



BACKGROUND

Dental implants are a widely used treatment for partial edentulism, with implant-protected occlusion commonly applied in clinical practice¹. However, the evidence supporting these guidelines is limited, necessitating further research to evaluate the long-term biomechanical stability of such restorations.

One of the key distinctions between dental implants and natural teeth is the absence of a periodontal ligament (PDL) around implants². Teeth supported by a PDL can move up to 100 micrometers in response to force vectors, occlusal wear, and other contributing factors³. Additionally, the surrounding alveolar bone may undergo remodeling. In contrast, osseointegrated dental implants, being ankylosed, exhibit limited movement of approximately 10 micrometers³. These factors can lead to the relative malposition of the implant. In addition, proprioceptors in the PDL can respond to finer stimuli and contribute to the magnitude of the occlusal forces. PDL loss after tooth extraction might undermine this control. Despite the potential for interproximal contact loss (ICL) between implants and adjacent natural teeth, there are limited reports in the literature documenting this phenomenon⁴.

This study aimed to monitor the long-term effects of implant-protected occlusion on tactile sensibility and interproximal contact loss over 1.5 years in patients with posterior single-implant supported restorations.

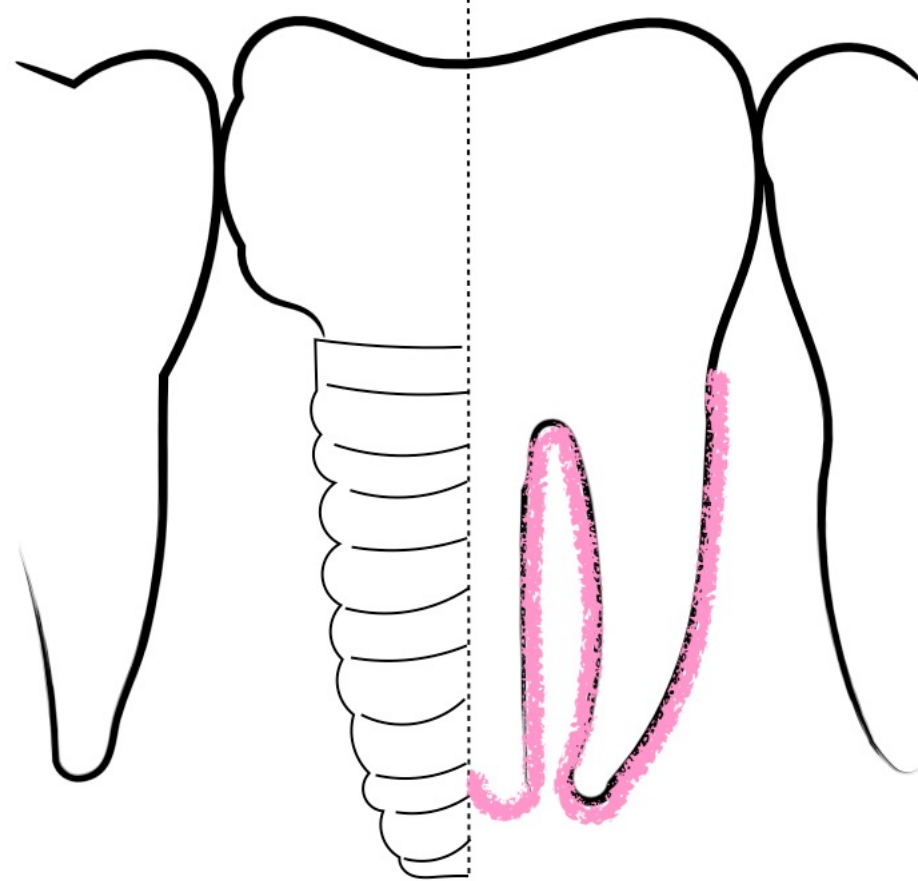


Figure 1: Biomechanical differences of natural teeth feature a periodontal ligament that aids in shock absorption. Implants lack a periodontal ligament, leading to direct osseointegration with bone

