

Compiled by Geoffrey M. Knight

Caries remineralization under restorations

The removal of softened dentine to create a firm base for a restoration has been one of the corner stones of restorative dentistry.

Students were taught that even if the tooth was asymptomatic, it was better to chase caries into the pulp rather than risk the chance of progression of a lesion.

In the late 1990s an emerging bank of evidence showed that the creation of a biological seal at the cavo margin (isolating the lesion from the overlying biofilm) reduced the viability of the bacteria remaining in the lesion and arrested further progression of caries. It was further shown that the infusion of dentinal tubular fluids from the pulp through the remaining hard tissues was able to generate remineralization of the softened caries affected dentine.

If a glass ionomer cement (GIC) restoration is placed over the remaining caries, fluoride and either strontium or calcium ions (depending upon the glass used in the cement) transfers from the cement into the underlying tooth structure and assists with remineralization.

Dentine forms in a biological soup resulting in hydroxy apatite crystals that are contaminated with carbonate ions and various mineral salts. The pH that this carbonated apatite demineralizes is around 5.5. If the demineralized dentine is able to remineralize without the presence of carbonate ions and with fluoride ions present, the resulting

complex of hydroxy and fluor apatite is able to resist demineralization to a pH of around 4.5, a level that pushes the biological tolerance of many oral bacteria.

Demonstrating caries remineralization under a well sealed occlusal restoration within the strict parameters of a clinical trial is one thing, predictability achieving a biological seal in a proximal box within the cut and thrust of general dental practice is another.

One of the constraints of atraumatic restorative technique (ART) dentistry is achieving a biological seal at the restorative interface. While glass ionomer cement certainly inhibits caries, a carious cavo margin restored with GIC will not seal the cavity from the adjacent biofilm.

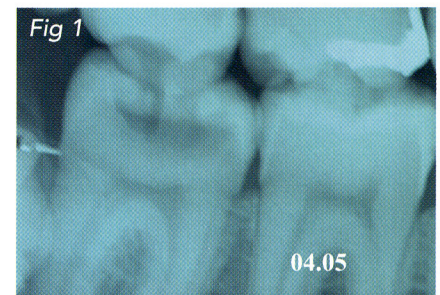
The challenge then is to find a way of predictably sealing caries from the overlying biofilm without relying on the mechanical sealing properties of a restorative material.

The infusion of ozone or the application of silver fluoride and potassium iodide to a carious lesion prior to placing a restoration reduces the viability of caries and assists remineralization by inhibiting the formation of a biofilm over the treated dentine.

CLINICAL CASE 1

A patient presented with a large carious

lesion on tooth 37. Although the lesion was asymptomatic a periapical radiograph showed extensive caries that may well have involved a pulpal exposure during cavity preparation (Fig 1).



Large carious lesion on tooth 37.

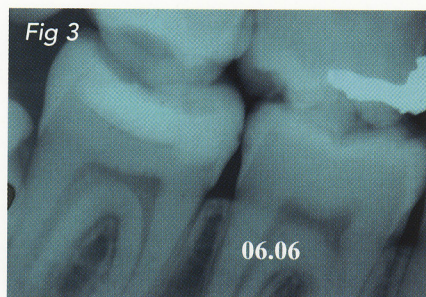
Overlying caries were removed and the residual softened dentine was infused with ozone for 20 seconds using a HealOzone (KaVo, Germany) instrument. Following this, a high fluoride releasing glass ionomer cement restoration was placed into the preparation. Extensive radiolucency below the restoration is shown in the radiograph taken immediately after the procedure (Fig 2).



Glass ionomer cement restoration placed over HealOzone treated lesion.

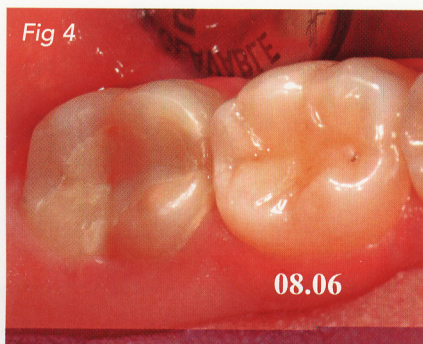
Twelve months later the patient was recalled and a composite

resin sandwich was placed over the glass ionomer cement (Fig 3).



Composite resin overlay sandwich restoration placed 12 months after initial GIC dressing.

