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Research Article

The Effect of Deep Bite on Periodontal Status of Anterior Teeth

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KEYWORDS

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ABSTRACT

Introduction: Deep bite is a malocclusion in which the vertical overlap of the mandibular incisor exceeds 4 mm when the teeth are positioned in centric occlusion. Traumatic deep bite, a condition in which deep bite has caused traumatic occlusion, can exert pressure that increases inflammation and damage to the periodontal tissue. The prolonged pressure produces injury to the gingival surface and periodontal tissues of the opposing teeth. **Objective:** To determine the effect of deep bite on the periodontal status of anterior teeth. **Methods:** A cross-sectional analytic study of 44 subjects who were divided into two groups of 22. Subjects gave informed consent and underwent an examination of periodontal status for gingival recession, probing depth, and clinical attachment loss. Dental impressions were taken for the measurement of deep bite. Data were then analyzed using univariate and multivariate analysis. **Result:** There were significant differences between the normal and deep bite group for the presence and severity of gingival recession, probing depth, and clinical attachment loss ($p < 0.05$). **Conclusion:** There is an association between deep bite and periodontal status (gingival recession, probing depth, and clinical attachment loss) of anterior teeth.

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INTRODUCTION

Malocclusion is a potential contributor to periodontal disease.¹ Deep bite is a malocclusion in which the vertical overlap of the mandibular incisor exceeds 4 mm when the teeth are positioned in centric occlusion.² It is reported that deep bite has the second-highest malocclusion prevalence (21%) after crowding (43.8%).³ Traumatic deep bite, a condition in which deep bite has caused traumatic occlusion, can exert pressure that increases inflammation and damage to the periodontal tissue. The prolonged pressure produces injury to the gingival surface and periodontal tissues of the opposing teeth.^{1,2}

In 2016, Danz et al. conducted a study of retention and relapse of deep bite after orthodontic treatment.⁴ In this study, 61 subjects with a deep bite of more than 50% incisor overlap before treatment were re-examined using cephalometric radiographs. The result showed that 10% of subjects showed deep bite relapse at 50% incisor overlap or more at long-term follow-up. The median follow-up period was 11.9 years.⁴ Incisal contact with the gingiva and palate is visible in patients with deep bite relapse, resulting in periodontal attachment loss.⁵ Laypeople's awareness of the impact of deep bite on periodontal tissue is low. This has resulted in patients with deep bite not seeking orthodontic treatment. Based on the above explanation and several previous studies, a study of the effect of deep bite on periodontal status was needed to determine the effect of deep bite on the periodontal status of anterior teeth.⁶

MATERIALS AND METHODS

The study was designed as a cross-sectional analytic study conducted at the Dental Study Program of the Faculty of Medicine, Universitas Sriwijaya, on February 4–13, 2019. The population in this study was the 2014–2018 batch of pre-clinical students in the study program. In this study, it was determined that 22 students from each group were needed as subjects, for a total of 44 students. They were divided into two groups, the normal and deep bite groups. Participants were chosen using a random sampling method. For the normal bite group, the inclusion criteria called for subjects with normal bite, complete permanent dentition on both arches, and good Oral Health Index-Simplified (OHI-S) scores, between 0–1.2. For the deep bite group, the inclusion criteria required subjects with deep bite of more than 4 mm, complete permanent dentition on both arches, and good OHI-S. Exclusion criteria for both groups prohibited subjects with a smoking habit, systemic diseases, history of orthodontic treatment, frequent use of anticonvulsants, immunosuppressant, or Ca-channel blockers, and pregnancy.

The study was conducted after registration with the Ethics Committee of Medical Faculty of Universitas Sriwijaya (No.313/kepkrsmhfkunsri/2018) of the Central General Hospital Mohammad Hoesin and the Faculty of Medicine, Universitas Sriwijaya. Researchers determined the study sample based on the inclusion and exclusion criteria. Subjects who agreed to participate in the study were directed to complete the informed consent.

Data Analysis

Data were obtained from two procedures. To measure overbite in the subjects, impressions were taken using dental alginate, and casts were later made using dental stone. The overbite was measured using sliding calipers on the study models. The periodontal status assessment was done on the subjects with the UNC-15 probe. Gingival recession (GR), probing depth (PD), and clinical attachment loss (CAL) were measured on the labial and palatal/lingual aspects of the incisors and canines on both arches. Univariate and bivariate analysis was done for both groups (SPSS Software 20, SPSS Science, Chicago, USA). The univariate analysis aimed to show the prevalence of deep bite and the severity of the periodontal status of the subjects. The bivariate analysis aimed to analyze the relationship between deep bite and periodontal status using the Chi-Square statistical test with the p-value <0.05. The obtained data were collected and tabulated to determine the relationship between deep bite and periodontal status.

