Biomarkers of Orthodontic Tooth Movement.

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Abstract

Introduction: Orthodontic tooth movement is made possible by remodeling of the alveolar bone process. Bone remodeling is carried out by cellular activities of osteoclasts, osteoblasts, and osteocytes. This in turn is regulated by a number of extracellular factors including growth factors, cytokines, chemokines, hormones and biomechanical force. This review is focused on chemical biomarkers characterizing orthodontic tooth movement.

Methods: Using keywords such as tooth movement, orthodontics, biomarkers, gingival crevicular fluid, bone remodeling, cytokine release and alveolar bone in PubMed and Google Scholar search engines, a pertinent literature was obtained. The search was run with no language, place or time restrictions.

Results: We included 15 articles that focused on biomarkers found during orthodontic tooth movement. Chemokines that are released during tooth movement are monocyte chemoattractant protein-1 (MCP-1 or CCL2), CCL3 and CCL5. The main pro-inflammatory cytokines released are interleukins (IL) IL-1α, IL-1β, IL-6 and tumor necrosis factor alpha (TNF-α). Additional inflammatory mediators are prostaglandins (PGs) and neuropeptides. The expression patterns of macrophage colony-stimulating factor (M-CSF), receptor activator of nuclear factor kappa B ligand (RANKL) and osteoprotegerin (OPG) by osteoblasts play key roles in tooth movement.

Conclusion: A rate of alveolar bone remodeling is determined by levels of activity of bone cells, which in turn are controlled by mechanical and biochemical factors. A study of these factors is important in order to better understand biological mechanisms of orthodontic tooth movement. By this means, a better planning and better outcomes of orthodontic treatment can be achieved and potential adverse effects could be prevented.