study comparing subjects under fixed orthodontic treatment for different time periods with those without orthodontic appliances.

## CONCLUSION

Our study concludes that with increasing the duration of orthodontic treatment the incidence of GE also increased. And the patients should be aware about their oral hygiene instructions.

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