



Longitudinal Evaluation of Oral Health Among Orthodontic Patients Prior Treatment, During Treatment and Post-Treatment

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KEYWORDS

*Gingival bleeding index,
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ABSTRACT

Aim: to evaluate oral health status among orthodontic patients: before, during, post treatment completion. **Subjects & methods:** Twenty-eight patients were selected from Outpatient clinics seeking Orthodontic treatment, Faculty of Dental Medicine, Al-Azhar University, Cairo, Egypt. A self-administrated questionnaire was prepared covering oral hygiene practice, oral hygiene cleaning aids and previous oral prophylaxis. Oral health status of each patient was assessed using: Gingival bleeding index (GBI), Plaque index (PI), Oral Hygiene Index (OHI-S) which performed for each patient 3; prior to, during and after orthodontic treatment termination. Measurement of probing pocket depth (PPD) and radiographic examination were done before treatment and 3 months following treatment termination. **Results:** No significant difference was observed between mean PI & GBI recorded before orthodontic treatment (T1) and that measured three months (T4) following treatment completion but there were significant differences between these measurements during treatment with both before and after treatment; no significant difference between males and females. PPD recorded no differences between any evaluation times. OHI-S recorded higher scores during treatment period with statistically significant difference when compared with recorded scores initially; however, it did not differ significantly with that of at after 3 from orthodontic termination. **Conclusion:** Dental plaque accumulation among orthodontic patients can aid in development of gingival and dental effects, as it seems likely that orthodontic appliances have potentiality to increase oral microbial population. Orthodontic patients should be monitored and motivated for proper oral hygiene to avoid risk of new caries and periodontal diseases.

INTRODUCTION

The presence and maintaining a good oral hygiene is prerequisite to ensure successful orthodontic treatment and the assessment of oral hygiene practices is essential for adequate understanding of patients' oral healthcare needs.¹ However, it was difficult to implement a comprehensive oral hygiene regimen in orthodontic patients; as more dental plaque can be build-up with greater rate in patients wearing

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fixed orthodontic appliances due to difficulty of teeth cleaning.^{2,3} Worsening of clinical parameters of periodontal diseases, as plaque index, bleeding on probing, attachment loss, and onset of pockets or gingival recessions, in association with time and type of orthodontic treatment has been reported in systematic reviews.⁴ Reasons for periodontal diseases onset among orthodontic patients may be attributed to: more difficult maintenance of oral hygiene, plaque retention to orthodontic devices, bone/periodontal movements and remodeling under orthodontic forces, which favor subgingival plaque accumulation and enhance periodontal pathogenic potential.^{5, 6} Even with good cleaning of teeth during orthodontic treatment period, generalized gingivitis commonly developed in most patients.⁷ Dental plaque accumulation / retention may cause subsequent oral health problems including decalcification, dental caries, periodontal disease, halitosis and teeth staining.⁸ The oral microbiota is the collection of more than 600 microbial species—eukaryotes, archaea, bacteria, fungi, and viruses—living in specific ecological niches of oral cavity⁹, 169 of which constitute the indigenous “core oral microbiome”, whose species are qualitatively and quantitatively housed in three different niches, classified as: Group 1, buccal mucosa, keratinized gingiva, hard palate; Group 2, saliva, tongue, tonsils, and throat (back wall of oropharynx); and Group 3, sub- and supra-gingival plaque.¹⁰ Patients and dental professionals should participate actively in controlling plaque build-up process through maintaining good oral hygiene condition.

Clinical and microbial differences existed in plaque samples from orthodontic patients and subjects not undergoing orthodontic treatment; as there was shift toward predominance of some bacterial species, known to be periodontal pathogens. Orthodontic subjects showed highest increase 3 months following orthodontic appliances placement and significant association of strongly pathogenic *P. gingivalis* bacterial species with gingivitis.¹¹ Amounts of red-complex bacteria (*P. gingivalis*, *P. intermedia*

and *T. forsythia* and *A. actinomycetemcomitans*) were considered in meta-analysis study; only *T. forsythia* showed a statistically significant increase 3 months after orthodontic appliances, while a transient increase of all other considered species was noted 6 months after treatment initiation. *P. intermedia* species were more significantly increased at incisors area than at molars area. Additionally, elevated levels of *P. gingivalis*, *P. intermedia* / *P. nigrescens*, *T. forsythia*, and *Fusobacterium* spp., were found in orthodontic patients 3 months after brackets placement compared to control group and baseline. Gram-negative superinfecting bacteria and enteric rods were found indistinctly in all groups, without significant differences.¹² A decrease in *Actinomyces* spp. after 1 year of treatment was also reported in samples from 17 adults with full-fixed orthodontic appliances¹³; during treatment, *P. intermedia* and other orange complex species increased, while red complex species proportion remained unchanged; return to pretreatments levels several months after removal of fixed appliances was reported. Similarly, microbial changes occurring in subgingival plaque samples from 30 orthodontic patients 3 months after removal of fixed orthodontic appliances compared to healthy subjects not undergoing orthodontic treatment.¹⁴

