JBACHS
Journal of Basic and Clinical Health Sciences

J Basic Clin Health Sci 2026; 10: 250-256
https://doi.org/10.30621/jbachs.1880159
RESEARCH ARTICLE

PREVALENCE OF INTERPROXIMAL CONTACT LOSS BETWEEN FREESTANDING SINGLE IMPLANT SUPPORTED CROWNS AND ADJACENT TEETH: A RETROSPECTIVE STUDY

Ayça Muhterem[1], Aleyna Bahar Erez Palacı[1*], Elif İnönü[1], Ahu Dikilitaş[1], Elif Figen Koçak[2], Aliye Akcalı[1]

[1] Dokuz Eylul University, Faculty of Dentistry, Department of Periodontology, Izmir, Türkiye
[2] Dokuz Eylul University, Faculty of Dentistry, Department of Prosthodontics, Izmir, Türkiye

ORCID: A.M. 0009-0001-7658-911X; A.B.E.P. 0009-0000-6813-6121; E.İ. 0000-0002-4789-748X; A.D. 0000-0003-4130-2526; E.F.K. 0000-0003-4708-788X ; A.A. 0000-0001-9811-0627

Corresponding author: Aleyna Bahar Erez Palacı, **E-mail:** aleynabahar.erez@deu.edu.tr
Received: 04.02.2026; **Accepted:** 21.05.2026; **Available Online Date:** 31.05.2026
©Copyright 2021 by Dokuz Eylül University, Institute of Health Sciences - Available online at https://dergipark.org.tr/en/pub/jbachs

Cite this article as: Muhterem A, Erez Palacı AB, İnönü E, Dikilitaş A, Koçak EF, Akcalı A. Prevalence of Interproximal Contact Loss Between Freestanding Single Implant Supported Crowns and Adjacent Teeth: A Retrospective Study. J Basic Clin Health Sci 2026; 10: 250-256.

ABSTRACT

Purpose: This retrospective study aimed to evaluate clinical and radiographic changes in the interproximal area between single-unit implant-supported restorations and adjacent natural teeth, and to assess their relationship with periodontal and peri-implant tissue health.
Materials and Methods: A total of 22 single-unit implants placed in 18 patients (mean age 52.38 ± 8.78 years) were followed for a mean period of 18.5 ± 3.2 months (range: 3–24 months). During recall appointments, periodontal and peri-implant clinical parameters, radiographic findings, adjacent tooth vitality, opposing dentition status, and patient-reported food impaction were comprehensively recorded.
Results: Interproximal contact loss (ICL) was detected in 68.2% of restorations, with mesial (36.4%) and distal (40.9%) contact loss observed. Additionally, contact loss affected both surfaces in 9.1% of cases. Among the 15 ICL implants, 9 (60.0%) were associated with patient-reported food impaction. ICL prevalence was notably higher in females (86.7%) compared to males (28.6%). Peri-implant mucositis was diagnosed in 53.3% of implants exhibiting contact loss, whereas no peri-implantitis was detected.
Conclusion: ICL between implant-supported restorations and adjacent natural teeth is a frequent finding often associated with food impaction and peri-implant mucosal inflammation. Therefore, regular clinical and radiographic evaluation of interproximal contacts is essential for maintaining peri-implant tissue health and ensuring long-term restorative success.

Keywords: Implant-supported restoration; interproximal contact loss; food impaction; peri-implant mucositis.

INTRODUCTION

Implant-supported prostheses are widely accepted as a predictable and reliable long-term treatment option for the rehabilitation of missing teeth, owing to their high success rates and favorable patient satisfaction (1). However, biological, mechanical, and esthetic complications associated with implant-supported prostheses remain critical clinical challenges (2). Among the most frequently reported complications are biomechanical problems, peri-implant soft tissue reactions, and interproximal contact loss (ICL) (3).

ICL refers to the loss of contact between two natural teeth, between two implants, or between an implant and an adjacent natural tooth. The resulting open contact area may lead to food impaction over time and predispose the site to periodontitis or peri-implantitis. Previous studies have reported that the prevalence of ICL between implant-supported fixed prostheses and adjacent teeth ranges from 34% to 66% (4).

