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The Effect of the Distance From the Contact Point to the Crest of Bone on the Presence or Absence of the Interproximal Dental Papilla

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The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental papilla.

J Periodontol. 1992 Dec;63(12):995-6.

Tarnow DP, Magner AW, Fletcher P.

Abstract

This study was designed to determine whether the distance from the base of the contact area to the crest of bone could be correlated with the presence or absence of the interproximal papilla in humans. A total of 288 sites in 30 patients were examined. If a space was visible apical to the contact point, then the papilla was deemed missing; if tissue filled the embrasure space, the papilla was considered to be present. The results showed that when the measurement from the contact point to the crest of bone was 5 mm or less, the papilla was present almost 100% of the time. When the distance was 6 mm, the papilla was present 56% of the time, and when the distance was 7 mm or more, the papilla was present 27% of the time or less.

The effect of inter-implant distance on the height of inter-implant bone crest.

J Periodontol. 2000 Apr;71(4):546-9.

Tarnow DP, Cho SC, Wallace SS.

Abstract

BACKGROUND:

The biologic width around implants has been well documented in the literature. Once an implant is uncovered, vertical bone loss of 1.5 to 2 mm is evidenced apical to the newly established implant-abutment interface. The purpose of this study was to evaluate the lateral dimension of the bone loss at the implant-abutment interface and to determine if this lateral dimension has an effect on the height of the crest of bone between adjacent implants separated by different distances.

METHODS:

Radiographic measurements were taken in 36 patients who had 2 adjacent implants present. Lateral bone loss was measured from the crest of bone to the implant surface. In addition, the crestal bone loss was also measured from a line drawn between the tops of the adjacent implants. The data were divided into 2 groups, based on the inter-implant distance at the implant shoulder.

RESULTS:

The results demonstrated that the lateral bone loss was 1.34 mm from the mesial implant shoulder and 1.40 mm from the distal implant shoulder between the adjacent implants. In addition, the crestal bone loss for implants with a greater than 3 mm distance between them was 0.45 mm, while the implants that had a distance of 3 mm or less between them had a crestal bone loss of 1.04 mm.

CONCLUSIONS:

This study demonstrates that there is a lateral component to the bone loss around implants in addition to the more commonly discussed vertical component. The clinical significance of this phenomenon is that the increased crestal bone loss would result in an increase in the distance between the base of the contact point of the adjacent crowns and the crest of bone. This could determine whether the papilla was present or absent between 2 implants as has previously been reported between 2 teeth. Selective utilization of implants with a smaller diameter at the implant-abutment interface may be beneficial when multiple implants are to be placed in the esthetic zone so that a minimum of 3 mm of bone can be retained between them at the implant-abutment level.

Vertical distance from the crest of bone to the height of the interproximal papilla between adjacent implants.

Tarnow D, Elian N, Fletcher P, Froum S, Magner A, Cho SC, Salama M, Salama H, Garber DA.

J Periodontol. 2003 Dec;74(12):1785-8.

Abstract

BACKGROUND:

As patient demand increases for more natural restorations in the esthetic zone, clinicians must have the highest level of skill and knowledge to maintain or reform the interdental papilla between teeth, between implants and teeth, and between adjacent implants. To date, there are no reports that have measured the distance from the contact point to the bony crest between implants. One reason for this may be the fact that, with two adjacent implants, the contact point of the crown can be established at any distance from the gingival margin according to the restorative dentist's specifications. Therefore, in this study, the height of the soft tissue to the crest of bone was measured between two adjacent implants independent of the location of the contact point. The purpose of this study was to determine the range and average height of tissue between two adjacent implants.

METHODS:

A total of 136 interimplant papillary heights were examined in 33 patients by eight different examiners in five private dental offices. After administration of appropriate local anesthesia, a standardized periodontal probe was placed vertically from the height of the papilla to the crest of bone. The measurements were rounded off to the nearest millimeter.

RESULTS:

The mean height of papillary tissue between two adjacent implants was 3.4 mm, with a range of 1 mm to 7 mm.

CONCLUSIONS:

Clinicians should proceed with great caution when placing two implants adjacent to each other in the esthetic zone. In most cases, only 2, 3, or 4 mm of soft tissue height (average 3.4 mm) can be expected to form over the interimplant crest of bone. These results showed that modification of treatment plans may be necessary when esthetics are critical for success.

Critical horizontal dimensions of interproximal and buccal bone around implants for optimal aesthetic outcomes: a systematic review.

Teughels W, Merheb J, Quirynen M.

Clin Oral Implants Res. 2009 Sep;20 Suppl 4:134-45.

Abstract

OBJECTIVE:

This systematic review was initiated to explore the critical horizontal interproximal and buccal bone dimensions around implants for an optimal aesthetic outcome.

