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SHORT COMMUNICATION

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Evaluation of biological width around implants inserted in native alveolar crest bone

ABSTRACT

Aim Biological width represents the distance necessary for a healthy existence of bone and soft tissue around teeth and/or implants. The mean value is about 3 mm and if it is compromised there is a greater probability of resorption of interproximal alveolar crest.

Materials and methods A retrospective study was performed on a series of 234 Spiral family Implants (SFIs) in order to detect the minimal biological width between implants or between tooth and fixture that does not determine a crestal bone resorption. The series was split in two groups: distances ≤1.8 mm and ≥ 1.9 mm. Lost implants and crestal bone resorption around implant neck were considered as survival and success outcome and several clinical variables were matched against them by using Kaplan-Meyer and chi-square tests.

Results No statistical significant difference was demonstrated between the two groups (i.e. ≤1.8 mm and ≥1.9 mm), but a clear trend over time was detected with a greater crestal bone resorption for distances ≤1.8 mm.

Conclusion The data confirm the importance of a correct IID and add new information as regard fixtures with reverse conical neck which permits the use of a reduced IID.

Keywords Kaplan-Meyer algorythm, Cox regression analysis, dental implant.

INTRODUCTION

Osseointegration is essential for the anchorage's implant and therefore the achievement of a supracrestal soft tissue seal is considered important for the protection of osseointegration ans success of treatment (1).

Despite the high success rates reported on osseointegrated implants, achieving optimal peri-implant mucosa dimension is a challenging procedure and maintaining it over time can be an equally demanding task (2). Hermann et al. (3) have emphasized that gingival aesthetics strongly depends on a stable and constant vertical dimension of healthy periodontal soft tissues, commonly referred to as "biologic width". The concept of a defined biological width of the supracrestal soft tissue has been supported by clinical data from studies evaluating soft tissue dimensions at implant-supported single-tooth replacements (4), showing that when the distance between the tooth and the implant was 3, 3.5 or 4 mm the papilla was present most of the time.

Preservation of interdental papillae is

essential for an aesthetic single tooth restoration and the characterization of the components that affect biological width is of great importance. Thus, a retrospective study was performed on a series of 234 SFIs to analyze the critical biological width, as regards the distance between implants or between tooth and fixture, to minimize the amount of crestal bone resorption.

MATERIALS AND METHODS

In the period between May 2004 and November 2007, 86 patients (55 females and 31 males) with a mean age of 53 years were operated and received a total of 234 spiral family implants (SFIs, 3D Alpha Bio, Pescara, Italy) were inserted. The last check-up was performed in October 2008, with a mean follow-up of 13 months.
Implant diameter was 3.75, 4.2, 5 and 6 mm in 24 (10.7%), 112 (49.9%), 65 (27.8%) and 33 (11.6%) SFIs respectively. Implant length was less than 13 mm, 13 mm and 16 mm in 94 (40.2%), 76 (32.5%) and 64 (27.3%) SFIs respectively. Implants were inserted to replace 50 incisors (21.4%), 26 cuspids (11.1%), 91 premolars (38.9%) and 67 molars (28.6%). One hundred and one fixtures were inserted in post-extractive sockets and the remaining 133 in healed bone; 129 (55.1%) were immediately loaded.
Disease-specific survival curves were calculated according to the product-limit method (Kaplan-Meier algorithm) as well as chi-square test after splitting the group in two: distances ≤ 1.8 mm and ≥ 1.9 mm.
Additional data regarding patients, data collections, implants, surgical and prosthetic technique and statistical analysis are available in a previous published report (5).

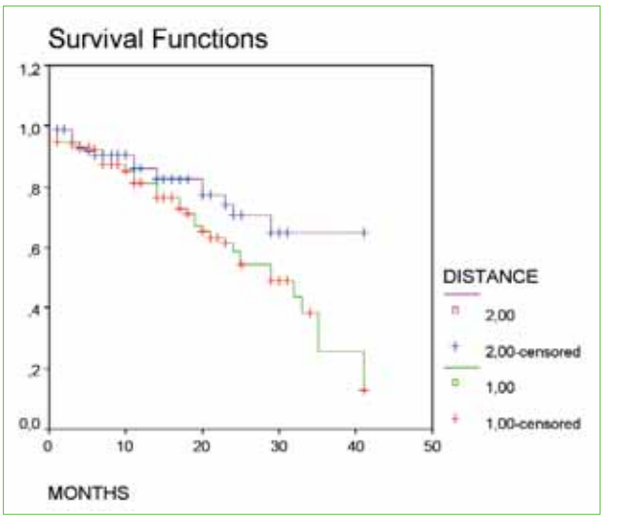

Fig. 1 The X axis reports the observation period in months, the Y axis reports the clinical success in terms of crestal bone resorption; the upper line is referred to implants inserted at a distance of ≤ 1.9 mm.

