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Cytotoxicity of Silver Fluoride Treatments

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Objectives Silver fluoride treatments have shown significant efficacy in arresting caries progression. This study aims to investigate the cytotoxicity of silver diamine fluoride or aqueous silver fluoride using dentin-barrier test and direct cell viability assays.
Methods Deep dentin discs (n=8/group) (400µm thick/10mm diameter) were prepared and distributed based on permeability measurements. 3-D cultures of odontoblast-like cells (SV40 transfected pulp-derived cells) transferred to the pulpal aspect of dentin slices inside individual perfusion split chambers designed for dentin barrier test according to ISO 7405 standards. An experimental glass ionomer cement served as the positive control (50% cell viability), while a polyvinylsiloxane impression material (Express, 3M-ESPE) served as the negative control (100% cell viability). The tested groups included (1) 38% silver diamine fluoride=SDF (Riva Star, SDI), (2) SDF+potassium iodide=KI (Riva Star, SDI), (3) 38% aqueous silver fluoride=AgF (Riva Star Aqua, SDI) and (4) AgF+KI (Riva Star Aqua, SDI). Materials were applied to the coronal section of the dentin discs for 1min and dried. After 24h, cell viability (%) was assessed by MTT assay. Additionally, direct dilutions (10^{-3}, 10^{-4}, and 10^{-5}) of the test solutions were evaluated at a well-plate, using the same cell line. Data were analysed using Kruskal-Wallis and Mann–Whitney U test (α=0.05).
Results Silver fluoride treatments significantly reduced cell viability compared to control in dentin-barrier test ($p<0.05$). AgF treatment resulted in significantly higher cell viability compared to other treatments ($p<0.05$). In direct exposure tests, all groups showed moderate cytotoxicity with 10^{-3} dilutions, while AgF treatment exhibited no cytotoxicity with 10^{-4} and 10^{-5} dilutions.
Conclusions Silver fluoride treatments, particularly in deep cavities, should be applied with caution due to potential cytotoxicity. AgF treatment resulted in lower cyctotoxicity compared to SDF in both dentin barrier test and direct dilution assays. Furthermore, the addition of KI increased cytotoxicity when combined with SDF and AgF.