Lo et al.¹⁵ reported prevalent aerobic flora before orthodontic treatment and one year from treatment initiation, with prevalent of facultative aerobic and anaerobic species during the first 2–4 weeks of treatment. Mean counts of *P. gingivalis* were similar on metallic and ceramic brackets isolated from both posterior and anterior teeth.¹⁶ The two types of bracket exhibited statistical differences in counts of 8 periodontal pathogen species: metallic bracket showed significant increased levels of *T. denticola*, *A. actinomycetemcomitans*, *F. nucleatum*, *S. anginosus* and *E. nodatum*, while in ceramic ones *E. corrodens*, *Capnocytophaga*, *Selenomonas noxia* were most increased species.¹⁷



The consistent quantitative and qualitative changes in the plaque one month after the start of orthodontic treatment were confirmed by a systematic review;¹² different orthodontic appliances tended indiscriminately to alter the oral microbiota during treatment, but fixed appliances reported a greater and significant cariogenic and periodontal pathogen effect than removable appliances. In this situation, Müller et al., concluded that reversibility of periodontal changes and permanence of enamel demineralization and white spots suggesting the use of antibacterial orthodontic bonding systems as an adjunct in maintenance of proper dental health in orthodontic patients.¹⁸ A study indicated that, 6 months after insertion of fixed/removable orthodontic appliance, microscopic counts of oral bacteria were increased; patients with fixed orthodontic appliances have an increased risk of white-spot lesion formation due to the oral microbiota changes, in particular *S mutans* which has a key role in dental caries formation.¹⁹ Orthodontic treatments may affect the oral microbiota equilibrium, as bands, brackets, wires and acrylic resins increase the risk of retention of food particles and microorganisms. Significant increase in PI and GI, no changes in PPD after the first 3 months of therapy and a decrease in PI, GI, and PPD 6 months after appliance removal was reported and at end of orthodontic therapy, periodontal parameters were higher than those at baseline; indicating that fixed orthodontic appliance promotes dental plaque accumulation and gingival inflammation; but orthodontic appliances seemed to have no permanent effects on periodontal status.²⁰ Clinical and microbiological changes after removal of fixed appliances was reported; PPD and BOP were assessed at baseline (T1), appliance removal (T2) and 3 months post-treatment (T3). Clinical parameters showed a significant increase between T1 and T2 and a decrease between T2 and T3. They concluded that fixed appliances have an impact on microbial and clinical parameters; the periodontal values tended to normalize after de-bonding, but most values remained elevated after de-bonding compared with baseline.²¹ A study showed increased

periodontal parameters from baseline to bracket removal and decreased 2 years after treatment; a normalization of clinical parameters, but some periodontal indexes were only partially reversed.^{22,23}

For the best of our knowledge, performing a longitudinal research on the oral health condition among orthodontic patient comparing that assessed prior to treatment initiation, during orthodontic treatment as well as after treatment termination, received little attention. Thus, the present study was designed and performed in an attempt to clarify this aspect.

PATIENTS AND METHODS

Study Group

Included patients who needed orthodontic treatment were free of systemic disease and had not used antibiotics and/or steroids in the last 3 months. They were asked to inform us if they had used any kind of medication or antibacterial agents two weeks before bacterial sample collection; any use of medications was reported and patients were excluded. They were examined intraorally and radiologically with regard to indication of orthodontic treatment and subsequently. Before orthodontic treatment starting, each patient received oral prophylaxis as well as hygiene instructions included the correct use of a toothbrush. Oral hygiene of each one of them was considered to be ideal at the beginning of the orthodontic treatment.

Twenty eight patients who attended postgraduate orthodontic clinic at Faculty of Dental Medicine, Al-Azhar University, Cairo, were included into the present study. They were seeking and indicated to have orthodontic treatment with fixed appliances; study protocol was approved by the Faculty Ethics Committee. A self-administered questionnaire was distributed and participants were requested to sign consent form and answering questionnaire contains two parts: a) Socio-demographic characteristics, b) Oral hygiene (OH) practices. Socio-demographic

variables included age, gender, race, level of education, and smoking status. OH practices were assessed through questions on type, and frequency use of toothbrush, other cleaning materials or tools used daily such as dental floss, mouth rinse, interdental brush, and toothpick and dental scaling visits during their orthodontic treatment period.

