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Frequency of oral mucosal lesions in fixed orthodontic patients

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Abstract

Background: Orthodontic treatment is employed to correct dentofacial anomalies and helps to improve esthetics. A variety of oral mucosal lesions is seen in patients receiving fixed orthodontic therapy due to the irritation caused by the brackets. It also affects the oral health by accumulation of plaque leading to the development of gingivitis and progression to periodontitis.

Aim: The aim of this study is to examine the frequency and the type of oral mucosal lesions in patients undergoing fixed orthodontic treatment. In addition, as the maintenance of oral hygiene is difficult during treatment, gingival index of the patients has also been reported.

Materials and Methods: A pro-forma used for evaluating fixed orthodontic patients included site, size, and degree of inflammation of the lesion, plaque and gingival index. This was used to evaluate randomly selected 100 patients under various stages of fixed orthodontic therapy. These patients were examined for inflammation, contusion, erosion, hyperkeratinization and ulceration. The results were tabulated and analysed.

Result: The most common topographic site for the occurrence of oral mucosal lesions was the right buccal mucosa. Of the 100 patients examined, 45 patients presented with lesions - 33 patients had a single lesion and 12 of them with multiple lesions of varying sites. The most common size of the lesion was less than 1cm. Only mild inflammation was seen in all the lesions. Most common oral mucosal lesion observed was ulceration. Most frequent plaque and gingival index was 1 and 2 respectively.

Conclusion: This study helps to identify the frequency of oral mucosal lesions and helps in early diagnosis and treatment of these lesions in order to avoid pain and accelerate their healing. Overall, the compliance and quality of life in fixed orthodontic patients is improved.

Keywords: Ulcer; contusion; oral mucosa; corrective orthodontics

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INTRODUCTION

Orthodontic therapy, although beneficial in the correction of malocclusion and improvement in the profile of the patient, it is associated with potential hard and soft tissue damage. The frequent side effect of fixed orthodontic therapy is ulceration, pain and discomfort caused by local tissue damage from the irritation of the brackets. [1] Previous studies report that there is a significant negative impact of fixed orthodontic treatment on oral health related quality of life. [2] Maintenance of oral hygiene during orthodontic treatment is challenging because of food entrapment between and on the brackets. This result in compromised gingival and periodontal health. [3] Oral mucosal lesions during orthodontic therapy can serve as a bad influence for patient compliance towards the treatment and the expected outcomes of the treatment cannot be achieved. [4] The occurrence of oral mucosal lesions can affect the motivation of the patient and lead to alteration in the duration of orthodontic treatment. Discomfort during the treatment due to tooth movement leads to difficulty in eating, impairment of speech, maintenance of oral hygiene resulting in halitosis and bleeding gingiva. It also has a negative influence on the daily activities of the patients. [5]

The aim of this study was to examine the frequency and the type of oral mucosal lesions in patients undergoing fixed orthodontic treatment. In addition, as the maintenance of oral hygiene is difficult during treatment, gingival index and plaque index of the patients has also been reported.

OBJECTIVE/ RATIONALE

The objective of this study is to create awareness among the patients about the oral mucosal lesions during fixed orthodontic therapy as they affect the compliance of the patient to the treatment. This makes the patient prepared for what type of lesions to expect during therapy and their appropriate management. It also stresses on the maintenance of oral hygiene and measures for plaque removal be taken during the therapy.

MATERIALS AND METHODS

This observational study consisted of randomly selected 100 patients under various stages of fixed orthodontic therapy. The study was done in the Department of Orthodontics in Saveetha Dental College from November to December 2017.

