A-3. The Effect of Recombinant Human Bone Morphogenetic Protein-4 Concentration on Bone Regeneration in Rat Calvarial Defects

Eun-Kyoung Pang[1], Se-Ung Im[2], Chang-Sung Kim[1], Seong-Ho Choi[2], Jung-Kiu Chai[1], Chong-Kwan Kim[2], Soo-Boo Han[3], Kyoo-Sung Cho[2]

[1]Department of Periodontology, Research Institute for Periodontal Regeneration, College of Dentistry, Yonsei University, Seoul, Korea.

[2]Department of Periodontology, Research Institute for Periodontal Regeneration, College of Dentistry, Brain Korea 21 Project for Medical Science, Yonsei University, Seoul, Korea.

[3]Department of Periodontology, College of Dentistry, Seoul National University, Seoul, Korea.

Background

Bone morphogenetic proteins (BMPs) are in the process of being evaluated as potential candidates for periodontal and bone regenerative therapy. To increase regeneration without provoking adverse effects, the effective dose of BMP needs to be kept to a minimum. The purpose of this study was to evaluate the effect of recombinant human bone morphogenetic protein-4 concentration on bone regeneration in the rat calvarial defect model.

Methods

8 mm calvarial critical-sized defects were created in 140 male Sprague-Dawley rats. The animals were divided into 7 groups of 20 animals each. The defects were treated either rhBMP-4/ACS or rhBMP-4/β-TCP (rhBMP-4 at 0, 0.025, 0.05mg/ml, total construct volume/defect ~ 0.1ml) or were left untreated for surgical control. The animals were sacrificed at 2 or 8 weeks postsurgery, and the treatment outcomes were evaluated by means of the histological and histomorphometric parameters.

Results

In the histologic observations, the surgical implantation of rhBMP-4/ACS and rhBMP-4/-TCP enhanced bone formation at both 2 and 8 weeks. Within the dose range examined, rhBMP-4 did not exhibit an appreciable dose dependent response. In the histomorphometric analysis, the total augmented areas of the rhBMP-4/β-TCP group were significantly greater than those of the rhBMP-4/ACS group at 8 weeks, but there were no significant differences in the amount of new bone formation between the two groups. As a result, the percentages of new bone formation in the rhBMP-4/ACS groups were sig-

nificantly greater than those in the rhBMP-4/β-TCP groups ($P<0.01$).

Conclusion

In conclusion, RhBMP-4 reconstituted with either ACS or β-TCP has a significant potential to induce the regeneration of bone in rat calvarial critical size defects. Within the selected rhBMP-4 dose range and observation interval, there appeared to be no meaningful differences in bone regeneration.

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