

Correlation Of Papilla To Crestal Bone Levels Around Single Tooth Implants In Anterior Maxilla – A Retrospective Study

Dr. Somya Maheshwari

Dr. Girish Bhutada

Dr. Vaishakhi Baisane

Dr. Geetika Soni

Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital,
Nagpur

Abstract:

Aim: The aim of this study is to determine whether the distance from the base of the contact point to the crest of the bone would correlate with the presence or absence of interproximal papillae adjacent to single-tooth implants.

Method: 20 patients who had been wearing a single-tooth restoration on osseointegrated dental implants qualified for participation in the study. The evaluation of papillae was made through a clinical and photographic examination. Intraoral radiographs were taken using the longcone paralleling and standardized method.

Results: There were significant ($P < .05$) relationships between the vertical distance from contact point to bone levels. When the distance from the base of the contact point to the crest of bone was 3, 4, or 5 mm the papilla was present almost 100% of the time, but when the distance was 7, 8, 9, or 10 mm the papilla was missing most of the time.

Conclusion: The papilla level around single-tooth implant restorations is mostly related to the bone level adjacent to the teeth and more specifically to the bone crest. As the distance from the contact point to the implant increased, there was a significant chance of loss of papilla.

Keywords: Crestal Bone, Contact Point, Dental Papilla, Dental Implants, Single Tooth.

I. INTRODUCTION

The presence of the dental papilla is critical to achieve an esthetic single tooth dental implant restoration. The loss of the papilla can lead to cosmetic deformities, phonetic problems, and lateral food impaction. If the papilla reforms after surgical treatment, there will be increased pocket depth which could create difficulties with oral hygiene.

The increased esthetic and functional demand aims to establish a soft tissue contour with an intact papilla and a gingival outline that is harmonious with the gingival silhouette of the adjacent healthy dentition. Implants in the anterior esthetic zone are most difficult to perform. Demands for optimal esthetic outcome make implant treatment in the maxillary anterior region a challenge. An implant that is

osseointegrated does not always translate into esthetic success. A major concern from the esthetic point of view is the peri-implant soft tissue recession occurring facially and interproximally.

The achievement of acceptable esthetic adjacent to the implant restoration is one of the most challenging outcomes, mainly because of the difficulty of re-creating the interproximal papilla that was lost after extraction and implant surgery.

In natural teeth, the height of the interdental papilla was influenced by the location of the contact point of the tooth and the level of the proximal bone crest (Tarnow et al. 1992). For single-tooth implants, a similar finding was observed (Choquet et al. 2001; Ryser et al. 2005; Palmer et al. 2007; Lops et al. 2008). In 2001, Choquet et al published a

retrospective study evaluating radiographic crestal bone height as it relates to papilla height. The study suggested that the contact point height relative to the crestal bone level, between the implant restoration and the adjacent tooth, correlated to crestal bone height. A distance greater than 5 mm was suggested to be the point at which the papilla no longer predictably filled the interdental space. The purpose of this study is to determine whether the distance from the base of the contact point to the crest of the bone would correlate with the presence or absence of interproximal papillae adjacent to single-tooth implants.

II. MATERIALS AND METHOD

Patients treated with single implants from the Department of Periodontology at Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital were recalled. 20 patients who had been wearing a single-tooth restoration on osseointegrated dental implants qualified for participation in the study. Clinical evaluations were done at 3 buccal sites and 3 palatal sites: 1) probing depth, performed using a periodontal probe with standardized markings, 2) presence/ absence of mucosa. These parameters were used as evaluation criteria

III. EVALUATION METHODS

The evaluation of papillae was made through a clinical examination. The presence or absence of the interproximal papilla was determined visually prior to probing. The gingival papilla was classified according to the index proposed by Jemt in 1997.

- ✓ score 0, no papilla is present
- ✓ score 1, less than half of the papilla is present
- ✓ score 2, at least half of the papilla is present, but not all the way up to the contact point between the teeth
- ✓ score 3, the papilla fills up the entire proximal space and is in good harmony with the adjacent papillae
- ✓ score 4, the papilla is hyperplastic and covers too much of the single-implant restoration and/or the adjacent tooth.

When score 3 was observed, the distance between the gingival papilla and the contact point as well as the distance between the bone crest and the contact point were considered coincident.

IV. RADIOGRAPHIC ANALYSIS

After clinical evaluation, patients underwent radiographic examination to collect data for quantitative analysis of the distances. Before the radiographic exam, about 1-mm-diameter flowable composite was placed in the region corresponding to the interdental contact point (Fig 1). This was done to precisely locate the interdental contact point at the moment of the radiographic analysis.

Retroalveolar radiographs were taken using the longcone paralleling technique. The radiographic images were made on superimposed grids with millimeter calibration, allowing the measurements obtained to provide accurate results (Fig 2).

The images obtained showed the regular anatomical structures of each studied area, teeth and bone tissue, the osseointegrated implants in the restored areas, and the lines obtained from the millimetric screen. Therefore, more precise radiographic analysis was performed.

The following data were obtained: distance from the most cervical region of the bone crest to the interdental contact point, which was represented on the radiograph by the composite and distance from the root wall to the most proximal region of the implant or the prosthetic component located on that implant, used for patients with single-tooth implant restorations (Fig 3).



