

necessary for the tumor growth. The tumor instigates the adjacent area cells to express proangiogenic signals helping the tumor to increase in size. Various compounds which interfere in this process have been studied for their potential therapeutic uses in tumor control (Saghiri et al., 2015).

12.8 EFFECT OF BIOGLASS ON DENTAL TISSUES

The property of the bioglass to form hydroxyapatite at the interface of hard tissue, facilitating adsorption of protein, progenitor cell attachment, differentiation of cells, collagen fibril incorporation, ECM release, and mineralization is vital in osteogenesis. It exhibits similar effects on dentin and cementum formation.

Compressive strength is improved by increasing the amount of SiO₂ to 60 wt%. In comparison to conventional microparticles, nanosized particles have more surface area to incorporate dental materials with improvised mechanical and biological properties of scaffolds. Nanocomposites with bioglass are useful dentin substitutes exhibiting osteogenic, angiogenic, antibacterial, wound-healing, and low curing shrinkage.

Ion doping changes the biological and intrinsic property of bioglass which is now made use of in patients prone to infection from poor oral hygiene due to systemic diseases, recurrent dental caries, and low regenerative potential. Cu²⁺ and Co²⁺ are more angiogenic and are used in elderly patients for enhanced blood supply for regeneration and in children requiring angiogenesis in the development of teeth. Lee et al. (2016) enabling customized treatment to patients.

Calcium phosphate cement with Zn bioglass was studied on human dental pulp cells. Results showed no cell toxicity, triggered odontogenic differentiation, blood vessel formation through integrin, MAPK, NF-κB, and Wnt pathways. There was increased expression of VEGF mRNA in the pulp cells and tube formation of endothelial cells compared with cement without Zn, which promises potential in pulp regeneration (Zhang et al., 2015).

The matrices of bioactive glass, in various forms such as scaffolds, foams, and meshes have shown excellent repair and new growth in human dentin-pulp complexes by reducing inflammation, increasing angiogenesis, and odontogenic differentiation. Nanofiber matrices were made, incorporated with the drug dexamethasone and bioactive glass nanoparticles (BGN) through electrospinning. They were used on human dental pulp cells (HDPC) for stimulation of odontogenic differentiation. The pulp cells remained viable for up to (Auerbach et al., 2003) days, in a slow drug release environment of dexamethasone (Lim et al., 2016).

The cellular differentiation as assessed by mRNA expression, alkaline phosphatase, and calcification was significantly higher in the bioglass matrices releasing dexamethasone. The possible molecular mechanisms were by integrins, mTOR, and bone morphogenetic proteins. There was an increased expression of α1, α5, β3, focal adhesion kinase (FAK), RhoA, Paxillin, stimulated bone morphogenetic protein mRNA, AKT, mammalian target of rapamycin (mTOR),