Effect of rhBMP-2 on contact osteogenesis: An in vivo pilot study using rabbit tibiae

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INTRODUCTION

Osteogenesis around endosseous titanium (Ti) implant divided into two distinct bone forming process. Contact osteogenesis is one of two bone forming process around endosseous titanium (Ti) dental implants and the molecular mechanism of contact osteogenesis is unclear. On an earlier study, newly formed bone around dental titanium implant expressed BMP-2, which is an activator for bone healing and substance from existing bone. Under the assumption that BMP-2 which was observed in newly formed bone around titanium implant may also affect contact osteogenesis, this study tried to evaluate effect of BMP-2 on contact osteogenesis.

MATERIALS AND METHODS

In this preliminary study, the rabbit tibia model was used, and Ti tubes were used to eliminate distance osteogenesis, minimizing its effect on the biologic response to implant surface for distance osteogenesis. Four New Zealand white rabbits were used.

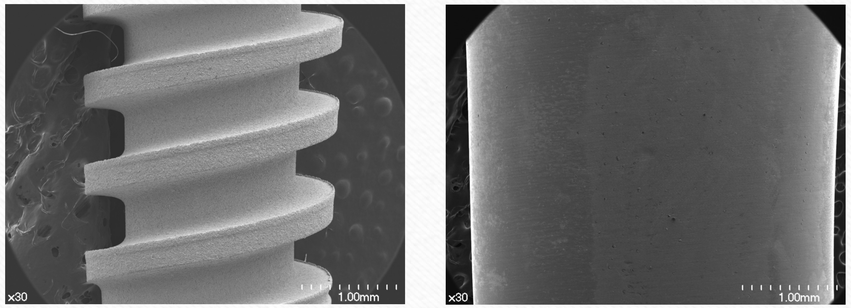


Fig.1 FE-SEM Image of Implant fixture and Tube

Fig.2 Implant fixture and Tube placement on Rabbit tibiae

The implants and tubes were inserted into the rabbit tibiae: To exclude the effects of distance osteogenesis, the tubes were inserted into the tibiae. Then, the implants were installed through the tubes: two implants and tubes for each tibia. Half of the implants served as control, and the others were placed with topical rhBMP-2 (CowellMedi, Busan, South Korea) application (rhBMP-2 group). After 4 weeks of implantation, the rabbits were euthanized, and the undecalcified specimens were prepared for histomorphometry. The independent t-test was used for statistical analysis.

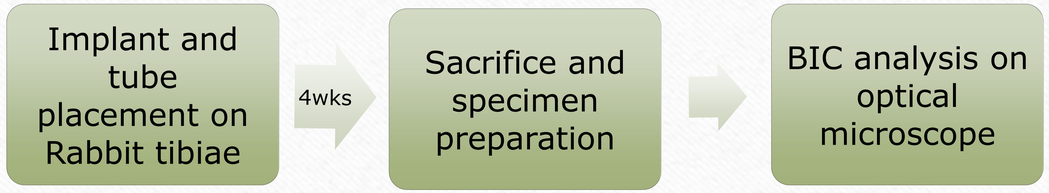
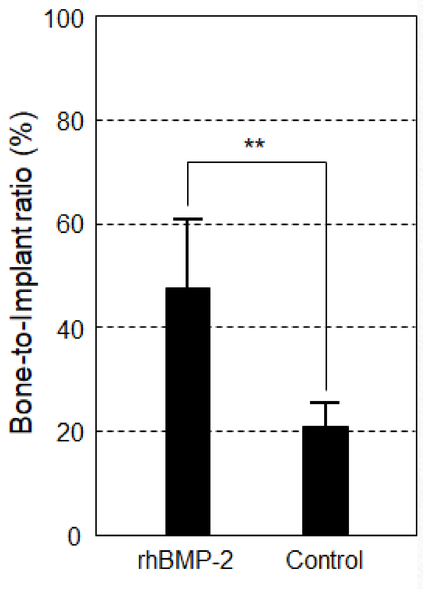
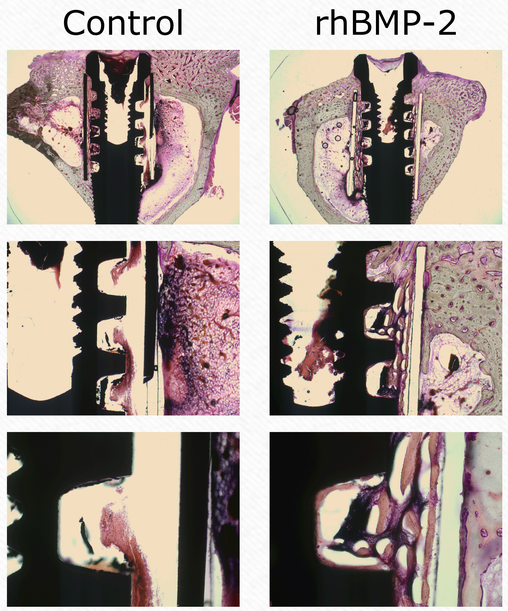


Fig.3 Experiment process

RESULTS

After the in vivo surgery, one of the rabbits exhibited complications and died at 16 days. The other three rabbits exhibited no complications in terms of wound healing, implant exposure, or other problems. Due to the inserted Ti tubes for isolating contact osteogenesis from distance osteogenesis, bone formation between the implants and inner surfaces of the Ti tubes was relatively low, compared with that of the outer surfaces of the tubes. The mean bone-to-implant contact (BIC) ratio was 20.6% for the control group and was 47.1% for the rhBMP-2 group. rhBMP-2 significantly increased the BIC ratios (P = 0.016).





	rhBMP-2	Control
BIC ratio	47.1%	20.6%

Fig.4 Histomorphometric BIC analysis

CONCLUSIONS

When minimizing the influence of distance osteogenesis, contact osteogenesis is affected by the addition of BMP-2, that is an activator for bone healing and a substance from the existing bone. It is suggested that contact osteogenesis is a bone-driven process.

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REFERENCE

Choi JY, Sim JH, Yeo IL. Characteristics of contact and distance osteogenesis around modified implant surfaces in rabbit tibiae. J Periodontal Implant Sci. 2017 Jun;47(3):182-191.