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Association Between Periodontal Bone Defects and Tonsilloliths on Cone Beam Computed Tomography Imaging: A Retrospective Study

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ABSTRACT

Objectives: Tonsilloliths are calcified structures commonly detected incidentally on radiographic examinations and are thought to be associated with chronic inflammatory and microbial processes. This study's objective was to assess the association between tonsillolith characteristics and periodontal bone defects using cone-beam computed tomography (CBCT) imaging.

Materials and Methods: This retrospective cross-sectional study included archived panoramic radiographs and CBCT images of 621 patients. Among them, 158 patients with tonsilloliths who met the inclusion criteria were included in the study. Tonsillolith characteristics, including number, size, localization, and Hounsfield Unit (HU)-based calcification degree, were evaluated using CBCT images. Periodontal bone loss and accompanying oral findings, including missing teeth, restored teeth, apical periodontitis, furcation involvement, and peri-implantitis, were also assessed radiographically. Statistical analyses were performed using non-parametric tests and Spearman correlation analysis.

Results: The prevalence of tonsilloliths was 25.4%. The mean age of the study population was 48.9 ± 17.5 years, and 58.9% of the patients were male. Tonsillolith size demonstrated statistically significant positive correlations with periodontal bone loss ($r = 0.270$, $p = 0.001$), missing teeth ($r = 0.264$, $p = 0.001$), apical periodontitis ($r = 0.301$, $p < 0.001$), and furcation involvement ($r = 0.234$, $p = 0.003$). Calcification degree was also positively correlated with periodontal bone loss, restored teeth, missing teeth, apical periodontitis, and furcation involvement ($p < 0.05$). Tonsillolith count showed a significant positive correlation only with missing teeth ($p = 0.009$). No significant differences were observed between unilateral and bilateral tonsillolith groups regarding periodontal and dental findings ($p > 0.05$).

Conclusions: Tonsillolith size and calcification degree were associated with several periodontal and dental pathologies, particularly periodontal bone loss, missing teeth, apical periodontitis, and furcation involvement. These findings suggest that tonsillolith characteristics may reflect chronic oral inflammatory burden and should be carefully evaluated during radiographic examination. Further prospective clinical and microbiological studies are needed to clarify the relationship between tonsilloliths and periodontal disease.

Keywords: Cone-beam computed tomography, oral microbiome, periodontal bone loss, periodontitis, tonsillolith

Konik Işınlı Bilgisayarlı Tomografi Görüntülerinde Periodontal Kemik Defektleri ile Tonsillolit Arasındaki İlişki: Retrospektif Bir Çalışma

Araştırma Makalesi

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ÖZ

Amaç: Tonsillolitler, radyografik incelemelerde sıklıkla tesadüfen saptanan kalsifiye yapılardır ve kronik inflamatuvar ile mikrobiyal süreçlerle ilişkili olduğu düşünülmektedir. Bu çalışmanın amacı, konik ışınlı bilgisayarlı tomografi (KIBT) görüntüleri kullanılarak tonsillolit özellikleri ile periodontal kemik defektleri arasındaki ilişkinin değerlendirilmesidir.

Gereç ve Yöntemler: Bu retrospektif kesitsel çalışmada, 621 hastaya ait arşivlenmiş panoramik radyografiler ve CBCT görüntüleri incelendi. Dahil edilme kriterlerini karşılayan ve tonsillolit saptanan 158 hasta çalışmaya dahil edildi. Tonsillolitlerin sayı, boyut, lokalizasyon ve Hounsfield Unit (HU) temelli kalsifikasyon derecesi gibi özellikleri KIBT görüntüleri üzerinden değerlendirildi. Ayrıca periodontal kemik kaybı ve eşlik eden ağız içi bulgular; eksik dişler, restorasyonlu dişler, apikal periodontitis, furkasyon tutulumu ve peri-implantitis açısından radyografik olarak incelendi. İstatistiksel analizlerde parametrik olmayan testler ve Spearman korelasyon analizi kullanıldı.