The physiological behavior of dental implants within the alveolar bone differs markedly from that of natural teeth. Implant-supported prostheses, lacking a periodontal ligament, demonstrate significantly less vertical movement during mastication and do not exhibit mesial migration, which makes them functionally similar to ankylosed teeth (1,2). This discrepancy between implant-supported restorations and adjacent teeth is considered the most likely etiological factor underlying mesial ICL (3,5). Potential factors that may influence the development of ICL include age, gender, duration of implant function, status of adjacent teeth, opposing dentition, periodontal health, oral hygiene, and parafunctional habits (6).

In the literature, ICL between implant-supported restorations and adjacent teeth has been investigated using different methodologies (8). ICL is associated with several adverse outcomes, including food impaction, gingival inflammation, peri-implant mucositis and peri-implantitis, and increased caries risk in the adjacent natural tooth, and may also cause esthetic concerns in some patients (7). Thus, regular clinical and radiographic follow-up, routine examination of interproximal contacts, and corrective interventions are considered critical for preserving peri-implant tissue health and ensuring the long-term success of implant-supported restorations (8). Moreover, re-establishing a lost proximal contact point is a time-consuming and costly procedure that often requires removal of the restoration and, depending on the restorative material, its modification or replacement (9).

This retrospective study aimed to investigate time dependent changes in interproximal contact relationships between single-unit implant-supported restorations and adjacent natural teeth and to evaluate the clinical and radiographic effects of these changes on periodontal and peri-implant tissues.

The study was based on the following hypotheses: interproximal contact relationships between implant-supported restorations and adjacent natural teeth remain stable over time; ICL is not associated with the development of dental caries in adjacent teeth; ICL does not lead to periodontal attachment loss; ICL is not associated with patient-reported food impaction; and ICL does not contribute to the development of peri-implant diseases or vary according to demographic factors such as gender.

MATERIALS AND METHODS

This retrospective study was conducted at the Department of Periodontology, Faculty of Dentistry, Dokuz Eylul University, in accordance with the STROBE statement guidelines. Clinical and radiographic records of patients who underwent dental implant therapy and completed prosthetic rehabilitation between January 2023 and May 2025 were reviewed. The study protocol was approved by the Dokuz Eylul University Non-Interventional Research Ethics Committee (No: 2025/35-26, Date: October 15, 2025), and all procedures were performed in accordance with the principles of the Declaration of Helsinki.

Due to the limited sample size (n=22), the 95% confidence interval was calculated using the Wilson Score Interval method to enhance the precision of the prevalence estimate and minimize the margin of error. This approach provides significantly more reliable boundaries compared to the standard Wald method, particularly in studies involving small cohorts. Based on the observed ICL prevalence of 68.2% in our sample, the analysis demonstrated that the study achieved a post-hoc power of 80%, with a 95% CI ranging from 47.3% to 83.6%. All clinical and radiographic assessments, including the evaluation of contact tightness and bone level measurements, were performed by a single, blinded examiner (A.M.).

The inclusion criteria were as follows: (1) patients with single-unit implant-supported fixed restorations, (2) presence of natural teeth on both the mesial and distal aspects of the implant-supported restoration, and (3) patients who had complete clinical and radiographic data during follow-up visits. Conversely, the exclusion criteria were: (1) implants without any contact with adjacent natural teeth, and (2) patients with missing radiographic or clinical records during the follow-up sessions. A total of 22 implant-supported restorations in 18 patients met the eligibility criteria and were included in the study. Of these patients, 12 (66.7%) were female, and 6 (33.3%) were male, with a mean age of 53.1 ± 9.2 years for females and 50.7 ± 8.6 years for males.

After the complete implant-supported restorations, initial proximal contact tightness was routinely evaluated by assessing the resistance encountered during the passage of dental floss through the interproximal area. Regarding the restorative characteristics, all implants utilized a platform-switched connection design. The prostheses consisted of 12 (54.5%) screw-retained and 10 (45.5%) cement-retained restorations, all of which were fabricated using metal-ceramic materials. During routine follow-up visits, the resistance of the same type of dental floss as it passed through the contact area was recorded, and periapical radiographs were obtained using the parallel technique. Bone levels were not assessed on periapical radiographs, as none of the participants exhibited clinical signs of peri-implantitis. Periodontal and peri-implant soft tissue health was routinely assessed. In addition, data regarding food impaction complaints, implant location, implant-abutment connection type, vitality of the adjacent natural tooth, parafunctional habits, presence of a restoration on the adjoining tooth, status of the opposing dentition, and duration of implant function were retrospectively retrieved and evaluated. The peri-implant clinical status was evaluated by recording the plaque index, probing depth, and bleeding on probing.