MATERIALS AND METHODS

Study Design:

This prospective clinical study involved 20 patients with osseointegrated posterior dental implants, drawn from the same cohort as a previous investigation (IRB18-1204). Custom titanium abutments were fabricated using digital impressions, and crowns for each patient were adjusted to achieve occlusal contact verified by shimstock drag. After these adjustments, patients were monitored over a 1.5-year period to assess tactile sensibility and interproximal contact loss (ICL). All follow-up examinations were conducted by the same examiner, who was not involved in the therapeutic phase. The following data were collected: measurements of ICL, tactile sensibility, probing depth (PD), bleeding on probing (BOP), and plaque control record (PCR).

Outcome Measures:

ICL was assessed using satin floss (0.05 mm width x 0.004 mm height, Oral-B). If the floss passed through the contact without resistance, the proximal contact was classified as open (ICL). Tactile sensibility was measured at both implant and control sites using interocclusal articulating foils of varying thicknesses (shimstock). Intraoral scans were performed at the initial crown delivery and at the final follow-up appointment. Two stereolithography (STL) files were generated and superimposed using Geomagic software for visual comparison.

RESULTS

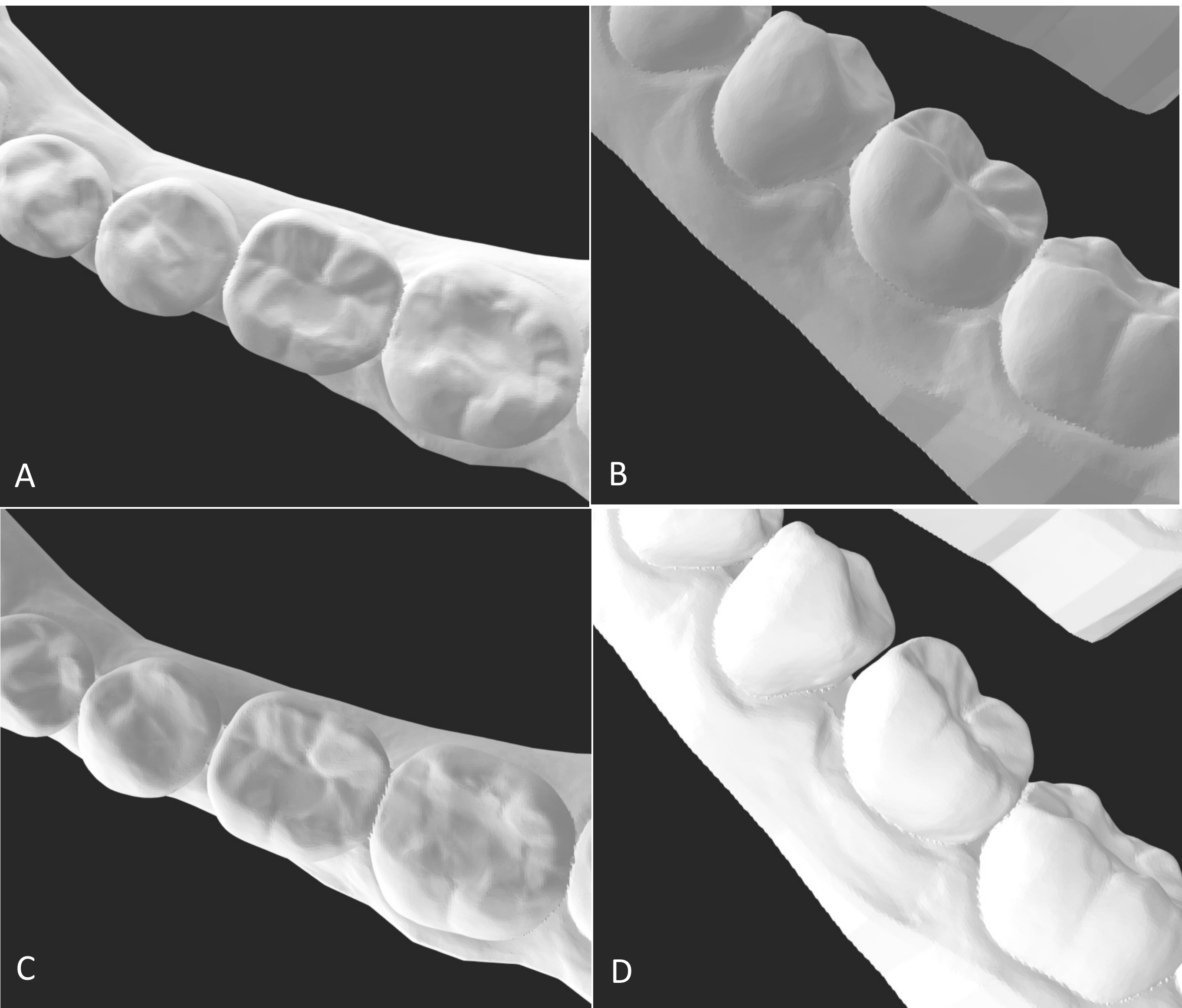


Figure 2:
A) Occlusal view of implant crown #19 at baseline (0 months).
B) Buccal view of implant crown #19 at baseline (0 months).
C) Occlusal view of implant crown #19 at 6-month follow-up.
D) Buccal view of implant crown #19 at 6-month follow-up.

Interproximal contact loss (ICL) was observed in approximately one-third of the cases during the monitoring period (Table 1 and 2). Furthermore, the findings indicated that the tactile sensibility of single-tooth implants in the posterior region was 2 to 3 times lower than that of natural teeth (Table 3).