Bulgular: Tonsillolit prevalansı %25,4 olarak bulundu. Çalışma grubunun yaş ortalaması 48,9 ± 17,5 yıl olup hastaların %58,9'u erkekti. Tonsillolit boyutu ile periodontal kemik kaybı ($r = 0,270$; $p = 0,001$), eksik diş sayısı ($r = 0,264$; $p = 0,001$), apikal periodontitis ($r = 0,301$; $p < 0,001$) ve furkasyon tutulumu ($r = 0,234$; $p = 0,003$) arasında istatistiksel olarak anlamlı pozitif korelasyonlar saptandı. Kalsifikasyon derecesi de periodontal kemik kaybı, restorasyonlu diş sayısı, eksik diş sayısı, apikal periodontitis ve furkasyon tutulumu ile pozitif korelasyon gösterdi ($p < 0,05$). Tonsillolit sayısı yalnızca eksik diş sayısı ile anlamlı pozitif korelasyon gösterdi ($p = 0,009$). Tek taraflı ve çift taraflı tonsillolit grupları arasında periodontal ve dental bulgular açısından anlamlı fark bulunmadı ($p > 0,05$).

Sonuçlar: Tonsillolit boyutu ve kalsifikasyon derecesinin özellikle periodontal kemik kaybı, eksik dişler, apikal periodontitis ve furkasyon tutulumu gibi çeşitli periodontal ve dental patolojilerle ilişkili olduğu gösterilmiştir. Bu bulgular, tonsillolit özelliklerinin kronik oral inflamatuvar yükün bir göstergesi olabileceğini ve radyografik incelemelerde dikkatle değerlendirilmesi gerektiğini düşündürmektedir. Tonsillolitler ile periodontal hastalıklar arasındaki ilişkinin daha iyi anlaşılabilmesi için ileriye dönük klinik ve mikrobiyolojik çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Konik ışınlı bilgisayarlı tomografi, oral mikrobiyom, periodontal kemik kaybı, periodontitis, tonsillolit

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Introduction

Tonsilloliths are dystrophic calcified structures that typically arise within the crypts of the palatine tonsils as a result of the retention and accumulation of desquamated epithelial cells, microorganisms, and organic debris.[1] Although usually asymptomatic, they can accompany clinical conditions such as halitosis, chronic pharyngeal discomfort, and recurrent tonsillar inflammation, and peritonsillar infections.[1,2] Often detected incidentally on radiological examination, the prevalence of tonsilloliths varies depending on the imaging method used; they are reported at low rates on panoramic radiographs[1,3], while they can be detected at significantly higher rates with computed tomography (CT) and cone-beam computed tomography (CBCT).[4,5]

Recent studies have revealed that tonsilloliths are not merely local tonsillar formations but may also be closely related to the oral microbial ecosystem. The microbial content of tonsilloliths is reported to significantly overlap with bacteria involved in the pathogenesis of periodontal disease, such as *Actinomyces*, *Fusobacterium*, *Porphyromonas*, *Prevotella*, *Tannerella*, and *Eubacterium*.[2,6] This strengthens the hypothesis that tonsilloliths may share common pathophysiological mechanisms with periodontal tissues and could be a potential microbial reservoir for periodontal infections.[2,7]

Periodontal diseases are chronic inflammatory conditions involving the gingiva, periodontal ligament, and alveolar bone, which may lead to alveolar bone destruction and eventual tooth loss in advanced stages. Although panoramic radiography is commonly used for the assessment of periodontal bone defects, CT and CBCT, which provide three-dimensional imaging, allow for a more accurate assessment of the extent and the degree and distribution of alveolar bone loss. In this context, investigating the association between tonsillolith presence and periodontal bone loss using three-dimensional imaging methods is of clinical importance.[5,7]

There are few studies in the literature reporting this association between the presence of tonsilloliths and periodontal pathologies. Retrospective evaluations of panoramic radiographs have demonstrated significantly increased prevalence of periodontal bone loss and tooth loss in patients with tonsilloliths.[3] More recent studies have shown positive correlations between the presence, size, and the quantity of tonsilloliths and the severity of periodontal bone defects using CT and CBCT; this relationship is particularly pronounced in older age groups.[5,7]