A pro forma used by Baricevic et al [3], was used in this study to evaluate the presence and absence of oral mucosal lesion, its site, size and the degree of inflammation. Gingival index and plaque index were included to assess the oral hygiene status of the patients. Each participant was explained the purpose of the study before a written informed consent was obtained from patients. For patients below 18 years, informed written consent was obtained parent/ guardian present on the day of examination. A clear medical history was obtained from the patients to exclude any systemic illnesses.
Inclusion criteria for the study was all patients under fixed orthodontic therapy between the ages of 12 to 40 years irrespective of the type of brackets and the type of fixed orthodontic therapy used. The exclusion criteria was patients with systemic illnesses and under medications. Stress and psychosomatic disorders were also excluded as a cause of oral lesions in patients under treatment. Only lesions that were present at the time of examination were included in the study.

On clinical examination, the patients were evaluated for oral mucosal lesions based on internationally accepted criteria and a systematic and standard approach for recording each lesion was followed (Figure 1). [6] Lesions were grouped into ulcerations, contusions, erosion, hyperkeratinization and mucosal overgrowth.The

degree of oral mucosal inflammation was graded using the following criteria as used by Baricevic et al [3]:
Degree 1: indicates barely visible localized inflammatory reaction presented by a lighter red color and <1 cm in diameter.
Degree 2: indicates medium intensity of inflammatory reaction, with moderately red color of oral mucosa varying from degree 1 to 3; no more than 2 cm in diameter.
Degree 3: indicates severe inflammatory reaction presented by a darker red color, spreading extensively more than 2 cm in diameter.
The gingiva was examined for inflammation, change in color, bleeding on probing, and edema by Loe and Silness's gingival index. [7] The oral hygiene status of the patient was examined using plaque index given by Loe and Silness. [7]
The pro formas of the patients were analyzed and results were expressed in frequencies and percentages. No statistical tests were performed.

RESULTS

Of the 100 patients examined, there were 31 males and 69 females. The age of the patients ranged between 12 to 38 years with the mean age of 18.9 years. The most common age of orthodontic patients examined was 14 years.

Maximum number of patients examined were bonded with metal brackets (92 out of 100 patients). Only 8 patients had ceramic brackets. MBT technique (pre – adjusted edgewise technique) was used in all the patients.

Out of 100 patients, 45 patients presented with mucosal lesions, 41 patients were wearers of metal brackets. Thus, the frequency of lesions were higher in patients with metal brackets rather than ceramic brackets. 73% of these patients reported with a single lesion that was confined to one topographic site and 27% had multiple lesions on various sites of oral mucosa (Figure 2).

The lesions were grouped into ulcerations, contusions, erosion, desquamation, hyperkeratinization and mucosal overgrowth. The frequency of occurrence of each lesion was recorded (Figure 3).

The site which was frequently affected by oral mucosal lesions in these patients was the right buccal mucosa. This area is denoted by number 19 in the Topographical classification of oral Mucosa given by WHO in the year 1980 [6]. This area of oral mucosa lies between the upper and lower buccal sulci, and extends forwards to a line drawn vertically from the angles of the mouth. Most prevalent lesions on the right buccal mucosa were contusion, erosion and ulceration.

The ulcerations were further sub – grouped into aphthous and traumatic ulcers. 3 patients reported with aphthous ulcers and the remaining were due to trauma. The size of the lesions were most commonly less than 1 cm in diameter. However, there was one patient who reported with a major aphthous ulcer on the lower lip that was grouped into size 2: lesions measuring 1 to 3 cm in diameter.

