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Osteogenic effect of platelet-rich fibrin on a bone defect model of long bone in rabbits

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Introduction and Background

This study aimed to evaluate the osteogenic effect of platelet-rich fibrin(PRF) graft with periosteal repair on a bone defect of long bone in rabbits, compared to control group that underwent only periosteal repair.

Material and Method

Twelve New Zealand white rabbits were used in this study. Two rabbits were designated for PRP preparation, mixed with a human thrombin agent to produce PRF. A bone defect was created in both proximal tibiae of ten rabbits. The defect site of the right proximal tibia was filled with PRF, followed by periosteal repair(PRF group). In contrast, only periosteal repair was performed on the left proximal tibia(control group). For histological evaluation, hematoxylin and eosin(HE) and Masson's trichrome staining were performed at week 4 and 8 after surgery. The bone healing ratio, defined as the proportion of newly formed bone area to surgically created defect area, was calculated to assess bone regeneration. For radiological examination, micro-computed tomography(micro-CT) was conducted at week 8 after surgery.

Results

A total of nine rabbits survived until the planned euthanasia time points. At 4-weeks postoperatively, HE staining revealed a higher bone healing ratio in the PRF group compared to the control group; however, the difference was not statistically significant(PRF group: 71.0 ± 15.6 , control group: 59.5 ± 18.1 , $P=0.34$). At 8-weeks postoperatively, histological analysis showed no difference in the bone healing ratio between the two groups(PRF group: 79.3 ± 8.7 , control group: 75.9 ± 13.2 , $P=0.55$). Micro-CT analysis demonstrated a superior Lane-Sandhu score in the PRF group compared to the control group, though this difference was also not statistically significant($P=0.15$).

Conclusions

PRF graft with periosteal repair appears to promote improved early-stage new bone formation in bone defects of long bone in animal model compared to periosteal repair alone, although there was no statistically significant difference. Further research with a large sample size is required to more comprehensively assess the osteogenic effect of PRF.