However, it has been previously demonstrated in clinical and microbiological studies that periodontal diseases may be associated with peritonsillar infections and tonsillar pathologies. It is reported that peritonsillar abscesses and severe tonsillar infections are more common in individuals with periodontitis, and this situation can be explained by common microbial and inflammatory mechanisms.[8]

However, in the current literature, the number of CT/CBCT-based studies that directly correlate the presence of tonsilloliths with detailed radiological evaluation of periodontal bone defects is limited. Furthermore there are few research that systematically examine this relationship according to different age groups and degrees of periodontal bone loss. Therefore, evaluating periodontal defects and tonsilloliths in the same individuals using three-dimensional imaging methods could fill an important gap between periodontology and otolaryngology disciplines.

The purpose of this study was to investigate the connection between periodontal bone defects detected in CT/CBCT images and the presence of tonsilloliths, and to contribute to the possible interaction between periodontal diseases and tonsillar pathologies with the findings obtained.

Materials and Methods

Study Population

This study has a retrospective and cross-sectional design and was conducted using panoramic and CBCT images. The study was carried out in compliance with the Declaration of Helsinki's principles. The study protocol was approved by the Scientific Research Ethics Committee of Lokman Hekim University (Ethics Committee No: 2025/348, Date: 30.12.2025). Written informed permission from the patients was not required because the study was retrospective in nature.

This retrospective study was performed using archived panoramic radiographs and cone-beam computed tomography (CBCT) images. No additional radiographic examinations were performed for the study. A total of 621 patient radiographs were retrospectively reviewed. Among these, 158 patients with tonsilloliths who fulfilled the inclusion criteria were included.

Individuals with both panoramic and CBCT images available in the database were evaluated. Only CBCT images with a field of view (FOV) of at least 12×8 cm were included. Images showing adequate visualization of the peritonsillar region and without motion artifacts were considered eligible for analysis. Patients with a history of maxillofacial surgery, syndromic conditions, or other pathologies that could affect the evaluated anatomical region were excluded.

The included CBCT (Newtom- VGI Evo, Italy) and panoramic radiographs (Newtom Giano Hr, Italy) had originally been obtained for different purposes, such as orthodontic evaluation, implant treatment planning, assessment of impacted teeth, and investigation of inflammatory dental conditions.

Image Evaluation

All panoramic radiographs and CBCT images were evaluated for the presence of tonsilloliths. Tonsilloliths detected on CBCT images were assessed separately for bilateral sides regarding number, size, and Hounsfield Unit (HU)-based calcification degree. Corresponding panoramic radiographs were also reviewed to determine the radiographic detectability of the identified tonsilloliths. Representative panoramic radiographic findings are shown in Figure 1.

In patients with tonsilloliths, accompanying oral and periodontal conditions were additionally evaluated, including periodontal bone loss, carious teeth, missing teeth, restored teeth, apical periodontitis, furcation involvement, and peri-implantitis. Incidental radiographic findings observed in the maxillofacial region were also recorded.

All radiographic assessments were performed by a six-year experienced oral and maxillofacial radiologist and a twelve-year experienced periodontologist. Demographic information were collected from the archived records.[5,7]

Radiological Evaluation of Tonsilloliths

Tonsilloliths are defined as nodular calcifications located medial to the mandibular ramus and the lateral wall of the oropharyngeal airway region and palatine tonsil region on axial sections, which are significantly more radiopaque than the surrounding soft tissue. The diagnosis is confirmed with sagittal and coronal sections. Representative CBCT images demonstrating the localization and HU-based assessment of tonsilloliths are presented in Figure 2.

In accordance with the literature, calcific structures showing a density of more than 100 HU on CT/CBCT images are considered tonsilloliths.[2,4] In cases with multiple tonsilloliths, the evaluation is based on the largest tonsillolith.

