Relationship between tooth irregularity and periodontal disease in children with regular dental visits

Elham S. J. Abu Alhaija*/ Ahed M. S. Al-Wahadni**

Objectives: *The aim of this study was to investigate any association between irregular teeth and periodontal breakdown among children who attend dental clinics regularly.*

Methods: *The subjects were 80 children (39 females and 41 males) with a mean age of 12.38 ± 0.75 years. Each subject had an alginate impression in the mandibular arch, periapical radiographs for the lower incisor teeth and clinical examination for periodontal health. Plaque accumulation, gingival condition and probing depth, bone level and status of lower incisor teeth contact areas were recorded. Spearman correlation test was used to observe any relationship between the clinical variables.*

Results: *The average probing depth, gingival index and plaque index scores in the subjects studied were 1.3±0.25, 0.99±0.28 and 1.17±0.52 respectively. The average number of sites with labiolingual displacement with mesiodistal overlap was 1.81±1.30 and those without mesiodistal overlap was 1.39±1.10. The average number of contact areas with spacing was 0.59±1.23. The correlation observed between irregularity and periodontal health indicated no association between the number and type of displacement and plaque accumulation, gingivitis, attachment loss and alveolar bone level.*

Conclusion: *There was no association between irregularity of teeth and periodontal diseases in presence of good oral hygiene.*

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INTRODUCTION

The association between tooth irregularity and periodontal disease is still controversial. Ainamo[1] found that periodontal disease was worse when crowding existed adjacent to maligned teeth in presence of average oral hygiene. However, this association was not found in exceptionally good or poor oral hygiene. Ingervall *et al.*[2] found no difference in plaque accumulation between crowded and non crowded teeth. Buckley[3] reported low but statistically significant correlation between tooth irregularity and plaque and gingival inflammation in a group of teenagers. Behlfelt *et al.* [4] reported difference between crowded and non-crowded teeth regarding plaque accumulation and gingivitis in the same individual. Helm and Peterson[5] suggested that certain malocclusion traits such as upper arch crowding, increased overjet and crossbite are usually associated with periodontal disease. Addy *et al.*[6] suggested that irregular teeth retain more plaque than straight teeth but not association with gingivitis was found. Ashley *et al.* [7] found a direct relationship between overlapping incisors and gingival inflammation.

The effectiveness of oral hygiene procedures was considered as the most important factor for the association between irregular teeth and periodontal diseases which was found to be affected by gender and social class.[5] Buckley[3] reported that irregular teeth usually facilitate the accumulation of plaque thus predisposing to gingivitis. Helm and Peterson[5] suggested that patients with upper arch crowding, increased overjet and crossbite should improve the oral hygiene therapy.

Glans *et al.* (2003) reported marked improvement in gingival condition during treatment of crowded incisors. He attributed this to behavioral factors as subjects with crowded teeth received more oral hygiene instructions than other with no crowding.

Staufer and Landmesser (2004) reported that all subjects with anterior crowding of more than 5mm experienced gingivitis and shallow periodontal pockets but he suggested that deep periodontal pocket could not be attributed to crowding.

The aim of this study was to investigate the association between tooth irregularity and periodontal disease in children with regular dental visits.

Materials and Methods:

80 students (39 females and 41 males) with a mean age of 12.38 ± 0.75 years were used in this study. Each subject had alginate impressions for the lower jaw, periapical X-ray for the lower inci-

*Elham S. J. Abu Alhaija, Associate professor, Department of Orthodontics, Faculty of Dentistry, Jordan University of Science and Technology, Irbid, Jordan.

**Ahed M. S. Al-Wahadni, Associate professor, Department of Restorative Dentistry, Faculty of Dentistry, Jordan University of Science and Technology, Irbid, Jordan.

Send all correspondence to: Dr. Elham S. J. Abu Alhaija, Orthodontic Department Faculty of Dentistry, Jordan University of Science and Technology P.O. Box 3030 Irbid 22110, Jordan

Telephone: 0096277330144

e-mail: elham@just.edu.jo

sor teeth and clinical examination for periodontal health. All subjects were examined by one examiner for oral hygiene status and periodontal condition while seated on a dental chair using dental mirror, explorer and a periodontal probe with William's markings. The mesio-buccal, midbuccal and disto-buccal sites together with the corresponding lingual sites on each of the four lower incisor teeth were assessed in each subject. Oral hygiene was evaluated by examining the dental plaque present on the lingual and labial surfaces of the lower incisor teeth, using the criteria of the plaque index of Silness and Löe.[8] Gingival condition was evaluated for the lower incisor teeth using the criteria of the gingival index of Löe and Silness.[9] Periodontal conditions were examined using probing pocket depth to measure the distance between the bottom of the pocket and the margin of the gingiva. Irrigularity was assessed for the 5 contact areas of the incisor teeth in the lower jaw by recording the amount of spacing, mesiodistal overlap and labio-lingual displacement for each of the contact areas using a metallic ruler. The status of the contact areas of lower incisor teeth was expressed as the number of contact areas with labio-lingual displacement, with mesio-distal overlap, labio-lingual displacement without overlap and spacing. Bone loss was measured from the periapical radiograph. Each radiograph was examined using an illuminated viewing box in a dark room. Bone loss was measured from the cemento-enamel junction to bone level. Any site for which measurement could not be made, were recorded as un-measurable. This included surfaces for which bone level could not be identified and these for which the cemento-enamel junction could not be identified.

