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Original Article

## Radiographic Evaluation Cervical Crestal Bone Resorption around Dental Implants in Maxilla and Mandible: One Year Study

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### Abstract

**Objective:** To analyze the amount of crestal bone loss in maxilla and mandible around Bredent Sky Blue implants of different dimension a year after implantation. **Material and Methods:** 36 implants diameter 3.5 x 10 mm were inserted in the maxilla and 12 in the mandible. 52 implants diameter 4.0 x 8 mm were inserted in the maxilla, and 61 in the mandible (two-stage implant surgery). The data were analysed using the IBM SPSS v.17 software package (descriptive statistics, ANOVA -test). **Results:** No statistically significant differences were found between maxilla right, maxilla left, mandible right and mandible left side at implant sites regarding distal and mesial bone losses. Statistically significant differences were found between maxilla front, maxilla posterior, mandible front and mandible posterior at implant sites regarding distal and mesial bone losses. **Conclusion:** This study showed more bone loss for anterior implants compared to the posterior ones, but there was no significant different bone loss between maxillary and mandibular implants regarding sites.

**Keywords:** Dental implants; Bone resorption; Maxilla.

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## Introduction

The process of healing around the implant is similar to that in the normal bone tissue. The studies of titanium implants have shown that the process of healing is conducted in three phases: osteophilic, osteoconductive and osteoadaptive [1,2]. Success of therapy is surgically, esthetically and functionally predictable only if we have sufficient bone and gingival tissue [3].

One of the most important criteria for evaluating implant success is determining crestal bone levels surrounding an implant [4]. The amount of crestal bone loss during the first year may affect the sulcus depth and environment for the longevity of the implant [5].

Implant surgery in the posterior regions of the upper and lower jaws is in cases with a satisfactory bone volume of the alveolar process not difficult. However, in cases of alveolar atrophy the anatomical limitations with the maxillary sinus cavity and the alveolar nerve canal the situation becomes more problematic and has to be solved by different kinds of graft techniques. However with the techniques which are available today most cases can be solved with good results [6].

Implant placement in the front region of the mandible is still the most common indications, especially when used four implants. The bone availability varies depending on the degree of atrophy. Implant placement in the posterior mandible is more often unilaterally in order to avoid a partial denture, or bilaterally after long periods of edentulous [7]. In the maxilla, conditionally favorable region for implantation is the front part of alveolar crest to the second premolar. Unfavorable region is the posterior maxilla, including the tuber maxillae [8].

When installing implants in front region of the maxilla the most attention should be paid to the aesthetics of the prosthesis [7]. Insufficient bone in vestibular-oral dimension is a common problem in treating missing front tooth with implants [3].

For implant in the posterior maxilla it should consider the maxillary sinus. In this case, accurate assessment of bone quality is the most important because the implant can be lost due to osteolysis if the compact bone is very hard [7].

## Material and Methods

This study analyzed a total of 161 implants type Bredent SKY BLUE. 36 implants diameter 3.5 x 10 mm were inserted in the maxilla and 12 in the mandible. 52 implants diameter 4.0 x 8 mm were inserted in the maxilla, and 61 in the mandible (two-stage implant surgery). Dental panoramic radiographs were made before surgery, immediately after surgery and after a year, using Ortopantomograph type Kodak 8000 c, XJAM530. Panoramic images were calibrated using CliniView (version 5.2 Instrumentarium Imaging). The measurements were performed using software Kodak dental software 6.11.7.0.

Crestal resorption was measured mesially and distally for each implant from the coronal portion of the abutment to the detectable margin of the alveolar bone, immediately after implant placement and after a year.

The data were analyzed using the SPSS v.17 software (descriptive statistics, ANOVA -test).

## Results

The study included a total of 42 male and female patients. Among male patients, 43.5% of them were smokers, while 56.5% were non-smokers. Among females, 42.1% of them were smokers and 57.9% nonsmokers. Among male patients, 78.3% were partially dentate, while 21.7% were totally edentulous. 94.7% females were partially dentate, only 5.3% were totally edentulous.

Table 1 shows the frequency of inserted implants in the front and posterior region of mandible and maxilla on the right and left side.

**Table 1. Frequency of inserted implant by region of maxilla and mandible.**

Region	Diameter of implant				Total	
	3.5 x 10 mm		4.0 x 8 mm		n	%
	n	%	n	%		
Maxilla right front	12	25.0	0	0.0	12	7.5
Maxilla left front	13	27.1	0	0.0	13	8.1
Maxilla right posterior	6	12.5	22	19.5	28	17.4
Maxilla left posterior	5	10.4	30	26.5	35	21.7
Mandible left front	4	8.3	0	0.0	4	2.5
Mandible right front	3	6.3	1	0.9	4	2.5
Mandible left posterior	4	8.3	28	24.8	32	19.9
Mandible right posterior	1	2.1	32	28.3	33	20.5
Total	48	100	113	100	161	100

No statistically significant differences were found between maxilla right, maxilla left, mandible right and mandible left side at implant sites regarding distal and mesial bone losses as shown by analysis of variance (Tables 2 and 3).