The presence (absence/presence), location (right, left, bilateral), and number of tonsilloliths are recorded. These evaluation criteria are consistent with previously published CT and CBCT-based studies.[2,3]



Figure 1. Panoramic radiographic evaluation of accompanying dental and periodontal findings in a patient with tonsillolith.

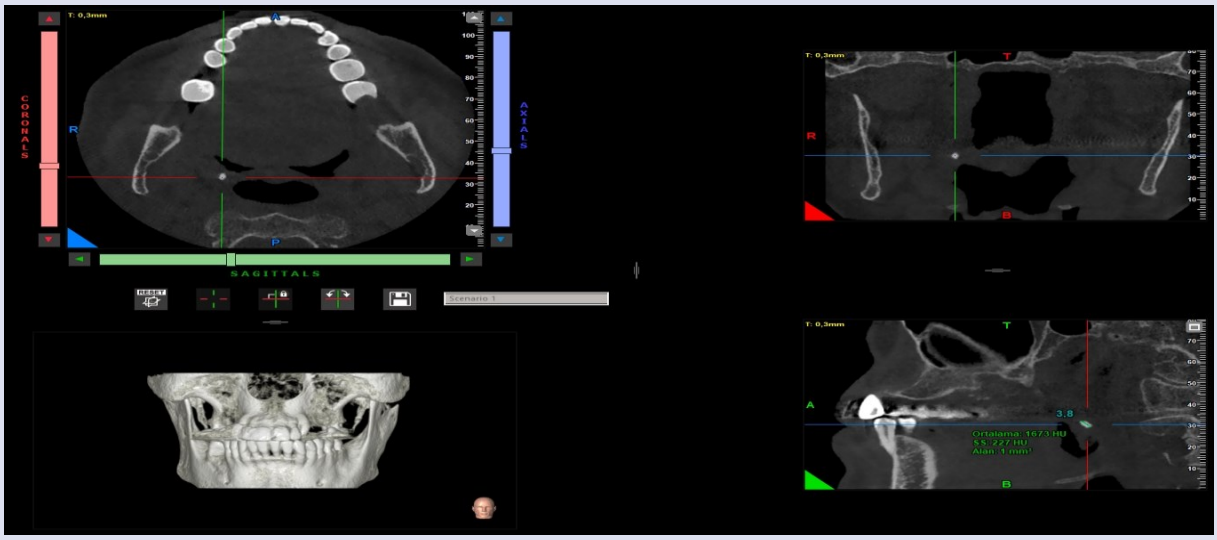


Figure 2. Axial, coronal, sagittal, and three-dimensional CBCT images demonstrating the localization of the tonsillolith in the palatine tonsillar region and HU-based calcification assessment

Evaluation of Periodontal Bone Defects

Periodontal bone loss was assessed using CBCT images. The distance between the alveolar crest and the cemento-enamel junction (CEJ) was measured to assess alveolar bone loss. A CEJ–alveolar crest distance of 2 mm or greater was defined as periodontal bone loss.[9]

The degree of bone loss was classified as follows, based on the total root length:

<1/3 of ideal bone height,

1/3–2/3 of ideal bone height,

>2/3 of ideal bone height.

This classification is based on commonly used and accepted methods in the literature for radiological evaluation of periodontal bone defects.[1,3,9]

All images were independently evaluated by a periodontist with at least 12 years of experience and an oral, maxillofacial, and facial radiology specialist. In case of discrepancies between the evaluations, a joint decision was reached.

Statistical Analysis

IBM SPSS Statistics software, version 25.0 (IBM Corp., Armonk, NY, USA), was used to conduct statistical analyses. The prevalence of tonsilloliths was calculated by dividing the number of patients with tonsilloliths by the total number of reviewed radiographs.

Descriptive statistics were used to summarize demographic, radiographic, dental, and periodontal variables. While categorical data were given as frequencies and percentages, continuous variables were displayed as mean ± standard deviation and median with interquartile range. The Shapiro-Wilk test was used to determine whether continuous variables were normal. Non-parametric tests were employed because most of the variables did not exhibit a normal distribution. Differences in tonsillolith characteristics between the right and left sides were evaluated using the Wilcoxon signed-rank test. Comparisons according to sex and laterality pattern, defined as unilateral or bilateral tonsillolith presence, were performed using the Mann–Whitney U test.

