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EFFECT OF AMALGAM TYPE ON ARTIFICIAL CARIES

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Cut cavity surfaces of freshly amalgam-restored teeth are particularly vulnerable to bacterial attack. A gap is always present at the tooth-amalgam interface following restoration allowing the passage of oral fluids and bacteria. There bacteria rapidly ferment ingested carbohydrates, causing the surrounding pH to drop, carious lesions to form and consequent re-restoration of the tooth. Should bacteria gain access to the dentine, pulpal inflammation can be sufficiently severe to result in tooth loss. Amalgams have short term anti-bacterial properties[1] which could prevent prompt bacterial penetration at this interface. The impact of aged amalgams on lesion development is not known. This study was undertaken to examine the influence of amalgam type on artificial, secondary carious lesion formation adjacent to amalgam-restored teeth aged for 3 months and 1 year.

Cavities were cut in 64 extracted intact human premolars and restored with a high (↑Cu) or a low (↓Cu) copper amalgam. After ageing in 1% NaCl with thymol for 3 months and 1 year, the teeth were subjected to a bacterial artificial caries challenge[2]. Each tooth was coated with nail varnish leaving the restoration margin and a 1mm peripheral area exposed. After sterilisation with gamma irradiation specimens were individually placed in sterile McCartney bottles filled with sufficient sterile brain heart infusion broth containing 3% sucrose to cover the tooth and were incubated for 3 days at 37°C to check sterilisation. Teeth were transfered under sterile conditions to a fresh broth inoculated with Streptococcus mutans ATCC 25175, a strain isolated from carious dentine, and incubated for 36 days changing the medium twice weekly. Thereafter the teeth were rinsed and resin embedded. One ground section 100-120μm thick, midway through the restoration, was prepared from each specimen and viewed using polarised light (Fig. 3). A Kontron Image Analysing System was used to measure lesion dimensions. The data were subjected to one way ANOVA and Tukey's test to establish statistical significance.

No statistically significant difference was apparent between lesions formed after 3 months and 1 year of ageing. The % wall lesion depth was significantly greater in ↑Cu (21%) than ↓Cu (12%). The outer lesion was significantly further from the cavity wall in ↓Cu (38μm) than ↑Cu (2μm).

The results of the study indicate that amalgam type has a significant effect on the formation of artificial carious lesions in the tooth adjacent to a restoration. Previous studies have shown that more marginal seal material is formed by ↓Cu[3] which can result in less marginal leakage[4] than ↑Cu. This implies that bacteria cannot easily gain access into the marginal gap of ↓Cu. Once within the gap, elements which migrate from the amalgam whether into the tooth structure or to form the marginal seal, could prevent bacterial multiplication and increase tooth resistance to demineralisation. Judicious choice of amalgam type could decrease the likelihood of caries development at the amalgam-tooth margin.

References

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Fig. 1. A carious lesion (c) formed next to the amalgam restoration (a).