Gingival Health Status among Patients Wearing Fixed Orthodontic Appliance in Erbil City

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KEYWORDS

Gingival health, orthodontic appliance, plaque index, gingival index, gingival sulcus depth, breathing routes.

ABSTRACT

Objectives and background: People have increasing demand for orthodontic treatment and it became a common treatment plan nowadays that may affect the gingival health. However, the correlation between orthodontics and periodontal health is not clear, which troubles the clinical orthodontist during planning of the treatment. So many studies showed previously a relationship between orthodontic appliance and the dental diseases that it may cause. This study aimed to evaluate the relationship between gingival health status and the duration of wearing fixed orthodontic appliance.
Method: The study included 40 patients wearing fixed orthodontic appliance. Patients' folders were analyzed according to the duration of wearing the appliance and route of breathing then comparing these two factors and their effects on plaque index, gingival index and gingival sulcus depth.
Results: As the duration of wearing the appliance increased, there was an increase in the plaque accumulation and gingival bleeding on probing, except for the forth group of duration (more than 12 months with the appliance). As for breathing factor, the findings were as the following (In order from less plaque accumulation to the most, respectfully): nasal, both (nasal and mouth) and finally mouth, while with the gingival index, the data showed the opposite.
Conclusion: Prolonged orthodontic treatment was associated with an increased plaque retention and increased bleeding on probing; however, the magnitude of the difference in gingival sulcus depth in both duration of wearing the appliance and different breathing routes was of no clinical significance. Breathing orally had negative effect on the oral hygiene.

1. Introduction

The periodontium is a supporting structure surrounding the teeth which include alveolar bone, cementum, periodontal ligament and gingival part. These part are responsible for maintaining the health of the dentition and oral structure for a long time in function and esthetic [1]

The incorrect occlusion and position of dentition has been shown to affect the health of periodontal part of dentition and important purpose of orthodontic correction of dentition is to promote better health of supporting structure of teeth and elevating the longitivity life of dentition. Correction of irregularity in dentition promote better oral hygiene by eliminating or reduces the occlusal forces on teeth and improving the seating of the dentition. Due to these reason the periodontal health improvement is suggested by orthodontic treatment because the regular teeth position and occluding dentition in normal position enhance the cleansing teeth process and controlling oral hygiene become easier and faster. Although the orthodontic appliance correct the dental and skeletal irregularity by this correct and change the bad oral habit like finger or thumb sucking and improving the periodontal status. Orthodontic appliances, as well as mechanical procedures, sometime affect the response of gingival tissue due to its proximity to the gingival sulcus and leading to more deposit and plaque accumulation between and inside the brackets and may affect the health of periodontium and need special care for controlling oral hygiene during orthodontic treatment procedure [2].

2. Methodology

This study included evaluation of the gingival health status among patients wearing fixed orthodontic appliance. Ethical approval was obtained from both periodontics department of Hawler Medical University - College of Dentistry and Khanzad Teaching Center in Erbil, Kurdistan, Iraq in 2020 and a

permission was got from all the participant after explaining all aspect of research work. A total of 40 patients from Khanzad Teaching Center in Erbil and students in Hawler Medical University - College of Dentistry already undergoing fixed orthodontic treatment were included in study.

The Included cases were the patients undergoing fixed orthodontic treatment for both upper and lower arches,Aged between (12 and 45) years old and the cases with cleft lip and palate or Patients with systemic complications were excluded un the study.

The method involved history taking from the patient as well as clinical examination to evaluate the gingival health. Many questions have been asked in the history taking from the patient, but only two factors have been included in the study, because they showed significant difference in data analysis and affect prominently on the gingival health, which are, the duration of wearing the appliance and route of breathing. The clinical examination involved the following parameters: plaque index, gingival index and gingival sulcus depth. The scoring of these parameters was done based on criteria described by loe and sillness (1963) [3]. Williams's periodontal probes were used for the clinical evaluation.

Analysis method of all the records was done in Microsoft excel sheet, and it was according to the duration of wearing the appliance and route of breathing, followed by comparing these two factors and their effects on plaque index, gingival index and gingival sulcus depth.

