

Cytotoxicity of Calcium Phosphate Root Canal Sealers

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I. Objectives

The combination of setting ability and biocompatibility makes calcium phosphate cement as a potentially useful material in a variety of dental and medical application. The objective of this study was to compare the cytotoxicity of calcium phosphate root canal sealers(Apatite Root Sealer(ARS) Type I, II, and III) with those of four other endodontic sealers(Pulp Canal Sealer EWT, AH Plus, Sealapex, Ketac Endo).

II. Materials and Methods

Sealer extracts were obtained in culture media after mixing of sealers during the following 7 periods : 1h(0-1h), 8h(1-8h), 24h(8-24h), 48h(24-48h), 1wk(48h-1wk), 2wks(1wk-2wks), 4wks(2-4wks). L929 mouse fibroblasts were exposed to the each sealer extract and the cytotoxic effects were evaluated using the dimethylthiazol dipyhenyltetrazolium(MTT) assay and the neutral red(NR) assay.

The percentage of cytotoxicity of each experimental group was calculated using the following formula:

$$\% \text{ cytotoxicity} = \left(1 - \frac{\text{mean OD of experimental group}}{\text{mean OD of control group}} \right) \times 100$$

III. Results

The results were statistically analyzed by the Kruskal-Wallis test and the Friedman's 2-way ANOVA. ARS Type I, II, and III exhibited very low cytotoxicity at all observation periods in both assays(23.65-0.55%). There was no significant difference among the cytotoxicity of ARS Type I, II, and III at each time interval($p > 0.05$). AH Plus and Ketac Endo induced severe, early cytotoxicity but low cytotoxicity after 8h(AH Plus) and 24h(Ketac Endo). Pulp Canal Sealer EWT and Sealapex showed long-lasting cytotoxicity until 4wks. In most cases, cytotoxic effects of each sealer extract showed similar patterns between the MTT assay and the NR assay.

IV. Conclusions

1. ARS Type I, II and III showed low cytotoxicity at all observation periods, and proved to be very biocompatible materials.
2. Calcium phosphate root canal sealers need further evaluation and development.