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Effect of the distance from the contact point to the crestal bone on the degree of vertical loss of interdental papillae



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Background: The loss of the interdental papilla is one of the adverse events that can occur after periodontal therapy. It can cause food impaction, aesthetic deformities and phonetic problems. The objective of this study was to evaluate the effect of the distance from the contact point to the crestal bone on the degree of vertical loss of interdental papillae.

Study design: A total of 125 interproximal sites from 26 patients were examined. Prior to transperiodontal bone probing, the class of the interdental papilla was determined based on the classification system developed by Nordland and Tarnow¹. The distance from the contact point to the crestal bone was measured by probing under local anaesthesia.

Results: The results revealed that when the distance from the contact point to the crestal bone was ≤ 5 mm, in 98.4% of the cases the papilla did not shrink. When the distance was ≥ 7 mm, 100% of papilla shrinkage was classified as class III. A significant association (Fisher exact test, $P < 0.001$) was observed between the degree of loss of interdental papilla and the distance from the contact point to the bone crest.

Conclusion: The distance of the base of the contact point to the coronal portion of the bone crest measured by bone probing is highly associated with the degree of the vertical loss of the interdental papilla.

■ Introduction

The loss of interdental papilla is well recognised as one of the adverse events that can occur after periodontal therapy¹. Especially in the maxillary anterior region, papilla loss is responsible for food impaction, aesthetic deformities and phonetic problems². The loss of the interdental papilla, therefore, represents a great concern to patients and a challenge for dentists^{2,3}.

The presence or absence of the interdental papilla can be influenced by the degree of inflammation,

probing depths, type of gingival tissue, type of therapy applied (surgical or non-surgical) and the quality of restorative treatments⁴.

In 1998, Nordland and Tarnow¹ developed a classification system that identifies progressive degrees of loss of the interdental papilla using three anatomical landmarks: the interdental contact point (CP), the buccal apical extent of the cemento-enamel junction (BCEJ) and the interproximal coronal extent of the cemento-enamel junction (ICEJ). This system classifies the vertical loss of interdental papilla in four degrees:



- Normal – when the interdental papilla completely fills the space to the apical extent of the contact point area
- Class I – when the interdental papilla lies between the CP and ICEJ
- Class II – when the interdental papilla lies at, or apical to, ICEJ and coronal to the apical extent of the BCEJ
- Class III – when the interdental papilla lies at or apical to the BCEJ.

In 2004, Cardaropoli et al⁵ developed a new index to classify the interdental papillary height on natural teeth. This classification system has four categories based on: aesthetic evaluations, measurements of interproximal soft tissue height in relation to the CEJ, adjacent teeth, and the point corresponding to the ideal contact point. This classification system can also be used in case of the presence of diastemata and contact point.

Tarnow et al⁶ developed a study that determined the relationship of the distance between the contact point and the bone crest with the presence or absence of interdental papilla, examining 288 areas in 30 patients. However, this study did not correlate the obtained distance to the degree of the vertical loss of the papilla. The objective of the present study was to verify whether or not the distance between the base of the contact point and the most coronal portion of the bone crest was correlated with the degree of vertical loss on the interdental papilla in humans.

Study design

The study protocol was approved by the Health Sciences Centre of Federal University of Pernambuco Ethics Committee, and informed consent was obtained from all subjects.

A total of 125 interproximal areas (68 in anterior and 57 in posterior areas) were examined in 26 patients (5 male, 21 female; aged 18 to 61). Systemically compromised individuals, those under any medication known to interfere in the periodontal health/disease process and with any pathological loss of dental structure from bruxism were not included in this sample. All the selected areas had a closed contact point, no adjacent proximal restorations/crowns and no orthodontic appliances. The areas should also not have been submitted to periodontal surgery. Individuals who presented clinical inflammation after probing underwent thorough scaling and root planing 4 weeks before the measurements.

Prior to bone probing, the class of the interdental papilla was visually determined based on the classification system developed by Nordland and Tarnow¹.

Prior to transperiodontal bone probing, all individuals received local anaesthetics. A Williams Trinity[®] periodontal probe was inserted vertically on the buccal aspect of the contact point to the most coronal portion of the bone crest (Figs 1 to 4).

The statistical analysis was performed by STATA SE 9.2. The outcome variable was the class of the interdental papilla. The vertical height between the contact point and the most coronal portion of the bone crest was stratified in ≤ 5 mm, > 5 to < 7 mm and ≥ 7 mm. The association was tested by Fischer's exact test. The alpha level was set at 0.05.

Table 1 Vertical degree of loss of interdental papilla versus distance from the base of contact point to the coronal portion of the bone crest.

