Should APF gel be used on glass ionomer cements?

Fluoride release, weight loss and erosive wear of modern aesthetic restoratives *H-K. Yip, W. T. C. Lam and R. J. Smales*
Br Dent J 1999; 187: 265-270

Objective
In this investigation, the *in vitro* sustained fluoride release, weight loss and erosive wear of three conventional glass ionomer cements (Fuji IX, ChemFil Superior, Ketac-Silver), three resin-modified glass ionomer cements (Fuji II LC, Vitremer, Photac-Fil), a polyacid-modified resin composite (Dyract), and a resin composite control material (Z100) were compared.

Methods
The amounts of fluoride released and weight changes were measured for 12 weeks using a fluoride electrode with TISAB III buffer. After 12 weeks, the specimens were recharged with fluoride using 2 mL of 1.23% APF gel. The recharged specimens were assessed for the amounts of fluoride released and weight changes over another 12 weeks. At the end of the experiment, the specimens were examined with SEM and surface profilometry.

Results
All materials, with the exception of Z100, showed the highest initial fluoride release rates during the first 2 days, dropping quickly over 2 weeks and becoming largely stabilised after 5 weeks, in an exponential mode. The recharging of the specimens with APF gel caused a large increase in the amounts of fluoride released during the first 2 days only. Analyses for all cements showed strong correlations between mean weight loss and cumulative fluoride release over a 5-week period following the application of the APF gel. SEM and surface profilometry found that roughness increased from the polyacid-modified resin composite to the conventional glass ionomer cements.

Conclusions
APF gel caused erosive wear of the glass ionomer cements especially, and the wear correlated well with the weight losses. To minimise surface erosion, APF gel should not be used on these cements, especially as the recharging effects are transitory.

In brief

- Recharging conventional GICs, resin-modified GICs, and a compomer with APF gel for 4 minutes resulted in large amounts of fluoride ions being released in artificial saliva.
- However, the effects were transitory and the acidic gel damaged the surfaces of the conventional GICs and resin-modified GICs, especially.
- The use of topically-applied acidic gels should be avoided with these restorative materials.

Comment

It has been shown that both resin modified glass ionomer cements (RMGICs) and conventional glass ionomer cements (GICs) release fluoride into water and artificial saliva.[1] This has been observed to a lesser extent with compomers.[2,3] The fluoride release has been regarded as beneficial in the prevention of recurrent caries. It has also been shown that all these materials may take up fluoride from the surroundings and then re-release it as the external conditions change.[4] Glass ionomer materials are known to erode in acid conditions.[5] The materials are tested for acid erosion using an erosive jet of lactic acid at pH 2.7 Erosion is not so readily demonstrated with RMGICs as the resin HEMA in its polymeric form will take up water and swell masking erosive changes.[6] Little is known of acid exposure to componers.

This study compares the effect of exposing GICS, RMGICs and componers to an acidulated phosphate fluoride gel (APF). Weight loss, erosive wear and fluoride release were monitored both before and after exposure to the APF gel. The fluoride release from the materials before exposure to APF gel replicates other work.[1,2] The materials were then exposed for 4 minutes to the APF gel and the fluoride release monitored for a further 12 weeks together with any weight and surface topography change. Initially after exposure all materials released a substantial amount of fluoride into solution. This was substantially greater than that released under normal conditions. The GICs exhibited the greatest increase in fluoride release. This was linked to the greatest change in surface roughness. It was disturbing that both the RMGICs and copomers while releasing fluoride showed a downgrading of the surface. This suggests that these materials are likely to be affected by acid erosion as well. The paper highlights the importance of understanding the interactions between materials. More specifically it confirms the risks of using APF gels in mouths where acid base reaction cement are *in situ*. Fluoride varnishes and solutions may be more appropriate.

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