3. Result and Discussion

The effect of the duration on plaque accumulation were illustrated in figure (1). Group 1 (1-4 months) showed (83%) good oral hygiene and (17%) fair oral hygiene, group 2 (5-8 months) showed decreasing in the percentage of good oral hygiene (63%) and (37%) fair oral hygiene, group 3 (9-12) showed (0%) of good oral hygiene and (100%) fair oral hygiene, whilst group 4 (>12 months) showed increasing in good oral hygiene (60%) and (40%) fair oral hygiene.

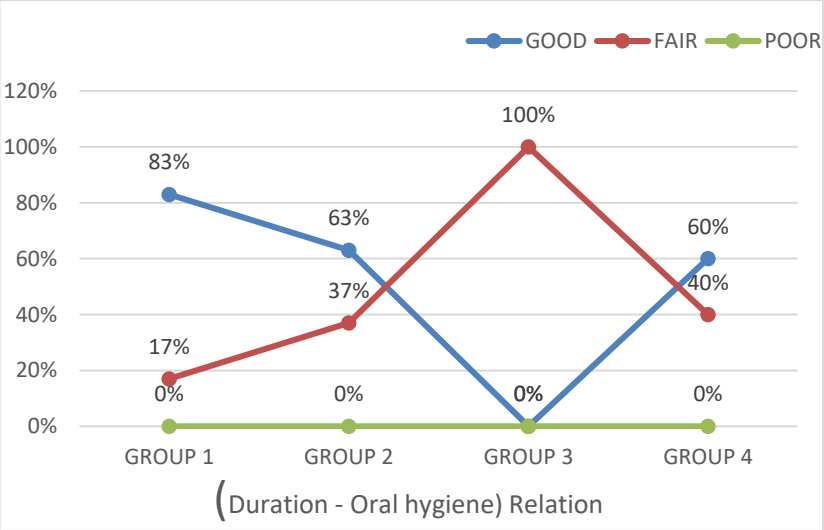

Figure (1) Effect of duration of wearing the appliance on oral hygiene

The effect of duration of wearing the appliance on gingival index shown in Figure (2) Group 1 (1-4 months) showed (25%) for mild gingivitis and (75%) for moderate gingivitis, group 2 (5-8 months) showed (21%) for mild gingivitis cases and (79%) of moderate gingivitis, group 3 (9-12) showed (0%) of mild cases and (100%) of moderate gingivitis, group 4 (>12 months) showed (20%) of mild gingivitis cases and decreasing in the moderate gingivitis cases (80%).

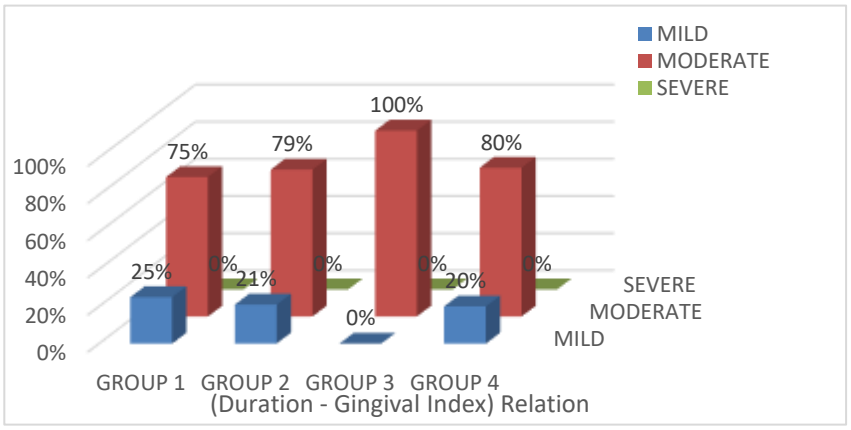

Figure (2) Effect of duration of wearing the appliance on gingival index

All the groups showed a depth which is (<3mm). As shown in Figure (3)