Orthodontic Treatment:

Following the obtaining of the answered questionnaire and completion of complete clinical examination, each patient was appointed to start the planned orthodontic treatment according to his / her situation. However, all of them were treated with fixed orthodontic appliances. Each patient was scheduled of follow up to continue orthodontic treatment steps.

Oral Health Assessment

The health status of periodontal tissues was determined using: **a)** modified plaque index (PI) according to *Silness and Loe*.²⁴ The PI was assessed according to plaque accumulation in the gingival area in four grades with the following scoring criteria: 0, no plaque or debris on inspection and probing; 1, a thin film of plaque only visible after probing; 2, a ribbon-like layer of plaque covering the sulcus and gingival crown areas but not filling the interdental spaces; and 3, a thick layer of plaque visible on inspection and filling the interdental spaces. **b)** Gingival bleeding index of *Loe &*

Silness;²⁵ **c)** Simplified Oral hygiene index of *Greene & Vermillion*;²⁶ which has two components (Debris index & Calculus index). **d)** Probing pocket depth (PPD) was done using graduated periodontal probe. They were recorded at 4 appointments: immediately prior to placement of orthodontic appliances (T1), 3 month & 9 month following orthodontic treatment initiation (T2), and at 3 month after orthodontic treatment termination (T3). After each appointment, proper oral hygiene instructions were given to the all patients and to brush their teeth with fluoride containing toothpaste* two times / day for a minimum of 3 minutes each time.

Dental caries was diagnosed applying the *WHO* diagnostic criteria for epidemiological studies;²⁷ teeth were marked as 'decayed' when any of following was noted: unmistakable cavitation on occlusal, buccal, or lingual walls of the tooth; a detectable softened floor or wall, or remaining, carious roots; and a filled tooth with signs of caries. Caries occurrence was expressed as decayed, missing (due to caries), and filled permanent teeth (DMFT) count.

Radiographic Evaluation

Radiographs (periapical and panoramic views) were performed before treatment and 3 months after treatment completion. They were used to evaluate the caries status and teeth supporting structures that helped in detection of early changes involving hard structures (Fig. 1).

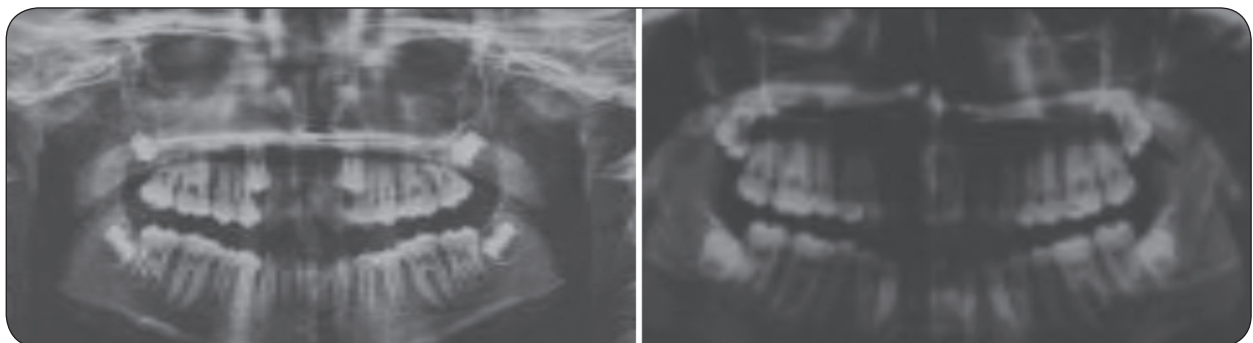


Fig. (1) Panoramic radiographs of two patients; they were treated with orthodontically.

Statistical Analysis

This was carried out by Wilcoxon and Manne Whitney U tests; descriptive data were given as appropriate as calculated using SPSS version 15 (SPSS, Chicago, IL, USA). Differences were considered statistically significant when P value ≤ 0.05 . Reliability was tested as 10% of randomly selected radiographs were re-examined for second time two weeks after the first examination by same examiner, and a reproducibility of 100% was obtained in identifying changes affecting hard teeth and periodontium.