Associations between tonsillolith characteristics, including number, size, and HU values, and accompanying oral and periodontal findings, including periodontal bone loss, carious teeth, missing teeth, restored teeth, apical periodontitis, furcation involvement, and peri-implantitis, were assessed using Spearman's rank correlation analysis. When comparing categorical variables, the chi-square test or Fisher's exact test were employed. A p-value of <0.05 was considered statistically significant.

The sample size was calculated based on the correlation-based design of the study, as the primary aim was to evaluate periodontal health status among patients with tonsilloliths. According to a similar CBCT-based study reporting an effect size of approximately 0.28 for the association between tonsillolith characteristics and periodontal bone loss, at least 153 participants were required to achieve 80% power with a significance level of 0.05.

Results

A total of 621 radiographic records were retrospectively reviewed. Among these, 158 patients with tonsilloliths who met the inclusion criteria were included in the study, corresponding to a prevalence of 25.4%. The demographic and radiographic characteristics of the study population are summarized in Table 1.

The study cohort comprised 93 males (58.9%) and 65 females (41.1%), with a mean age of 48.9 ± 17.5 years. Bilateral tonsilloliths were observed in 73 patients (46.2%), whereas unilateral tonsilloliths were detected in 85 patients (53.8%). Right-sided unilateral tonsilloliths were identified in 48 patients (30.4%) and left-sided unilateral tonsilloliths in 37 patients (23.4%).

The mean total tonsillolith count was 3.39 ± 3.18. The mean maximum tonsillolith size was 2.14 ± 1.10 mm, and the mean calcification degree was 1002.6 ± 432.7 HU. Tonsillolith count, size, and calcification degree demonstrated weak but statistically significant positive correlations with age ($p < 0.05$). However, no statistically significant sex-based differences were identified in terms of tonsillolith number, size, or degree of calcification ($p > 0.05$).

When the both sides were compared, no statistically significant differences were observed regarding tonsillolith count or calcification degree ($p > 0.05$). In contrast, right-sided tonsillolith size was significantly greater than left-sided tonsillolith size ($p = 0.021$).

Regarding periodontal findings, periodontal bone loss scores were recorded as score 0 in 72 patients (45.6%), score 1 in 45 patients (28.5%), and score 2 in 41 patients (25.9%). Tonsillolith size demonstrated statistically significant positive correlations with periodontal bone loss, missing teeth, apical periodontitis, and furcation involvement ($p < 0.05$). Similarly, calcification degree was positively correlated with periodontal bone loss, restored teeth, missing teeth, apical periodontitis, and furcation involvement ($p < 0.05$). Tonsillolith count showed a significant positive correlation only with missing teeth ($p = 0.009$). Correlations between tonsillolith characteristics and oral/periodontal findings are summarized in Table 2.

Among the evaluated tonsillolith characteristics, tonsillolith size demonstrated the strongest associations with periodontal and dental pathologies.

No statistically significant differences were observed between unilateral and bilateral tonsillolith groups regarding periodontal bone loss ($p = 0.412$), missing teeth ($p = 0.287$), restored teeth ($p = 0.531$), apical periodontitis ($p = 0.364$), furcation involvement ($p = 0.448$), or peri-implantitis ($p = 0.617$). Comparisons of oral and periodontal findings between unilateral and bilateral tonsillolith groups are presented in Table 3.

Incidental radiographic findings were also detected during image evaluation. Two patients presented with ovoid submandibular sialoliths measuring 9.6 mm and 10.4 mm in diameter, with HU values ranging between 1592 and 1915. In addition, parapharyngeal soft tissue calcifications were identified in two patients. One patient with 19 missing teeth exhibited a 3-mm calcification with

an HU value of 2170 located on the posterior pharyngeal wall, whereas another patient with 16 missing teeth demonstrated a 2.7-mm calcification with an HU value of 1687 located on the anterior pharyngeal wall.

