Crestal Bone Level and its Association With Varying Densities of Bone

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ABSTRACT

INTRODUCTION: Crestal bone levels associated with dental implants are an indication of the health or status of the implant. **PURPOSE:** The purpose of this study was to evaluate crestal bone levels on plateau designed implants in various densities of bone. **METHODS:** A case series study design was used. The sample was composed of patients who had single tooth implant supported restorations placed between February 1997 and August 2006 with densities of bone information available in the charts. Bone levels on the mesial and distal surfaces of the implants were established by direct measurement from the top of the implant to the radiographic position of the bone on the implant surface. Radiographs were mathematically corrected for distortion. Bone density was determined objectively by examination of the bone which collected on the flute of the reamer during preparation of the osteotomy. Type I bone was characterized by bone which had minimal blood content, type II bone by blood wetted bone in the reamer, type III bone by a partially filled reamer of blood wetted bone and type IV bone as a reamer devoid of bone. Descriptive statistics were computed and data was analyzed with analysis of variance mixed models. **RESULTS:** The sample consisted of 214 patients (50.0% females), Average age of the patients was 56.6 years. 264 plateau designed implants were included in this study. 50 implants were placed in type II bone density, 117 implants were placed in type III bone density and 97 were placed in type bone IV bone density. The mean age of implants was 2.3 ± .8 years. Mesial and distal bone levels in each of the 4 types of densities was reported as: For density type II: mesial -.9 ± .6 mm and distal -.9 ± .6 mm. For density type III: mesial -.8 ± .7 mm and distal -.8 ± .9 mm. For density type IV: mesial -.8 ± .6 mm and distal -.8 ± .5 mm. Statistical testing reveals no statistically significant differences in mesial bone levels (P=0.38) and distal bone levels (P=0.79) between the three groups of bone densities. **CONCLUSIONS:** This study suggests that the crestal bone loss associated with the plateau designed implant is well within guidelines established in the literature. Secondly, there is no statistically significant difference in the crestal bone levels when comparing various densities of bone. The results of the study are relevant only to the plateau design implant.

BACKGROUND AND PURPOSE

The guidelines established in the literature evaluating crestal bone level changes is ≤ 1.5 mm of bone loss in the first year of function and ≤ 0.2 mm loss annually. Poor bone density at the time of implant placement, surgical trauma, design of the implant, bacterial colonization of the microgap, movement of the abutment and stress concentration in the crestal bone have all been implicated as reasons for crestal bone loss. Crestal bone loss has the potential to produce changes in soft tissue contours which can result is esthetic problems. The purpose of this study was to evaluate crestal bone levels on plateau designed implants in various densities of bone.

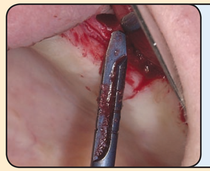
METHODS

Bone levels on the mesial and distal surfaces of the implants were established by direct measurement of standardized radiographs from the top of the implant to the radiographic position of the bone on the implant surface. Measurements were made using 3x-magnification and mathematically corrected for distortion. Bone density was determined objectively by examination of the bone which collected on the flute of the reamer during preparation of the osteotomy.

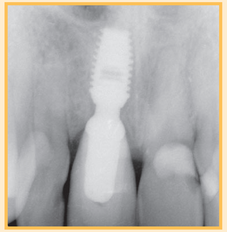
Type I — **Dense Cortical**
Flute of a 3.5mm reamer bur filled with bone and minimal blood

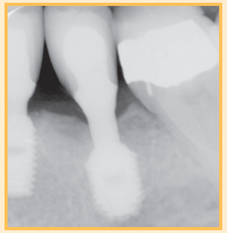
Type II — **Porous Cortical and Course Trabecular**
Flute of a 3.5mm reamer bur filled with blood wetted bone

Type III — **Porous Cortical and Fine Trabecular**
Flute of a 3.5mm reamer bur only partially filled with blood wetted bone



Type IV — **Fine Trabecular**
Flute of a 3.5mm reamer bur devoid of bone



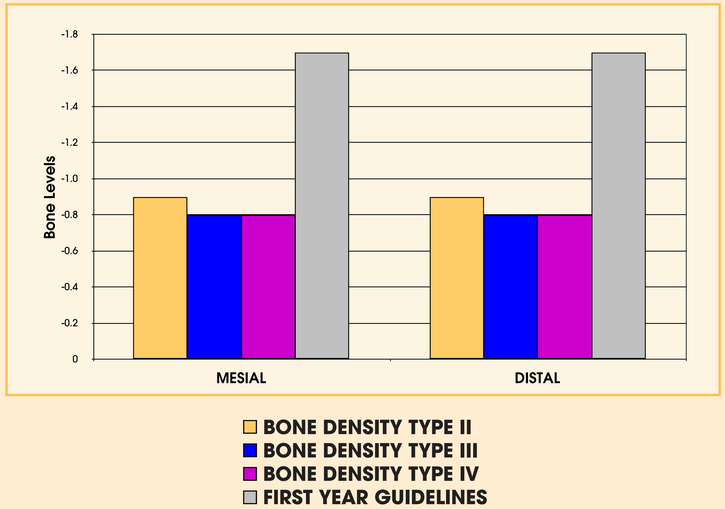


RESULTS

PATIENTS	IMPLANTS MEASURED	TIME SPAN OF IMPLANT PLACEMENT
214	264	February 1997 to August 2006

MEAN AGE OF IMPLANTS	IMPLANTS PLACED IN TYPE II BONE	IMPLANTS PLACED IN TYPE III BONE	IMPLANTS PLACED IN TYPE IV BONE
2.3 ± .8 years	50	117	97

CRESTAL BONE LEVELS



Statistical testing reveals no statistically significant differences in mesial bone levels (P=0.38) and distal bone levels (P=0.79) between the three groups of bone densities.

CONCLUSIONS

This study suggests that the crestal bone loss associated with the plateau designed implant is well within guidelines established in the literature. Secondly, there is no statistically significant difference in the crestal bone levels when comparing various densities of bone. The results of this study are relevant only to the plateau designed implant.