RESULTS

A. Bio demographic Findings:

Twenty-eight orthodontic patients were included; all of them completed the study and comply with the protocol planned. More than half of them were students ($n=16$; 57.1%), 7 were working (25%), & 5 without work (17.9%). Majority were non-smokers ($n=24$; 85.7%). Most patients were performing the tooth-brushing once a day (60.7%), while the rest

(39.3%) used to brush their teeth twice a day. Twenty patients (71.4%) preferred to use soft toothbrush, and eight patients were using medium tooth brushes (28.6%). Daily use of other oral hygiene measures were: 15 patients (53.8%) used interdental brush, 13 patients (46.4%) used mouthwash, while dental floss silk was used by 8 patients (28.6%) and toothpick use by only 6 patients (21.4%). These data are illustrated in Fig. 2

B. Results of Clinical Parameters Measurements:

The plaque index (PI) recorded high mean scores ($1.56 \pm SD 0.38$ and $1.72 \pm SD 0.34$) at 3 & 9 months of orthodontic treatment (T2 & T3), respectively. No significant difference was observed between mean PI recorded before orthodontic treatment (T1) and that measured three months (T4) following treatment completion ($p=0.845$), but a significant difference was observed when comparing between measurements during treatment with both before and after treatment ($p \leq 0.05$); (Table 1). Fig. 3 presenting the clinical appearance of gingiva of two patients before treatment and 3 months after orthodontic treatment termination.

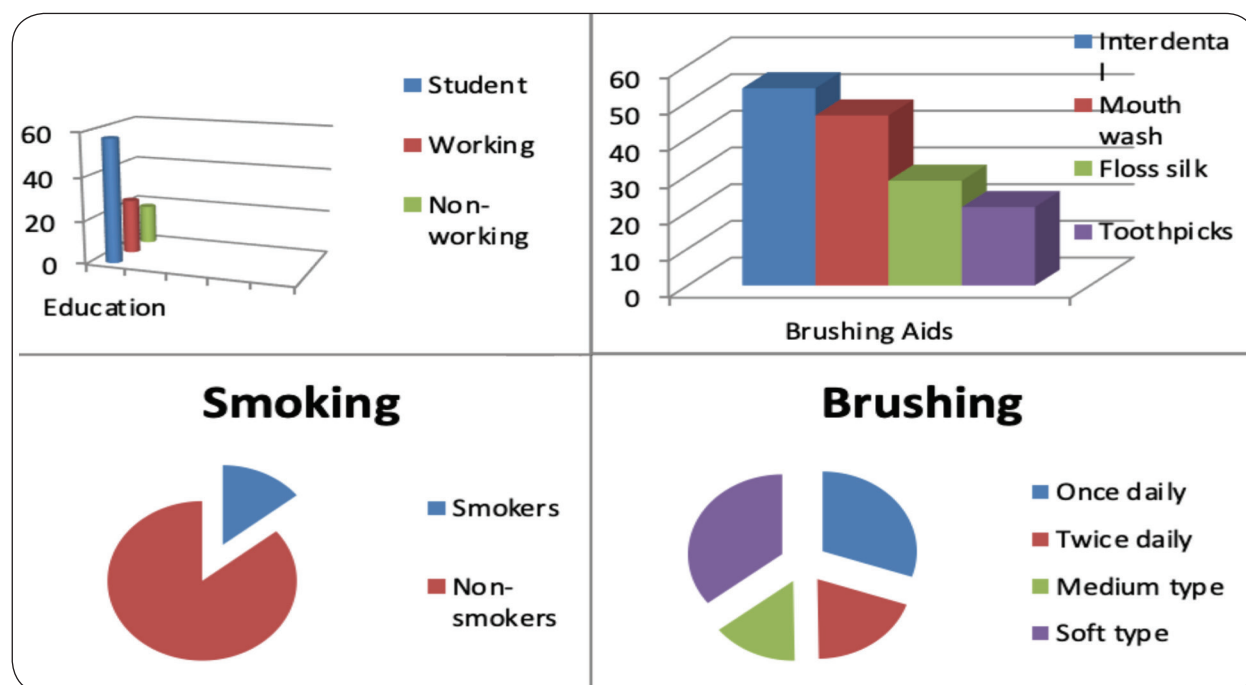


Fig. (2) Presenting the education state, tooth brushing use & type and use of other cleaning aids among the included sample of orthodontic; these variables are presented as %.

