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Regulation of Orthodontic tooth movement by stem cells: A Systematic Review

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During Orthodontic Tooth Movement (OTM), the tooth relocates to a new periodontal position formed by alveolar bone and periodontal ligament remodeling. Instrumental to this process and to the maintenance of homeostasis in periodontal tissues are an unique group of multipotent stem cells residing in the periodontal ligament, called Periodontal Ligament Stem Cells (PDLSCs). PDLSCs can respond to mechanical (orthodontic force), environmental (hypoxia) and biological (paracrine signals) stimuli present during OTM, and orchestrate it both directly (osteogenic differentiation and osteogenesis, collagen regeneration in the extracellular matrix of the periodontal ligament) and indirectly (paracrine signaling with other cell types to promote angiogenesis, osteoclastogenesis or recruiting of circulating cells to the periodontal ligament). The understanding of the mechanisms through which PDLSCs govern OTM, as well as the stimuli which cause this response and the different signals and messengers involved could give rise to development of future therapies leveraging modulation of endogenous PDLSCs activity to control OTM, adding Orthodontics to the growing number of disciplines which benefit from the application of stem cell therapies, for many the next revolution in Medicine.

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