

Role Of Occlusal Adjustment As An Adjunct To Scaling And Root Planing In The Management Of Periodontitis

Research Article

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Abstract

Background: The role of excessive occlusal forces in the progression of periodontal disease was explored for several years. If occlusal trauma has any relationship to the progression of periodontitis, then its elimination should improve clinical outcomes of periodontal disease. Occlusal adjustment is commonly recommended for patients with periodontitis and traumatic occlusion. However, the scientific evidence linking occlusal adjustment to the improvement of periodontal parameters is limited.

Aim: This systematic review aims to analyse the available evidence for occlusal adjustment as an adjunct to conventional surgical or non-surgical periodontal treatment in the management of periodontitis.

Materials And Methodology: A comprehensive search was done in electronic databases such as PubMed, Google Scholar, Cochrane and hand search was made based on pre-determined eligibility criteria. Studies assessing the effectiveness of occlusal adjustment as an adjunct to scaling and root planing in the management of periodontitis were selected after through screening.

Results: The selected 4 studies evaluated the influence of occlusal adjustment as an adjunct to periodontal therapy. All studies assessed the clinical parameters including probing depth, clinical attachment level and tooth mobility. Out of 4 studies, 2 studies showed significant improvement in all clinical parameters among the group where occlusal adjustment was done along with periodontal therapy. Whereas, 2 studies showed statistically insignificant differences between the groups with and without occlusal adjustment along with periodontal therapy.

Conclusion: Available studies showed limited evidence to support the implementation of occlusal adjustment as an adjunct to scaling and root planing in the management of periodontitis. However, the results are inconclusive because of the heterogeneity of the studies.

Keywords: Occlusion; Periodontitis; Occlusal Trauma; Occlusal Therapy.

Introduction

The role of occlusal trauma in the initiation and progression of periodontitis remains a controversial subject in periodontology. Occlusal trauma is defined as the injury of the attachment apparatus of the periodontium resulting from functional or parafunctional occlusal forces that exceed its adaptive capacity. It is characterized by progressive tooth mobility, widening of periodontal ligament space, thermal sensitivity, cemental tear, angular defects in the bone, root resorption.[1]

Since occlusal trauma is a histologic event, it is debatable if occlusion has any relationship with periodontitis. In the early 20th century, investigators suggested that excessive occlusal force was the cause of periodontitis and the forces need to be controlled to treat periodontitis successfully.[3-6] In a study done using human autopsy material, it was concluded that gingival inflammation extending into the supporting bone was the cause for periodontal destruction.[7] In a subsequent animal study, it was suggested that the excessive occlusal forces caused alteration in the direction of the periodontal ligament fibers and hence the gingival inflammation entered directly into such areas.[8] Later, it was further pro-

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posed that inflammation begins in gingiva due to bacterial plaque and progresses into the supporting periodontal tissues and hence there is an alteration in the pathway of spread of inflammation in teeth subjected to occlusal trauma. This combined effect of occlusal trauma and bacterial plaque-induced inflammation was termed “co-destruction.”[9, 10].

In order to prove the relationship between traumatic occlusion and periodontal disease, studies were performed on animal models in the presence and absence of bacterial plaque. In the presence of bacterial plaque and occlusal trauma, there was more bone loss and progressive tooth mobility, but loss of connective tissue attachment was the same as on teeth subjected to periodontitis alone. When occlusal trauma was combined with periodontitis, there was an accelerated loss of connective tissue attachment. In contrast, when oral hygiene was maintained and inflammation was controlled, occlusal trauma resulted in increased mobility and loss of bone density without loss of connective tissue attachment, during the length of the study. If the occlusal forces were removed, the loss of bone density was reversible.[11-13] These findings concluded that without inflammation, occlusal trauma does not cause irreversible bone loss or loss of attachment. However, none of the animal studies were able to reproduce all aspects of human periodontitis. Also, these studies used excessive occlusal forces and were conducted for a relatively short duration. Therefore, these studies failed to prove the causal relationship between occlusal trauma and the initiation of periodontal disease. In parallel, researchers started to assess the effect of occlusal adjustments on periodontal parameters in patients with periodontitis. A series of studies tested the influence of occlusal adjustments in association with periodontal therapy on attachment levels, pocket depth, and tooth mobility. The findings from these studies suggested that teeth that received occlusal reduction presented better improvement in clinical attachment level. However, there was no significant difference in reduction of tooth mobility and probing depth between the groups with and without occlusal adjustment.[14-16, 2] On the contrary, Vollmer et al.[17] suggested no effect of occlusal adjustment on the degree of gingival inflammation. Also, Hakkarainen et al.[18] studied the effect of occlusal adjustment of teeth with deep periodontal pockets as an adjunct to scaling to root planing and reported no additive effect of occlusal adjustment in terms of mobility and probing pocket depth.