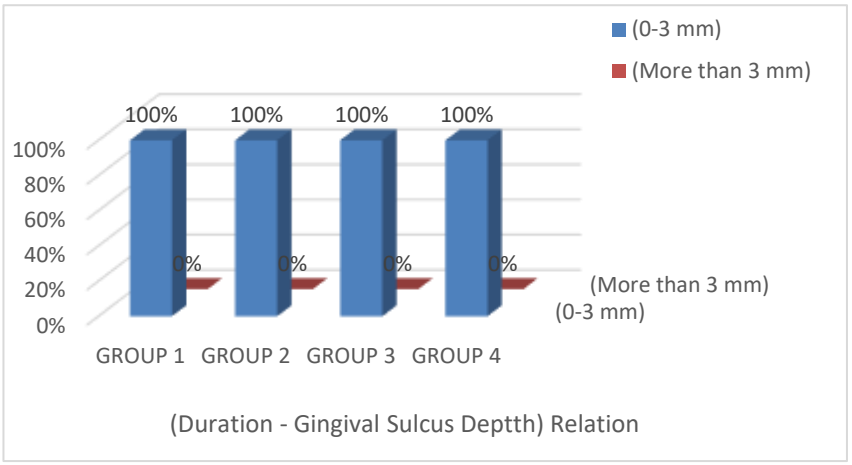

Figure (3) Effect of duration of wearing the appliance on gingival sulcus depth

The first group (mouth breathers) showed (50%) for good oral hygiene and (50%) for fair oral hygiene, the second group (Nasal breathers) showed (78%) for good oral hygiene and (22%) for fair oral hygiene, the third group (Both routes breathers) showed (60%) for good oral hygiene and (40%) for fair oral hygiene. As shown in Figure (4)

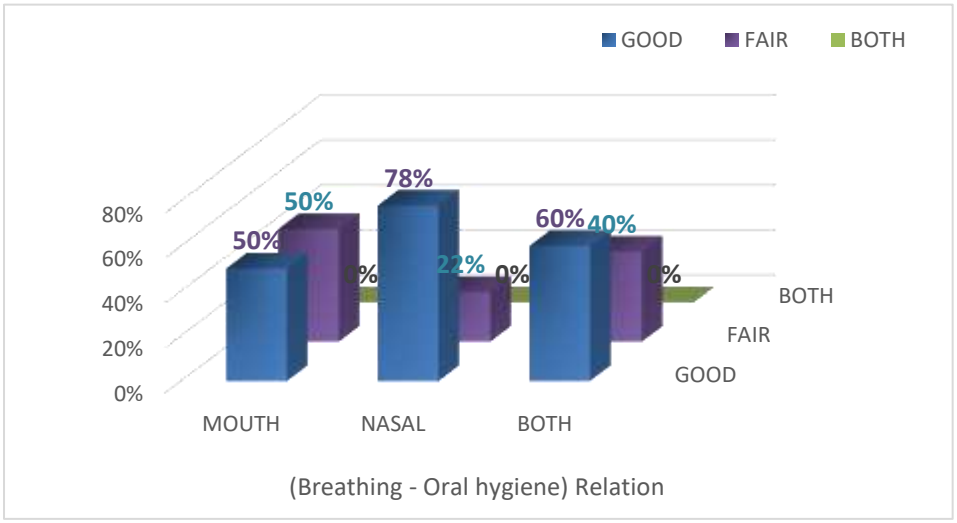

Figure (4) the breathing route and its effect on oral hygiene for patients wearing fixed orthodontic appliance

The first group (mouth breathers) showed (50%) for mild gingivitis and (50%) for moderate gingivitis, the second group (Nasal breathers) showed only (11%) for mild gingivitis and (89%) for moderate gingivitis, the third group (Both routes breathers) showed (16%) for mild gingivitis and (84%) for moderate gingivitis. As shown in Figure (5)