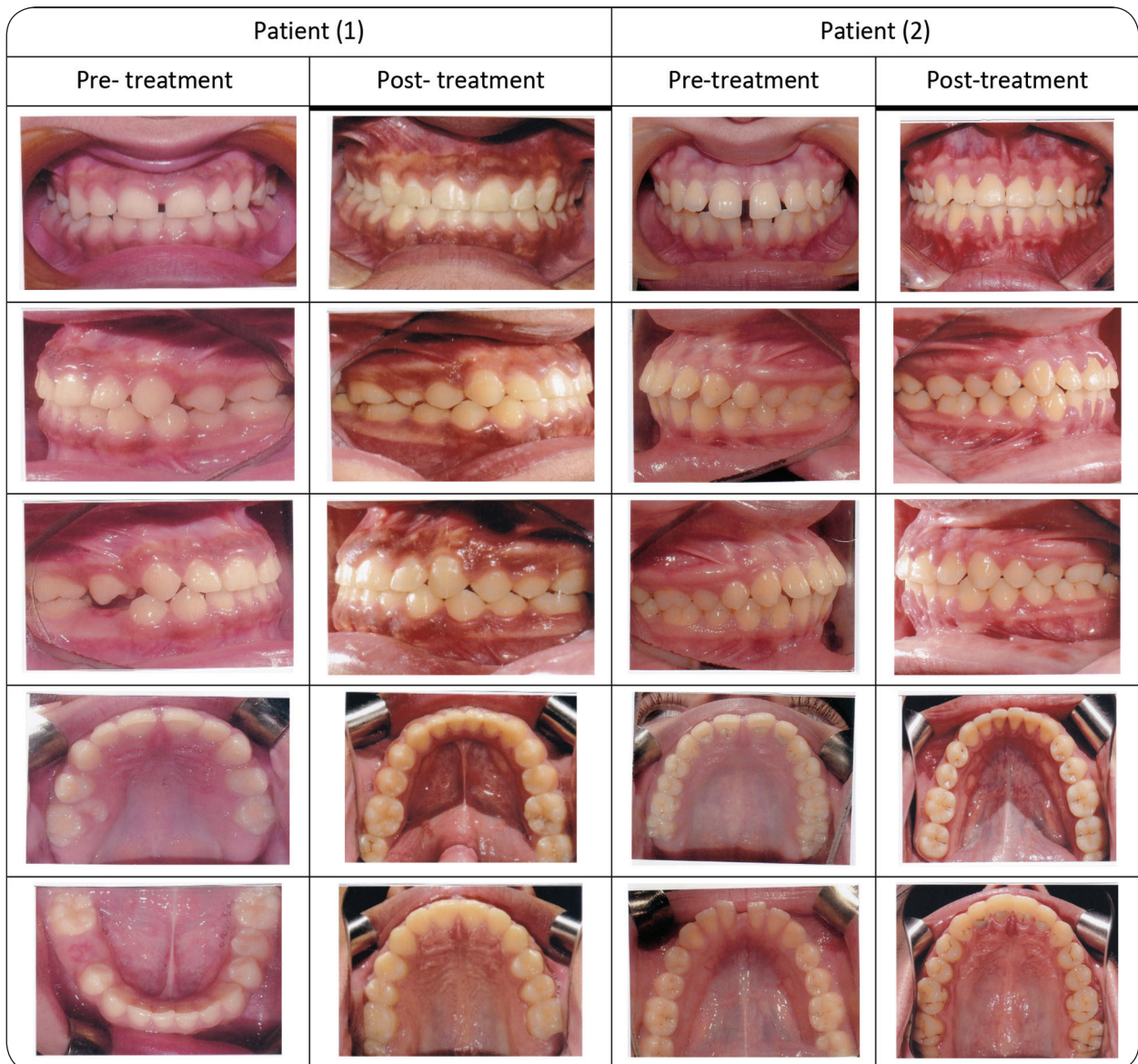


Fig. (3) Clinical presentation of two patients before and after orthodontic treatment

The OHI-S showed the included patients had fair oral hygiene at the time of starting orthodontic treatment. This index recorded higher scores during treatment period with statistically significant difference when compared with recorded scores initially ($p \leq 0.05$), however it did not differ significantly with that recorded after 3 from orthodontic termination ($p > 0.05$). Table 2

The GBI showed highest mean score during treatment (T2 and T3) compared with those recorded before treatment (T1) and after treatment termi-

nation (T4); difference was statistically significant ($p \leq 0.05$). Again the recorded measurements of GBI mean scores did not differ significantly between that recorded before treatment with after treatment ($p > 0.05$); Table 3. Probing pocket depth (PPD) showed that all included patients had normal depth of gingival crevice; there were no actual loss of attachment. Some patient recorded increased depth of sulcus during treatment period due to inflammatory changes involving gingival tissue. However, such change was transient as with resolution of inflammation, there was no existence of this finding.



Table (1) Changes of Plaque Index (PI) recorded from orthodontic patients before (T1), during (T2, T3) and after treatment (T4) with fixed appliances.

