Healing capacity of bone marrow mesenchymal stem cells versus platelet-rich fibrin in tibial bone defects of albino rats: an in vivo study

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Abstract

Background: Various techniques for tissue engineering have been introduced to aid the regeneration of defective or lost bone tissue. The aim of this study was to compare the in vivo bone-forming potential of bone marrow mesenchymal stem cells (BM-MSCs) and platelet-rich fibrin (PRF) on induced bone defects in ratsô tibiae.
Methods: In total, one defect of 3-mm diameter was created in each tibia of 36 Wistar male rats. There were two groups: group A, left tibia bone defects that received PRF; and group B, right tibia bone defects of the same animal that received BM-MSCs loaded on a chitosan scaffold. Subsequently, Scanning electron microscope/energy-dispersive X-ray (SEM/EDX) analyses was performed at 3 and 10 days, and 3 weeks post implantation and following euthanasia; (n=12).
Results: The EDX analysis performed for each group and time point revealed a significant increase in the mean calcium and phosphorous weight percentage in the BM-MSC-treated group relative to the PRF-treated group at all-time intervals ($P < 0.05$). Moreover, the mean calcium and phosphorus weight percentage increased as time progressed since the surgical intervention in the PRF-treated and BM-MSCs groups ($P < 0.05$).
Conclusions: In the present study, both BM-MSCs and PRF were capable of healing osseous defects induced in a rat tibial model. Yet, BM-MSCs promoted more adequate healing, with higher mean calcium and phosphorous weight percentages than PRF at all-time points, and showed greater integration into the surrounding tissues than PRF.

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