Table 1. Demographic and radiographic characteristics of the study population

Variable	Value
Total screened radiographs	621
Patients with tonsilloliths	158
Tonsillolith prevalence	25.4%
Mean age (years)	48.9 ± 17.5
Male, n (%)	93 (58.9%)
Female, n (%)	65 (41.1%)
Bilateral tonsilloliths, n (%)	73 (46.2%)
Unilateral tonsilloliths, n (%)	85 (53.8%)
Mean tonsillolith count	3.39 ± 3.18
Mean maximum size (mm)	2.14 ± 1.10
Mean calcification degree (HU)	1002.6 ± 432.7

Table 2. Correlation between tonsillolith characteristics and oral/periodontal findings

Variable	Periodontal bone loss	Missing teeth	Restored teeth	Apical periodontitis	Furcation involvement
Tonsillolith count	–	0.207 (0.009)	–	–	–
Tonsillolith size	0.270 (0.001)	0.264 (0.001)	–	0.301 (<0.001)	0.234 (0.003)
Calcification degree (HU)	0.178 (0.026)	0.169 (0.034)	0.242 (0.002)	0.158 (0.047)	0.165 (0.038)

Values are presented as Spearman correlation coefficient (p-value)

Table 3. Comparison of periodontal findings between unilateral and bilateral tonsillolith groups

Variable	Unilateral tonsilloliths (n = 85)	Bilateral tonsilloliths (n = 73)	p-value
Periodontal bone loss	1.08 ± 0.79	1.16 ± 0.82	0.412
Missing teeth	6.42 ± 5.11	7.03 ± 5.46	0.287
Restored teeth	4.25 ± 3.18	4.47 ± 3.36	0.531
Apical periodontitis	0.82 ± 1.04	0.96 ± 1.13	0.364
Furcation involvement	0.41 ± 0.73	0.48 ± 0.81	0.448
Peri-implantitis	0.09 ± 0.29	0.12 ± 0.34	0.617

Values are presented as mean ± standard deviation. No statistically significant differences were observed between unilateral and bilateral tonsillolith groups regarding oral and periodontal findings.

Discussion

The present study evaluated tonsillolith characteristics using both panoramic radiography and CBCT images and investigated their associations with oral and periodontal findings. The main findings demonstrated that tonsillolith size and calcification degree were significantly associated with several periodontal and dental pathologies, including periodontal bone loss, missing teeth, apical periodontitis, and furcation involvement. Among the evaluated tonsillolith parameters, tonsillolith size showed the strongest associations with periodontal and dental findings. In contrast, unilateral or bilateral tonsillolith distribution was not significantly associated with periodontal health status.

The etiology and pathogenesis of tonsillolith formation have not been fully clarified. However, chronic inflammation of the tonsillar crypts, epithelial debris accumulation, bacterial colonization, and biofilm maturation are considered important contributing mechanisms.[10] Previous microbiological studies have reported substantial similarities between the bacterial composition of tonsilloliths and periodontal biofilms, suggesting a possible association between oral health status and tonsillolith development.[2,11,12]

Stoodley et al.[2] emphasized that tonsilloliths should not be regarded merely as passive calcified structures, but rather as living biofilm-associated formations. Similarly, Tsuneishi et al.[6] demonstrated that tonsilloliths contain a complex bacterial flora, including anaerobic microorganisms commonly associated with periodontal disease. These microbiological findings support a potential association between tonsillolith formation and chronic oral inflammation.

The relationship between tonsilloliths and periodontal status observed in the present study may be related to shared inflammatory and microbial mechanisms between the oral cavity and tonsillar tissues. Georgalas et al.[8] previously demonstrated a significant relationship between periodontal disease and peritonsillar infection, suggesting that chronic oral inflammatory burden may contribute to pathological changes in the tonsillar region. Similarly, Kryukov et al.[13] emphasized the close interaction between chronic tonsillitis and periodontal diseases, highlighting the potential bidirectional relationship between periodontal inflammation and tonsillar pathology. These findings support the present results, in which tonsillolith size and calcification degree were linked with radiographic evidence of periodontal bone loss and additional dental abnormalities.