Time of examination	Range		Mean	SD	p value
	Minimum	Maximum			
T1	0.08	0.45	0.26	0.19	T1 /T2, T1 /T3*
T2	1.30	2.0	1.56	0.38	T2 /T3, T3 /T4*
T3	1.64	2.34	1.72	0.34	T3 / T4**
T4	0.40	1.10	0.48	0.32	

Table (2) Changes of Oral Hygiene Index (OHI) recorded from orthodontic patients before (T1), during (T2, T3) and after treatment (T4) with fixed appliances.

Time of examination	Range		Mean	SD	p value
	Minimum	Maximum			
T1	0.25	0.60	0.42	0.15	T1 /T2, T1 /T3*
T2	2.10	2.80	2.40	0.25	T2 /T3, T3 /T4*
T3	2.35	3.10	2.62	0.40	T3 / T4**
T4	0.60	1.60	0.75	0.55	

Table (3) Changes of Gingival bleeding Index (GBI) recorded from orthodontic patients before (T1), during (T2, T3) and after treatment (T4) with fixed appliances.

Time of examination	Range		Mean	SD	p value
	Minimum	Maximum			
T1	0.00	0.20	0.12	0.07	T1 /T2, T1 /T3*
T2	1.20	1.60	1.35	0.24	T2 /T3, T3 /T4*
T3	1.48	1.80	1.52	0.18	T3 / T4**
T4	0.25	0.85	0.35	0.24	

* $P \leq 0.05$, ** $P > 0.05$

These findings regarding the measurements of various clinical parameters assessed the periodontal health status were illustrated in Fig.4.

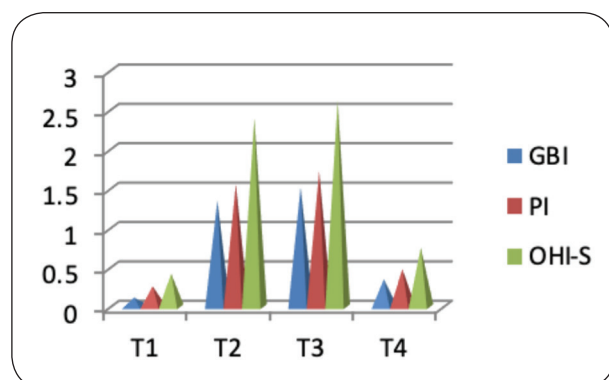


Fig. (4) Clinical parameters recorded before orthodontic treatment (T1), during treatment (T2 and T3; at 3rd and 9th months, respectively and 3 months post-treatment (T4).

C. Findings of Teeth condition (DMFT)

The presence of missing / decayed / filled teeth were checked and counted in all included patients before treatment starting and 3 months following treatment completion. For clarity and simplicity, the findings were presented in 4 divisions: upper anterior teeth, upper posterior teeth, lower anterior teeth and lower posterior teeth. Before starting of orthodontic treatment, missing teeth were 16 in 4 patients (premolars), filled teeth were 16 in 4 patients, also, (all were molars on both arches),

while no decayed were present. After treatment completion, there was no change in number of missing teeth, filled teeth were 20 divided equally on the two arches, while total carious (decayed) teeth were 28; mainly affecting posterior teeth (Table 4 & Fig. 5).

Table (4) Frequencies of missing (M), carious (D), and filled (F) teeth counted from the included sample; presented as numbers and calculated as percentages (%) according the total sample (n=28 patient) and total number of teeth they should have ($28 \times 28 = 784$; wisdoms on the both dental arches were not included).

Examination Time	Upper Anterior			Upper Posterior			Lower Anterior			Lower Posterior			Total Teeth M F D	Patients No. with			Teeth % of			Patient % with				
	M	F	D	M	F	D	M	F	D	M	F	D		M	F	D	M	F	D	M	F	D		
Before Treatment	0	0	0	8	7	0	0	0	0	8	9	0	16	16	0	4	4	0	2	2	0	14	14	0
After Treatment	0	0	8	8	10	9	0	0	4	8	10	7	16	20	28	4	6	5	2	3	3.8	14	21	18

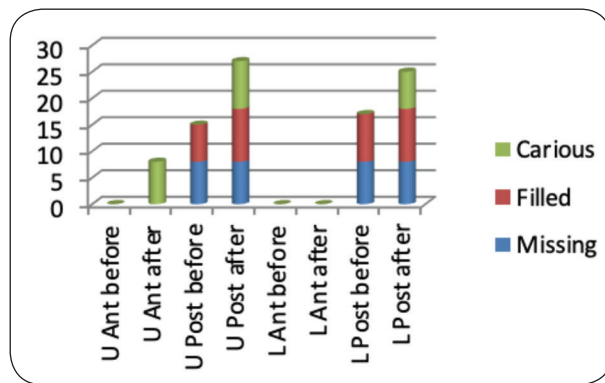


Fig. (5) Frequencies of missing / carious/ filled permanent teeth, recorded from the included sample, presented according to site in jaw as anterior (incisors & canines) and posterior (premolars & molars).

