Conservative Glass Ionomer Cement Occlusal Restorations can be as Effective as Conventional Amalgam Occlusal Restorations

SUMMARY

Subjects
The study sample was composed 152 children from 5 primary schools in the Ilala District (one of the districts of the capital city Dar es Salaam, Tanzania) and the mean age at baseline was 11 years. These children were in need of 2 or more restorations on permanent molars. A total of 430 matched contralateral restorations were randomly placed in 152 children, and at the 6-year follow-up, 114 (75%) children were available for evaluation.

Key Exposure/Study Factor
The primary study factor was the comparison of the success at 6 years of an amalgam occlusal restoration (the conventional technique carried out in a dental school setting), a low-viscosity glass ionomer cement occlusal restoration (the modified-conventional technique carried out in a portable dental clinic setting), and a low-viscosity glass ionomer cement occlusal restoration (the ultraconservative “ART” approach placed in a field setting).

Main Outcome Measure
The main outcome measure was failure of the 3 restorative methods/materials at 6 years, evaluations being completed by 2 calibrated examiners using a modification of the USPHS-Ryge criteria.¹

Main Results
The principal findings at 6 years were 75% success with conventional occlusal amalgam restorations, 76% success for the modified-conventional low-viscosity glass ionomer cement occlusal restorations, and 69% success for the ultraconservative low-viscosity glass ionomer cement occlusal restorations. There were statistically significant ($P < .05$) differences in the success rates of the 3 restoration types. The most common causes of failures were restoration fracture/poor marginal integrity, which was most common for amalgam restorations, and loss of material, which occurred significantly ($P = .003$) more in glass ionomer cement restorations. Secondary caries was significantly greater ($P = 0.001$) with amalgam restorations (16) compared with glass ionomer cement restorations (3).

Conclusions
The authors concluded that the 6-year survival of conventional occlusal amalgam restorations placed in a university clinical setting demonstrated no more success than modified-conventional low-viscosity glass ionomer cement occlusal restorations and ultraconservative low-viscosity glass ionomer cement occlusal restorations.

COMMENTARY AND ANALYSIS
The authors concisely explained and well referenced the high-caries-risk population in Tanzania, the difficulty of obtaining contemporary...
comprehensive dental care in a dental clinic, and the potential benefit of placing glass ionomer restorations, initially referred to as the atraumatic restorative treatment (ART). The purpose of the research was clearly presented.

The materials and method were thoroughly explained. Subjects were identified from a previous oral health survey that had been performed by 2 calibrated examiners according to criteria described by the World Health Organization. Restoration preparation and placement were well described, including the preparations that were performed with the use of the chemical agent Caridex. All restorations were placed in the occlusal surface of permanent molars, using a randomized split-mouth design. This was a good experimental methodology, the split-mouth design offering the advantage of different experimental restorations being exposed to the same oral environment. One dental therapist performed all treatment, allowing for standardization in tooth preparation and restoration placement. Restorations were randomly placed, having almost equal numbers in each restoration group. The same 2 calibrated dentists who conducted the baseline examinations also completed the 6-year assessments. Although these examiners were blinded to treatment, it would have been obvious if an amalgam restoration was being evaluated. Appropriate statistical analyses were used to interpret the experimental data. There was excellent follow-up for a 6-year clinical study, with 75% of subjects returning for evaluation. However, significantly ($P = .02$) more subjects dropped out of the conventional amalgam and the modified-conventional glass ionomer cement group compared with the ultraconservative glass ionomer group. Because the ultraconservative glass ionomer group, representing the atraumatic restorative treatment (ART), had the greatest retention of subjects, there is more confidence in the outcome findings for this conservative restorative technique.

The rationale for the use of the Caridex system in removing caries was explained well. Furthermore, problems associated with the original Caridex system were presented, and there was an excellent explanation on the impact this might have on findings.

The greatest portion of failures was associated with restoration fracture/poor marginal integrity. This was associated most closely with amalgam restorations. Loss of material was the second most common reason for restoration failure. This was associated with glass ionomer cement restorations. This emphasizes the need to adjust occlusion appropriately to relieve stress-bearing areas and to use highly filled glass ionomer cements in stress-bearing areas. Secondary caries was significantly greater ($P = .001$) with amalgam restorations compared with glass ionomer cement restorations. This can most likely be associated with the fluoride associated with glass ionomer cements, which have been described to inhibit secondary caries.

In a recent issue of the *Journal of Evidence-Based Dentistry*, a review was conducted on an article exploring the effectiveness of ART provided to children in a school setting in China. The authors of the reviewed article reported that 76% of small ART restorations and 59% of large ART restorations had not failed at 6 years of follow-up. Interestingly, in the current study reviewed, 69% of the ART restorations had not failed at 6 years of follow-up. Recurrent caries was observed in 6% of the small ART restorations placed in the cohort study conducted in China, whereas recurrent caries was observed in 10% of the amalgam restorations and 2% of the glass ionomer restorations (includes ART) in the clinical trial conducted in Tanzania. In summary, this well-performed, split-mouth designed, randomized clinical trial demonstrated that ultraconservative glass ionomer cement restorations (ART) and modified-conventional glass ionomer cement restorations could perform as well as amalgam as an occlusal restoration and could be of particular benefit to underserved children in settings where electricity is not readily available to provide contemporary dental care.

REFERENCES


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