The results showed that greater tonsillolith size coincided with more advanced periodontal bone loss as well as higher frequencies of tooth loss, apical periodontitis, and furcation involvement. Similar associations have been reported previously, supporting a possible relationship between tonsillolith formation and

periodontal destruction. Oda et al.[5] identified a relationship between tonsillolith presence and radiographically detected periodontal bone defects.

In a CBCT-based retrospective study, tonsillolith characteristics were observed more frequently in patients with periodontal bone loss and dental pathologies. The present findings further support this association, suggesting that larger tonsilloliths may be more strongly related to periodontal and dental disease severity than the mere presence of tonsilloliths alone.[7]

The positive association between tonsillolith size and missing teeth may reflect the cumulative effect of chronic oral disease over time. Missing teeth are often considered an indirect marker of previous periodontal destruction, caries experience, or long-standing oral inflammatory burden. In this context, larger tonsilloliths may indicate prolonged exposure to inflammatory and microbial factors within the oropharyngeal environment. Likewise, the association between tonsillolith size and apical periodontitis may suggest that chronic odontogenic infections contribute to a shared inflammatory and microbial environment that favors calcified biofilm formation.

The present study utilized CBCT for detailed evaluation of periodontal and tonsillolith-related findings. Compared with conventional radiographic examinations, CBCT provides superior visualization of osseous structures and periodontal defects.[14,15] Zhang et al.[16] demonstrated that CBCT offers improved visualization of periodontal bone loss relative to clinical findings and two-dimensional intraoral radiographs. Therefore, the use of CBCT in the present study may have contributed to the more comprehensive evaluation of the relationship between tonsillolith characteristics and periodontal conditions.

Calcification degree, expressed as HU values, was also positively correlated with periodontal bone loss, restored teeth, missing teeth, apical periodontitis, and furcation involvement. This finding may suggest that more highly mineralized tonsilloliths are associated with a greater cumulative inflammatory or microbial burden. However, the correlations were generally weak, indicating that calcification degree alone cannot explain the relationship between tonsilloliths and periodontal status. Therefore, HU values should be interpreted as a supportive imaging parameter rather than an independent diagnostic indicator of periodontal disease.

The association between oral and tonsillar microbiota may also explain the observed associations. Xu et al.[17] reported a correlation between the microbiota of the oral tissues and tonsils, suggesting that these anatomical regions may share similar microbial communities. In addition, bacterial genera such as *Actinomyces*, *Fusobacterium*, *Porphyromonas*, *Prevotella*, *Selenomonas*, and *Tannerella* have been identified in both tonsilloliths and periodontal biofilms. These microorganisms are well-known contributors to periodontal disease. Therefore, the present findings may reflect the interaction between periodontal pathogens, oral biofilm accumulation, and tonsillar crypt colonization.

Gürbüz et al.[3] investigated the potential link between tonsilloliths and plaque-induced oral diseases based on panoramic radiographic findings and reported associations with oral conditions related to dental plaque accumulation. However, panoramic radiography has inherent limitations due to superimposition, distortion, and reduced sensitivity for small calcifications. In contrast, CBCT provides three-dimensional evaluation and allows more accurate localization and characterization of tonsilloliths. The present study benefits from the combined use of panoramic radiography and CBCT, enabling both clinical relevance and improved radiographic detection.

Previous prevalence studies have reported variable tonsillolith detection rates depending on imaging modality, patient population, and diagnostic criteria. Fauroux et al.[18] evaluated tonsillolith prevalence using CT images, whereas Takahashi et al.[19] assessed palatine tonsilloliths using paired panoramic radiographs and CT images.

More recently, Durmuş et al.[20] reported the frequency of palatine tonsilloliths detected on panoramic radiographs among individuals from Southeastern Anatolia. Differences between studies may be related to imaging method, field of view, slice thickness, age distribution, and inclusion criteria. In the present study, the prevalence of tonsilloliths was 25.4%, which is within the range reported in previous imaging-based studies.

