# Significance of Buccopalatal Implant Position, Biotype, Platform Switching, and Pre-implant Bone Augmentation on the Level of the Midbuccal Mucosa

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This study assessed whether buccopalatal implant position, biotype, platform switching, and pre-implant bone augmentation affects the level of the midbuccal mucosa (MBM). Ninety patients with a single-tooth implant in the esthetic zone were included. The level of the MBM was measured on photographs taken 1 year after crown placement. The factors analyzed only explained 22% of the level of the MBM. The more an implant was placed to the buccal, the more the MBM was positioned apically. A comparable phenomenon was observed in cases with a thick biotype and cases that underwent pre-implant bone augmentation. Platform switching did not affect the level of the MBM. *Int J Prosthodont 2014;27:477–479. doi: 10.11607/ijp.4008*

Few studies have focused on factors influencing the level of the midbuccal mucosa (MBM). It has been suggested that implants placed too far to the buccal and cases with a thin biotype show more midbuccal recession.[1,2] Furthermore, it has been shown that pre-implant bone augmentation is associated with less satisfactory overall soft tissue esthetics,[1] but its effect on the position of the MBM has not been considered yet. The same holds true for the effect of using implants with a nonmatching implant abutment diameter (ie, platform switching). Although implants with platform switching show less marginal periimplant bone loss,[3] the effect of platform switching on the position of the MBM is debatable. Therefore, by means of a multivariate analysis (MANOVA), the present study assessed the significance of buccopalatal implant position, biotype, platform switching, and pre-implant bone augmentation on the level of the MBM for single-tooth implants in the esthetic zone.

## Materials and Methods

Ninety patients (53.3% male; mean age: 36.5 years; range: 18 to 71 years) with a single-tooth implant replacing a central (75.6%) or lateral incisor (24.4%) were included. Patients participated in clinical trials of different implant types and received an implant depending on the study in which they were enrolled: NobelReplace Groovy and NobelReplace Select (Nobel Biocare) without platform switching (45 patients), or Bone Level Implants (Straumann) with platform switching (45 patients). Implants were inserted in healed sites (45.6% with pre-implant bone augmentation) and restored after 3 months.

Implant position, ie, its distance from the buccal contour of the alveolar crest, was measured on the definitive crown casts with a digital caliper (Fig 1). The vertical position of the MBM was measured on photographs taken 1 year after placement of the implant crown, using the GNU Image Manipulation Program (http://www.gimp.org/; Fig 2). Negative values, which indicated a more coronally positioned mucosa compared to the contralateral tooth, were considered as no difference in mucosa position. Measurements

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**Fig 1** Measurement of the buccopalatal implant position. A reference line was drawn between the cervical edges of the neighboring teeth. The distance of the buccal aspect of the implant to this line was measured with a digital caliper.

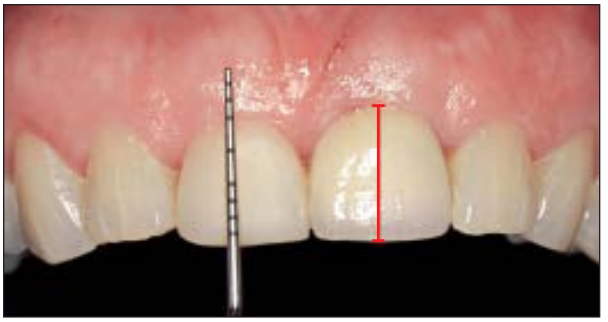

**Fig 2** Measurement of the position of the MBM. After calibration with a periodontal probe, the length of the clinical implant crown along the vertical axis (ie, distance between incisal edge and mucosal margin) was measured and subtracted from the length of the crown of the contralateral tooth.

**Table 1** Results of the Multiple Linear Regression Analysis

| Variable | β | *P* value | $R^2$ |
|---|---|---|---|
| Pre-implant bone augmentation | .29 | .005 | 0.086 |
| Biotype | .28 | .005 | 0.166 |
| Implant position | -.24 | .015 | 0.222 |

were taken to the nearest 0.1 mm. Biotype was rated visually on the same photographs based on specific features according to De Rouck et al[4] by two examiners independently. Data were analyzed using IBM SPSS Statistics (version 20.0, SPSS). Univariate analyses were performed for each predictor variable. Predictors with a *P* value ≤ .2 were entered into a multivariate linear regression model using a stepwise entry procedure. A significance level of .05 was chosen.

