

ROLE OF CELLULAR AND MOLECULAR FACTORS IN ALVEOLAR RIDGE REMODELING AFTER TOOTH LOSS

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Introduction: The bone remodeling after the tooth loss is a complex process that occurs at the cellular level, being regulated by a complex mechanism, maintaining the balance between the bone resorption, influenced by osteoclasts activity and new bone formation, regulated by osteoblasts activity. Our purpose was to emphasize the molecular mechanisms of post-extraction osteoclastogenesis.

Material and methods: A thorough review of publications from Web of Sciences, PubMed, HINARI, Scopus, Google Scholar and Semantic Scholar databases was done. Only original articles and experimental studies were analyzed.

Results: Osteoclastogenesis is a complex process regulated through the receptor activator of nuclear factor kappa-B ligand (RANKL), at the level of the osteoblasts and stromal cells. RANKL binding to its receptor promotes the osteoblasts precursor differentiation and bone resorption, while osteoprotegerin (OPG) acts as a decoy receptor, playing an inhibiting role. For the enhancement of the osteoclasts' activity, during the early healing phase, inflammatory cytokines such as interleukin-1 (IL-1), tumor necrosis factor-alpha (TNF- α) and prostaglandins are released. The mesenchymal stem cells are recruited at the extraction site and under the influence of the insulin-growth factors and morphogenetic proteins, stimulation of osteoblasts differentiation and bone matrix deposition occurs. The osteoclastogenesis depends on vascularization, inflammatory status and mechanical stimuli, modulating the cellular activity. Without functional loading, the bone formation cannot entirely compensate the process of bone resorption, and a progressive reduction of the alveolar ridge occurs.

Conclusion: The bone remodeling after tooth extraction is a complex and multifactorial process involving cellular and molecular mechanisms. The interaction between osteoclast-mediated resorption, osteoblast-driven bone formation, and local microenvironment determines the extent of morphological alterations of the alveolar ridge, having a significant impact on dental rehabilitation.

Key-words: osteoclastogenesis, osteoclasts, osteoblasts, mesenchymal stem cells