

Age and gender influence on oral hygiene among adolescents with fixed orthodontic appliances

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SUMMARY

Background. Many factors can influence oral health including oral hygiene measures, eating habits, attention from parents, education and the social situation. It is even harder to keep good oral health when orthodontic treatments are applied, because orthodontic treatments are usually undergone by children and adolescents who have fewer skills and pay less attention to their oral health; this may lead to bleeding on probing (BOP), a higher plaque index (PI), a higher gingival index (GI), and an increase in probing pocket depth (PPD). The aim of this study was to compare the features of oral hygiene among different age groups and gender in patients with fixed orthodontic appliances.

Material and methods. The study consisted of 107 patients from the Department of Orthodontics of Lithuanian University of Health Sciences aged 12 to 18 years with fixed orthodontic appliances. The patients were given a questionnaire with 17 questions about their oral hygiene and how it changed after they started their treatment with fixed orthodontic appliances. A statistical analysis was performed using the IBM SPSS Statistics 22.0.

Results. Among the 107 participants, 69 (64.5%) were females and 38 (35.5%) were males. 57 (53.3%) participants were 12 to 15 years old and 50 (46.7%) 16 to 18 years old. There was a statistically significant result when comparing the differences between females and males: females brushed their teeth more regularly than males ($p < 0.005$). Statistically significant results could also be observed when comparing the different age groups: 16 to 18 year old patients reported more often brushing their teeth three or more times a day ($p < 0.005$), reported more intensive changes in their oral hygiene after starting orthodontic treatments ($p < 0.005$), and received more recommendations from their orthodontist about oral hygiene measures ($p < 0.005$).

Conclusion. In patients with fixed orthodontic appliances, the oral hygiene of 16 to 18 year old adolescents is better than the oral hygiene of 12 to 15 year old adolescents. Females brush their teeth more regularly than males. More studies should be done to evaluate any differences.

Key words: oral hygiene, fixed orthodontic appliances, adolescents.

INTRODUCTION

In contemporary dental care an increasing number of patients are seeking orthodontic treatments due to malocclusion and aesthetic dental problems causing a range of negative physical, social and psychological effects. However, after the placements of fixed orthodontic appliances, patients continue to deal with other difficulties such as plaque accumulation leading to an increased risk of developing gingivitis, white spot lesions and halitosis (1).

Orthodontic treatments are usually undergone by children and adolescents, which can be problematic as they tend to have fewer skills and pay less attention to their oral health.

A lot of factors influence oral health including oral hygiene measures such as the frequency of brushing, the type of toothpaste used, and the method of brushing and additional measures such as the use of mouthwash and interdental floss or brush. Eating habits, the role of parents, the social situation and the education of the patient are also important. Consequently it is necessary for orthodontists to advice children and their parents on how to take care of their oral health (2).

For patients with fixed orthodontic appliances it is difficult to achieve good oral hygiene because the appliances can be an obstruction to mechanical

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brushing – food can often get trapped around the brackets and under the arch wires after eating, and for patients whose treatment is lengthy it can be a challenge to maintain good oral health and avoid enamel demineralisation, periodontal disease or halitosis (3). Atassi *et al.* (4) reported that after three months of orthodontic treatment beginning there is a statistically significant increase in stimulated salivary flow rate, buffer capacity and levels of lactobacilli, as well as increased bleeding on probing (BOP), a higher plaque index (PI), a higher gingival index (GI), and an increase in probing pocket depth (PPD).

Studies have proven that in situations where the accumulation of plaque is not supervised and controlled after applying brackets, gingivitis is more likely to develop after six months (5). When assessing incidence rates of gingivitis among patients with fixed orthodontic appliances in different age groups, Eid *et al.* (6) found that gingivitis was most common in 10 to 19 year old patients. At this age oral hygiene habits are forming and adolescents need supervision and motivation to successfully maintain their oral hygiene. Before an orthodontic treatment begins it is important to do an examination assessing the gum condition of the patient and directing them to an oral hygienist if needed (7).

One of the main challenges faced by orthodontists and dental hygienists is to help patients avoid the demineralisation of enamel during orthodontic treatment. If the accumulation of plaque is not controlled once orthodontic treatment begins then the bacterial flora is likely to rapidly change causing an increase in the amount of streptococcus and lactobacillus bacteria, which can lead to a lower pH and therefore white spot lesions being observed after the first month of treatment. According to the research of Chapman *et al.* (8) the incidence of white spot lesions are most common on the lateral incisor, canine, premolar and central incisor.

Tufekci *et al.* (9) found that when a prophylactic examination was carried out, 50 percent of patients had one or more white spot lesions by the end of their orthodontic treatment. Khalaf *et al.* (10) states that the appearance of white spot lesions is three times more likely to occur in males than females, because females more attentively look after their oral health.

