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Applications of Stem Cells in Prosthodontics: A Narrative Review

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Abstract:

Stem cells have revolutionized regenerative medicine, offering transformative potential for tissue engineering and dental rehabilitation. In prosthodontics, stem cell therapy is emerging as a cutting-edge approach for regenerating lost oral tissues, enhancing alveolar bone augmentation, facilitating periodontal regeneration, and advancing craniofacial reconstruction. Various stem cell sources, including mesenchymal stem cells (MSCs), dental pulp stem cells (DPSCs), periodontal ligament stem cells (PDLSCs), and bone marrow-derived stem cells (BMSCs), have shown promising results in regenerating hard and soft tissues essential for prosthetic rehabilitation. These stem cells contribute to bone and periodontal regeneration through their differentiation potential and ability to modulate the host response. Despite significant advancements, challenges such as immune rejection, ethical concerns, standardization of protocols, and the need for long-term clinical studies remain barriers to widespread clinical application. Recent innovations in tissue engineering, biomaterial scaffolds, and gene editing techniques have further enhanced the regenerative potential of stem cell therapy in prosthodontics. This review explores the role of various stem cells in prosthodontic applications, discusses current challenges, and highlights future directions, aiming to bridge the gap between research and clinical implementation in dental rehabilitation.

Keywords: Stem cells, Prosthodontics, Dental tissue engineering, Regenerative dentistry, Mesenchymal stem cells, Bone regeneration.

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