Advanced injectable scaffold system signpost for development in endodontic tissue regeneration

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Commentary:

Tissue engineering is a reassuring approach for dentin-pulpal complex regeneration. Tissue regeneration consists of three factors: stem cells, growth factors, and scaffolds. The scaffold is an artificial extracellular matrix (ECM) which serves as a template for cell growth and tissue regeneration¹. Required properties of scaffolds are they ought to be biocompatible, biodegradable, have specific physical and mechanical properties, and have to mimic the in-vivo environment. According to shape, scaffolds are of two types: preformed scaffolds and injectable scaffolds. Preformed scaffolds have the previous form whereas injectable scaffolds can be injected into destined space and form shape of in situ structure². Considering tiny form and size of the root canals injectable scaffolds are additionally appealing than that of preformed ones in endodontics³. Recently certain bio-inductive materials are added into synthetic scaffolds for obtaining superior outcomes.

These materials include the following:

A) Bioactive molecules: They are vital for the formation of reparative dentin. They are liberated from the dentin matrix. Biomolecules induce stem cell proliferation and cytodifferentiation. e.g. cell-binding peptides and biofunctional factors⁴.

B) Cell instructive scaffolds: Apart from being a functional cell carrier, they also supply stepwise steering for brand new tissue formation⁵. These biomaterials preferentially direct cells for movements and temporally manage neo-tissue formation. Thus known as cell-instructive biomaterials. e.g. metalloproteinase-sensitive hydrogel.

C) Self-assembled nanofibres: A category of amphiphilic peptides, known as “multidomain peptides” (MDP) were designed to self-assemble into nanofibers.⁶ This variety of scaffolds have been developed as a replacement for the natural ECM at the nanomolecular level. e.g. KLD12 peptides.

D) Injectable microspheres: These were developed for controlled drug delivery because they are small with an enormous specific surface area. Therefore used as injectable scaffolds. They are either natural or synthetic. Different techniques used for their manufacture include solvent evaporation, spray drying technique, hot melt, solvent removal, and phase inversion microencapsulation⁷.

So, injectable scaffolds in endodontics can be looked at as a promising era for tissue engineering habits to prevent oral and dental disturbance in the long run⁵.
References


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