

PR-1-2. Bone healing in critical-size defects treated with various bone graft substitutes in rat calvaria

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Background

This study investigated the relative efficacy of a newly developed bone graft substitute and commercially available bone substitute, anorganic bovine bone (Bio-Oss, BO) in the healing of 8 mm diameter critical sized defects (CSD) of rat calvaria histomorphometrically.

Materials and methods

Eggshell-derived microporous hydroxyapatite bone substitute (ES-HA) was produced by hydrothermal treatment using phosphate solution. For histomorphometric evaluation, twenty eight adult Sprague-Dawley rats were used. The animals were randomly allocated to four groups of 7 animals each as follow: 1. Unfilled defect; 2. ES-HA grafted defect; 3. BO grafted defect; 4. ES-HA mixed with calcium sulfate hemihydrate (CS) (HA/CS) grafted defect. After 12 weeks of healing, new bone formation between groups were compared using one-way ANOVA.

Results

ES-HA particles exhibited active new bone formation and a high degree of bone apposition on their surfaces. ES-HA ($19.2 \pm 6.1\%$), BO ($8.2 \pm 3.9\%$), and HA/CS ($12.6 \pm 6.0\%$) grafted defects showed increased amount of newly formed mineralized bone (NB%) over unfilled defects ($6.4 \pm 4.8\%$). ES-HA group showed significantly greater NB% compared to unfilled and BO groups ($P = 0.0006$). There were no significant differences in NB% between unfilled, BO, and HA/CS groups. The use of CS, which was used to improve the handling characteristics of ES-HA and maintain the graft volume, did not increase the amount of newly formed bone, compared to the

use of ES-HA alone.

Conclusion

These results demonstrate the potential efficacy of ES-HA as an excellent osteoconductive bone substitute for treating osseous defects.

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