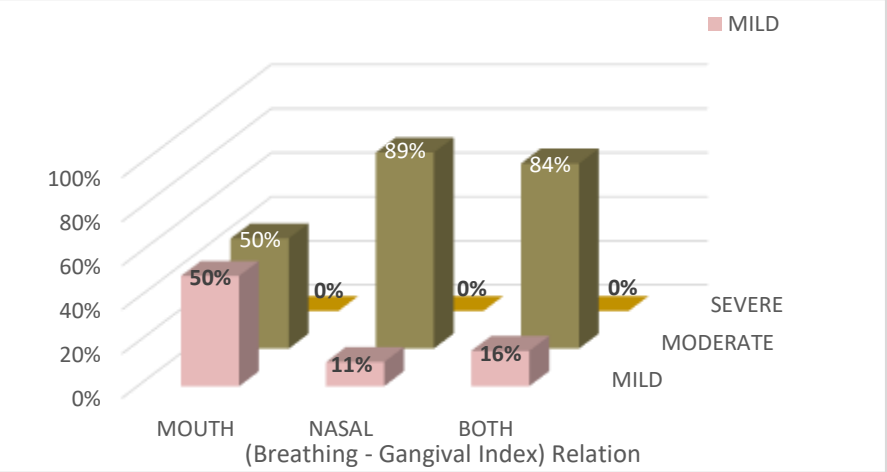

Figure (5) The breathing route and its effect on gingival index for patients wearing fixed orthodontic appliance

All the groups showed a depth which is (<3mm). As shown in Figure (6)

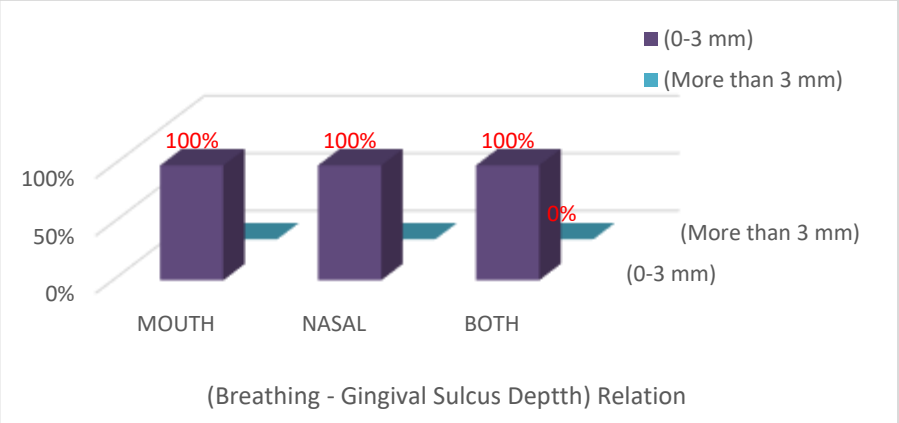

Figure (6) the breathing route and its effect on gingival sulcus depth for patients with fixed orthodontic appliance

Discussion

Most of the patient looking orthodontic treatment for function, esthetic and phonetic improvement. These patients mostly present with crowding or malalignment of the teeth. The positive effects of orthodontic treatment on their appearance and self-esteem are easy to envision. The most commonly reported adverse effects of orthodontic treatment can be gingivitis or worsening in bad oral hygiene that may affects the teeth color, enamel, or root resorption, or periodontal complications. So many studies showed previously a relationship between orthodontic appliance and the dental or periodontal diseases that it may cause. Hence; this study planned to evaluate the relationship between gingival health status and the duration of wearing fixed orthodontic appliance, in order to have more understanding of the effects of the appliance on the gingiva as well as the routes of breathing and their effects on gingiva during the orthodontic treatment, thereby providing ideals for clinicians to formulate