In the present study, tonsillolith count, size, and calcification degree showed weak but significant positive correlations with age. This finding is clinically plausible because tonsilloliths may develop progressively over time due to repeated inflammation, microbial accumulation, and gradual mineralization. Previous studies have also suggested that tonsilloliths are more frequently observed in adults and older individuals.[5,16]

However, no significant sex-related differences were observed in tonsillolith number, size, or calcification degree, suggesting that age-related cumulative exposure may be more relevant than sex in tonsillolith development.

No significant difference was found between unilateral and bilateral tonsillolith groups in terms of periodontal bone loss, missing teeth, restored teeth, apical periodontitis, furcation involvement, or peri-implantitis. This finding suggests that laterality pattern alone may not be a reliable indicator of periodontal disease burden. Instead, quantitative characteristics such as tonsillolith size and calcification degree appear to be more informative than whether the lesion is unilateral or bilateral.

Incidental calcifications were also detected during image evaluation, including submandibular sialoliths and parapharyngeal soft tissue calcifications. These findings highlight the importance of careful assessment of the entire imaging volume, particularly in CBCT examinations. Since soft tissue calcifications may mimic each other radiographically, differentiation based on anatomical location, morphology, size, and density is essential. CBCT

may provide valuable information for distinguishing tonsilloliths from other calcified structures of the head and neck, such as sialoliths, phleboliths, and calcified lymph nodes.[21,22]

Collectively, these findings provide evidence supporting the proposed relationship between tonsilloliths may be associated with chronic oral inflammatory burden, particularly periodontal and dental pathologies. However, the observed correlations were weak to moderate, and the retrospective nature of the study precludes causal inference. Therefore, tonsilloliths should not be interpreted as direct markers of periodontal disease, but their presence, especially when larger or more highly calcified, may indicate the need for careful evaluation of oral and periodontal status.

The findings should be interpreted in the context of several study limitations. First, because of the retrospective design, causal relationships between tonsillolith characteristics and periodontal or dental pathologies cannot be established. Therefore, the observed associations should be interpreted with caution.

Second, the study cohort was limited to individuals who had both panoramic radiographs and CBCT images available in the archive database. Since CBCT examinations are generally obtained for specific clinical indications, including implant planning, orthodontic assessment, impacted teeth, and inflammatory dental conditions, selection bias may have influenced the study population and prevalence findings.

The reliance on radiographic evaluation alone prevented the assessment of important clinical periodontal parameters, including probing depth, clinical attachment loss, plaque index, and bleeding on probing, which could have contributed to a more comprehensive characterization of periodontal health. Consequently, periodontal status was assessed only according to radiographic findings.

In addition, although CBCT provides superior visualization compared with two-dimensional imaging, small tonsilloliths or soft tissue calcifications may still be affected by image quality, voxel size, and motion-related limitations. Furthermore, the microbiological composition of tonsilloliths was not evaluated; therefore, the proposed relationship between tonsillolith formation and periodontal pathogens could not be confirmed microbiologically.

Another limitation is that the study was conducted at a single institution, which may restrict the applicability of the results to other populations with different demographic or ethnic characteristics. Future multicenter studies incorporating radiographic, clinical, and microbiological data are warranted to better elucidate the relationship between tonsilloliths and periodontal disease.

Conclusions

The present findings indicate that tonsillolith size and calcification degree were significantly associated with several periodontal and dental pathologies, particularly periodontal bone loss, missing teeth, apical periodontitis, and furcation involvement. Among the evaluated parameters, tonsillolith size demonstrated the strongest associations with oral and periodontal findings. These results suggest that tonsillolith characteristics may reflect chronic oral inflammatory burden and should be carefully evaluated during radiographic examination. Although the observed associations do not establish causality, the presence of large or highly calcified tonsilloliths may indicate the need for careful oral and periodontal assessment. Further prospective studies incorporating clinical and microbiological analyses are required to better clarify the occurrence of periodontal disease in patients with tonsilloliths.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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