The contact relationship between the implant-supported restoration and the adjacent natural tooth during follow-up was classified as follows: (a) tight, defined as resistance present during the passage of dental floss; (b) loose, defined as reduced resistance during the passage of dental floss; and (c) open, defined as no resistance during the passage of dental floss.

To ensure the consistency of these subjective clinical assessments, all measurements were performed by a single experienced clinician.

Radiographic evaluations were standardized by using the parallel technique with the aid of film holders to ensure reproducible images for longitudinal comparison of peri-implant bone levels. Measurements were performed at follow-up visits starting from the date of superstructure delivery, and changes in contact relationship and related parameters over time were recorded.

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Due to the limited sample size, the analysis was restricted to descriptive statistics. Categorical variables were expressed as frequency (n) and percentage (%), while continuous variables were presented as mean ± standard deviation (SD). Continuous variables were summarized as median (minimum–maximum), and categorical variables as number and percentage. Due to the limited sample size and the low expected frequencies in some cells, Fisher's Exact Test was used for categorical comparisons. The Mann–Whitney U test was applied for the age variable. A *p*-value of <0.05 was considered statistically significant.

RESULTS

A total of 22 implants in 18 patients who underwent dental implant treatment and completed prosthetic rehabilitation at the Department of Periodontology, Faculty of Dentistry, Dokuz Eylul University between 2023 and 2025 were included in the study. The follow-up period after delivery of the prosthetic restorations ranged from 3 to 24 months, during which mesial–distal contact tightness was recorded at control visits. The restorations were evaluated over a mean period of 18.5 ± 3.2 months. Of the 22 implants, 18 (81.81%) were placed in the molar region and 4 (18.18%) in the premolar region. Regarding jaw distribution, 10 implants (45.45%) were located in the maxilla, comprising 6 molars (27.27%) and 4 premolars (18.18%). The remaining 12 implants (54.55%) were placed in the mandible, all of which were located in the molar region (as shown in Table 1). A total of 22 implants were analyzed. The rate of having non-ideal proximal contact was 86.7% (13/15) in female patients and 28.6% (2/7) in male patients. This difference was statistically significant according to Fisher's Exact Test (p=0.014). In contrast, no statistically significant association was found between the presence of food impaction and sex, retention type, presence of adjacent restoration, contact characteristics, bone support, or parafunction (p>0.05).

Table 1. Distribution of implant locations (n=22 restorations)

Jaw	Molar n (%)	Premolar n (%)	Total n (%)
Maxilla	6 (27.27)	4 (18.18)	10 (45.45)
Mandible	12 (54.55)	0 (0)	12 (54.55)
Total	18 (81.81)	4 (18.18)	22 (100)

A total of 22 implant-supported single crowns were evaluated to assess the prevalence of ICL. Among these restorations, mesial contact loss was observed in 8 cases, representing a rate of 36.4%. When this finding was analyzed by tooth type, it was determined that mesial contact loss occurred in 5 molar and 3 premolar restorations. Furthermore, distal contact loss was identified in 9 restorations (40.9%); among these, the vast majority were in the molar region (8 implants), while only 1 premolar implant exhibited distal contact loss (Figure 1 and 2).

Simultaneous ICL involving both the mesial and distal surfaces was detected in a smaller subset of 2 (9.1%) restorations, which consisted of 1 molar and 1 premolar. Consequently, when all categories were combined, ICL on at least one surface was established in 15 out of the 22 implants, corresponding to an overall prevalence of 68.2%. A closer examination of these 15 restorations revealed that the condition was predominantly located in the posterior segments, with 12 (54.5%) occurring in the molar region and 3 (13.6%) in the premolar region (as shown in Table 2).

When ICL was evaluated according to gender, it was detected in 13 (86.7%) of the 15 implants in female patients and in 2 (28.6%) of the 7 implants in male patients. Regarding the anatomical distribution by jaw, the results indicated that 7 of the implants with ICL (31.8%) were located in the maxilla. These maxillary implants showing ICL comprised 4 molars and 3 premolars. In contrast, 8 implants with ICL (36.4%) were situated in the mandible. It is worth noting that all mandibular implants exhibiting ICL were located exclusively in the molar region, with no premolar involvement observed in the lower jaw.

The antagonists in the opposing arch for these 15 implants were predominantly natural teeth in 13 cases, followed by a tooth-supported single crown in 1 case, and an implant-supported fixed partial denture in 1 case.

