Fluoride-releasing dental restorative materials: An update

The fluoride ion has a well-established beneficial role in dentistry in protecting the teeth from assault by caries. It is known to contribute to the dynamic mineralisation process of the natural tooth mineral, and also to become incorporated with the mineral phase, forming a thin layer of fluorapatite. This is more resistant to acid attack than the native hydroxyapatite, hence protects the tooth against further decay. Other recently discovered aspects of the role and uptake of fluoride will also be discussed.

One of the widely used dental restoratives, the glass-ionomer dental cement, is able to release fluoride in a sustained manner that may continue for many years, and this is seen as clinically beneficial. The closely related resin-modified glass-ionomer cement, and also the polyacid-modified composite resin (“compomer”) are able to do the same. There are also fluoride-containing conventional composite resins able to release fluoride.

This paper will review these various materials, and describe the way in which they release fluoride and the effectiveness of the release at the levels involved. Fluoride exchange has been demonstrated for conventional glass-ionomers, i.e. that they will take up fluoride under appropriate conditions, and re-release it when needed. However, recent results have shown that the majority of fluoride taken up becomes irreversibly bound into the cement, i.e. is not subsequently released; and that maturation affects this process. The significance of these new findings will be discussed.

Studies of effectiveness of fluoride release from these various classes of material will be reviewed, and shown to suggest that release from conventional and resin-modified glass-ionomers is more beneficial than from composite resins. This is attributed to two causes: firstly, that it is not possible to replace the lost fluoride in composites, unlike glass-ionomers, and secondly because the other ions released from glass-ionomers (calcium, phosphate) are able to contribute to local remineralisation of the tooth. The absence of these other ions in fluoridated composites means that remineralisation is able to occur to a lesser extent, if at all.