The Mann-Whitney nonparametric test was used to compare the implant site and control site groups in terms of active tactile sensibility (Table 3). The test revealed that participants in the implant group exhibited reduced tactile sensibility compared to those in the control group at the 3-month follow-up post-loading. A statistically significant difference was identified between the active tactile sensibility of implants and that of the natural contralateral teeth.

Table 1: Number of implants and proximal contact status relative to period of follow-up

Status	Month 0	Month 3	Month 6	Month 12	Month 18	Total
Open	0 (0%)	1 (5%)	2 (11%)	3 (18%)	0 (0%)	6 (30%)
Closed	20 (100%)	19 (95%)	17 (89%)	14 (82%)	14 (100%)	14 (70%)
Total	20	20	19	17	14	20

RESULTS CONT.

Table 2: Number of implants and proximal contact status as function of maxillary versus mandibular sites

	Maxilla	Mandible	Total
Open	2 (22%)	4 (36%)	6 (30%)
Closed	7 (78%)	7 (64%)	14 (70%)
Total	9 (45%)	11 (55%)	20

Table 3: Comparison between implant site and control site in active tactile sensibility of varying thicknesses of articulating foil at 3-month follow-up

Thickness	Implant site (n=20)	Control site (n=20)	Mann-Whitney Value	P
8 µm	0 (0%)	2 (10%)	50	<.001
16 µm	0 (0%)	7 (35%)	70	<.001
24 µm	2 (10%)	11 (33%)	83	<.001
32 µm	8 (40%)	15 (75%)	115	0.022
40 µm	14 (70%)	20 (100%)	140	0.107
80 µm	20 (100%)	20 (100%)	200	0.992
100 µm	20 (100%)	20 (100%)	200	0.992

CONCLUSIONS

This study highlights the importance of long-term monitoring in implant restorations to ensure their success and longevity. The findings provide crucial insights for clinicians to make precise adjustments during the CAD/CAM process and emphasize the need for regular occlusal assessments to adapt to changes in occlusal forces over time, thereby maintaining the functionality and stability of implant-supported restorations.

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