Papilla index	Distance (mm) from the base of contact point to the coronal portion of the bone crest			P value*
	5 mm n (%)	> 5 mm to < 7 mm n (%)	≥ 7 mm n (%)	
Normal papilla	61 (98.4)	1 (1.6)	0 (0)	< 0.001
Class 1	25 (71.4)	9 (25.7)	1 (2.9)	
Class 2	2 (33.3)	3 (50)	1 (16.7)	
Class 3	0 (0)	0 (0)	22 (100)	
Total	88 (70.4)	13 (10.4)	24 (19.4)	

*Fisher exact test *P* < 0.001

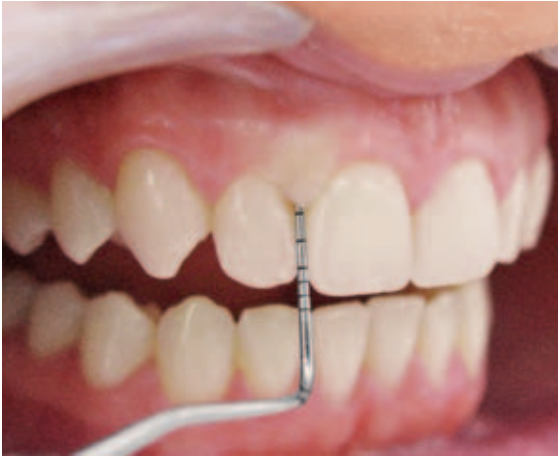
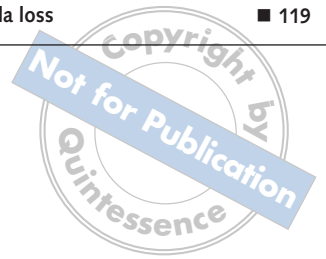


Fig 1 Patient with 5 mm between contact point and bone crest: normal papilla.

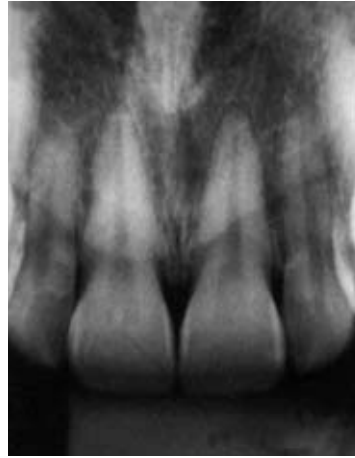


Fig 2 Radiograph from the patient in Fig 1.



Fig 3 Patient with 9 mm between contact point and bone crest: class II papilla.



Fig 4 Radiograph of the patient in Fig 3.

■ Results

Table 1 shows that when the distance from the base of the contact point to the most coronal point of the bone crest was ≤ 5 mm, the papilla was normal in 98.4% of the situations.

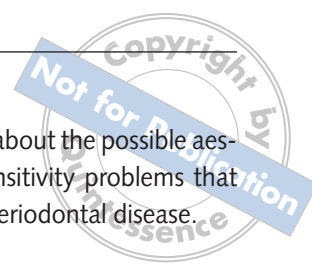
When the measurement was between 5 and 7 mm, the interproximal papilla was class II in 50% of cases, and when the distance was ≥ 7 mm, the papilla was class III in 100% of cases.

The relationship between the degree of vertical loss of interdental papilla and the distance of the base of the contact point to the most coronal portion of the bone crest was highly significant (Fisher exact test, $P < 0.001$).

■ Discussion

The main purpose of this study was to evaluate the effect of the distance between the contact point to the most coronal portion of the bone crest on the level of vertical loss of interdental papilla. This relates to a very critical problem in clinical dentistry.

Tarnow et al⁶ showed that when this distance was ≥ 5 mm, the papilla was present in 100% of cases. In the present study, the papilla was present in 98% of cases when these distances were detected. These little differences could be related to the methodological designs for both studies. In their study, Tarnow et al⁶ did not exclude areas with interproximal restorations, and did not describe characteristics from the patients



used in their sample. Gingival biotype (thick or thin) could also affect the dimension of the periodontal tissues; a thin biotype is prone to gingival recession following mechanical or surgical manipulation⁷. Unfortunately, the influence of gingival biotype on the presence of interdental papilla was not evaluated in the present study.

Yu-Jen et al⁸ developed a study that revealed that when the distance from the contact point was ≤ 5 mm, the papilla was present in 100% of cases, and when it was ≥ 7 mm, the papilla was present in only 23% of cases. Only maxillary anterior regions were examined, but, in addition, standardised periapical radiographs to measure the distance from the contact point to the crestal bone were used. As demonstrated, radiographs may not show exactly the true measurements. This could account for the differences observed in our results.

The use of periapical radiographs to measure the distance from the bone crest to the contact point and length of interdental papilla in teeth and implants is well described in the literature^{6,8,9}. Nevertheless, Choquet et al¹⁰ reported that radiographic interpretation is difficult to perform accurately, especially for dental implants. To solve this problem, Dong-Won et al¹¹ created a new method using standardised periapical radiographs by using a radiopaque material to measure the length of the interdental papilla and compare it to the transperiodontal bone probing. The results from this study showed that these methods were significantly correlated.

Although bone probing is an invasive method because the local anaesthetic can cause some discomfort and pain to the patient, this method was used in the present study because of its simplicity and validity^{6,12}.

The findings of the present study are challenging to dentists, as they can clarify the process involved in predicting an adverse event after periodontal therapeutic procedures. When evaluating risk, the distance from the contact point to the most coronal portion of the bone crest could help in the process of decision-making. Additionally, information about the possibility of losing the interdental papilla during the periodontal disease process could be included in the

information given to patients about the possible aesthetic, phonetic and hypersensitivity problems that could arise from destructive periodontal disease.

Conclusions

Within the limits of this study, the distance of the base of the contact point to the coronal portion of the bone crest measured by probing is highly associated with the degree of the vertical loss of the interdental papilla.

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