OBJECTIVES

The aim of this study was to investigate the ability of an osteoinductive calcium phosphate ceramic alone or in combination with rhBMP-2 to bridge a critical sized calvarial defect in rats. The hypothesis was that the use of intrinsically osteoinductive ceramic could minimize the dosage of rhBMP-2.

METHODS

120 male Wistar Han rats were used upon approval by institutional animal ethics committee (IMI,Zg,HR). 14mm critical sized circular defects were created on calvaria of animals by using a dental drill. Animals received a PTFE ring Ø14mm h 4mm, that was filled with either only a biphasic calcium phosphate ceramic BCP, particles 150-500 μm, consisting of β tricalcium phosphate and hydroxyapatite in 20:80 ratio, or BCP loaded with 5μg of rhBMP-2, or 2.5μg of rhBMP-2 or left empty (sham). Animals were sacrificed at 3, 6 and 12 weeks post-implantation. Bone formation was quantitatively evaluated using μCT (SkyScan 1076, BE). 3D reconstruction was performed by CTAn software, different thresholding values were used to distinguish ceramic particles from the newly formed bone and to determine BV% in total volume of interest BV/TV. ANOVA with Duncan’s post hoc test was used to compare different conditions, in addition qualitative histological analysis on Goldner trichrome-stained tissue sections.

RESULTS

CONCLUSIONS

Study results showed no statistically significant differences in bone formation between the BCP alone and loaded with 2.5 or 5 μg rhBMP-2 in a critical sized calvarial defect in rats. While it is generally thought that CaP biomaterials are not osteoinductive, BCP used here was previously shown to possess intrinsic osteoinductivity which may explain comparable performance in this study in terms of dynamic bone formation and the total amount of bone formed in presence and in absence of rhBMP-2.

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