ORIGINAL ARTICLE

PERIODONTAL STATUS OF FIRST MOLARS DURING ORTHODONTIC TREATMENT

Imtiaz Ahmed, Saif ul Haque*, Rozina Nazir**

Department of Orthodontics, Dr. Irshat-Ul-Ebad Khan Institute of Oral Health Sciences, DOW University of Health Sciences, *Department of Operative Dentistry, Fatima Jinnah Dental College, **Bahria University Medical and Dental College, Karachi

Background: The most important aetiological factor of periodontal disease is plaque deposition around gingival margin. The aim of the study was to investigate the negative changes in periodontal health (increase in pocket depth) of first molars in fixed orthodontic treatment and to discuss the available options to avoid it. **Methods:** Group A (6 month of treatment) comprised of 45 patients, compared to Group B (12 month of treatment) comprised of 45 patients. Initial pocket depth of first molars checked before placement of molar bands in both groups of patients, then for Group A patients pocket depth evaluated after 6 month of treatment and for Group B patients pocket depth evaluated after 12 month of treatment period. **Results:** In patients with 6 months of treatment the pocket depth of molars mostly falls between 1.5 and 2.0 mm. In some severe cases it exceeded 3 mm. In patients at 12 months of treatment pocket depth was greater than 6 month group and it mostly fell in the range of 2.0–2.5 mm. **Conclusion:** Increase in pocket depth showed that plaque deposition leads to periodontal destruction around molar bands. Patient motivation to maintain oral hygiene and regular scaling will minimise hazardous effects.

Keywords: Pocket depth, Gingivitis, Oral hygiene, fixed orthodontics

INTRODUCTION

Gingivitis is an inflammation of the gums surrounding teeth. Gingivitis is one of many periodontal diseases that affect the health of the periodontium.[1] Periodontal diseases are often classified according to their severity. They range from mild gingivitis; to more severe periodontitis.[2] It is well established that the patients who undergo orthodontic treatment have a high susceptibility to present plaque accumulation on their teeth because of the presence of bands, brackets, wires and other orthodontic attachments. Recent studies show that the most important etiological factor of periodontal disease is plaque deposition around gingival margin.[2,3] Orthodontic treatment is a double-action procedure, regarding the periodontal tissues, which may be sometimes very significant in increasing the periodontal health status, and sometimes a harmful procedure which can be followed by several types of periodontal complications, namely: gingival recessions, bone dehiscence, gingival invaginations and/or the formation of gingival pockets.

Measurement of CAL (clinical attachment loss) remains the gold standard to evaluate the destruction of periodontal support associated with fixed orthodontic appliances. Boyd and Baumrind addressed this problem in banded teeth.[4] However, partial recording of CAL, limited to the bucco-mesial surfaces of upper right and lower left molars, may not reflect the real situation around the teeth, limiting comparison with unbanded molars. The limitations of partial recordings have been highlighted and the importance of a full-mouth examination, six sites per tooth, for a description of periodontal status has been stressed.[4] Maintenance of high standards of oral hygiene is essential for patients undergoing orthodontic treatment as proven by other studies as well.[5] Orthodontist has a double obligation: to advise the patient about methods of plaque control and, at routine visits monitor the effectiveness of the oral-hygiene regime.

The aim of the present study was to evaluate the periodontal conditions in patients who had undergone orthodontic therapy with fixed appliances, to determine the periodontal condition, periodontal pocket depth examined of banded first molars at six different sites on each tooth.

MATERIAL AND METHODS

This was a cross-sectional descriptive study. A total of 90 healthy young patients were investigated in this study at Orthodontic Department of Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences, Karachi for clinical presence of pocket depth in all of the 1st molars banded with molar bands during orthodontic treatment. Patients included in the study were 12–26 years of age, both sexes, extraction and non-extraction cases, and all first molars only were banded with molar bands with initial pocket depth of 1–1.5 mm on all banded molars before banding. Patients with any systemic disease, generalised periodontal problems/disease, cyst, clefts or congenital malformations, and patients receiving removable appliance treatment were excluded from the study.