MATERIALS AND METHODS:

Pubmed, the Cochrane and the ISI web of Science databases were searched to identify eligible human studies that reflect on the aesthetic outcome of implants in relation to the thickness of the buccal bone after osteotomy preparation, and in relation to the tooth-to-implant or interimplant distance. Vertical bone dimensions were not considered.

RESULTS AND DISCUSSION:

Articles relating horizontal buccal bone dimensions to aesthetic outcome could not be retrieved. The relation between horizontal buccal bone dimensions and vertical bone resorption could also not be confirmed. In relation to horizontal interproximal bone dimensions, some uniformity was detected among the limited number of articles.

CONCLUSIONS:

Interproximally, a 3 mm interelement distance seems to result more frequently in an adequate papillary fill. In the bucco-oral direction, there is insufficient evidence to set a threshold for minimal buccal bone thickness to ensure an optimal aesthetic outcome. Many additional factors appear to be of importance and interact with each other.

Evaluation of the Effects of Buccal-Palatal Bone Width on the Incidence and Height of the Interproximal Papilla Between Adjacent Implants in Esthetic Areas.

J Periodontol. 2012 Mar 16. [Epub ahead of print]

Siqueira S Jr, Pimentel SP, Vasconcelos RA, Sendyk W, Cury PR.

Abstract

Background: The presence of interproximal papilla depends on the distance between the contact point to the bone crest, as well as the mesio-distal distance between implants, or between implants and teeth. The aim of this study was to evaluate the effects of buccal-palatal bone width on the presence of the interproximal papilla between adjacent implants in esthetic areas of the mouth. **Methods:** The presence or absence of the gingival papilla, distance from the base of the interproximal contact to the tip of the gingival papilla (black space), distance from the base of the interproximal contact to the alveolar crest (vertical distance), alveolar bone width (bone width) between adjacent implants as well as the spacing between the implants (horizontal distance), and soft tissue biotype were assessed in 29 interimplant areas in the upper incisor, canine, and premolar regions of 18 patients. **Results:** The papilla was always present when and vertical distance was ≤ 5 mm ($P \leq 0.04$), frequently present when the horizontal distance was ≥ 4 mm ($P = 0.04$). The black space was smaller when the vertical distance was ≤ 5 mm ($P \leq 0.04$) and when the horizontal distance was ≥ 4 mm ($P = 0.76$). Bone width and soft tissue biotype did not influence the incidence of gingival papilla ($P \geq 0.41$) and black space ($P \geq 0.15$). **Conclusion:** Within the limits of this study, it can be concluded that bone width and tissue biotype do not have an effect on the incidence and height of papilla between adjacent implants in esthetic areas of the mouth, and the incidence was greater when vertical distance was ≤ 5 mm, or when horizontal distance was ≥ 4 mm.

Effect of Interimplant distance (2 and 3 mm) on the height of interimplant bone crest: a histomorphometric evaluation.

Elian N, Bloom M, Dard M, Cho SC, Trushkowsky RD, Tarnow D.

J Periodontol. 2011 Dec;82(12):1749-56. Epub 2011 Mar 29.

Abstract

BACKGROUND:

Implants restored according to a platform-switching concept (implant abutment interface with a reduced diameter relative to the implant platform diameter) present less crestal bone loss than implants restored with a standard protocol. When implants are placed adjacent to one another, this bone loss may combine through overlapping, thereby causing loss of the interproximal height of bone and papilla. The present study compares the effects of two interimplant distances (2 and 3 mm) on bone maintenance when bone-level implants with platform-switching are used.

METHODS:

This study evaluates marginal bone level preservation and soft tissue quality around a bone-level implant after 2 months of healing in minipig mandibles. The primary objective is to evaluate histologically and histomorphometrically the affect that an implant design with a horizontally displaced implant-abutment junction has on the height of the crest of bone, between adjacent implants separated by two different distances.

RESULTS:

Results show that the interproximal bone loss measured from the edge of the implant platform to the bone crest was not different for interimplant distances of 2 or 3 mm. The horizontal position of the bone relative to the microgap on platform level (horizontal component of crestal bone loss) was 0.31 ± 0.3 mm for the 2-mm interimplant distance and 0.57 ± 0.51 mm above the platform 8 weeks after implantation for the 3-mm interimplant distance.

CONCLUSIONS:

This study shows that interimplant bone levels can be maintained at similar levels for 2- and 3-mm distances. The horizontally displaced implant-abutment junction provided for a more coronal position of the first point of bone-implant contact. The study reveals a smaller horizontal component at the crest of bone than has been reported for non-horizontally displaced implant-abutment junctions.

The relationship between interimplant distances and vascularization of the interimplant bone.