In summary, data obtained from the existing interventional studies do not provide strong evidence to support occlusal therapy as an adjunct to scaling and root planing. Nonetheless, occlusal adjustment as a part of the periodontal treatment is recommended, scientific support is still inconclusive. In this context, the objective of this systematic review was to analyze the available evidence for occlusal adjustment as an adjunct to conventional surgical or non-surgical periodontal treatment in the management of periodontitis.

Materials And Methodology

A comprehensive search was done in electronic databases such as PubMed, Google Scholar, Cochrane and hand search was made and the article selection was carried out according to PRISMA guidelines. Studies which assess the effectiveness of occlusal adjustment as an adjunct to scaling and root planing in the management of periodontitis were selected after through screening.

The search terms were identified based on the following PICO format.

Population: Patient with chronic periodontitis

Intervention: Occlusal adjustment

Comparison: No occlusal adjustment but with conventional surgical or non-surgical periodontal treatment alone.

Outcome: Tooth mobility, Probing pocket depth, Clinical attachment level.

Inclusion Criteria

1. Randomised controlled clinical trials or clinical trials wherein the effectiveness of occlusal adjustment in periodontitis patients were evaluated with respect to clinical or radiographic parameters
2. Any cohort study which assessed the effectiveness of occlusal adjustment in periodontitis patients were evaluated with respect to clinical or radiographic parameters.

Exclusion Criteria

1. Animal studies
2. No statistical analysis of data
3. The study without a group with no occlusal adjustment done
4. The study without evaluation of clinical or radiographic parameters but only other parameters such as GCF flow

Results and Discussion

The selected 4 studies evaluated the influence of occlusal adjustment as an adjunct to periodontal therapy. All studies assessed the clinical parameters including probing depth, clinical attachment level and tooth mobility. Out of 4 studies, 1 study showed significant improvement in clinical attachment level among the group where occlusal adjustment was done along with periodontal therapy when compared with the group who had undergone periodontal therapy alone without occlusal adjustment. But in the same study there was no significant difference in tooth mobility and probing depth in patients treated with or without occlusal adjustment.[2] Whereas, 2 studies showed significant reduction in tooth mobility and probing depth in patients treated with occlusal adjustment. Teeth with untreated occlusal discrepancies were about 1.3 times likely to worsen in tooth mobility compared to untreated teeth with occlusal discrepancies.[19, 20] Another study showed statistically insignificant differences between the groups with and without occlusal adjustment along with periodontal therapy.[21]

The role of trauma from occlusion in the etiology of periodontal disease has been discussed since the early 90s. The literature evidence supports that trauma from occlusion causes disorganisation of periodontal tissues, impairing their normal repair function.[22, 23] Also, the occlusion trauma acts as a co-destructive zone, influencing the spread of inflammation directly to the periodontal ligament, eliciting a combined lesion of trauma from occlusion and periodontitis.[24, 25] Conversely, few studies showed no causative association between trauma from occlusion and periodontal disease, indicating little to no correlation between trauma from occlusion and periodontitis.[26-28] Despite extensive research over many decades, the role of occlusion in the etiology and pathogenesis of periodontal disease is still not completely understood. Thus, we carried out this systematic review with the

Table 1. Show the characteristics and summary of the included studies.