Statistical analysis:

The mean and standard deviations were calculated for probing depth (PD), gingival index(GI), plaque index(PI), status of the contact areas of lower incisors and bone level. The relationship between clinical variables was assessed using Spearman correlation coefficients.

Method Error:

Ten subjects records were re-examined two weeks later and reproducibility was tested using Dahlberg error[10] for bone level and probing depth and kappa statistics[11] for the other data. Dahlberg error was 0.2 and 0.1 for the bone loss and probing depth respectively. Kappa values were above 0.80 which indicated substantial agreement.[12]

Results:

The mean and standard deviations for pocket depth (PD), gingival index (GI), plaque index (PI), status of the contact areas of lower incisors and bone level are shown in Table 1-3. There was no significant difference between males and females for the variables studied. The subjects were pooled during the correlation test.

The average pocket depth, gingival index and plaque index in the subjects studied were 1.3±0.25, 0.99±0.28 and 1.17±0.52 respectively.

Sixty five subjects had one or more incisor contact point area with labiolingual displacement and mesiodistal overlap, 18 subjects had labiolingual displacement without mesiodistal overlap and 20 subjects had spacing. The average number of sites with labiolingual displacement with mesiodistal overlap was 1.81±1.30 and those without mesiodistal overlap was 1.39±1.10. The average number of

Table 1. Mean scores for plaque, gingivitis and probing depth around lower incisor teeth.

Variable	Females N=39 Mean±SD	Males N=41 Mean±SD	Total N=80 Mean±SD
PD	1.24± 0.26	1.33±0.24	1.30±0.25
GI	0.96±0.29	1.00±0.28	0.99±0.28
PI	1.16±0.60	1.17±0.48	1.17±0.52

Table 2. Mean scores for the number of contact areas plaque accumulation, gingivitis, attachment loss and bone level of lower incisor teeth.

Variable	Females N=39 Mean±SD	Males N=41 Mean±SD	Total N=80 Mean±SD
no contact point displacement			
labiolingual	1.63±1.25	1.81±1.14	1.75±1.18
mesiodistal	3.30±1.30	3.06±1.32	3.14±1.31
abiolingual displacement with mesiodistal overlap	1.67±1.27	1.89±1.33	1.81±1.30
abiolingual displacement without mesiodistal overlap	1.63±1.31	1.26±0.96	1.39±1.10
Spacing	0.52±1.01	0.62±1.33	0.59±1.23

Table 3. Mean scores for the number of contact areas plaque accumulation, gingivitis, attachment loss and bone level of lower incisor teeth.

Variable	Females N=39 Mean±SD	Males N=41 Mean±SD	Total N=80 Mean±SD
No plaque	0.52±1.01	0.42±0.69	0.45±0.81
Plaque	4.11±2.15	3.64±2.04	3.80±2.08
Visible plaque	1.00±1.92	1.94±2.27	1.63±2.20
Covering more than 1 tooth	0.37±1.28	0	0.13±0.75
No gingival inflammation	1.30±1.51	1.06±1.41	1.39±1.44
Redness	4.48±1.42	4.60±1.55	4.56±1.50
Bleeding on probing	0.22±0.58	0.34±1.06	0.30±0.92
No attachment loss	0.59±1.37	0.13±0.48	0.29±0.90
Attachment loss of <1.5mm	5.26±1.43	5.70±0.64	5.55±0.99
Attachment loss of ≥1.5 mm	0.22±0.70	0.21±0.45	0.21±0.54
Bone loss <1.5mm	6.22±1.76	6.40±1.50	6.38±1.58
Bone loss ≥1.5mm	1.78±1.76	1.60±1.50	1.66±1.58

Table 4. Spearman correlation coefficients: number of contact areas with irregularity or spacing versus plaque, gingival, probing depth and bone loss scores.

variables	Plaque accumulation			Gingival condition		Probing depth		Bone loss	
	Score 1	Score 2	Score 3	Redness	bleeding on probing	<1.5mm	≥ 1.5 mm	<1.5mm	1.5 mm
labiolingual displacement with mesiodistal overlap	-0.13	0.18	-0.16	0.13	- 0.70	0.02	0.09	-0.06	0.06
labiolingual displacement without mesiodistal overlap	0.11	-0.12	0.03	-0.11	0.05	-0.05	0.03	0.12	-0.12
Spacing	0.15	-0.12	-0.04	-0.04	0.00	0.07	-0.17	-0.17	0.17

contact areas with spacing was 0.59±1.23.

