

ABSTRACT

Background: Adipose-derived mesenchymal stem cells (ADMSCs) is a potential biomaterial in regenerative medicine. It has tissue source and multipotent somatic stem cells. ADMSCs have been combined with biomaterials such as osteoinductive and osteoconductive scaffold in order to improve bone regeneration. Demineralized dentine matrix (DDM) is a scaffold-derived tooth dentine containing type I collagen and morphogenetic bones protein (BMP). ADMSCs-DDM composites are expected to have the ability in wistar rat alveolar bone regeneration.

Purpose: The aim of the study was to analyse and explain the mechanism of the ability of ADMSCs-DDM composites in alveolar bone regeneration on days 7, 14 and 28 *in vivo*.

Methods: This study was an experimental research. ADMSCs were isolated from rat fat tissue and characterized by immunocytochemistry and flowcytometry methods. DDM was extracted from bovine's teeth and made into particles with the size of 355-710 μm . The effect of DDM scaffold on ADMSCs cell viability were analysed by MTT assay. ADMSC attachment to DDM scaffold was analysed by means of SEM. The sample consisted of 50 male wistar rats were divided into 4 groups, where each contains of 5 rats. control group (K-); periodontitis only (K+), periodontitis DDM scaffold therapy (Ks), and the fourth group is the periodontitis model with composite ADMSCs-DDM (Ksc). Rats were decapitated on days 7, 14 and 28, and then immunohistochemistry (IHC) of STRO-1, RUNX-2, OSX and COL-I and OCN were performed. The area of trabeculae was also calculated to see the occurrence of periodontal tissue regeneration. Static results were analysed by Kruskal Wallis and Mann Whitney and followed by Path analysis.

Results: The highest viability of the cells (97.08%) were found in the concentration of 10% by means of MTT test. ADMSCs cell attachment to DDM scaffold showed a significantly increasing number of cells attached in 24 hours compared to 1 hour and 12 hours. From this study, it was found that there were significant differences in STRO-1, RUNX-2, OSX, OCN and COL-I expression between the study groups on the day 28 ($p < 0.05$). ADMSCs-DDM application was significantly higher than the control group. The trabeculae area in all groups showed significant results where the administration of ADMSCs-DDM composites had greater trabecular area on day 28 ($p < 0.05$).

Conclusion: Composite ADMSCs-DDM can be a promising material for alveolar bone regeneration.

Keywords: *Adipose-derived mesenchymal stem cells, Demineralized dentin matrix, scaffold, Cells Seeding, alveolar bone regeneration.*