S.No	Author and year	Title	Study design	Sample size	Groups	Sample size calculation	Randomisation	Method of TPO evaluation	Method of occlusal adjustment	Study duration	Statistical test	Mobility	Probing depth	Clinical attachment level	Bleeding index	Overall conclusion
1	Burgett FG et al. 1992	A randomized trial of occlusal adjustment in treatment of periodontitis patients	Randomized control trial	n=50	Group 1: Occlusal adjustment Scaling and root planing widerman flap Group 2: No occlusal adjustment Scaling and root planing Modified widerman flap	Not done	Done - Computer generated	Not done	Not mentioned	3 months	ANOVA	Not mentioned	Occlusal adjustment Scaling and root planing Baseline 3.66(0.75) (mm) 1 year follow-up 3.12(0.44) (mm) 2 year follow-up 3.80(0.41) (mm) No occlusal adjustment Scaling and root planing Baseline 3.58(0.58) (mm) 1 year follow-up 3.05(0.53) (mm) 2 year follow-up 3.04(0.43) (mm) Occlusal adjustment Modified widerman flap Baseline 3.64(0.61) (mm) 1 year follow-up 2.81(0.30) (mm) 2 year follow-up 2.90(0.33) (mm) No occlusal adjustment Modified widerman flap Baseline 3.62(0.68) (mm) 1 year follow-up 2.72(0.68) (mm) 2 year follow-up 2.89(0.41) (mm)	Occlusal adjustment Scaling and root planing Baseline -3.52(0.81) (mm) 1 year follow-up 0.43(0.56) (mm) 2 year follow-up 0.46(0.66) (mm) No occlusal adjustment Scaling and root planing Baseline -3.44(1.20) (mm) 1 year follow-up 0.04(0.39) (mm) 2 year follow-up 0.08(0.53) (mm) Occlusal adjustment Modified widerman flap Baseline -3.48(0.76) (mm) 1 year follow-up 0.18(0.52) (mm) 2 year follow-up 0.37(0.68) (mm) No occlusal adjustment Modified widerman flap Baseline 0.18(0.52) (mm) 1 year follow-up 0.37(0.68) (mm) 2 year follow-up -0.33(0.54) (mm)	Not mentioned	Patients treated with occlusal adjustment along with SRP showed significantly more gain in clinical attachment level as compared to patients treated with SRP alone. Similarly, patients treated with occlusal adjustment along with modified widerman flap showed greater gain in clinical attachment level as compared to patients treated with modified widerman flap alone. There was no significant difference in tooth mobility and probing depth in patients treated with or without occlusal adjustment in both SRP and modified widerman flap
2	Harrel SK et al. 2001	The effect of occlusal discrepancies on periodontitis. II. Relationship of occlusal treatment to the progression of periodontal disease	Retrospective epidemiological study	n=89	Three groups Group 1: n=30 (Untreated patients) Group 2: n=18 (Partially treated) Group 3: n=41 (Surgically treated)	Not done	Not done	Not done	Not mentioned	1 year	ANOVA	Worsening of tooth mobility (p<0.001) Treated versus untreated discrepancies p-value (0.368)	Change in probing depth per year by occlusal treatment status adjusted for significant confounders: Untreated occlusal discrepancy: -0.167 (p<0.001) Treated occlusal discrepancy: -0.027 (p<0.001) No occlusal discrepancy: -0.297 (p<0.001)	Change in probing depth per year for surgical treatment by occlusal treatment status adjusted for significant confounders: Treated occlusal discrepancy: -0.031 (p<0.001) No occlusal discrepancy: -0.297 (p<0.001)	Not mentioned	There was a significant increase in probing depth per year among patients with untreated occlusal discrepancies. Teeth with untreated occlusal discrepancies were about 1.3 times likely to worsen in tooth mobility compared to teeth with treated occlusal discrepancies, although it was not statistically significant
3	Wang PC et al. 2015	Effect of periodontal initial therapy on teeth with chronic periodontitis and secondary occlusal trauma	Clinical trial	n=18	Two groups Group 1: 9 patients treated with scaling and root planing. After 28 days, occlusal adjustment was done. Group 2: 9 patients treated with occlusal adjustment. After 28 days, SRP was done.	Not done	Not mentioned	Occlusal analysis using T scan III	Not mentioned	8 weeks	Paired t test	Not mentioned	No occlusal adjustment Scaling and root planing Baseline 4.42 ± 1.41 After SRP There was significant decrease in probing depth (p < 0.05) Occlusal adjustment Baseline 4.36 ± 1.38 There were no significant differences (p > 0.05)	No occlusal adjustment Scaling and root planing Baseline 2.75 ± 1.32 After SRP There was significant decrease in probing depth (p < 0.05) Occlusal adjustment Baseline 2.63 ± 1.37 There were no significant differences (p > 0.05)	No occlusal adjustment Scaling and root planing Baseline 2.20 ± 0.81 Occlusal adjustment Baseline 2.24 ± 0.89 There were no significant differences (p > 0.05)	On the 28th day of observation, the clinical parameters were improved only in group 1 (SRP) whereas there was no improvement in clinical parameters group 2 (Occlusal adjustment). On the 56th day, there was no significant difference between two groups in clinical parameters. However, the change in percentage of occlusal force was more significant in group 1 than group 2. Occlusal adjustment alone was inadequate for control and management of periodontitis. SRP therapy can eliminate the inflammation and decrease the occlusal time of tooth with occlusal trauma. The combination of SRP and occlusal adjustment had more stable results
4	Joo JY et al. 2014	Intentional passive eruption combined with scaling and root planing of teeth with moderate chronic periodontitis with traumatic occlusion	Case report	n=16	Two groups Test group: 20 teeth (Intentional passive eruption) Control group: 20 teeth (No additional intentional passive eruption)	Not done	Not done	Periotest	Crownoplasty with intentional passive eruption	6 months	Paired t test and independent t test	Not mentioned	Control group Baseline 3.99±1.26 4 weeks after initial therapy 2.85±0.61 6 months after intentional passive eruption Not mentioned Test group Baseline 3.51±0.85 4 weeks after initial therapy 2.83±0.72 6 months after intentional passive eruption 2.98±0.44 p value < 0.05	Control group Baseline 4.17±1.67 4 weeks after initial therapy 3.48±1.22 6 months after intentional passive eruption 3.36±1.04 Test group Baseline 3.73±1.02 4 weeks after initial therapy 3.66±0.72 6 months after intentional passive eruption 2.98±0.44 p value < 0.05	Control group Baseline 1.00±0.00 4 weeks after initial therapy 0.60±0.50 6 months after intentional passive eruption Not mentioned Test group Baseline 0.85±0.37 4 weeks after initial therapy 0.55±0.51 6 months after intentional passive eruption Not mentioned p value < 0.05	Tooth mobility (measured by periotest) and probing depth were significantly less in test group as compared to control group