RESULTS

Nine implants were lost (5 in the post-operative period, i.e. within 1 month) in 9 different patients.
In univariate analysis, the distance between implants or between tooth and fixture did not reach a significant value (Kaplan Meier algorithm, Log rank = 3.00 df =1 p = .0833) although a clear trend is showed in figure 1.
Also the chi-square test did not demonstrated a statistical significance (observed ≤1.8 mm = 122, observed ≥1.9 mm = 103, expected = 112.5, df = 1, chi-square = 1.604).
In group 1 the mean distance was 1.5 mm (122 cases) whereas in group 2 was 2.0 mm (103 cases) (Fig. 2, 3).

DISCUSSION

The object of modern implantology is supplying excellent aesthetics and health

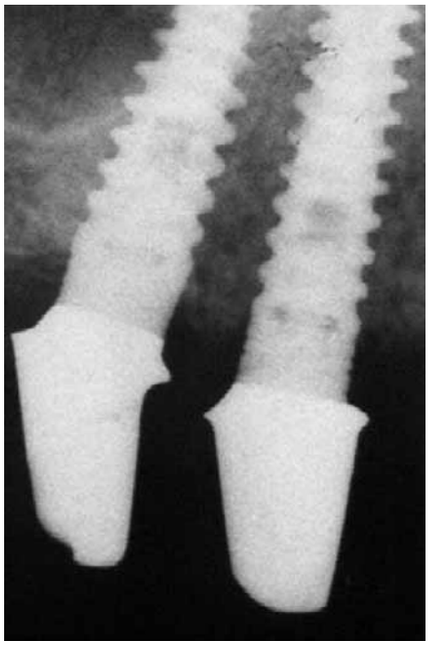

Fig. 2 The figure shows implant inserted with a reduced inter-implant distance: note the bone resorption between fixtures.

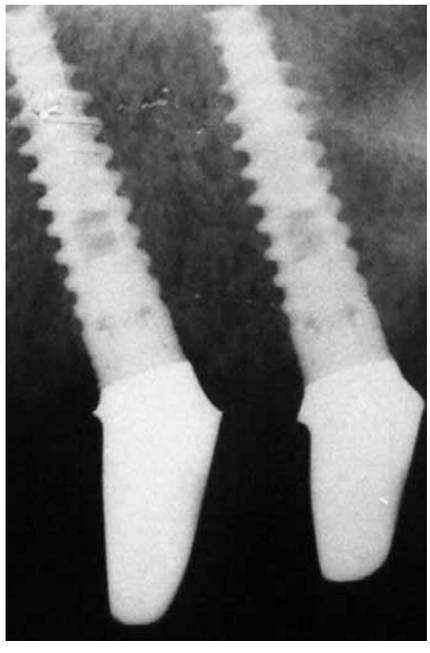

Fig. 3 The photo shows implant inserted with a wide inter-implant distance: here is no bone resorption between fixtures.

of soft peri-implant tissues with minimum or no resorption of the bone crest. Hence, because the bone crest constitutes the basis for the soft tissue seal, alterations in the peri-implant bone level will affect the position of the soft tissue margin (1).

Tarnow (6) showed that inter-implant distance plays a very important role in influencing bone resorption. The critical distance is identified in 3 mm, behind which there is bone loss > 1.5 mm that can cause the absence of inter-implant papilla. Specifically, Tarnow et al. evaluated the effect of inter-implant distance (IID) on the height of inter-implant bone crest. The purpose of the 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. They demonstrated 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 basis of the contact point of the adjacent crowns and the crest of bone. Selective use of implants with a smaller diameter at the implant-abutment interface may be beneficial when multiple implants are to be placed in the aesthetic zone, so that a minimum of 3 mm of bone can be retained between them at the implant-abutment level. Our reported data confirm this result as our series is mainly composed of SFB, a spiral family implants characterized by a reverse conical neck. In fact two groups were detected: one with an average distance of 1.5 mm and one with an average distance on 2.0 mm, that is smaller than those reported by Tarnow et al.

In 2008 Degidi et al. analyzed the outcome

of immediately loaded implants in the aesthetic area to verify the clinical relevance of different IID (7). They demonstrated that implants with an IID >2 mm seemed to lose less bone laterally. When the IID was <2 mm, vertical crestal bone loss was significantly greater than in the group with IID >4 mm. The result is comparable to that previously reported by Tarnow.

Recently, Rodríguez-Ciurana et al. focused on the effect of IID on the height of the interimplant bone crest when using platform-switched implants and demonstrated that this system determine a mean bone height preservation (8).

In the present study a series of 234 SFIs with only 9 implants lost was considered. By analyzing the remaining 223 cases no statistical differences was detected between distance ≤1.8 mm and ≥1.9 mm either altogether, or by considering the distance between implants or between tooth and implant. However, a clear trend over time is showed in Fig. 1 with greater crestal resorption for distances ≤1.8 mm. These data confirm the importance of a correct IID and add new information as regard fixtures with reverse conical neck which permit the use of a reduced IID.

ACKNOWLEDGMENTS

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