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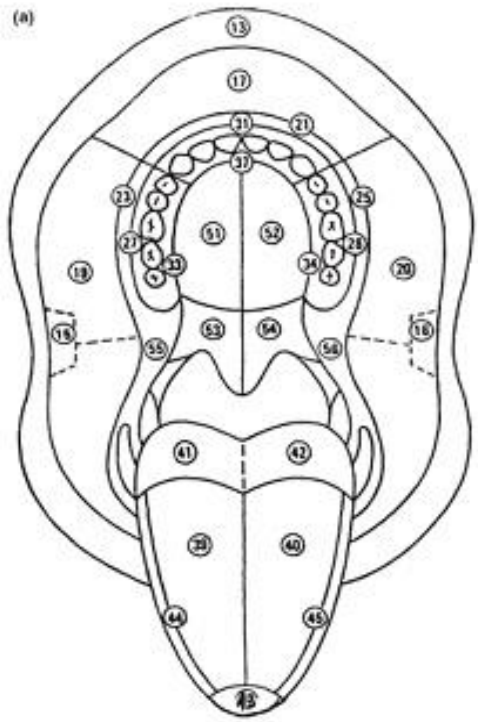
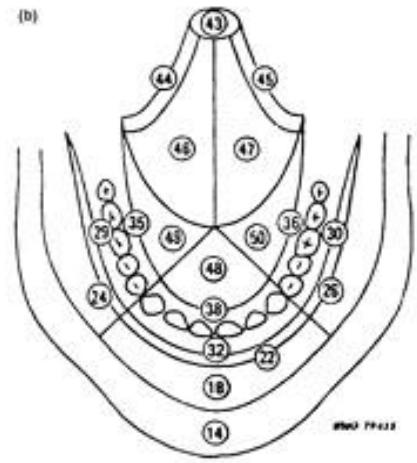
The degree 1 was the most frequently recorded degree of mucosal inflammation which concurs that most lesions were mildly inflamed at the time of examination.

The most prevalent gingival and plaque indices recorded was 1 and 2 respectively. Most frequently observed gingival lesions were gingival hyperplasia, gingival inflammation and gingival recession. Gingival inflammation was present among 91% of the population. 16% of the patients presented with a plaque score of 3 and 39% with a score of 2.





- Vermilion border - upper (13), lower (14)
- Labial commissures - right (15), left (16)
- Labial mucosa - upper (17), lower (18)
- Cheek (buccal mucosa) - right (19), left (20)
- Labial sulci - upper (21), lower (22)
- Buccal sulcus - right upper (23) lower (24)
- Buccal sulcus - left upper (25) lower (26)
- Upper gingiva or edentulous alveolar ridge buccally - right(27), left (28)
- Lower gingiva or edentulous alveolar ridge buccally - right(29), left (30)
- Upper anterior gingiva or edentulous alveolar ridge labially (31)
- Lower anterior gingiva or edentulous ridge labially (32)
- Upper gingiva or edentulous alveolar ridge palatally – right (33), left (34)
- Lower gingiva or edentulous alveolar ridge lingually – right (35), left (36)
- Anterior gingiva or edentulous ridge palatally (37) and lingually (38)
- Dorsum of the tongue - right (39), left (40)
- Base of the tongue - right (41), left (42)
- Tip of the tongue (43)
- Margin of the tongue - right (44), left (45)
- Ventral (inferior) surface of ike tongue - right (46), left (47)
- Floor of the mouth
  - Frontal (48)
  - Lateral - right (49), left (50)
- Hard palate - right (51), left (52)
- Soft palate - right (53), left (54)
- Anterior tonsillar pillar - right (55), left (56)

Figure 1: Topography of oral mucosa by WHO modified after Roed-Petersen and Renstrup.