The pattern of correlation observed between irregularity and periodontal health (Table 4) indicated no association between the number and type of displacement and plaque accumulation, gingivitis, attachment loss and alveolar bone level.

Discussion:

Males and females did not differ in the effectiveness of their oral hygiene measures. This was not in agreement with Helm and Petersen[5] who suggested that female's periodontal health was better than males.

The result of this investigation supported the concept that there is no direct association between irregular teeth and periodontal health. The gingival condition did not differ around spaced, well aligned and crowded incisors in subjects with good oral hygiene. This is in agreement with Addy *et al.*[6] who reported that there is no association between irregular teeth and gingivitis. However, contradicting results were reported by others.[3,4,7] Ashley *et al.*[7] found a relationship between irregular teeth and gingivitis that increased as the labiolingual displacement was accompanied with mesiodistal overlap. However, in the same study, this association was not found in the subjects with good oral hygiene.

In this study, there was no relationship between tooth irregularity and the number of sites with plaque. This finding is in agreement with Ingervall *et al.*[2] and Ashley *et al.*[7] and contrary to that reported by Griffiths and Addy[13] and Addy *et al.*[6] where a relationship between mal-aligned teeth and plaque accumulation was reported. In our study, no association between irregularity of teeth and attachment loss was found. This was not in agreement with Årtun and Osterberg[14] who reported more attachment loss a round mal-aligned incisors compared with well aligned incisors.

Bone level around irregular teeth did not differ from that a round spaced and well aligned teeth. This finding is expected taking into consideration the lack of correlation between irregular teeth and gingivitis and plaque accumulation.

The present study confirms the concept that in the presence of a good oral hygiene there is no relationship between irregularity of teeth and periodontal disease.

Conclusion:

No association between irregularity of teeth and periodontal disease in the presence of a good oral hygiene was found.

REFERENCES

1. Ainamo J. Relationship between malalignment of the teeth and periodontal disease. Scand J Dent Res.80: 104-110, 1972
2. Ingervall B, Jacobsson U, Nyman S. A clinical study of the relationship between crowding of teeth, plaque and gingival condition. J Clin Periodont.; 4: 214-222, 1977
3. Buckley LA. The relationships between malocclusion, gingival inflammation, plaque and calculus. J Periodont. 52: 35-40,1981
4. Behlfelt K, Ericsson L, Jacobson L, Linder-Aronson S. The occurance of plaque and gingivitis and its relationship to tooth alignment within the dental arches. J Clin Periodont. 8: 329-337,1981
5. Helm S, Petersen PE. Causal relation between malocclusion and periodontal health. Acta Odontologica Scandinavica 47: 224- 228. 1989
6. Addy, M, Griffiths GS, Dummer PMH, Kingdon A, Hicks R, Hunter ML, et al. The association between tooth irregularity and plaque accumulation, gingivitis, and caries in 11-12-year-old children. Eu J Orthod. 10: 76-83. 1988
7. Ashley, FP, Usiskin LA, Wilson RF, Wagaiyu E. The relationship between irregularity of incisor teeth, plaque, and gingivitis: a study in a group of schoolchildren aged 11-14 years. Eu J Orthod. 20: 65-72. 1998
8. Silness J and Löe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. Acta Odontologica Scandinavica; 22: 121-135, 1964
9. Löe H and Silness J. Periodontal disease in pregnancy I. Prevalence and severity. Acta Odontologica Scandinavica; 21: 533, 1963
10. Dahlberg G. Statistical methods for medical and biological students. Interscience Publications, New York;1940
11. Cohen JA. A coefficient of agreement for nominal scales. Educational Psychological Measurement; 20: 37-46, 1960
12. Landis JR and Koch GG. The measurement of observer agreement for cathegorical data. Biometrics; 33:159-174, 1977
13. Griffiths GS, Addy M. Effects of malignment of teeth in the anterior segments on plaque accumulation. Journal of Clinical Periodontology; 8: 481-490, 1981
14. Årtun J, Osterberg SK. Periodontal status of teeth facing extraction sites long-term after orthodontic treatment. J Periodont 58: 24-29. 1987
15. Glans R, Larsson E, Ogaard B. Longitudinal changes in gingival condition in crowded and uncrowded dentitions subjected to fixed orthodontic treatment. Am J Orthod Dentofac Orthop. 124: 679-682. 2003
16. Staufer K, Landmesser H Effects of crowding in the lower anterior segment- a risk evaluation depending upon the degree of crowding. J Orofac Orthop. 65: 13-25,2004