Patients were divided into 2 groups, i.e., Group A: 6 months treatment period, (45 patients), and Group B: 12 months treatment period, (45 patients).

Patients of both groups were strictly advised with oral hygiene measures before and during the entire treatment course. The intraoral clinical examination and diagnosis was conducted by direct examination with

Michigan periodontal probe to measure the pocket depth. No radiographs were used, as the diagnosis of pocket depth was not visible on radiographs. Probing depth recorded on both buccal and lingual surfaces on first molars in millimetres. The measurement includes the distance from the bottom of the gingival pocket to the gingival edge with the Michigan periodontal probe.

Periodontal pocket depths were recorded on 6 different surfaces of each tooth, i.e., Buccal, Mesio-buccal, Disto-buccal, Lingual, Mesio-lingual, and Disto-lingual.

RESULTS

Ninety patients who were evaluated in the study had mean age 17.44±3.073 years with a range 12–26 years. The ratio between male and female was 44:46. The 2 groups were analysed on the basis of pocket depth on 6 different surfaces of molars.

Table-1 presents the results of patients with 6 months of treatment and illustrates the pocket depth of molars which mostly fall in between 1.5–2.0 mm (normal). In some cases it exceeds up to 3 mm which indicates the need of scaling and strict measures in future for periodontal maintenance and periodic checkups for gingivitis and periodontitis.

Table-2 depicts the data of patients at 12 months of treatment. In these patients pocket depth was greater than 6 month group and it mostly fell in the range of 2.0–2.5 mm. It showed that increasing treatment time leads to increase in pocket depth.

DISCUSSION

In both groups pocket depth increased with time. Similar age groups has been studied by Zachirson[6] with data collected pre-treatment, 1, and 2 months showed increase in pocket depth after 2 months. Studies by Kobayashi and Ash Jr[7] selected the same patients for their longitudinal study in which pocket depth increased up to 3 mm. In other longitudinal studies, measuring pocket depth in the same group after 6 and 12 months of time period is not reliable if the patient is not maintaining oral hygiene properly. In our study regardless of personal hygiene measures, we measured pocket depth in different patients at different time interval. Our and others' studies suggest that presence of fixed appliances with banded molars does influence inflammation which is clearly evident with increase in pocket depth.[8] Pocket depth in our study is slightly more than others[7] because of many factors like oral hygiene measures, band position and overhanging material.

Subgingival plaque is a major aetiological factor in the beginning, progression and recurrence of periodontal disease.[9] Resolution of gingival inflammation is imperative in managing periodontal disease. Patients might be able to adequately manage plaque control if their periodontal disease is mild or moderate.[10] Most patients in our study developed mild to moderate gingivitis during the first 6 months after placement of molar bands. This pocket depth increased in some patients despite continuous motivation for tooth brushing and maintenance of oral hygiene as shown by other studies.[11] Severe inflammation was not seen in any of our patients. Similar results were reported by Spence[12] where increased pocket depth was also recorded without any severe problems.

Our study has been focused on alterations of periodontal parameters around 180 teeth in patients who underwent orthodontic treatment. In another study only 120 teeth were measured for pocket depth.[13] Pocket depth increased significantly on mesial and distal sites. This could be explained by accumulation of dental plaque on those surfaces by raising difficulty for patients to maintain those areas free of plaque. It is extremely useful for detecting early inflammatory changes and the presence of inflammatory lesions located at the base of periodontal pocket. Baer *et al*[14] also suggested that interdental areas are especially more periodontally affected in orthodontic patients. This increase reflects and assures ability of fixed orthodontic elements to attract dental plaque which is the most powerful initiating factor for periodontal diseases. These results agree with those obtained from other studies.[15] In clinically healthy gingiva in humans, a sulcus of some depth can be found. The depth of periodontal sulcus was determined differently in other studies as some reported the depth of 1.5 mm and others reported 1.8 mm.[16,17] Radiographs indicate areas of bone loss where pockets may be suspected.[18] Zachrisson *et al* reported an increase in probing depth and a slight loss of attachment around teeth of patients who underwent orthodontic treatment with fixed orthodontic appliances.

