EMD-liquid as adjunct to natural bovine bone grafting at buccal bone dehiscence defects at implant sites: an experimental study in beagle dogs

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Abstract

Objectives: To evaluate the effect of enamel matrix derivative in liquid form (EMD-liquid) as adjunct to grafting with natural bovine bone (NBB), on new bone formation and osseointegration in buccal dehiscence defects at dental implants.

Material and Methods: In six beagles, 3 months after extraction of mandibular premolars and first molars, 3 titanium implants (3.5 x 8 mm) were inserted and dehiscence-type defects (mesiodistal width 3 mm x 5 mm depth) were created on their buccal aspects of the defects. The beagles were randomly assigned to one of the following 3 treatment groups: Group 1: NBB, Group 2: NBB-EMD-liquid, Group 3: Control. All sites were covered with a collagen membrane. Histomorphometric measurements were performed after 3 months of healing.

Results: New bone area, bone-to-implant contact (BIC), and first BIC (FBC) in the NBB and NBB/EMD-liquid groups were significantly greater than in the control group (P < 0.05). Further, F-BIC was at a significantly more coronal position in the NBB/EMD-liquid group (0.4±0.1 mm) compared with the NBB group (1.2±0.2 mm).

Conclusions: NBB grafting enhances bone regeneration and osseointegration at implants with buccal dehiscence compared with no grafting, and adjunct use of EMD-liquid appears to further enhance bone formation and osseointegration.

Background and Aim

Enamel matrix derivative (EMD) is primarily used to promote periodontal regeneration. However, most of studies concluded EMD-gel failed to promote bone formation. Recently, EMD-liquid mixed with bone grafts may stimulate bone regeneration.

Natural bovine bone (NBB) is relatively new bone graft and effect of NBB combined with EMD liquid remains unclear.

The present study aimed to evaluate osseointegration and bone formation after application of NBB combined with EMD-liquid in buccal bone defects at dental implants.

Methods and Materials

Clinical procedures

- Six beagle dogs
- Both sites of the mandible
- 3 implants with 3 mm x 5 mm buccal bone defect.
- Treatment randomly:
  1) NBB group: grafting of NBB
  2) NBB/EMD-L group: grafting of NBB with EMD-liquid
- Control group: no grafting
- Collagen membrane covering the defect.

Histomorphometric measurements

- A rectangular region of interest (ROI) was previously buccal exposed implant threads (5 mm apically from the implant shoulder)
- Histomorphometrically measurements (1) bone–implant contact (BIC; in %) (2) first bone–implant contact (FBC; in mm) (3) augmented area (AA; mm²) (4) the proportions of various components;
  - Mineralized tissues (MT; %)
  - Fibro-vascular connective tissues (FCT; %)
  - Residual bone graft (G; %)

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- Titanium implant (3.5 x 8 mm, Straumann Bone Level; Straumann)
- NBB (Cerabone®; Bottis Dental, Berlin, Germany)
- Collagen membrane (Collprotect®; Bottis Dental, Berlin, Germany)
- NBB-liquid (Entegrate®; Straumann KG, Basel, Switzerland)
- Enamel matrix derivative (EMD; Enamel Matrix Derivative; Boehringer, Ingelheim, Germany)
- Liquid (Osteogein®; Strauman AG, Basel, Switzerland)

Statistical analysis

Descriptive statistics were calculated and the differences among groups were examined using the Friedman test (P < 0.05). Bonferroni correction for multiple tests was used to assess any significant differences among treatment modalities in a post-hoc analysis.

Results

NBB grafting enhances bone regeneration and osseointegration at implants with buccal bone dehiscence compared with no grafting.

EMD-liquid as an adjunct appears to further enhance bone formation and implant osseointegration.

Conclusion

Histomorphometric measurements

NBB NBB/EMD-L control

AA (mm²) 6.9 ± 2.3* 8.0 ± 1.5* 2.6 ± 1.4

MT (%) 32.8 ± 15.6 25.3 ± 14.0 26.5 ± 20.1

FCT (%) 36.2 ± 8.9 34.4 ± 9.3 73.4 ± 20.1**

G (%) 29.9 ± 16.3 35.3 ± 13.9

BIC (%) 52.8 ± 11.7* 57.4 ± 7.1* 20.5 ± 5.6

BIC (mm) 1.2 ± 0.2 0.4 ± 0.1*** 2.0 ± 0.1***

Mean ± Standard Deviation were analyzed for statistical significance by Friedman test and the Bonferroni correction for multiple tests as a post hoc analysis.

- ** Significantly different between NBB and NBB/EMD-L groups (P < 0.05).
- ***Significantly different from the control group (P < 0.05).

References


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

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This study was supported by ITI small Grant Number 1069_2015 and JSPS KAKENHI Grant-in-Aid for Young Scientists Number 19K17001.

Dr. Takahiro Ikawa has been an ITI Scholar at the Department of Periodontology, Faculty of Dentistry, Malmö University, Malmö, Sweden (Chair Prof. Andreas Stavropoulos) during the year 2019-2020.