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Reduced Diameter Implants - A Long Term Follow-Up

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Abstract: ***The success rate of 327 Straumann Bone Level implants with diameter of 3,3 mm was observed for a period of one to six years. At the control visit the following were registered: absence or presence of exudation, bleeding on probing and marginal bone resorption visible on radiography, and survival rate.The survival rate of the implants with reduced diameter was 98,2%. Bleeding on probing was registered in 18,7% of the cases.The mean marginal bone resorption was 0,137 in the cases without registered bleeding on probing, and 0,705 in the cases where bleeding on probing was observed.***

Keywords: reduced diameter implants, narrow implants

1. Introduction

The aim of this study was to evaluate reduced diameter implants as a reliable alternative to conventional diameter implants in combination with bone augmentation procedures in cases with horizontal bone loss. The observed criteria were: marginal bone loss, bleeding on probing and survival rate.

2. Literature Survey

As "narrow" are defined implants with diameter less than 3,5mm (1). In a systematic literature review Klein et al. (2) distributed implants in three categories: Category 1- mini implants (diameter less than 3 mm); Category 2 - implants with a diameter of 3 to 3.25 – used to replace single teeth in the anterior areas; Category 3 – implants with diameter 3.3 to 3.5mm – with wider indications. For Class 1 authors reported survival rate of 90.9% to 100% and mean bone loss of 0.98 mm, for Class 2 – survival rate from 93.8% to 100% and mean bone loss of 0.78 mm and for Class 3 - survival rate from 88.9% to 100% and mean bone loss of 0.31 mm.

A number of authors reported their results of placing reduced diameter implants (3.0-3.4mm incl.), which were loaded with non-removable prosthetics: 100% survival rate for a period of 3 years (3); 99.4% for a period of 3 years (4); 96.7% for 1 year (5); 98.1% in upper jaw and 96.9% in the mandible for a period of seven years (6); 100% in the anterior area of the upper jaw for 24-39 months (7); 96% for a period of 5 years (8); 93,8% for a period of 8 years (9); 99.4% for period of 1 year (10).

In a systematic literature review Lee *et al*. (11) reported high reliability of implants with reduced diameter when used as abutments for single restorations in narrow interdental spaces. The authors reported that most often these implants are used for restoration of upper and lower laterals.

Quirynen *et al*. (12) performed a comparative study on the success rate, survival rate and the marginal bone loss of implants with reduced diameter made of titanium and of titan-zirconium alloy. The authors didn't report significant differences in the monitored parameters. The mean bone loss for a period of 36 months was 0,6-0,78 mm. Similar results were reported by Benic *et al*. (13).

3. Material and Methods

The success rate of implants with reduced diameter was observed for a period of one to six years. This study included 327 Straumann Bone Level implants with a diameter of 3,3 mm. The distribution of the implants according to the areas, where they were placed is shown in fig. 1. Bone Level Implants from Straumann Dental Implant System (Institut Straumann AG, Basel, Switzerland) were used.

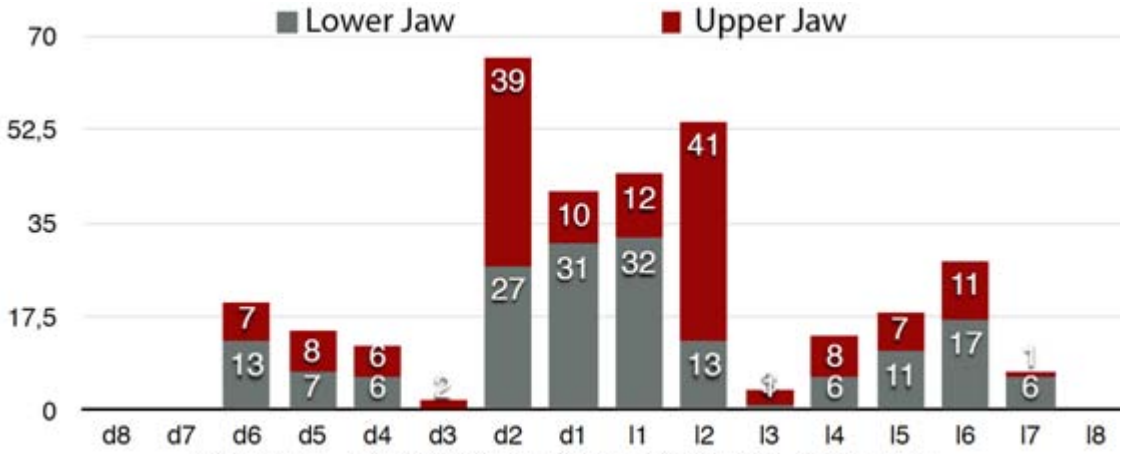

Figure 1. Distribution of the implants by regio

After elevation of the muco-periosteal flap using one horizontal incision along the alveolar ridge and one or two paramedian vertical incisions, the osteotomy for the implant placement was performed observing the following clinical protocol:

1) The position of the osteotomy was marked with a 1.4 mm round bur
2) The mark was expanded with a 2.3 mm round bur
3) Pilot osteotomy was done with a 2.2 mm pilot drill to the appropriate depth at a maximum speed of 800 rpm
4) The osteotomy was enlarged to the desired diameter with a final twist drill - 2.8 mm.
5) The orifice of the osteotomy was enlarged with a profile drill with a corresponding diameter of 3.3 mm implant.
6) A tap was used to prepare a thread in the compact bone.

The osteotomy was performed with continuous cooling with sterile saline solution. The procedures on all patients was carried out under local anesthesia, using a 4% articaine solution with adrenaline 1/100 000 (Septanest - Septodont, France).

The flap was repositioned and sutured using a 5/0 monofilament polyamide thread (Dafilon, B.Braun-Melsungen, Germany) with single interrupted sutures.

A second-stage surgery was performed after the third month after the implant placement.

The dumping capacity was measured before the implants were functionally loaded. Implants with PTV 0 and less were considered successful. In the control visit the following were registered: absence or presence of exudation, BOP (bleeding on probing) and marginal bone resorption visible on radiography, and survival rate. Probing was performed with a periodontal probe UNC-15.

4. Results

The patients were monitored for 5 to 6 years, and the mean observation period was 5,54 years. The mean age of the patients was 35, 65 years. The survival rate of the implants was 98,2%. Bleeding on probing was registered in 18,7% of the cases. A correlation was established between bleeding on probing and marginal bone loss. The mean marginal bone resorption was 0,137 in the cases without registered bleeding on probing and 0,705 in the cases where bleeding on probing was observed.

5. Discussion

Implants with reduced diameter, according to our methodology, demonstrated 98,2% survival rate. The results are similar to those which Tarpelle *et al.* (4) report. However, the survival rate was lower, compared to the survival rate of implants with reduced length, according to our study, but the mean marginal bone resorption was similar for both groups - 0,245 mm. All failed implants with reduced diameter were placed in the area of the lower incisors, which supports the hypothesis of a plaque-induced process, responsible for the failure of these implants. At the same time, a great number of implants were placed in the areas of the upper and the lower molars and no failures were observed. That's why we consider that implants with reduced diameter with SLA modification of the surface topography are a reliable alternative to implants with conventional diameter in combination with larger augmentation procedures in which their use has similar benefits as implants of reduced length (14).

6. Conclusion

Implants with reduced diameter are a reliable alternative to implants with conventional length in combination with larger augmentation procedures in cases with horizontal bone loss. The treatment with narrow implants is less invasive, with less peri-operative complications and consumes less time. Consequently, their use is predictable and cost-effective.

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