In one study[19] maximal record of probing depth was 2.34 mm after 6 months (lower jaw-mesial sites), but in our study the maximum recorded pocket depth after 6 months was 3 mm which is more than other studies. These data remain almost the same in the group of 12 months with a slight increase of 0.5 mm in some cases. It is considered to be normal and does not reflect any destructive disease that may affect the periodontal tissues permanently.

Further histological studies are still needed in order to reveal the exact tissue alterations that take place during different phases of orthodontic treatment. Periodontal conditions in patients undergoing orthodontic treatment should be monitored carefully. Removable and fixed orthodontic appliances impede correct periodontal hygiene, resulting in more plaque accumulation, inflammation, and bleeding. Therefore, appropriate oral hygiene methods and instruments should be used to control plaque. Powered and interdental tooth brushes and special types of floss have been shown to improve plaque control in orthodontic patients.[20]

Table-1: **Pocket depth of molars at 6 month into treatment (Number of teeth)**

Tooth Surfaces	Pocket depth (mm)					
	1	1.5	2	2.5	3	3.5
Pocket depth 16						
Buccal side	4	21	19	0	0	0
Mesio-Buccal side	6	19	15	5	0	0
Disto-Buccal side	6	14	18	6	1	0
Lingual side	11	23	9	2	0	0
Mesio-lingual side	2	19	18	5	1	0
Disto-lingual side	5	15	15	9	1	0
Pocket depth 26						
Buccal side	9	16	18	2	0	0
Mesio-Buccal side	4	20	13	8	0	0
Disto-Buccal side	6	14	13	10	2	0
Lingual side	12	22	8	3	0	0
Mesio-lingual side	7	16	15	7	0	0
Disto-lingual side	7	21	12	5	0	0
Pocket depth 36						
Buccal side	10	15	17	3	0	0
Mesio-Buccal side	4	23	11	6	0	0
Disto-Buccal side	7	15	17	4	2	0
Lingual side	14	16	14	1	0	0
Mesio-Lingual side	4	22	16	3	0	0
Disto-Lingual side	7	14	20	4	0	0
Pocket depth 46						
Buccal side	9	17	18	1	0	0
Mesio-Buccal side	5	17	12	10	1	0
Disto-Buccal side	7	14	11	11	2	0
Lingual side	10	18	17	0	0	0
Mesio-Lingual side	4	22	14	5	0	0
Disto-Lingual side	5	18	17	4	1	0

Table-2: Pocket depth of molars at 12 month into treatment (Number of teeth)

Tooth surfaces	Pocket depth (mm)					
	1	1.5	2	2.5	3	3.5
Pocket depth 16						
Buccal side	0	6	34	5	0	0
Mesio-Buccal side	0	3	27	15	0	0
Disto-Buccal side	0	4	19	21	1	0
Lingual side	0	6	22	17	0	0
Mesio-lingual side	0	5	15	19	6	0
Disto-lingual side	0	4	22	14	5	0
Pocket depth 26						
Buccal side	0	4	20	21	0	0
Mesio-Buccal side	0	6	23	16	0	0
Disto-Buccal side	0	3	18	24	0	0
Lingual side	0	4	24	17	0	0
Mesio-lingual side	0	5	19	21	0	0
Disto-lingual side	0	4	17	24	0	0
Pocket depth 36						
Buccal side	0	2	23	20	0	0
Mesio-Buccal side	0	3	14	22	0	0
Disto-Buccal side	0	1	13	24	7	0
Lingual side	0	12	22	11	0	0
Mesio-Lingual side	0	5	29	11	0	0
Disto-Lingual side	0	5	26	14	0	0
Pocket depth 46						
Buccal side	0	6	28	10	1	0
Mesio-Buccal side	0	4	15	25	0	1
Disto-Buccal side	0	6	16	19	4	0
Lingual side	0	8	29	8	0	0
Mesio-Lingual side	0	9	25	10	1	0
Disto-Lingual side	0	5	26	14	0	0

CONCLUSION

During the orthodontic treatment, negative effects on the periodontal tissues were noted but it did not lead to any severe bone loss, tooth mobility and loss, the gingiva was in a relatively stable situation, no remarkable recessions or bone dehiscences were reported. As long as the patient's oral hygiene is maintained in high levels, the negative effects of the orthodontic treatments can be minimised.