Figure 1: Composite in the region corresponding to the interdental contact point

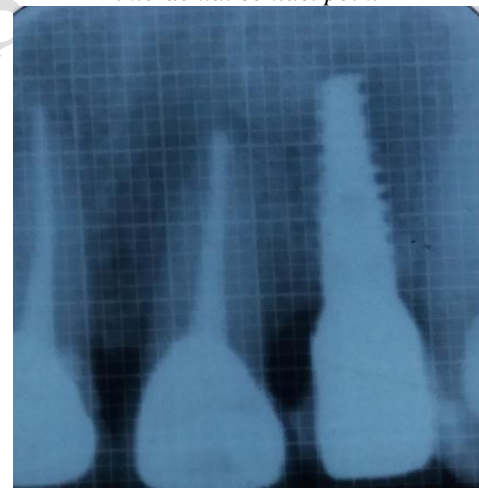


Figure 2: Radiographic image showing the regular anatomical structures of each studied area and the lines obtained from the millimetric screen

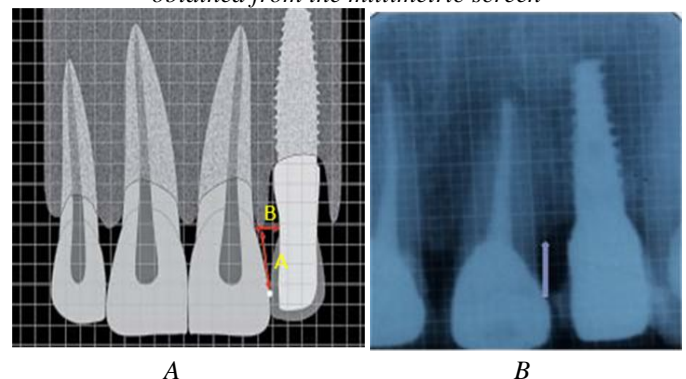


Figure 3: A = distance from the most cervical region of the bone crest to the interdental contact point; B = distance from

the root wall to the most proximal region of the implant or the prosthetic component located on the implant

V. RESULTS

Since use of the index proposed by Jemt depended on the position of the contact point between the tooth and crown over the implants, the distance between the gingival papilla and the bone crest was also measured in this study.

While analyzing the data of the soft tissue height in relation to the distance between the bone crest and contact point (Table 1), the overall results, without disclosing the surgical technique, show a soft tissue height of 4.6 mm for the papilla. (Table 2) the papilla level in relation to the interproximal bone crest to the contact point. The results demonstrated that the majority of areas examined were between 5 to 7 mm in distance between the contact point to the bone crest. When the distance from the base of the contact point to the bone crest was 3 to 4 mm, the papilla was fully present or almost fully present (Jemt Index 2 and 3); between 5 to 6 mm, a clear shift seemed to occur with missing papillae (Jemt Index 0 and 1) 50% of the time.

Soft Tissue Height in Relation to Distance Between Bone Crest and Contact Point (mm _ SD)

Presence/absence of papilla around single-tooth implant in relation to distance (mm) from contact point to bone crest

	Overall (20)
Soft Tissue Height	4.6 ± 0.82
Distance Contact Point to Bone Crest	5.85 ± 1.31

Table 1

	>3	3	4	5	6	7	8
N	0	1	3	5	4	7	0
% Present	0	100	100	60(3)	50(3)	57(4)	0
% Absent	0	0	0	40(2)	50(3)	43(3)	0
Jemt index score							
0	0	0	0	0	0	0	1(5)
1	0	0	0	0	0	0	0
2	0	0	1(5)	1(5)	3(15)	6(30)	0
3	0	1(5)	1(5)	4(20)	1(5)	1(5)	0
4	0	0	0	0	0	0	0

Table 2

VI. DISCUSSION

Peri-implant soft tissue recession is a major esthetic complication, especially in the anterior maxilla since the absence of this structure could lead to devastating esthetic results. As the distance from the contact point to the bone crest increased, the papilla fill was less. Complete papilla fill has been observed when the distance from the contact point to the bone crest was < 5mm.

The index described by Jemt has been utilized in the present study for a more descriptive and scientific evaluation of the presence or absence of papillae. The present study

showed that the soft tissue level around anterior single-tooth implants was influenced by multiple factors like the gingival papilla height and the distance from the contact point to the crest of the bone.

Several studies showed that the interimplant and inter implant-tooth distance was an important factor that influenced the presence or absence of interproximal papilla (Tarnow et al. 2000; Lops et al. 2008; Romeo et al. 2008). The importance of this horizontal distance was first suggested by Tarnow et al. (2000). They found that the average crestal bone loss between two adjacent implants placed 43mm apart was 0.45mm, whereas the crestal loss for two adjacent implants placed 3mm apart was 1.04mm. Therefore, it was concluded that reduced crestal bone height may affect inter-implant papilla fill and a minimum distance of 3mm was recommended to retain crestal bone height. Studies of single-tooth implants showed that the interproximal papilla was significantly present when the implant-tooth distance was 3-4mm (Lops et al. 2008; Romeo et al. 2008). Therefore, they recommended interproximal space dimensions of 3-4mm between an implant and the adjacent tooth. Our study and others, however, did not observe the effect of inter implant-tooth distance on the papilla level.

As observed by Tarnow et al. in a study on teeth, this study demonstrates a shift in the presence or absence of papilla when the distance between the contact point to the interdental crest of bone is between 5 to 6 mm on a single-tooth implant. At 6 mm and above, some papilla is still observed (even at 9 mm or more) on teeth as well as single-tooth implants, but with no predictability.

From the present investigation, we established that the papilla level around single-tooth implant restorations is mostly related to the bone level adjacent to the teeth and more specifically to the bone crest. The regeneration of papillae after single implant treatment is successful with a distance of 5 mm between the contact point to the bony crest. Above 5 mm, the occurrence of papilla regeneration is at least 50%.

VII. CONCLUSIONS

Within the limitations of this study, it was concluded that gingival papilla height in areas of natural dentition was higher than that in areas restored with single implants when measured at the moment of definitive prosthesis cementation.

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