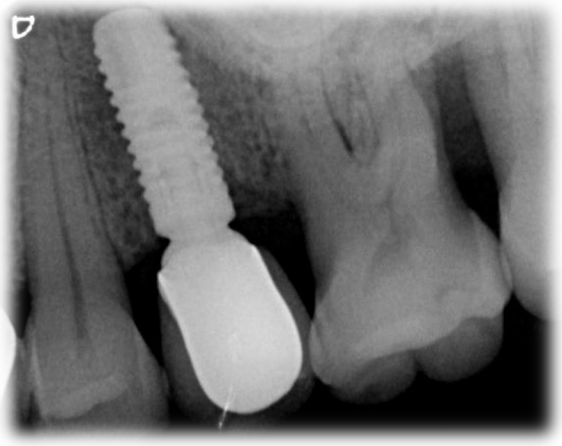


Figure 1. Periapical radiograph taken on the day of completion and delivery of the implant-supported prosthetic restoration, demonstrating a well-established and tight mesial proximal contact with the adjacent tooth.

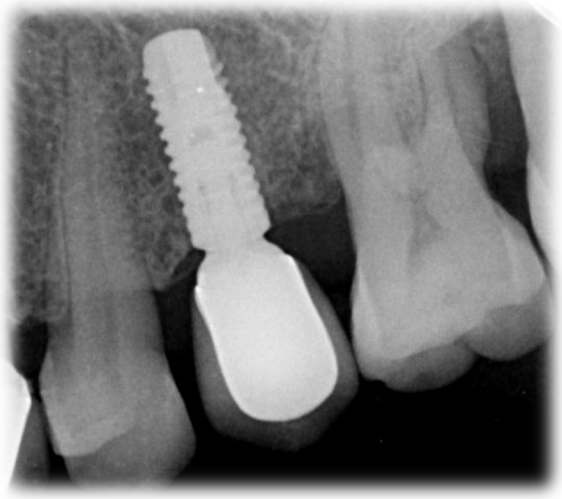


Figure 2. Periapical radiograph obtained at the 20-month follow-up visit, revealing loss of the mesial proximal contact between the implant-supported restoration and the adjacent natural tooth.

Table 2. Distribution of interproximal contact loss by tooth type (n=22).

Variables	Molar (%)	Premolar (%)	Total (%)
Mesial surface of contact loss	5 (22.72)	3 (13.63)	8 (36.36)
Distal surface of contact loss	8 (36.36)	1 (4.54)	9 (40.90)
Both surfaces of contact loss	1 (4.54)	1 (4.54)	2 (9.09)
Contact loss by jaw			
Maxilla	4 (18.18)	3 (13.63)	7 (31.81)
Mandible	8 (36.36)	0 (0)	8 (36.36)
Total implants with contact loss	12 (54.54)	3 (13.63)	15 (68.18)

From a clinical perspective, complaints of food impaction were reported in 9 (60.0%) of the 15 implant-supported restorations with ICL. Regarding soft tissue health, peri-implant mucositis was diagnosed in 8 (53.3%) of the 15 implants exhibiting ICL, while peri-implantitis was not observed in any of the implants included in the study. Finally, regarding the status of the adjacent dentition among the 15 implants with ICL, the tooth mesial to the implant was non-vital in only 1 case, whereas all other adjacent teeth were vital, and a restoration on the adjacent tooth was present in only 1 case.

DISCUSSION

In this retrospective study, the prevalence of ICL between implant-supported single crowns and adjacent natural teeth, as well as its clinical effects, was evaluated. The literature suggests that ICL may begin as early as 3 weeks after delivery of the implant-supported restoration (4). In the present study, implant-supported restorations with follow-up periods ranging from 3 to 24 months were assessed, and ICL on at least one of the mesial or distal surfaces was detected in 68.2% of the restorations, which is consistent with the prevalence values of 34–66% reported previously (7,10,11). This suggests that ICL appears to be a frequent finding rather than a rare occurrence in implant dentistry, warranting careful monitoring during routine follow-up.

Previous studies have indicated that ICL is observed more frequently on the mesial aspect, which has been attributed to the physiological mobility of teeth and the cumulative effects of occlusal loading over time (12). However, in the current study, distal contact loss (40.9%) was observed slightly more frequently than mesial contact loss (36.4%). This discrepancy may be related to the small sample size and heterogeneous follow-up periods, which represent important limitations of this study. Nevertheless, while this finding contrasts with the dominant 'mesial drifting' theory, it highlights that ICL is not an event exclusive to the mesial surface.

