UNIVERSITI TEKNOLOGI MARA

THE EVALUATION OF BONE REGENERATION FOLLOWING SOCKET PRESERVATION WITH CONCENTRATED GROWTH FACTOR (CGF) AND POLY LACTIC-CO-GLYCOLIC ACID (PLGA) SCAFFOLD: AN *IN VIVO* STUDY IN RABBITS

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Socket preservation procedures with various grafting techniques have gained much attention in minimizing physiological resorption. There is currently a paradigm shift towards applying poly lactic-co-glycolic acid (PLGA), which is regarded as an excellent scaffold for tissue engineering. Concentrated growth factor (CGF) has also been reported to promote wound healing at the site of injury. Nevertheless, the role of PLGA microspheres as a substitute for bone graft material with CGF in bone regeneration remains unclear. The objectives of this study were, 1) to evaluate the influence of CGF+PLGA on the proliferation of osteoblast cells and bone formation in the extraction socket and, 2) to evaluate the expression of alkaline phosphatase (ALP) following the procedure. PLGA microspheres were fabricated and examined under a scanning electron microscopy (SEM). Blood was collected from the rabbits and centrifuged to obtain CGF. *In vitro* study was conducted with human osteoblast (HOB) cells while *in vivo* study involved 24 New Zealand White rabbits that were subjected to an upper left first premolar tooth extraction. Both HOB cells and extraction sockets were treated with CGF, PLGA or CGF+PLGA. MTS assay was used to evaluate cellular proliferation and extraction sockets were observed with microscopic computed tomography. ALP was measured from the blood collected from each rabbit before and after the extraction. The time and treatment effects were analysed by subjecting the data to repeated-measures analysis of variance with significant effects when the *p*-value was less than 0.05. Based on the SEM image, spherical shapes of PLGA particles ranging from 53.709μm to 120.375μm with a pore size of 40μm were observed. Overall, CGF+PLGA groups presented the greatest mean HOB cells proliferation, radiographic bone regeneration outcomes and ALP expression. Time effect comparison showed a significant difference in HOB cells treated with CGF from 24 to 72 hours while CGF+PLGA groups showed a significant difference in radiographic outcomes from four to eight weeks. ALP expression also showed a significant difference for CGF+PLGA groups from baseline to four and eight weeks. Treatment comparison showed a significant difference between control and PLGA but not significant between PLGA and CGF+PLGA on osteoblast proliferation. A significant difference was also observed between CGF and PLGA, and between CGF and CGF+PLGA groups. Meanwhile, CGF+PLGA groups showed a significant difference in radiographic outcomes and ALP expression. In conclusion, CGF+PLGA provided the best outcomes and both CGF and PLGA have the potential in promoting bone regeneration for human clinical application.

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