Editorial

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Efficacy of tissue engineering for periodontal therapy: stem cells and extracellular vesicles

Volume 9 Issue 1 - 2023

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Received: November 13, 2023 | **Published:** November 14, 2023

Introduction

Periodontal disease is characterized by a chronic and destructive inflammatory process, affecting the tooth supporting tissues (cementum and periodontal ligament) and the alveolar bone.[1,2] It affects around 20-50% of the global population and represents the main cause of tooth loss.[1,3]

After clinical diagnosis, conventional non-surgical periodontal therapy, represented by scaling and root planing, is the first choice for treating the disease. This therapy aims to remove microbial biofilm, as well as altered tissue remains, providing conditions for healthy tissue to be formed in the affected area. Surgical procedures may be necessary to help control the disease, prevent apical epithelial migration, bone neoformation and reinsertion of periodontal ligament fibers.[1,4,5]

Despite these efforts, the search for therapies and approaches that can accelerate and improve the repair process has been the target of many studies.[6–8] Furthermore, regenerative therapies can help recover lost tissues.[9–11] With the introduction of tissue engineering, regenerative medicine, and its significant advances,[12–14] a change in periodontal treatment can be proposed, culminating in the formation of a newly formed tissue identical to the original.

Tissue engineering is based on the use of scaffolds, stem cells and growth factors.[15–18] Scaffolds are biomaterials that support and allow or stimulate the cell adhesion, proliferation and differentiation.[12,13] An ideal scaffold must present the following requirements:[12,13] (a) high porosity and adequate pore sizes to facilitate cell proliferation and the diffusion of nutrients and oxygen between cells; (b) be biodegradable, and the rate of degradation must coincide with the rate of formation of new tissue; (c) be biocompatible; (d) have adequate chemical and mechanical forces. Stem cells are cells with a great capacity for proliferation and differentiation; they can give rise to different cell types, which will form a new tissue with architecture and functions similar to the original lost or damaged tissue.[14,18,19] Growth factors (GF) play a fundamental role in cell differentiation, mobilization and signaling, being selected according to the tissue to be formed.[16,20]

In periodontal tissue engineering, the most used stem cells are cells extracted and isolated from the periodontal ligament itself (PDLSCs), as they can give rise to new cementum and a new periodontal ligament.[1,21] Several biomaterials have already been analyzed to obtain suitable scaffolds for periodontal regeneration, highlighting natural and synthetic biomaterials.[1] Among the natural ones, collagen, alginate, and chitosan are listed; poly-lactic acid (PLA), poly-lactic-glycolic acid (PLGA) and poly-glycolic acid (PGA) are among the most used synthetics.[1,22]

Thinking about the aspects discussed above and the need for effective and assertive therapies, the question arises about the efficiency of using tissue engineering for periodontal regeneration. Comparing scientific findings with the results obtained with the use of conventional therapies could guide professionals in their clinical choices, promoting advances in the treatment of periodontal diseases.

Acknowledgments

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Funding

None.

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Citation: Santinoni CS, Mori GG. Efficacy of tissue engineering for periodontal therapy: stem cells and extracellular vesicles. *Adv Tissue Eng Regen Med*. 2023;9(1):69–70. DOI: 10.15406/atroa.2023.09.00144