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Dental tissue-derived stem cell sheet biotechnology for periodontal tissue regeneration: A systematic review

[Fabiana Divina Magalhães¹](#), [Giovanna Sarra²](#), [Giovanna Lopes Carvalho³](#), [Ana Clara Fagundes Pedroni¹](#), [Márcia Martins Marques¹](#), [Leandro Chambrone¹](#), [Thaís Gimenez¹](#), [Maria Stella Moreira⁴](#)

Affiliations expand

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Abstract

Objective: This study aimed to conduct a systematic review of the use of a cell sheet formed by mesenchymal stem cells derived from dental tissues (ddMSCs) for periodontal tissue regeneration in animal models in comparison with any other type of regenerative treatment.

Design: PubMed and Scopus databases were searched for relevant studies up to December 2020. The review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-analysis guidelines.

Results: Of the 1542 potentially relevant articles initially identified, 33 fulfilled the eligibility criteria and were considered for this review. Even with a wide variety of selected study methods, the periodontal tissue was always regenerated; this indicates the potential for the use of these cell sheets in the future of periodontics. However, this regeneration process is not always complete.

Conclusion: Despite the implantation, ddMSCs sheets have a great potential to be used in the regeneration of periodontal tissue. More in vivo studies should be conducted using standardized techniques for cell sheet implantation to obtain more robust evidence of the relevance of using this modality of cell therapy for periodontal tissue regeneration.

Keywords: Cell sheet; Dental tissue-derived; Periodontal tissue; Stem cells; Tissue engineering; Tissue regeneration.

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Roles of Dental Mesenchymal Stem Cells in the Management of Immature Necrotic Permanent Teeth

[Dixin Cui](#)¹, [Sihan Yu](#)¹, [Xin Zhou](#)¹, [Ying Liu](#)¹, [Lu Gan](#)¹, [Yue Pan](#)¹, [Liwei Zheng](#)¹, [Mian Wan](#)²

Affiliations expand

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Abstract

Dental caries and trauma always lead to pulp necrosis and subsequent root development arrest of young permanent teeth. The traditional treatment, apexification, with the absence of further root formation, results in abnormal root morphology and compromises long-term prognosis. Regeneration endodontics procedures (REPs) have been developed and considered as an alternative strategy for management of immature permanent teeth with pulpal necrosis, including cell-free and cell-based REPs. Cell-free REPs, including revascularization and cell homing with molecules recruiting endogenous mesenchymal stem cells (MSCs), have been widely applied in clinical treatment, showing optimistic periapical lesion healing and continued root development. However, the regenerated pulp-dentin complex is still absent in these cases. Dental MSCs, as one of the essentials of tissue engineering, are vital seed cells in regenerative medicine. Dental MSC-based REPs have presented promising potential with pulp-dentin regeneration in large animal studies and clinical trials via cell transplantation. In the present review, we summarize current understanding of the biological basis of clinical treatments for immature necrotic

permanent teeth and the roles of dental MSCs during this process and update the progress of MSC-based REPs in the administration of immature necrotic permanent teeth.