therapeutic schedule and implementing future fundamental orthodontics and periodontal research. Regarding the duration of wearing the appliance in total of 40 patients already undergoing fixed orthodontic treatment were included in the study. The amount of plaque accumulation and gingivitis showed significant increases among the groups with increasing the duration of orthodontic treatment. The increase in the duration of wearing the appliance will cause increase in plaque accumulation, i.e. will cause bad oral hygiene and the gingivitis was greater in subjects who used fixed appliance for longer duration as well, i.e. more bleeding on probing. The plaque-retentive nature of orthodontic appliances and accumulation of plaque around the orthodontic appliances, such as brackets and wires resulting in bad oral hygiene and gingivitis This observation is also seen in the studies which are done by Boke et al in 2014 [4] and Sandhu in 2018 [5] that discussed in their studies in which they showed that there's increasing in the plaque amount and gingival inflammation during the fixed orthodontic treatment. Also Sharma et al in 2017 [6] showed same result that found a significant increase in the value of the plaque after orthodontic treatment. While as the duration reached a peak of 12 months and more in fourth Group, it was noticed that there was improvement in both oral hygiene and gingival inflammation. This behavior of decreasing in the data in such significant way as the duration exceeds 12 months may help us to understand the following points: (1) long duration period may lead the orthodontist to pay more attention for intensive awareness and instructions about keeping good oral hygiene in order to have class I relationship of the teeth without causing distraction or having aligned but badly carious teeth in the end result, (2) maybe the patient got used to the appliance and became familiar with the correct way of brushing and maintaining good oral hygiene, (3) the patient's fears from prolonging the treatment for longer duration may enhance him to keep good oral hygiene in order to have a beautiful smile after waiting for months during the treatment to see the final result and may correlate it with finishing the treatment earlier. But this observation was in opposite to the questionnaire data that was obtained by Alhaija et al in 2018 [7], in which they found that duration of orthodontic treatment negatively affected subjects' attitude toward fixed orthodontic treatment. All the groups showed gingival sulcus depth less than 3 mm, which is considered normal, so this present study didn't show any abnormality in gingival sulcus depth with increasing the duration of using the fixed orthodontic appliance, it because all the cases were controlled by a specialist and monthly followed up. Patient's oral care is highly important during the orthodontic treatment. Suboptimal appliance care and compliance may lead to extended duration of treatment and increase risk of common iatrogenic effects of orthodontics including enamel demineralization and adverse periodontal effects (Fleming, 2019) [8]. The orthodontist and periodontist cooperation play an important role in the treatment of the orthodontic cases, this was in agreement with Priyanka and Vivek (2010) [9] that showed the many benefits in integrating orthodontics and periodontics in the management of patients with underlying periodontal defects. The key to treating these patients is communication and proper diagnosis before orthodontic therapy, as well as continued dialog during treatment. Also in agreement with Shuang et al (2017) [10], they showed that good periodontal condition is the prerequisite for the success of orthodontic treatment and the low friction and light force orthodontic treatment can quickly line up teeth and improve the periodontal health condition. As well as the avoidance of using the bands on the teeth as Paschos et al (2008) [11] concluded in their study, that if the clinical situation allows, brackets should be preferred rather than bands, as they show less influence on gingival health. Considering the relationship between orthodontic treatment and gingival health, patients, orthodontists and periodontists should cooperate during orthodontic treatment, in order to gain good result. The regular visits to the orthodontist are the most likely reason for improvement in oral hygiene and gingival health (Davies et al, 1991) [12]. Regarding the Breathing routes; in The present study showed that the breathing route affects the plaque index among the patients who are undergoing fixed orthodontic treatment, the nasal breathers showed the best oral hygiene, followed by the patients who are using both routes (Nasal and oral), then the worse oral hygiene found among the patients who are using their mouth only to breath, and this finding was the same finding which were done by Triana et al in 2016 [13] , who showed that the mouth breathing affects the gingival normal status and decreases the epithelial resistance to bacterial plaque. The gingival index in this study showed opposite results to the plaque index, it showed that the gingiva of the nasal breathers bleed more on probing, followed by both

routes breathers and then the oral breathers. This result may be due to the bias errors and the lack of the time and may be due to the small number of subjects that included in this study. Further studies are needed in order to explore the real relationship between the breathing routes and their effect on gingival status. All the groups showed gingival sulcus depth less than 3 mm, which is considered normal, so this present study also didn't show any abnormality in gingival sulcus depth with different methods of breathing during using the fixed orthodontic appliance, it also may be due to the controlling of all the cases by a specialist and monthly follow up, or may be due to the small number of subjects that included in this study.

4. Conclusion and future scope

In conclusion, 3 dimensional team (3D team) consists of patient, orthodontist and periodontist should cooperate together during orthodontic treatment, in order to gain the desirable result. The plaque accumulation and gingival inflammation increase on increasing the duration of the orthodontic treatment. Therefore, prior to orthodontic treatment the orthodontist should pay close attention to the periodontal health status of the patient with the assists of a periodontist, patients should have a high level of periodontal health and it should be maintained during the treatment period. Breathing orally also showed negative effects on the oral hygiene.

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