Because orthodontic appliances increase the accumulation of plaque, the risk of enamel demineralisation and periodontal diseases increases also, as well as the risk of halitosis. Zurfluh *et al.* (11) stated that after four weeks of orthodontic treatment beginning, patients report an unpleasant taste and smell in the mouth and the effect of a dry mouth .

Wanting to avoid gum inflammation and the demineralisation of enamel during orthodontic treatment, it is important to follow certain oral hygiene measures. The research of Nassar *et al.* (12) shows that the most effective method of toothbrushing is the modified Bass method because it removes plaque not only from the surface of tooth and gum but also reaches a depth of 0,5mm under the gum. According to Erbe *et al.* (3) the most effective toothbrush for orthodontic patients is an electric toothbrush with an orthodontic head. It is highly beneficial to use additional measures for oral hygiene such as an interdental toothbrush (13), dental floss (14), toothpaste containing fluoride (to avoid enamel demineralization) (15) and an oral irrigator.

The aim of this study was to compare the features of oral hygiene between the patients of different age groups and gender who wear fixed orthodontic appliances.

MATERIAL AND METHODS

Study design

The study included patients that were all being treated with fixed orthodontic appliances at the Department of Orthodontics of Lithuanian University of Health Sciences during the period from December 2014 to March 2015. The study consisted of patients aged 12 to 18 years old. The study was reviewed and approved by the Biomedical Ethics Committee (No: BEC-BH(B)-151).

An informed consent form was read, understood and signed by the parents of patients who were under 18 years old, and questionnaires were given. 150 questionnaires were sent out and 107 were returned.

Data collection

Data was collected from questionnaires which consisted of 17 questions. First part was questions about general information (gender, age); patients were asked about general aspects of oral hygiene (frequency and method of brushing, possibility to brush teeth at school), others were more specific and were concerned with changes in oral hygiene after orthodontic treatment began; what kind of measures were recommended by orthodontist to keep good oral health during treatment such as single tufted brushes, electric brushes, floss etc.; which measures patients used and if they were effective; changes in their oral health evaluated by orthodontist or dental hygienist.

Statistical Analysis

The statistical analysis was performed using the IBM SPSS Statistics 22.0. Pearson's chi-squared

test and Fisher's exact test were used to evaluate the statistical significance of the differences among the groups.

RESULTS

The study consisted of 107 patients who underwent treatment with fixed orthodontic appliances. 38 were male and 69 female. According to their ages, the patients were divided into two groups – one

Table 1. Teeth brushing regularity among different genders

Teeth brushing	Gender	
	Female	Male
Regularly	64 (59.81%)*	24 (22.43%)*
Irregularly	5 (4.67%)*	14 (13.09%)*

*p<0.005

Table 2. Teeth brushing frequency among different age groups

Frequency of teeth brushing	Age	
	12-15	16-18
1	2 (1.87%)	0 (0%)
2	46 (43.0%)*	26 (24.3%)*
3	9 (8.4%)*	21 (19.63%)*
>3	0 (0%)	3 (2.8%)*

*p<0.005

Table 2. Teeth brushing frequency among different age groups

Oral hygiene changes after placing fixed appliances	Age	
	12-15	16-18
1	2 (1.87%)	0 (0%)
2	46 (43.0%)*	26 (24.3%)*
3	9 (8.4%)*	21 (19.63%)*
>3	0 (0%)	3 (2.8%)*

*p<0.005

Table 4. Measures for oral hygiene recommended by orthodontist among different age groups

Measures of oral hygiene recommended by orthodontist	Age	
	12-15	16-18
None	15 (26.32%)*	1 (2.0%)*
Orthodontic brush	33 (57.89%)*	45 (90.0%)*
Single tufted brush	20 (35.09%)*	33 (66.0%)*
Electric toothbrush	1 (1.75%)	7 (14.0%)
Floss	3 (5.26%)*	15 (30.0%)*
Interdental brush	6 (10.53%)*	20 (40.0%)*
Mouthwash	12 (21.05%)*	28 (56.0%)*
Irrigator	1 (1.75%)	6 (12.0%)
Toothpaste	1 (1.75%)	1 (2.0%)

*p<0.005

group for those aged 12 to 15, containing 57 patients, and another for those aged 16 to 18, containing 50 patients. The mean age was 14.9 years.

When evaluating the regularity of teeth brushing among adolescents it was found that 88 respondents brush their teeth regularly, and 74 out of 107 twice a day. When assessing which measures patients use for their oral health, there were no statistically significant results between genders and age groups ($p>0.05$), but the most common used measures were an orthodontic toothbrush (55.1%) and a single tufted brush (25.2%), while the most common additional measure was mouthwash (49.5%). All of these measures were effective for patients with fixed orthodontic appliances. Even with patients who changed their oral hygiene habits during treatment, orthodontists noted during review visits that some of the patients had white spot lesions, gum inflammation and staining on the teeth.

