Biodentine™ induces TGF-β1 release from human pulp cells and early dental pulp mineralization

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Abstract

Aim To assess the ability of a recently developed tricalcium silicate-based cement (Biodentine™) to induce reparative dentine synthesis and to investigate its capacity to modulate pulp cells TGF-*β*1 secretion.

Methodology Biodentine™ was directly applied onto the dental pulp in an entire human tooth culture model. After various culture periods, the interaction of the material with dental pulp tissue was analysed on tissue sections. The effect of increasing surface area of this material on TGF-*β*1 secretion was investigated on pulp cell cultures and compared with that of MTA, calcium hydroxide and Xeno®III adhesive resin. After performing artificial injuries on pulp cell cultures, the materials eluates were added for 24 h and then TGF-*β*1 secretion was quantified by ELISA. Controls were performed by incubating intact cells with the culture medium, while injured cells TGF-*β*1 level was used as the baseline value.

Results Biodentine™ induced mineralized foci formation early after its application. The mineralization appeared under the form of osteodentine and expressed markers of odontoblasts. Biodentine™ significantly increased TGF-*β*1 secretion from pulp cells ($P < 0.03$) independently of the contact surface increase. This increase was also observed with calcium hydroxide and MTA, but not with the resinous Xeno®III. The statistical analysis showed statistically significant differences between capping materials and the resinous Xeno®III ($P < 0.001$).

Conclusions When Biodentine™ was applied directly onto the pulp, it induced an early form of reparative dentine synthesis, probably due to a modulation of pulp cell TGF-*β*1 secretion.