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The influence of composite resin restoration on gingival tissue: a pilot study

C. Bertoldi [1], M. Martani [1], L. Generali [1], A. Lucchi [1], D. Zaffe [2], U. Consolo [1]

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Aim. The study is aimed to compare human gingival tissue close to composite cement restorations with the physiologic situation to natural dental hard tissue at the dental neck of the same tooth.

Methods. Eight healthy patients with almost a tooth suprabony jeopardized at the neck/root zone requiring endodontic-conservative therapy, were treated by composite build-up (Esthet.X®) to ensure marginal tissue stability and to allow secure dental matrix apposition. Esthet.X® was used to treat the defect but the perimeter of the residual coronal tooth had to present at least a subgingival restored section and another section consisting of natural enamel to permit subsequent comparison of the gingival tissues close to the natural hard tissues of the tooth (control site) and to the composite restorations (test site). Three months after the Esthet. X® build-up, the crown lengthening surgical procedure was performed to restore the physiological dimension of the biological space. During the surgical procedure, the secondary flap was harvested, fastened to a semirigid support, and histologically examined using the following grade scale of inflammation: 1) Absence or occasional (0-3), 2) Weak (4-19), 3) Moderate (20-99), 4) High (100-499) and 5) Severe (500 and above). The statistical analysis was performed by the non-parametric Mann-Whitney test.

Results. The histological analysis showed an uneven distribution of inflammatory cells in the corion of gingiva portions, both close to the Esthet.X® restorations and the dental hard tissues, in all biopsies. The inflammation grade varied from severe to weak. The statistical analysis did not show any significant difference between the corion of gingival tissue close to the restoration and dental hard tissue surface.

Conclusion. No information exists about the behavior of human gingival tissue close to composite cements used to treat crown and dental neck defects. The reaction of the human gingival to composite build up performed in the dental neck area and the coronal part of the dental root was analyzed in this study and within the limitations of this pilot study, the results seem to indicate that use of this kind of composite does not so much alter greatly the gingival tissue.

Aptamers improve cell biocompatibility of implantable biomaterials

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Aim. Biomaterials, once inserted into a tissue, adsorb plasma proteins, which trigger and control the subsequent host reactions. To stimulate undifferentiated precursors to commit to the desired lineage, implantable biomaterials have been coated with different bioactive molecules, which can enhance tissue regeneration. A possible approach is to coat biomaterials with elements able to dock a specific peptide, such as aptamers. Aptamers are oligonucleotides able to bind and sequester specific proteins on the surface of the scaffold, enriching it for desired protein species, to control and direct tissue responses. The aim of the present study was to investigate whether immobilised anti-Fibronectin aptamers could selectively enrich hydrogel scaffolds for Fibronectin and promote the attachment and growth of osteoblastic cells. This preliminary study aimed to serve as a proof of concept for a novel class of biomimetic coatings, which could selectively sequester useful proteins on biomaterial surfaces.

Methods. We had anti-human Fibronectin DNA aptamers screened for and functionalized with a thiol group on their 3' end. Polyethyleneglycole diacrylate/thiolated Hyaluronic Acid hydrogels (PEGDA/tHA) were selected as 3D matrix. Aptamers were first immobilised on hydrogels and incubated with DMEM enriched with 10% human serum (HS). Fibronectin binding on hydrogels was investigated by spectrophotometry and immunofluorescence. To investigate aptamer effect on cell adhesion, we plated primary human osteoblasts (hOB) on the surface of PEGDA/tHA hydrogels in the presence or in the absence of aptamers and added DMEM enriched with 10% HS in 24 well plates. Cells were cultured on hydrogels for 10 days, rinsed with PBS and fixed for microscopy. Cells were also stained for fluorescent labelling of focal adhesions, microfilaments and nuclei. We quantitated cell number on hydrogels by MTT assay. We then encapsulated hOBs in PEGDA-tHA hydrogels in the presence or in the absence of aptamers in DMEM enriched with 10% HS. After 10 days, gels were fixed, paraffin enclosed and cut. Sections were then stained with hematoxylin-eosin and analyzed at transmission microscope. Hydrogels were then implanted in subcute pouches in rats and harvested 4 and 7 days after surgery for histology.

Results. Aptamers specifically bound to Fibronectin and enriched hydrogel scaffolds for this protein.