Condensable metal-reinforced glass ionomer cements in primary molars

Clinical performance of a condensable metal-reinforced glass ionomer cement in primary molars by N. Krämer, R. Frankenberger Br Dent J 2001; 190: 317-321

Objective
Aim of the present study was to evaluate the clinical suitability of the condensable metal-reinforced glass ionomer cement Hi-Dense in classes I and II cavities of primary molars.

Methods
Seventeen children received a total of fifty four Hi-Dense fillings (nineteen class I and thirty five class II). The restorations were clinically assessed at baseline, after one and after two years of clinical service according to modified USPHS codes and criteria. The restorations were replicated in each recall and representative samples were qualitatively analysed under a SEM.

Results
Over the observation period of two years, five restorations failed due to total retention loss, two fillings needed replacement because of persisting hypersensitivity, one filling was lost because of an unsuccessful endodontic treatment, and four restorations remained intact until natural exfoliation (Two year survival rate: 92% for Class I and 66% for Class II). The SEM analysis of surfaces and marginal areas exhibited an inferior adhesive performance primarily in proximal areas, whereas a negative step formation due to wear was frequently observed in occlusal parts.

Conclusions
The results clearly indicate that the condensable, metal-reinforced GIC Hi-Dense reveals no enhanced performance and lifetime expectancy for class II restorations in primary molars when compared to other non-resin-modified GICs.

In Brief
- Condensable glass ionomer cements with metal additions such as Hi-Dense provide favourable handling characteristics in children with low compliance.
- Newer generation glass ionomers with higher viscosity like Hi-Dense show the same disadvantages regarding flexural strength as their predecessors with lower viscosity such as Ketac Silver.
- Independent of the stage of development it can be stated that non-resin-modified glass ionomers perform unsatisfactorily in Class II restorations of primary molars.

Comment

Concerns have been raised, particularly in Europe, about the use of amalgam as a restorative material in children. This has led to the profession striving to develop alternative materials for use in the deciduous dentition. Restorative care for the deciduous dentition poses a series of challenges to the practitioner in terms of the size and shape of the cavities, the co-operation of the patient and the nature of the substrates (deciduous enamel and dentine which are different in structure and mineralisation to the permanent equivalents) when an adhesive material is to be used.

Clinical studies of alternative restorative materials in the deciduous dentition have been undertaken with the full spectrum of tooth coloured restorative materials from conventional glass ionomer cement to composite resins as well as metal reinforced /modified GICs. The clinical performance of glass ionomer cements has been disappointing in this setting, but reflects their physical characteristics. These materials are subject both to wear on the functional surfaces of the teeth and to bulk failure by fracture in clinical service, particularly in extensive cavities. There are also concerns about breakdown of marginal adaptation of the material to the tooth.

The manufacturers of glass ionomer cements continue to develop these materials to produce products that have more favourable mechanical characteristics. This paper reports a small clinical study of the use of one such material (Hi-Dense from Shofu) in the deciduous dentition of relatively young patients in whom the challenges of moisture control and patient compliance would be relatively high.

There have been some reports in the literature of improved performance in the laboratory of this newer high viscosity glass ionomer material. Unfortunately, the clinical data reported in this study demonstrate few apparent clinical benefits derived from the selection of this new product compared with earlier metal reinforced glass ionomer cements. The newer material seems to have a similar pattern of clinical performance to both metal reinforced and conventional glass ionomer cements when used in the management of the deciduous dentition in previous studies. However the handling characteristics (notably its increased viscosity) of the new product may offer some advantages in terms of clinical placement.

The authors conclude that there are advantages to the use of glass ionomer cements in unco-operative children where moisture control is particularly problematic but that other (resin-based) materials are preferable in the co-operative subject.

Care needs to be taken in interpreting this conclusion, it must be remembered that the attachment strength of glass ionomer cements to both enamel and dentine is also compromised by the presence of salivary pellicle on the surface of the prepared tooth tissue, and that the clinical performance of all GICs is affected adversely by contamination of the surface of the material with moisture before the material has set adequately. It is worthy of note that the authors created cavities in this study with slight undercuts, which may have helped to retain the restorations in the study when chemical adhesion may have failed.

It would appear that this more recent generation of glass ionomer cements are no significant improvement on their predecessors in their use within the deciduous dentition, particularly for Class II restorations where approximately one third of the restorations placed failed within the 2.5 year follow-up period.

It would be reasonable to summarise that these materials offer some benefits in terms of their placement and clinical handling characteristics in comparison with composite resin and compomer materials but have a reduced life expectancy in oral function.

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