One of the aims of this study was to assess the differences in oral hygiene features between males and females who were receiving treatment with fixed orthodontic appliances. Statistically significant results were obtained showing that females brush their teeth more regularly than males (Table 1). 39 out of 69 females brush their teeth twice a day and 30 of them brush their teeth three or more times a day. Meanwhile just 2 males brush their teeth three or more times a day ($p>0.005$).

Comparing the differences between the oral hygiene features in different age groups, 43 patients aged 12 to 15 and 45 aged 16 to 18 claimed that they brushed their teeth regularly. Distribution is similar, but when assessing the frequency of tooth brushing, statistically significant results were obtained showing that patients aged 12 to 15 brush their teeth twice a day more frequently, while more respondents aged 16-18 brush their teeth three or more times a day (Table 2).

Comparing the answers on how the patients assessed the changes to their oral hygiene after beginning orthodontic treatment with fixed orthodontic appliances, more than half of the patients aged 12 to 15 claimed that their oral hygiene did not change after orthodontic treatment began. Patients aged 16 to 18 assessed their changes more intensively; after orthodontic treatment began additional measures were used such as orthodontic brushes, single tufted brushes and mouthwashes in order to reduce plaque accumulation, gum inflammation and bad breath (Table 3).

Another statistically significant result comparing the different age groups was that patients aged 16 to 18 received more recommendations from their orthodontist on what kind of dental hygiene measures

they should undertake (Table 4). Most commonly this was encouragement to use an orthodontic, single tufted toothbrush, and an electric toothbrush, as well as dental floss, an interdental toothbrush, mouthwash and an oral irrigator.

DISCUSSION

This study was carried out to assess the differences in the oral hygiene features of adolescents with fixed orthodontic appliances. The results showed that patients brush their teeth regularly, the majority twice a day, but with only a small percentage of respondents reporting that they brush their teeth three or more times a day. The respondents claimed that their oral hygiene features changed after they started orthodontic treatment. According to the studies of other authors, after the beginning of orthodontic treatment the accumulation of plaque increases and it is difficult to remove plaque from around brackets and interdentally. Because of changes in microflora, the risks of enamel demineralisation, periodontal disease and halitosis also increase. It is important to maintain good oral health and to use additional oral hygiene measures (2, 16, 17). The study showed that adolescents rarely use additional oral hygiene measures such as an interdental toothbrush, dental floss or an oral irrigator, and both during and after orthodontic treatment are faced with complications such as plaque accumulation, enamel demineralisation, tooth discoloration and calculus. To avoid complications it is important to use an orthodontic or electric toothbrush, fluoride-containing measures, an interdental toothbrush or dental floss (18, 19).

One of the aims of the study was to compare the differences in oral hygiene maintenance between genders, and the results showed that females brush their teeth more regularly than males. According to the study of Nanys *et al.* (2) females have a better condition of teeth and periodontal health as they pay more attention to their oral health. It has been found that compared to males, females tend to carry oral hygiene measures with themselves more often and more frequently tend to brush their teeth three or more times a day, but more studies should be done to get significant results.

Within the different age groups it was noted that patients aged 16 to 18 pay more attention to their oral health compared with patients aged 12 to 15. Compared to younger patients, a higher amount of older patients tend to brush their teeth three or more times a day. They also reported more intensive changes in their oral hygiene after undertaking orthodontic treatment, and got more recommendations from their orthodontist on oral hygiene measures. However, more studies need to be carried out as most usually compare the differences in oral hygiene features between adolescents and adults, as opposed to the differences in oral hygiene features between children and adolescents of varying ages (4, 20, 21).

Patients with fixed orthodontic appliances face difficulties when attempting to take care of their oral health. The risks of periodontal diseases, enamel demineralisation and halitosis increase due to plaque accumulation. Patients tend to agree that after the implementation of fixed orthodontic appliances, oral hygiene changes and it is more difficult to remove plaque and avoid complications. During appointments with specialists, orthodontists report often noticing plaque accumulation around brackets as well as tooth discoloration, gum inflammation, calculus and even enamel demineralization. It is important for patients to be motivated and cooperate with their specialist, following the instructions how to maintain good oral hygiene (22, 23).

More studies have to be done to evaluate the differences between gender and different age groups patients with fixed orthodontic appliances.

CONCLUSION

1. Evaluating oral hygiene differences between genders, it was found that females brush their teeth more regularly than males.

2. Evaluating differences between different age groups, it was found that patients aged 16 to 18 more often reported brushing their teeth three or more times a day compared to younger patients.

3. Patients aged 16 to 18 reported the use of more various measures for oral hygiene, and more intensive changes in their oral health after the placement of orthodontic appliances.

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Received: 16 03 2015

Accepted for publishing: 29 06 2016