REFERENCES

1. Stuteville OH. Injuries caused by orthodontic appliances and methods of preventing these injuries. JADA 1937;24:1494–507.
2. Skillen WG. Krivanek FJ. Effects of orthodontic appliances on gingival tissues. Northw Uni Bull 1938;38:18–22.
3. Brandtzaeg P. Local factors of resistance in the gingival area. J Periodont Res 1966;1:19–42,
4. Boyd Y D, Baumrind S. Periodontal considerations in the use of bonds or bands on molars in adolescents and adults. Angle Orthod 1992;62:117–26.
5. Årtun J, Urbye K S. The effect of orthodontic treatment on periodontal bone support in patients with advanced loss of marginal periodontium. Am J Orthod Dentofacial Orthop 1998;93:143–8.
6. Zachirisson BU, Zachrisson S. Caries incidence and orthodontic treatment with fixed appliances. Scand J Dent Res 1971;79:183–92.
7. Kobayashi, LY, Ash MM Jr. A clinical evaluation of an electric toothbrush used by orthodontic patients. Angle Orthod 1964;34:209–19.
8. Di Murro C, Paolantonio M, Petti S, Tomassini E, Festa F, Grippaudo C, *et al*. The clinical and microbiological evaluation of the efficacy of oral irritation on the periodontal tissues of patients wearing fixed orthodontic appliances. Minerva Stomatologica 1992;41:499–506.
9. Dubey R, Jalili V P, Garg S. Oral hygiene and gingival status in orthodontics patients. J Pierre Fauchard Acad 1993;7:43–54.
10. Atack NE, Sandy JR, Addy M. Periodontal and microbiological changes associated with the placement of orthodontic appliances, A review. J Periodontol 1996;67:78–85.
11. Page R, Offenbacher S, Schoreder HE. Advances in the pathogenesis of periodontics. Periodontology-2000 1997;14:216–48.
12. Spence WJ. A clinical and histologic study of the pathology of the gingiva during orthodontic therapy. Northw Univ Bull 1955;55:12–5.
13. Zaahrisson BU, Zachrisson, S. Caries incidence in relation to oral hygiene during orthodontic treatment. Scand J Dent Res 1971;79:394–401.
14. Baer PN, Coccaro PJ. Gingival enlargement coincident with orthodontic therapy. J Periodont 1964;35:436–9.
15. Nunn ME. Understanding the etiology of periodontitis: an overview of periodontal risk factors. Periodontol-2000 2003;32:11–23.
16. Anerud A. The effect of preventive measures upon oral hygiene and periodontal health. Thesis. University of Oslo 1970.
17. Frandsen A, Barbano JP, Suomo JD, Chang JJ, Burke AD. The effectiveness of the Charter's scrub and roll methods of tooth brushing by professionals in removing plaque. Scand J Dent Res 1970;78:459–63.
18. Diamanti-kipioti A, Gusberti FA, Lang NP. Clinical and microbiological effects of fixed orthodontic appliances. J Clin Periodontol 1987;14:326–33.
19. Zachrisson S, Zachrisson BU. Gingival condition associated with orthodontic treatment. Angle Orthod 1972;42(1):26–34.
20. Diedrich P, Rudzki-Janson I, Wehrbein H, Fritz U. Effects of orthodontic bands on marginal periodontal tissues. A histological study on two human species. J Orofac Orthop 2001;62:146–56.

Address for Correspondence:

Dr. Imtiaz Ahmed, A-227, Block-D, North Nazimabad, Karachi, Pakistan. **Cell:** +92-321-2201021
Email: drimtiaz75@hotmail.com, drimtiaz76@yahoo.com