DISCUSSION

It has been acknowledged that orthodontic appliances create retentive areas for plaque accumulation and complicate oral hygiene, increasing risk for gingival inflammation, deteriorated periodontal health, dental demineralization and caries.^{18, 20} Brackets bonding alter the ecology of the oral cavity, by the collection of biofilm at retentive areas; complexity of the orthodontic appliances represents difficulty to perform proper tooth cleaning by patients.^{17,19} This study was carried out longitudinally on a group of

28 patients indicated to have orthodontic treatment. Their oral hygiene status was evaluated clinically and radiographically prior to treatment initiation as well as after treatment completion. During the performing of planned orthodontic treatment, oral hygiene of each patient was evaluated at 3rd month as well as 9th month to assess longitudinally the oral health status before, during as well as after their treatment with fixed orthodontic appliances. All of included patients completed the treatment, comply with various appointments and co-operated well in answering prepared questionnaire.

The results showed that all included patient were using tooth brushes to clean their mouth; regular tooth brushing is the first mean in the protocol of defense to control dental plaque. Majority of them (60.7 %) brush their teeth once a day, while (29.3 %) from the sample brushed twice a day (37.76%), which is in accordance with previously reported.²⁸⁻³⁰ The patients of the present study were instructed to use Bass brushing method, as it has been showed that it is the most effective technique of tooth brushing because it eliminates plaque from the surface of the tooth and gingival surfaces;³¹ all included patients brushed their teeth



using a conventional brush. In this respect, a study³² concluded that manual toothbrush was the first option of almost all participants and clean teeth sufficiently. It has been proposed that, the higher the frequency of tooth brushing, the lower the plaque biofilm accumulation, the obtained results from the present study lend support to this speculation. Thus, PI and GBI tend to decrease in patients with high reported frequency of regular tooth brushing process, however the difference did not reach a statistically significant level. Again, this finding was parallel to that of other studies²⁹⁻³³ found decreased gingival indexes mean scores as the patients clean their teeth more frequently and regularly. However, this was not always the case; conversely, a study³⁴ reported that plaque accumulation in orthodontic patients was extremely high. This controversy can be attributed to several factors including sample size, state of orthodontic treatment, assessment method, patient's compliance with oral hygiene measures as well as frequency and efficacy of used cleaning aids; further clarification of this aspect is needed.

Results showed that majority of included patients mentioned that they used to brush their teeth daily (once / twice), which was the case reported in other studies.³⁵⁻³⁷ However, a study² reported unsatisfactory oral hygiene in their patients even though more than half of them brushed twice daily and one-fifth 3 times daily. Tooth brushing procedure able to remove plaque under arch wires.³⁸ Most of included patients (71.4%) preferred soft bristles while 28.6% used medium tooth brush type; medium toothbrush removed more plaque but caused more gingival abrasion than soft toothbrush.³⁵ The use of supplementary measures for oral hygiene as interdental toothbrush, dental floss, toothpaste containing fluoride (to avoid enamel demineralization), and oral irrigator has been advocated.^{39,40} In the present study, it was found that 53.8% of included sample used interdental brush, 46.4% used mouthwash, while dental floss silk was used by 28.6% and toothpick used by only 21.4%. It has been mentioned that use of

interdental brushes eliminates subgingival plaque to a depth between 2 to 2.5 mm.³⁷ Hence, more than half of included sample were using brushing aids as interdental brushes; is higher percentage than that of a study³⁵ found that 18% of subjects use interdental brushes regularly, but another study reported that 68,6% of patients treating by fixed orthodontic appliances used interdental toothbrushes daily.³⁶ In addition, 55% of patients included in the present study reported the use of mouthwash to aid in oral cleansing process. These oral hygiene aids (toothbrush, dental floss, interdental cleanser, chewing gum) as well as antibacterial agents (mouth rinses, dentifrices, chewing gum) are valuable mechanical oral cleansing methods.