RESULT

This study was conducted on 44 subjects, consisting of 22 deep bite subjects and 22 normal bite subjects with a distribution of 9 men and 35 women. The number of Dentistry Study Program, Faculty of Medicine, Universitas Sriwijaya female students was more prevalent than males, thus the ratio was in line with that of the general population. All subjects participated in the whole procedure. No drop-out rate was recorded. Table 1 shows the study's characteristics.

As shown in Table 2, gingival recession was examined on all subjects from both the normal and deep bite groups. Fourteen subjects (63.63%) in the deep bite group experienced GR. In the normal bite group, there was no recession in the majority of subjects (n = 16; 72.7%). Chi-square test analysis showed $p = 0.033$ ($p < 0.05$). There was a statistically significant impact of deep bite to gingival recession. Table 3 shows the average periodontal status of anterior teeth in the normal and deep bite groups. The highest average of maxillary periodontal status in the deep bite group was palatal probing depth and palatal loss of attachment (palatal CAL). The highest average of mandibular periodontal status in the deep bite

Table 1. Study characteristics

Variable	n	Percentage
Normal bite group		
Male	5	22.7%
Female	17	77.3%
Deep bite group		
Male	4	18.2%
Female	18	81.8%
Age (years old)		
19	4	9.1%
20	4	9.1%
21	14	31.8%
22	12	27.3%
23	10	22.7%

Table 2. Chi-square test of gingival recession between deep and normal bite

	Gingival recession		p-value
	Present n (%)	Absent n (%)	
Deep bite group	14 (63.63%)	8 (36.4%)	0.033
Normal bite group	6 (27.3%)	16 (72.7%)	

group was labial probing depth and labial loss of attachment (labial CAL). Table 4 shows the prevalence of CAL in all subjects. It was recorded that 12 subjects were classified in the normal category (no CAL), 12 subjects in the mild category (CAL 1–2mm), and 20 subjects in the moderate category (CAL 3–4mm). No subject was classified in the severe category (CAL >5mm). In the deep bite group, two subjects (9.1%) experienced mild CAL while 20 subjects (90.9%) experienced moderate CAL. Ten subjects from the normal bite group showed mild CAL (45.5%) while the rest were classified as normal. Chi-square test analysis results showed $p = 0.000$ ($p < 0.05$). There is a statistically significant difference between CAL of the deep bite and normal bite groups.

Table 5 shows the prevalence of PD of all subjects. The normal category is $PD < 3$ mm, moderate is 4–5mm, and severe is >5mm. It was recorded that 29 subjects from both groups were classified into the normal category (65.9%) and the rest were put into the moderate category ($n=15$, 34.1%). In the deep bite group, most subjects experienced PD at moderate severity ($n=15$, 68.2%). In the normal bite group, all samples were classified in the normal category. Chi-square test showed $p = 0.000$ ($p < 0.05$). There is a statistically significant difference between PD in the deep bite and normal bite groups.

Table 3. Average periodontal status of anterior teeth

	Tooth Element					
	13	12	11	21	22	23
Maxillary						
Normal bite group						
<i>Probing depth (PD)</i>						
Labial	2.27	2.22	2	2.13	2.22	2.18
Palatal	2.45	2.27	2.09	2.22	2.4	2.18
<i>Clinical Attachment Loss (CAL)</i>						
Labial	0.9	0.5	0.27	0.3	0.5	0.95
Palatal	1.04	0.54	0.54	0.63	0.68	0.68
Deep bite group						
<i>Probing depth (PD)</i>						
Labial	3.4	3.59	3.9	3.95	3.63	3.5
Palatal	4.09	4.5	4.18	4.09	4.27	4.9
<i>Clinical Attachment Loss (CAL)</i>						
Labial	3.5	3.31	2.95	3.09	3.36	3.77
Palatal	3.9	4.04	4.09	3.86	3.95	4.04
Mandibular	43	42	41	31	32	33
Normal bite group						
<i>Probing depth (PD)</i>						
Labial	2.22	2.54	2.18	1.9	2.27	2.13
Lingual	2.36	2.54	2.4	2.36	2.5	2.31
<i>Clinical Attachment Loss (CAL)</i>						
Labial	0.68	0.72	0.77	0.81	0.45	0.72
Lingual	0.85	0.63	1.04	0.81	0.68	0.63
Deep bite group						
<i>Probing depth (PD)</i>						
Labial	3.9	4.18	4.5	4.36	4.04	4.13
Lingual	3.86	4.04	4.27	4.31	3.68	3.31
<i>Clinical Attachment Loss (CAL)</i>						
Labial	3.72	3.81	4.22	3.72	4	4.09
Lingual	3.59	3.31	3.77	3.63	3.04	3.54