contemporary methodological principles to reflect the highest available evidence.

A systematic review involves the application of methodological strategies that limit bias and evaluate and summarize crucial scientific evidence. These systematic analyses can help practitioners be aware of the scientific literature. The search strategy results in 4 studies, all studies assessed the role of traumatic occlusion and occlusal adjustment in the treatment of periodontitis.

Burgett FG et al conducted a randomized control trial to evaluate the influence of occlusal adjustment as an adjunct to non-surgical and surgical periodontal therapy. It was found out that the gain in clinical attachment was significantly more in the group where occlusal adjustment was done along with either non-surgical or surgical periodontal therapy, whereas in terms of probing pocket depth there was no significant improvement. Also, there was no significant difference in reduction of tooth mobility between the groups with and without occlusal adjustment. In addition, the reduction in tooth mobility was similar with either surgical and

non-surgical periodontal therapy. Another finding of this study was the initial tooth mobility and initial severity of periodontal disease did not affect the clinical attachment response to occlusal adjustment.[2]

Similarly, Harrel SK et al investigated the effect of treatment of occlusal discrepancies on periodontitis through a retrospective epidemiological study. In this study, when worsening in teeth mobility was observed over time, it was found that teeth with no initial occlusal discrepancies were significantly less likely to worsen in mobility when compared to either treated or untreated occlusal discrepancies. In addition, there was no statistical significant difference between teeth with treated occlusal discrepancies and teeth with untreated occlusal discrepancies in terms of worsening in mobility over time. However, it was observed that the mean increase in probing depth per year among teeth with untreated occlusal discrepancies was statistically significant and greater than either teeth with no occlusal discrepancies or those with treated occlusal discrepancies.[19]

Wang PC et al investigated the effect of scaling and root planing and occlusal adjustment in terms of probing depth, clinical attachment loss, occlusal time, percentage of occlusal force on patients with chronic periodontitis and secondary occlusal trauma. In this study, at baseline, one group was treated by full-mouth scaling and root planing and the other group was treated by occlusal adjustment in occlusal trauma site and after 28 days, the treatment was exchanged between both the groups. After scaling and root planing alone, all the clinical parameters were significantly decreased whereas, none of the parameters exhibited significance difference after occlusal adjustment alone. After the treatments were exchanged between both the groups, the reduction in parameters was not statistically significant between two groups, however the reduction of occlusal time and percentage of occlusal force were more significant in patients who had undergone scaling and root planing followed by occlusal adjustment than the patients who had undergone occlusal adjustment followed by scaling and root planing [21].

Joo JY et al evaluated the effectiveness of occlusal adjustment in the form of intentional passive eruption using occlusal reduction on patients with chronic periodontitis and traumatic occlusion. In this study, teeth with intentional passive eruption were compared to teeth with additional intentional passive eruption in terms of probing depth, clinical attachment level, tooth mobility and marginal bone loss. The teeth with additional intentional passive eruption showed a significantly greater decrease in pocket depth, tooth mobility and marginal bone loss when compared to the teeth with intentional passive eruption. However, there was no significant change in clinical attachment level in both the groups.[20]

Conclusion

Available human studies showed that there is limited evidence that the combination of scaling and root planing and occlusal adjustment may achieve more stable results in the management of periodontal diseases. More randomized control studies with long term follow-up are required to support the implementation of occlusal adjustment as an adjunct to scaling and root planing in the treatment of periodontitis.

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