Periodontal clinical evaluation was assessed with PI, GI, PPD showed that orthodontic appliances were associated with development of more plaque accumulation with clinical signs of orthodontic gingivitis within few months. Such gingival changes associated with orthodontic therapy have been reported in various studies,^{41,42} however, Liu et al. reported that there are transient changes; no permanent effects on gingival status occurred from orthodontic appliances use.²⁰ Additionally, results of present study showed that after 3 months from treatment termination, the gingiva returned to normal condition without inflammatory changes. This finding was in accordance with a study⁴³ reported that periodontal values tended to normalize 3 months after fixed appliance removal even if the same parameters remained higher with respect to baseline. In this respect a study concluded that, fixed appliance placement does not have a long-term impact on clinical periodontal parameters; in fact, many values normalized 2 years after de-bonding.⁴⁴ Other research conducted on a wider sample size with includes a control group and a longer follow up period to obtain clear understanding and clarification regarding influence of fixed appliances on periodontal health, are needed.

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تقييم طولي لصحة الفم لدي مرضي العلاج التقويمي للأسنان: قبل وأثناء وبعد الانتهاء منه

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الملخص :

الهدف: التقييم الاكلينيكي للحالة الصحية للفم عند المعالجون بتقويم الاسنان بمابعتهم قبل البدء بالعلاج وأثناء العلاج وبعد ثلاثة شهور من انتهاء العلاج التقويمي للأسنان.

المواد والأساليب : اشتملت الدراسة علي ثمانية وعشرون شخصا تم اختيارهم من المترددين علي العيادات الخارجية بكلية طب اسنان الازهر بالقاهرة. وقد تم اعداد استبيان متضمنا العديد من الاسئلة حول الحالة التعليمية ، الوظيفة ، الحالة الاجتماعية ، التاريخ المرضي ، عادة التدخين. حالة الفم والاهتمام بها واستخدام الوسائل والطرق في ذلك وكذا الزيارات السابقة لتلقي تنظيف الاسنان بعيادات الاسنان.. كما تم تسجيل حالة اللثة باستخدام مؤشر التهاب اللثة. وكذا مؤشر تكوين الطبقة الجرثومية علي أسطح الاسنان واللثة وتحديد وقياس عمق الجيوب اللثوية وكذا حالة نظافة الفم. وقد تم تسجيل هذه القياسات الاكلينيكية في الفترات الثلاثة: قبل وأثناء وبعد العلاج التقويمي للأسنان. واشتمل الفحص الاكلينيكي للفم علي تسجيل حالة كل الاسنان الموجودة من حيث التسويس والحشو والفقء. وقد تم عمل تصوير اشعاعي لكل مريض قبل وبعد العلاج التقويمي.

النتائج: وقد أظهرت النتائج ان أكثر من نصف المرضي طلابا. و25% يعملون والنسبة الباقية بدون عمل. وأن الغالبية العظمي غير مدخنين... وأفادوا جميعا باستخدامهم لفرشاة الاسنان يوميا وأن 60% منهم يستخدمونها لمره واحدة يوميا والنسبة الباقية تفضل استخدام الفرشاة مرتين يوميا. كما ان نسبة كبيرة جدا منهم تتعدى الثلثان اي 71.4% يستخدمون فرشاة الاسنان من النوع اللين. وفيما يتعلق بالقياسات الاكلينيكية التي تم تسجيلها لم يكن هناك فارق احصائي بين هذه القياسات المسجلة قبل البدء في العلاج التقويمي و بعد الانتهاء منه. ولكن النتائج أوضحت فوارق ذات دلالة احصائية عند مقارنة ما تم تسجيله اثناء العلاج مع كلا من ما تم تسجيل قبل وبعد العلاج حيث كان هناك ارتفاعا لمؤشر هذه القياسات اثناء فترة العلاج. ولقد أوضحت النتائج انه لا يوجد ثمة تغيير فيما يتعلق بفحص الاسنان الموجودة ومقارنة النتائج قبل وبعد العلاج عدا أن هناك زيادة طفيفة في عدد الاسنان المصابة بالتسويس المسجلة بعد الانتهاء من العلاج مقارنة بما تم تسجيله قبل البدء بالتقويم ولكن الفارق لم يصل للأهمية الاحصائية.

الخلاصة: زيادة تراكم الطبقة الجرثومية علي الاسنان واللثة يؤدي الي تغييرات مرضية كنتيجة لصعوبة تنظيف الفم مع وجود أجهزة التقويم المثبتة علي الاسنان والتي تؤدي الي مزيد من التراكومات البكتيرية. لذا فانه يراعي دوما خفض المرضي أثناء علاج تقويم الاسنان للاهتمام الزائد بحالة الفم والتنظيف المستمر والمنظم للفم والاسنان لتجنب حدوث التهابات اللثة أو تسويس الاسنان.

الكلمات المفتاحية: مؤشر التهاب اللثة. مرضى تقويم الاسنان ، صحة الفم ، التهاب اللثة. التراكومات البكتيرية