Table 4. Chi-square test of CAL between deep and normal bite groups

	CAL			p-value
	Normal N (%)	Mild N (%)	Moderate N (%)	
Deep bite group	0 (0%)	2 (9.1%)	20 (90.9%)	0.000
Normal bite group	12 (54.5%)	10 (45.5%)	0 (0%)	

Table 5. Chi-square test of probing depth between deep and normal bite groups

	Probing depth			p-value
	Normal n (%)	Moderate n (%)	Severe n (%)	
Deep bite group	7 (31.8%)	15 (68.2%)	0 (0%)	0.000
Normal bite group	22 (100%)	0 (0%)	0 (0%)	

DISCUSSION

The results of this study found that gingival recession of the anterior teeth showed a statistically significant difference between subjects with deep bite and normal bite. Thus, it is concluded that deep bite is correlated with the occurrence of gingival recession. Gingival recession is exposure to the root surface due to an apical shift from the position of the gingival margin. In the case of a deep bite, the mandibular incisors are in contact with the palatal gingival margins, and the maxillary incisors are in contact with the labial gingival margins. This may be the leading cause of gingival recession.⁷ These findings are in line with the study by Zimmer and Ustun, which stated that trauma caused by deep bite could be manifested as gingival recession, especially in anterior teeth.^{8,9}

There was a statistically significant probing depth difference between subjects with deep bite and normal bite. It was deduced that there was an influence between deep bite and the depth of the pocket. The pocket was formed due to damage to the periodontal tissue, which resulted in tooth mobility and loss.¹⁰ Pressure from the mandibular anterior incisors to the cervical palatal area of the maxillary incisors could stimulate the formation of periodontal pockets.⁷ These results were in alignment with the study conducted by Nasry, which suggested that deep traumatic teeth bite can deepen the probing depth.⁶

Deep bite has a correlation with (CAL), proven in this study by the measurement between deep bite and normal bite subjects, which showed statistically significant differences. CAL is one of the clinical parameters that determines the level of remaining tooth support.

Excessive pressure from the mandibular incisors could increase periodontal probing depth in the palatal area. Excessive and continuous functional trauma could cause periodontal inflammation, damaging the periodontal ligament tissue and causing attachment loss.¹¹ These results originated in research conducted by Liu et al. and Daing et al., which stated that CAL was associated with traumatic deep bite.^{7,9}

In this study, the deepest pocket in the lower jaw is in the labial part, as found in the study by Lee et al. This can be caused by anatomy and angulation of the crown/root; it often occurs anteriorly due to a thin alveolar bone, and it occurs in the maxilla, where distal root furcation is present in two-thirds of the palatal aspect.¹² Based on the research conducted by Daing et al., deep bite can cause periodontal abnormalities on the palatal surface of the maxillary incisors and labial surfaces of the mandibular incisors.⁸

In addition to periodontal defects, the lingual inclination of the maxillary and mandibular incisors in deep bite cases can affect occlusion.¹⁰ The maxillary incisors in an upward position can cause limited movement in the head of the mandibular condyle and can continuously cause abnormal mandibular movements.¹¹ This will make the traumatic occlusion more severe and affect the periodontal tissue even more.¹²

The limitation of this study is the choice of subject. The subjects of this study were dental students, and they may have better periodontal statuses since they know about oral health. Therefore, the result of this study may not apply to people with less oral health knowledge. Further studies should be conducted among laypeople to get a more realistic result.

CONCLUSION

Based on the study above, there is an association between deep bite and periodontal status (gingival recession, probing depth, and clinical attachment loss) of anterior teeth. In the deep bite group, there were increased instances of gingival recession, probing depth, and clinical attachment loss.

CONFLICT OF INTEREST

All authors confirm that there is no conflict of interest.

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