This study revealed the difference between genders with respect to ICL prevalence. When ICL was evaluated according to gender, it was detected in 13 (86.7%) of the 15 implants in female patients, compared to only 2 (28.6%) in males. While some studies suggest gender is not a significant risk factor, our findings indicate that female patients might require more frequent monitoring for ICL (7,11). However, these findings should be considered cautiously due to the small sample size, which may limit the generalizability of the results regarding gender-specific differences.

In the present study, 8 of the 15 implant-supported restorations exhibiting ICL were located in the mandible. Although the underlying mechanism has not been fully clarified, previous research has shown that ICL between implant-supported restorations and adjacent teeth is more frequently encountered in the mandible (6). This higher frequency has been attributed to the mesial drift of teeth over time and the greater root angulation typically observed in the mandibular arch (7).

60% of the patients with ICL reported complaints of food impaction, indicating that open contacts represent not only a mechanical complication but also a factor with direct impact on patients' quality of life. Consistent with these findings, earlier studies have associated ICL with adverse outcomes such as food impaction, gingival trauma, local inflammation, and an increased risk of caries in adjacent teeth. In the present sample, peri-implantitis was not observed in any implant; however, peri-implant mucositis was diagnosed in 53.3% of the implants exhibiting ICL, suggesting a potential association between open contacts and mucosal inflammation (5,13). This is in agreement with reports indicating that ICL may increase the risk of peri-implant mucositis by facilitating food impaction and plaque accumulation (11).

The etiology of ICL is considered multifactorial. Physiological mesial migration of teeth, the ankylosis-like immobility of implants due to the absence of a periodontal ligament, age, gender, duration of implant function, implant position and location, status of adjacent teeth, opposing dentition, craniofacial growth, periodontal condition, oral hygiene, and parafunctional habits have all been implicated as contributing factors (11). For the long-term success of implant therapy, it is therefore essential that clinicians carefully evaluate proximal contacts during routine follow-up visits, taking these etiological factors into account, assess the risk and possible consequences of ICL, and implement appropriate corrective measures at an early stage (14). For the long-term success of implant therapy, clinicians should prioritize the use of retrievable, screw-retained restorations where possible. This design allows for easier removal and modification of the prosthesis to re-establish contact points when ICL occurs (8). Furthermore, the implementation of preventive measures, such as the

fabrication of rigid occlusal splints (Essix retainers) for night use, has been suggested in literature as a viable strategy to restrict nocturnal tooth movement and maintain interproximal stability (15).

The present study has several limitations that should be acknowledged. First, the retrospective design and reliance on existing clinical records may have introduced potential selection bias and limited the standardization of data collection. Second, the relatively small sample size (n=22) restricted the statistical analysis to descriptive methods and precluded advanced multivariate analyses to identify independent risk factors for ICL. Third, the follow-up period varied among patients (ranging from 3 to 24 months); this heterogeneity may have influenced the reported prevalence of ICL, given that ICL is a time-dependent phenomenon. Furthermore, the assessment of contact tightness relied on the resistance to dental floss, which, although a common clinical method, is subjective compared to more precise quantitative measurements. Consequently, prospective studies with larger cohorts and standardized, long-term follow-up periods are needed to more clearly elucidate the causes and clinical consequences of ICL between implant-supported restorations and adjacent teeth.

CONCLUSION

Within the limitations of this retrospective study, ICL between single-unit implant-supported restorations and adjacent natural teeth was found to be prevalent, affecting more than two-thirds of the restorations evaluated. Although peri-implantitis was not observed in any of the implants, peri-implant mucositis was diagnosed in over half of the cases with ICL, suggesting a potential association between open contacts, food impaction, plaque accumulation, and mucosal inflammation.

Given the multifactorial etiology of ICL, clinicians should carefully assess and maintain proximal contacts during routine follow-up visits and implement corrective measures at an early stage to support the long-term success of implant therapy. Further prospective studies with larger sample sizes and standardized long-term follow-up are needed to clarify the underlying mechanisms of ICL and its long-term clinical consequences.

Acknowledgements: None.