Traini T, Novaes AB, Piattelli A, Papalexiou V, Muglia VA.

Clin Oral Implants Res. 2010 Aug;21(8):822-9.

Abstract

BACKGROUND:

Long-term success of the implant restorations is based upon the biology and vasculature of the bone surrounding the implants, especially for the bone between two implants.

PURPOSE:

The aim of this study was to evaluate how loaded implants placed 2 or 3 mm apart influence bone vessel organization.

MATERIAL AND METHODS:

Six mongrel dogs were used for the study. The four mandibular premolars were extracted and 3 months later, four 4.5 x 10 mm implants were placed on each side of the mandible. The implants were placed so that two adjacent implants were 2 mm (group 1) or 3 mm (group 2) distant from each other. After 12 weeks, the implants were loaded with provisional prostheses, then metallic crowns were placed 4 weeks later. Both temporary and metallic restorations were made so that the distance between the contact point and the bone crest was 5 mm. The animals were sacrificed after 8 weeks. The hemi-mandibles were removed

and prepared for analysis. The interimplant bone vasculature of the two groups was studied using scanning electron microscopic images fractal analysis. The fractal dimension (D(f)) was calculated using the box-counting method.

RESULTS:

The values of the D(f) for the blood vessels were significantly higher ($P < .05$) in the specimens of the group 2 (1.969 \pm 0.169) than the group 1 (1.556 \pm 0.246).

CONCLUSION:

The presence of more blood vessels in the group 2 is another indication that 3 mm is a preferable distance for contiguous implants than the 2 mm distance.

Factors and techniques influencing peri-implant papillae.

Chow YC, Wang HL.

Implant Dent. 2010 Jun;19(3):208-19.

Abstract

AIM:

Loss of implant papilla is one of the more troubling dilemmas in implant dentistry. The "black triangle" around the implant-supported restoration causes not only phonetic difficulties and food impaction but also unpleasant esthetics. This is considered to be a failure in today's implant therapy standards. As a consequence, many techniques have been developed to either preserve or regenerate the interimplant soft tissue. It is the purpose of this article to examine factors that may affect the appearance of the peri-implant papilla.

MATERIALS:

MEDLINE search was used to identify articles published through September 2007 related to implant esthetics as interimplant papillae.

RESULTS:

Factors such as crestal bone height, interproximal distance, tooth form/shape, gingival thickness, and keratinized gingival width have all been identified to influence the appearance of the interimplant papillae. In addition, many techniques/materials have been successfully used in promoting interimplant papillae formation.

CONCLUSION:

This article presents a comprehensive review of factors that may influence the interimplant papillae and illustrates techniques used in attempting to recreate/correct this challenging problem in implant dentistry.

Interproximal tissue dimensions in relation to adjacent implants in the anterior maxilla: clinical observations and patient aesthetic evaluation.

Kourkouta S, Dedi KD, Paquette DW, Mol A.

Clin Oral Implants Res. 2009 Dec;20(12):1375-85. Epub 2009 Aug 4.

Abstract

OBJECTIVES:

This clinical study aimed to assess (i) interproximal tissue dimensions between adjacent implants in the anterior maxilla, (ii) factors that may influence interimplant papilla dimensions, and (iii) patient aesthetic satisfaction.

MATERIAL AND METHODS:

Fifteen adults, who had two or more adjacent implants (total of 35) in the anterior maxilla, participated in the study. The study design involved data collection from treatment records, clinical and radiographic assessment, and a questionnaire evaluating aesthetic satisfaction.

RESULTS:

The median vertical dimension of interimplant papillae, i.e., distance from tip of the papilla to the bone crest, was 4.2 mm. Missing papilla height (PH) at interimplant sites was on average 1.8 mm. Median proximal biologic width at interimplant sites was 7 mm. The most coronal bone-to-implant contact at implant-implant sites was located on average 4.6 mm apical to the bone crest at comparable neighbouring implant-tooth sites. The tip of the papilla between adjacent implants was placed on average 2 mm more apically compared with implant-tooth sites. The contact point between adjacent implant restorations extended more apically by 1 mm on average compared with implant-tooth sites. Median missing PH was 1 mm when an immediate provisionalization protocol had been followed, whereas in the case of a removable temporary it was 2 mm. Split group analysis showed that for missing $PH \leq 1$ mm, the median horizontal distance between implants at shoulder level was 3 mm. Patient satisfaction with the appearance of interimplant papillae was on average 87.5%, despite a Papilla Index of 2 in most cases.

CONCLUSIONS:

The apico-coronal proximal biologic width position and dimension appear to determine papilla tip location between adjacent implants. There was a significant association between the provisionalization protocol and missing PH, which was also influenced by the horizontal distance between implants. Patient aesthetic satisfaction was high, despite a less than optimal papilla fill.