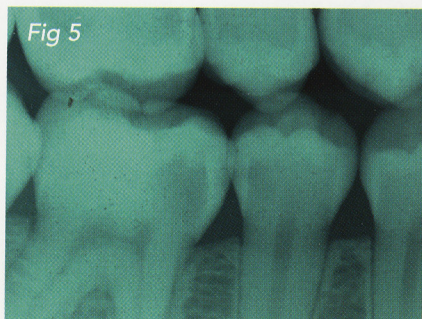
At this appointment a further radiograph was taken showing a dramatic increase in radiopacity below the glass ionomer cement (Fig 4).



Dramatic remineralization 12 months after HealOzone treatment and GIC dressing.

CLINICAL CASE 2

Large proximal carious lesions were diagnosed radiographically on teeth 45 and 46 (Fig 5). After gaining access to the lesions caries were removed around



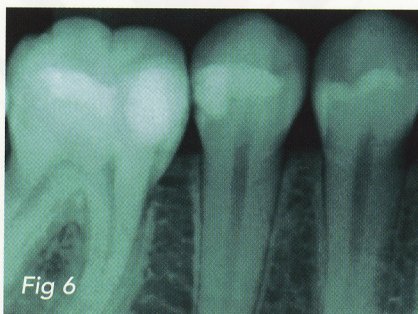
Large proximal carious lesions teeth 45 and 46.

the perimeter of the preparations and left in the deepest parts of the cavities overlaying the pulps.

After etching the teeth with 34 per cent phosphoric acid for five seconds;

washing and drying; a solution of ammoniated silver fluoride was applied followed by a solution of potassium iodide to prevent the black staining associated with AgF.

After washing and drying the preparations, glass ionomer cement restorations were applied to the cavities. Eighteen months later the teeth were again radiographed. Although this patient has a high caries rate as demonstrated by the new lesion that had formed on the distal aspect of tooth 46, there was increased radiopacity present below the restorations, especially in tooth 46 (Fig 6).



Eighteen months after AgF/KI treatment there has been increased remineralization, especially in tooth 46.

Theoretically, achieving a biological seal at the cavo margin will predispose

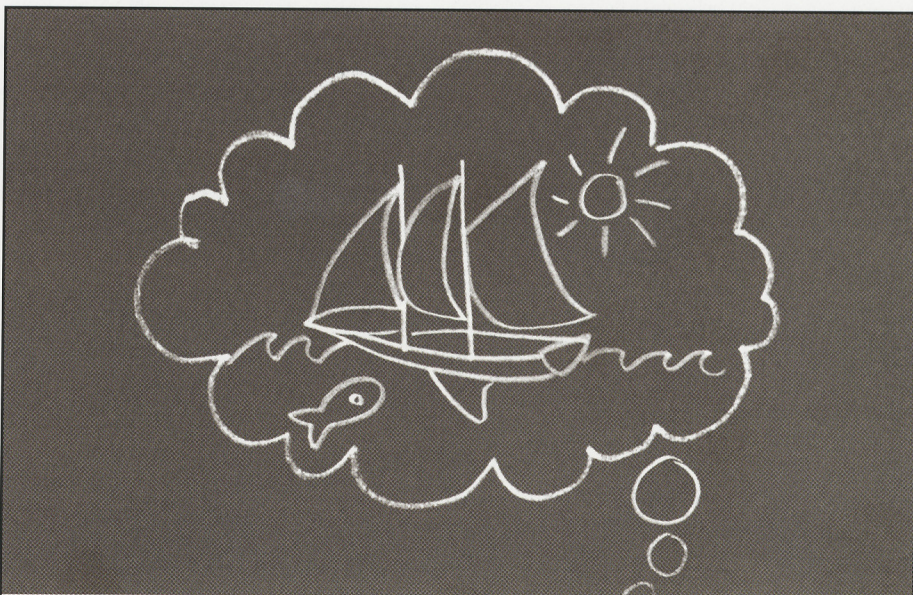
to remineralization in a vital tooth. The use of ozone or silver fluoride increases the predictability of remineralization occurring by biologically sealing the cavo margins. Glass ionomer cement restorations transfer fluoride and calcium or strontium ions into the lesion and assist with remineralization and the formation of fluor apatite. This is certainly a powerful argument for using a glass ionomer instead of a composite resin base when restoring a carious lesion.

INFORM PATIENTS OF PROCEDURE

Intentionally leaving caries under a restoration can predispose to dental legal problems if the patient is unaware of what has been done particularly if another practitioner should radiograph a tooth treated in this manner. Dentists who carry out remineralization procedures are well advised to provide their patients with explanatory notes on what has been done and the outcomes to be expected.

DISCLOSURE

The author's name appears on a process patent for the application of silver fluoride and potassium iodide.



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