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Effects of dimethyl sulfoxide (DMSO) on odontoblast-like cells activity

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Objectives: The aim of this study was to investigate the effects of dimethyl sulfoxide (DMSO) on pulp tissue repair-related activity of cultured odontoblast-like cells.

Materials and methods: DMSO was diluted in fresh DMEM culture medium to prepare solutions with the following final concentrations: 0.05, 0.1, 0.3, 0.5 and 1.0 mM. Then, 1 mL of each solution was applied in wells of 24-well dishes in which MDPC-23 odontoblast-like cells (5×10^4 cells/cm^2) were previously seeded. The solutions were incubated in direct contact with the cells for 24 h. For the control group, only fresh DMEM was used. Eight replicates ($n = 8$) were prepared for each solutions according to the following methods of analysis: violet crystal dye for cell adhesion (CA), quantification of total protein (TP), alkaline phosphatase activity (ALP) and alizarin red for mineralization nodules formation (MN). CA, TP and MN data were analyzed by one-way ANOVA and Tukey's test while ALP data were submitted to Kruskal–Wallis and Mann–Whitney tests ($\alpha = 0.05$).

Results: Cell adhesion was not affect by DMSO solutions at any concentration. A slight reduction in total protein was observed when 0.3, 0.5 and 1 mM of DMSO solution was applied in contact with the MDPC-23 cells. Alkaline phosphatase was also slightly affected, with lower activity detected for 0.5 mM. Finally, 26–30% reduction in mineralization nodules formation occurred for all DMSO solutions evaluated.

Conclusions: According to the methodology used in the present in vitro study and based upon the data obtained, it was concluded that the investigated concentrations of DMSO caused none or slight detrimental effects on the pulp tissue repair-related activity of odontoblast-like cells.

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Can silane treatment for ceramic bonding be optimized?

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Objectives: Evaluate different silane treatments as a method to optimize resin shear bond strength (SBS) to ceramics.

Materials and methods: Two ceramic blocks of each, e.max CAD (Ivoclar Vivadent) and Vitablocs Mark II (VITA), were sectioned into slices (5 slices/block) and embedded in acrylic resin then polished with 400 and 600-grit SiC paper. The surface of each block was cleaned in ultrasonic bath for 5 min. The blocks were randomly assigned to 5 groups; GE: etching with hydrofluoric acid (HF) according manufacturer instructions, rinsing for 60 s, followed by cleaning in ultrasonic bath (2 min); GE/S: HF-etching, rinsing for 60 s, cleaning in ultrasonic bath (2 min) followed by silane application for 20 s and air drying for 20 s and hot drying (60 °C) for 20 s; GE/S plus: HF-etching, rinsing for 60 s and cleaning in ultrasonic bath (2 min), followed by silane application for 60 s, air drying for 20 s and hot air drying (60 °C) for more 20 s, rinsing with boiling water for 15 s and hot air drying for 20 s; GS: application of silane for 20 s followed by air drying for 20 s and hot air drying (60 °C) for 20 s; GSplus: application of silane for 60 s followed by air drying, hot air drying (60 °C) during 20 s, rinsing in boiling water during 15 s and hot drying (20 s). Cylinders of composite resin ($n = 12$) (Z100, 3M-ESPE) were bonded with adhesive resin (Optibond FL adhesive, Kerr). SBS testing (Shear Bond Tester; Bisco Inc.) with a ramp load of 43.8-kgf/min was carried out after 24 h of storage in water.

Results: GE/S specimens showed significantly higher mean bond strength, for both ceramic (e.max 21.06 MPa; Vita 24.27 MPa), than those of GE and GE/Splus (range: 15.50–20.96 MPa). The use of silane alone showed significantly lower mean bond strength independent of the ceramic (e.max 3.92–4.32 MPa; Vita 5.69–5.91 MPa). No significant differences were found between GE/S and GE/Splus for Vita.

Conclusions: The association of etching and silane showed to be significant to obtain a high resin-ceramic SBS; when considering a single treatment, HF-etching proved superior to silane. Furthermore, the results showed that the optimized application of silane (hot water rinsing) it is not necessary.

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Morphological evaluation of bonding interface of fiber post and tooth

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Objectives: Considering all the problems regarding the adhesion of resin luting agents to dental root structures, the objective of this study was to assess the type of dentin etching procedure and the type of cement that show best regularity on bonding interface between fiber post and tooth structure.

Materials and methods: The glass fiber conical posts (Exacto™ – Angelus) were luted to the dental roots, 12 mm deep, using alternate types of etching procedure and resin cements. Groups were divided according to the etching procedure and luting system combination used: G1: phosphoric acid at 37%, adhesive system 2.1 and activator (Primer&Bond 2.1™ and Activator™ – Dentsply) and resin cement (Cement Post™ – Angelus); G2: self-adhesive resin cement (RelyX™ U100 – 3M ESPE) and G3: self-etching dentin adhesive system (Fusion Duralink™ – Angelus) e resin cement (Cement Post™ – Angelus). The roots were longitudinally sectioned and subjected to SEM. Photomicrographs were taken every