## Results

On average, the MBM was located 0.55 ± 0.72 mm more apically compared to the gingival level of the contralateral tooth. Of the total number of implants, 94.4% were placed at least 1.0 mm palatal to the reference line; 53.3% of the cases were screened as a thin biotype. Multivariate linear regression analysis showed that the factors of implant position, biotype, and pre-implant bone augmentation together explained 22% of the variance of the level of the MBM. Platform switching provided no contribution to this variance. The more the implant was positioned to the buccal, the more the MBM was situated apically. The same was found for a thick biotype and pre-implant bone augmentation. Results of the analysis are shown in Table 1.

## Discussion

The factors analyzed in this study only explained 22% of the variance of the MBM level, meaning that there are more factors influencing this position. It might be that the soft and hard tissue levels before implant placement play a dominant role for the final position of the MBM. According to the literature, an intact buccal bone wall is associated with little risk of recession for immediate implant cases.[5] Although implants in the present study were conventionally placed, the authors hypothesize that a favorable preoperative situation with little resorption of the buccal bone wall will lead to a more favorable final position of the MBM. This hypothesis might be supported by the finding that in the present study a pre-implant bone augmentation contributed most to the variance of the vertical position of the MBM. The fact that a pre-implant bone augmentation is needed implies that the pre-existing architecture is already compromised. Of course, the augmentation procedure itself might also lead to a more apically located MBM.

The present study found a more apically situated MBM in cases with a thick biotype. This is in contrast with the study by Evans and Chen,[2] showing more midfacial recession in cases with a thin biotype. It should be noted, however, that this study only included immediate implant cases. Furthermore, as stated in a recent systematic review,[5] evidence to support increased risk for midfacial recession in patients with a thin biotype is limited. To what extent biotype is of significance needs further investigation.

## Conclusions

The factors analyzed in this study account for only a small portion of the variance of the MBM position. The more an implant was placed to the buccal, the more the MBM was positioned apically. A comparable phenomenon was observed in cases with a thick biotype and in cases in which pre-implant bone augmentation was performed, whereas platform switching did not affect the level of the MBM.

## Acknowledgments

The authors reported no conflicts of interest related to this study.

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*Literature Abstract*

**Accuracy of ceramic restorations made using an in-office optical scanning technique: An in vitro study**

This study investigated the marginal and internal pre-cementation gap width of ceramic crowns made using an in-office digital impression technique and subsequent computer-aided design/computer-assisted manufacturing (CAD/CAM) fabrication. Two chairside digital impression systems, the Lava Chairside Oral Scanner (3M Espe) and Cadent iTero (now Align Technology), were used to make digital impressions of a typodont molar prepared with a 1.5 mm chamfer margin. Nine Lava (Lava Oral) and nine iTero (iTero Oral) all-ceramic crowns were produced from these digital impressions. In addition, 9 Lava (Lava Die Stone) and 9 iTero (iTero Die Stone) all-ceramic crowns were produced from the scans of stone die models made from addition-cured silicone impressions of the typodont tooth. Hot-pressed leucite-reinforced glass-ceramic crowns (Empress) made using die stone models, wax copings, and press casting were selected for comparison. A replica of the pre-cementation gap width of each crown was made by seating a crown filled with addition-cured light-body silicone impression material onto the typodont tooth. The crown was removed upon polymerization of the light-body impression material; a medium-body silicone impression material of a different color was then used to cover the polymerized light-body impression material. The polymerized impression materials were subsequently sectioned mesiodistally and buccolingually, and the thickness of the light-body impression material, which represented the pre-cementation gap width, was measured using a measuring microscope (x20) at 38 measuring points. The Lava Oral crowns showed a mean overall internal gap width of 162 µm, which was significantly smaller than the other groups (174 to 183 µm). The Empress crowns showed a mean marginal gap width of 170 µm, which was significantly larger than those of the other groups (107 to 128 µm). Occlusally, the gap width for iTero Oral and Lava Die Stone crowns was significantly larger than that of the Empress crowns. The authors concluded that an in-office digital impression technique can be used to fabricate ceramic crowns with a marginal and internal accuracy comparable to that of a conventional hot-pressed glass ceramic crown.

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