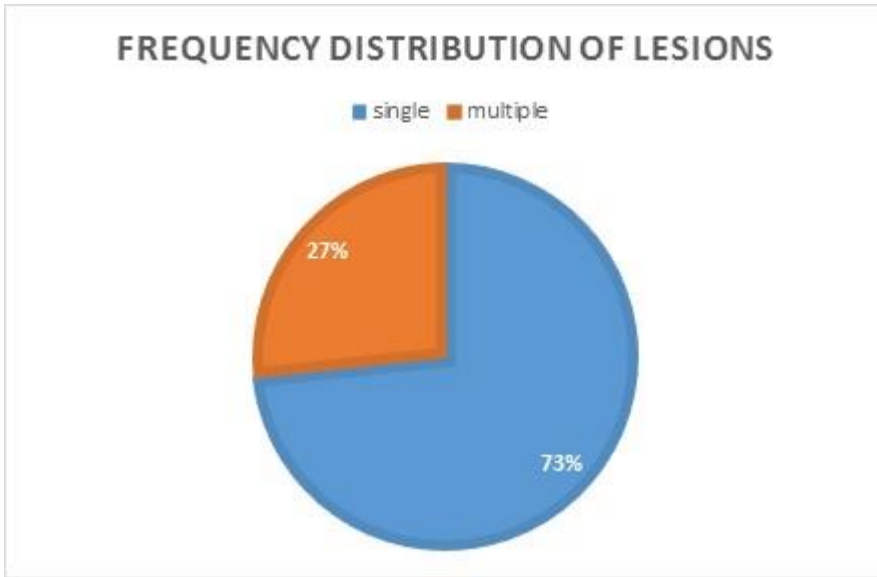


Figure 2 Frequency distribution of lesions

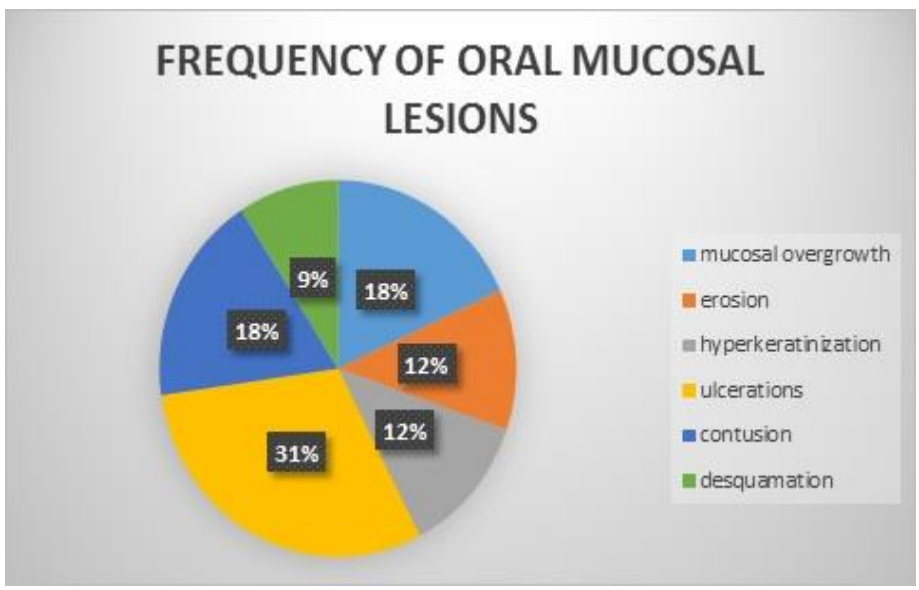


Figure 3 Frequency of oral mucosal lesions

DISCUSSION

The ages of the examined patients ranged from 12 to 38 years unlike 6 to 18 years as considered by Baricevic et al. [3] This wide range could help in the identification of lesions that not only occur in adolescents but also in adult population as there is difference in the duration of the orthodontic treatment.

The occurance of oral mucosal lesions during orthodontic treatment is a common finding and there are many previous studies done to associate these lesions to the orthodontic treatment. [3-5, 10, 11] In the present study, ulcerations were the most prevalent oral lesion (31%) (Figure 4). This is similar to the findings reported by Baricevic et al [3] and Rennick et al. [12] These ulcerations were most frequently seen in the buccal and the lower labial mucosa. These lesions are due to extension of unsupported arch wire near the molar tubes and the irritation from the canine hooks soldered to the arch wire resting against the lower lip. [1] Ulcerations also occurred in the floor of the mouth as a result of irritation from the lingual appliance placed. A study by Mainali, [12] reported a 40.8% occurrence of ulcers in orthodontic patients of which 60.8% were traumatic ulcers and 8.3% were recurrent aphthous ulcers.