Author contributions: AM, ABEP, and Eİ contributed to the conception of the study. AM, ABEP, Elif İnönü, and AD contributed to the study design. Eİ and AA supervised the study. AM and ABEP were responsible for materials and referred patients. AM, ABEP, Eİ, AD, and EFK contributed to data collection and/or processing. AM, ABEP, Eİ, AD, and EFK contributed to data analysis and interpretation. AM and ABEP performed the literature review and writing of the manuscript. AA critically reviewed the manuscript. All authors read and approved the final manuscript and take full responsibility for the content of the study. ***This study was contributed to equally by AM and ABEP; therefore, both authors share first authorship.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: The study protocol was approved by the Dokuz Eylul University Non-Interventional Research Ethics Committee (Date: October 15, 2025, No:2025/35-26)

Funding: This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Peer-review: Externally peer-reviewed.

REFERENCES

1. Brägger U, Aeschlimann S, Bürgin W, Hämmerle CHF, Lang NP. Biological and technical complications and failures with fixed partial dentures (FPD) on implants and teeth after four to five years of function. Clin Oral Implants Res 2001;12(1):26-34.
2. Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JYK. Clinical complications with implants and implant prostheses. J Prosthet Dent 2003;90(2):121-132.
3. Byun SJ, Heo SM, Ahn SG, Chang M. Analysis of proximal contact loss between implant-supported fixed dental prostheses and adjacent teeth in relation to influential factors and effects. A cross-sectional study. Clin Oral Implants Res 2015;26(6):709-714.
4. Pappous GC, Campbell S, Goldstein G. Risk factors contributing to interproximal contact loss between an implant crown and a natural tooth. J Prosthodont 2026 Apr;35(4):443-449.
5. Liu CLS, Wen SC, Chang Chien CJ, Du JK. The mesial–mesial/distal–distal (MM-DD) occlusal adjustment technique: A 2–21.5-year retrospective study on preventing open contacts in posterior implant restorations. J Dent Sci 2025;20(4):2163-2175.
6. Bento VAA, Gomes JML, Lemos CAA, Limirio JPJO, Rosa CDDRD, Pellizzer EP. Prevalence of proximal contact loss between implant-supported prostheses and adjacent natural teeth: A systematic review and meta-analysis. J Prosthet Dent 2023;129(3):404-412.
7. Cui X, Zhang C, Li Y, et al. Prevalence and risk factors of interproximal contact loss between implant-supported prostheses and adjacent teeth

in posterior dentitions: a retrospective study. BMC Oral Health 2025;25(1):1445.
8. Steven Liu CL, Wen SC, Chang Chien CJ, Du JK. Open contacts adjacent to posterior dental implants: Current understanding and emerging preventive concepts. J Dent Sci 2026;21(1):9-18.
9. Manicone PF, De Angelis P, Rella E, Papetti L, D'Addona A, D'Arcangelo C. Proximal contact loss in implant-supported restorations: A systematic review and meta-analysis of prevalence. Journal of Prosthodontics 2022;31(3):201-209.
10. Bompolaki D, Edmondson SA, Katancik JA. Interproximal contact loss between implant-supported restorations and adjacent natural teeth: A retrospective cross-sectional study of 83 restorations with an up to 10-year follow-up. J Prosthet Dent 2022;127(3):418-424.
11. Nery JC, Manarte-Monteiro P, Aragão L, Da Silva LP, Brandão GSP, Lemos BF. Clinical effects of interproximal contact loss between teeth and implant-supported prostheses: Systematic review and meta-analysis. Prosthesis 2024;6(4):825-840.
12. Tu Y, Zhao X, Zhao G, Ding Q, Sun Y, Zhang L. Assessment of physiological posterior-tooth displacement under habitual occlusal force by intraoral scanning using implant-supported crowns as the reference. J Prosthet Dent 2025;133(5):1260-1267.
13. Chang M, Wennström JL. Peri-implant soft tissue and bone crest alterations at fixed dental prostheses: a 3-year prospective study. Clin Oral Implants Res 2010;21(5):527-534.
14. Shi JY, Zhu Y, Gu YX, Lai HC. Proximal contact alterations between implant-supported restorations and adjacent natural teeth in the posterior region: a 1-year preliminary study. Int J Oral Maxillofac Implants 2019;34(1):165-168.
15. Kandathilparambil MR, Nelluri VV, Vayadadi BC, Gajjam NK. Evaluation of biological changes at the proximal contacts between single-tooth implant-supported prosthesis and the adjacent natural teeth - An in vivo study. The Journal of Indian Prosthodontic Society 2020;20(4):378-386.