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# Use of Dental Stem Cells Harvested from a Tooth or Follicle

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*Abstract-* Regenerative medicine is gaining popularity and inspires dentists to follow evidence-based literature for educating the parents about collecting, storing, sustainability and utility of dental stem cells about autologous regenerative therapies. Stem cells are present intrinsically in the apical papilla or dental pulp cells for treatment associated to regenerative endodontics.[1, 2, 3]

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# Use of Dental Stem Cells Harvested from a Tooth or Follicle

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*Abstract-* Regenerative medicine is gaining popularity and inspires dentists to follow evidence-based literature for educating the parents about collecting, storing, sustainability and utility of dental stem cells about autologous regenerative therapies. Stem cells are present intrinsically in the apical papilla or dental pulp cells for treatment associated to regenerative endodontics.[1, 2, 3]

## Introduction

Stem cells are pluripotent cells which can divide and increase for a protracted period and differentiate into specialized cell types and tissues of a wide variety. Dental stem cells are a subset of adult mesenchymal stem cells which proliferate rapidly and differentiate into many cell lines.[4]

Adult stem cell therapy applies to medical presentations as metabolic disorders, bone marrow transplant for hematopoietic cancers and congenital immunodeficiency syndromes. It is undergoing clinical testing for diabetes, brain trauma/ spinal cord injuries and Parkinson's disease among other conditions.[5, 6]

The oral health applications of stem cells include dental and periodontal tissue regeneration, craniofacial structure repair (cleft lip/palate) and wound healing.[7] They are derived from various sources such as preserved umbilical cord blood, pulp tissue of exfoliating primary teeth, fibroblasts from oral mucosa,[8] periodontal ligaments, surgically removed third molars[9] and gingival fibroblasts.[2, 9, 10] They are secured and stored for conserving their proliferation and differentiation potential.[11, 12] Since these dental stem cells are not very stable and lead to in vivo tumours,[2] more studies are required to assess their safety and efficacy prior to initiating clinical trials in humans.[11, 12]

Modern regenerative endodontics is augmented by newer techniques including tissue engineering and regenerative medicine.[13] Stem cell transplantation and cell homing strategies are applicable to pulp regeneration. Stem cells are isolated, expanded, seeded and transplanted into the scaffold. Cell homing achieve tissue repair/regeneration by replacing the necrotic, inflamed or injured pulpal tissue with a regenerated pulp-like tissue by recruiting endogenous cells via signaling molecules. Compared with stem cell transplantation, cell homing strategies do not need to isolate and manipulate stem cells in vitro.[14, 15, 16]

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An example of cell homing strategy is pulp revascularization of immature teeth. Histologically most of the tissues formed in suc cases are unlike pulp like tissue and comprise of cementum, periodontal, and bone-like tissues.[17] Additional studies are required to increase the success rate of pulp revascularization in immature teeth, facilitate the formation of pulp-like tissues and applying cell homing in mature teeth.

The first prerequisite for promoting pulpal regeneration include disinfection of the pulp space and dentinal walls via different root canal disinfectants including intracanal medication with antibiotics, ultrasonic-assisted irrigation, EndoVac apical negative-pressure system of irrigation and laser irradiation. [18]

Another precondition for pulp regeneration is the proper size of the apical foramen, especially in mature teeth with closed apex in adults. An apical foramen too small in size will affect both the migration of endogenous cells as well as neovascularization and re-innervation during regeneration. A minimum of 1.1 mm apical foramen is necessary to obtain revascularization.[19]

Morphologically the regenerated tissues should encompass connective tissues for new dentin formation at a controlled rate similar to healthy pulp, display cell density, and architecture as the natural tissue, and have innervation and vascularization.[20] Vascularization and innervation are vital pulpal characteristics hence the new regenerated blood vessels must connect with the periapical or bone marrow tissues around the teeth to receive a regular blood flow from circulation, nutrient supply and sense hot/cold stimulation and pain during infection. [21]

An area of concern for homing cell strategy is the source of stem. They are derived from dental pulp stem cells (DPSCs), apical papilla (SCAP), bone marrow stem cells (BMSCs), periodontal ligament cells migrating to the root canal by chemokines and others.[22]

To conclude; even though some experimental and clinical studies yield pulp-like vascularized tissue; the information about the function of this tissue is insufficient. Hence further studies are required to succeed in functional pulp regeneration.

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