Figure 4 Ulcerations

Minor and major aphthous ulcers were also detected in patients (Figure 5). Occurrence and increased frequency of recurrent aphthous ulcers in orthodontic patients was also reported in a study done by MF Rashidi et al. [14]

Figure 5 Major and Minor aphthous ulcer

Contusion is the reddish discoloration of the skin with no visible bleeding. In orthodontic patients, contusions can occur as a result of trauma to the oral mucosa from the components of fixed orthodontic appliance mainly the buccal tube. The most common site of occurrence of contusion, observed in the present study was the buccal mucosa (Figure 6). In the present study, contusions were observed in 18% patients and is one of the commonly occurring lesions. This is identical to the results of the study by Baricevic et al. [3]

Erosion of the oral mucosa occurs due to the abrasion of the oral mucosa by the brackets. In the present study, erosion was most commonly seen in the buccal and the labial mucosa. Erosion, as an adverse effect of orthodontic treatment and as a predecessor for ulcerations was also reported by Baricevic et al, [3] Preoteasa CT et al. [15] (Figure 6)

Figure 6 Contusion and Erosion

Mucosal overgrowth was commonly seen in the buccal mucosa in the present study (18%) (Figure 7). This overgrowth may be due to the entrapment of buccal mucosa between the orthodontic brackets or the molar tubes. There are chances of such entrapment forming an ulcer in the later stages of the therapy. Ahmed et al also reported mucosal overgrowth in fixed orthodontic therapy. [16]

Figure 7 Mucosal overgrowth

Another finding of the present study was the hyperkeratinization in the oral mucosa (Figure 8). The hyperkeratinization may be due to the friction between the brackets and the mucosa or due to the initiation of cheek biting habit after placement of the fixed appliance. Hyperkeratotic lesions were also observed and reported by Ahmed et al. [16]

Figure 8 Hyperkeratinization

Gingival health during fixed orthodontic therapy:

Orthodontic appliances may affect the equilibrium of oral flora and lead to increase in bacterial retention. In response to bacterial retention, there is inflammatory reaction of the periodontal tissues. [17] Such inflammation can result in gingival hyperplasia and gingival recession [15](Figure 9). Gingival hyperplasia has been reported to occur in patients during space closure at the extraction site. It should also be stressed that the patients maintained good oral hygiene. Previous studies have shown increase in candida colonization before and after fixed orthodontic therapy. [18, 19]

Due to extensive retention of bacterial biofilm on the brackets, it leads to inflammation of interdental papilla, edema, glazing and increased bleeding tendencies. The most common site for gingival inflammation was the marginal gingiva in both upper and lower arches due to accumulation of plaque (Figure 10). Previous studies (1) also reported that gingival inflammation was higher in fixed orthodontic patients. An article by Florman [20] states that poor oral hygiene during orthodontic treatment results in development of caries, gingivitis that has the potential to develop into periodontitis. It also reports that discontinuation of treatment can also occur to prevent further periodontal damage because of patient's unwillingness to maintain oral hygiene.

Figure 9 Gingival hyperplasia, recession and gingival inflammation

Figure 10 Gingival index

The limitation of this study was that the duration of the orthodontic therapy was not taken into consideration. The correlation between duration and oral mucosal lesion may be more beneficial to the orthodontist and to the patient as they will be aware of what type of lesions to expect during a particular phase of therapy.

For ulcerations, like recurrent aphthous ulcers, stress can also role in its etiology. Cortisol levels can be measured and correlated to stress. This association can lead to definitive differentiation of aphthous ulcers that occur due to orthodontic treatment and those ulcers that occur due to stress.

CONCLUSION

Oral mucosal lesions have a multifactorial etiology involving the patient, the orthodontist and technical features that involve the treatment. Prevention of oral mucosal lesions in fixed orthodontic patients should be aimed by the orthodontist such that iatrogenic damage to the patient is minimized. Early diagnosis and treatment of oral mucosal lesions can help improve the quality of life and the compliance of the patient. The patient should be counseled to maintain good oral hygiene throughout the treatment to prevent periodontal complications during the treatment.

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