**Table 2. Alveolar bone resorption measurements for implant diameter 3.5x10 mm.**

Diameter of implant 3.5 x 10 mm		n	Mean	Std. Deviation	F	p*
Distal resorption (mm)	Maxilla right	18	0.60	0.32	0.749	0.529
	Maxilla left	18	0.62	0.28		
	Mandible right	4	0.85	0.24		
	Mandible left	8	0.68	0.40		
Mesial resorption (mm)	Maxilla right	18	0.50	0.36	2.191	0.102
	Maxilla left	18	0.59	0.29		
	Mandible right	4	0.88	0.30		
	Mandible left	8	0.77	0.36		

\*Analysis of variance (ANOVA)

Table 4 shows statistically significant differences between maxilla front, maxilla posterior, mandible front and mandible posterior. Statistically significant differences were found between maxilla front, maxilla posterior, mandible front and mandible posterior at implant sites regarding

distal and mesial bone losses. The highest mean of bone resorption was measured in mandible front distally ( $M = 0.91$ ), and the mandible front mesially ( $M = 0.96$ ).

**Table 3. Alveolar bone resorption measurements for implant diameter 4.0 x 8 mm.**

Diameter of implant 4.0 x 8 mm		n	Mean	Std. Deviation	F	p*
Distal resorption (mm)	Maxilla right	22	0.52	0.41	0.485	0.693
	Maxilla left	30	0.60	0.44		
	Mandible right	33	0.49	0.40		
	Mandible left	28	0.50	0.36		
Mesial resorption (mm)	Maxilla right	22	0.53	0.40	0.128	0.943
	Maxilla left	30	0.54	0.39		
	Mandible right	33	0.58	0.35		
	Mandible left	28	0.54	0.36		

\*Analysis of variance (ANOVA)

**Table 4. Alveolar bone resorption measurements for implant diameter 3.5x10 mm in different region of maxilla and mandible.**

Diameter of implant 3.5 x 10 mm		n	Mean	Std. Deviation	F	p*
Distal resorption (mm)	Maxilla front	25	0.67	0.26	4.083	0.012
	Maxilla posterior	11	0.47	0.34		
	Mandible front	7	0.91	0.22		
	Mandible posterior	5	0.48	0.37		
Mesial resorption (mm)	Maxilla front	25	0.57	0.32	3.411	0.026
	Maxilla posterior	11	0.49	0.35		
	Mandible front	7	0.96	0.21		
	Mandible posterior	5	0.60	0.37		

\*Analysis of variance (ANOVA)

The mean of distal and mesial resorption at implant diameter 4.0 x 8 mm between regions of the mandible front, mandible lateral and the maxilla lateral were not tested by ANOVA due to insufficient number of cases in the mandible front ( $n = 1$ ).

## Discussion

Marginal bone loss is evaluated by means of radiography and is directly associated with the long-term success of implant treatments [9]. The most observed loss occurring in mesial or distal sides are considered as the final implant bone loss [10]. According to Albrektsson et al, marginal bone level changes in the first year after implant insertion should be less than 1-1.5 mm and the ongoing annual bone loss should be less than 0.2 mm [11]. According to some other authors, the critical values of bone loss following one year of implantation have been proposed to be less than 1.5 mm with the mean 0.1 mm annual rate in the following years [12-14]. In this study, the mean mesial

and distal bone loss of the implants were measured less than the mentioned critical value, which may be regarded as successful.

Previous authors found no significant differences regarding bone loss occurring at the distal and mesial sides of the mandibular and maxillary implants or the maximum bone loss, taking place at these sides between the upper and lower implants. After 1-year loading the mean distal bone loss of mandibular and maxillary implants were 0.759 mm (0.088) and 0.615 mm (0.097), and the mean mesial bone loss of mandibular and maxillary implants was also 0.701 mm (0.088) and 0.627 mm (0.097), respectively [9]. Others authors reported the mean bone loss of 1-1.5 mm for the first year of implant placement [15]. A previous report showed a mean bone loss amounting to 0.4 mm at the first year [16]. However, a bone loss of 0.7 mm after the first year was found [17]. Mesial crestal resorption ranged from 0.4 mm to 1.2 mm and distal crestal resorption ranged from 0.3 mm to 1.3 mm [17]. Hürzeler et al found bone loss of 0.40 mm ( $\pm$  0.12 mm) within one year [18].

Several factors influence implant prognosis and can attribute to implant failure: length and diameter of the implant, implant location, implant designs, bone quality, implant surface and the general health of the patient [19-22].

In this study, we found no significant different bone loss between maxillary and mandibular implants regarding sites. This finding is in agreement with results by some studies [10,23,24]. On the contrary, some researchers reported more bone loss for maxillary implants than mandibular ones [25, 26].

This study showed more bone loss for anterior implants compared to the posterior ones, which is contrary to results of previous study [10]. Some authors found no significant differences regarding implants placed at anterior and posterior regions [9,27].

## Conclusion

The assessment crestal bone loss around implants is necessary for evaluating implant success. This study showed more bone loss for anterior implants compared to the posterior ones, but there was no significant different bone loss between maxillary and mandibular implants regarding sites.

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