Microleakage of bonded amalgam restorations using different adhesive agents with dye under vacuum: An in vitro study

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ABSTRACT

Aim: In an effort to minimize tooth preparation, yet provide additional retention to compromised tooth structure, bonded amalgam restorations were introduced. Various resin-based adhesives have been tried earlier under bonded amalgam restorations. Still there are controversies regarding the outcome of bonded amalgam restorations regarding their adaptability to the tooth structure and microleakage. Therefore, this study was undertaken to compare the microleakage of bonded amalgam restorations using different adhesive materials.

Materials and Methods: Standard Class I cavities were prepared on occlusal surfaces of 60 human molars. Teeth (n=60) were divided into three groups according to the material employed, as follows: group I: amalgam with glass ionomer cement (GIC) (type I); group II: amalgam with resin cement (Panavia F 2.0) and group III: amalgam with Copalux varnish as a control. Following restoration, the teeth were submitted to thermal cycling. The teeth were subsequently immersed in 2% rhodamine B dye under vacuum for 48 hours and sectioned to allow the assessment of microleakage under stereomicroscope.

Results: The values were tabulated and the results were statistically analyzed using analysis of variance (ANOVA), Tukey's post hoc test and Kruskal–Wallis test. Amalgam with type I GIC showed the least leakage with no statistically significant difference (P value 0.226) when compared to amalgam with Panavia F 2.0 and amalgam with varnish (P value 0.107).

Conclusion: It can be concluded that bonded amalgam with type I GIC is a good alternative to amalgam with resin cement (Panavia F 2.0) and amalgam with varnish for large restorations, with the added advantages of GICs.

Clinical Significance: Bonded amalgam restorations prevent over-preparation and reduce the tooth flexure. GIC type I under amalgam provides chemical bonding in between amalgam and tooth structure and thus reduces the microleakage.

Key words: Adhesive agents, bonded amalgam, dye under vacuum

Dental amalgam has been used successfully for almost 200 years as a restorative material. Despite the poor esthetic characteristics and potential mercury exposure, this material still provides strong, durable and the best cost-effective direct posterior restoration. However, amalgam in complex restorations shows some disadvantages which include microleakage, lack of adhesion to the tooth structure and post-operative sensitivity. The use of boxes, locks, channels, or pins for added retention in large amalgam restorations requires the removal of additional tooth structure and weakens the remaining enamel and dentin. In an effort to minimize tooth reduction, yet provide additional retention to compromised tooth structure, bonded amalgam restorations were introduced in the late 1980s. In the bonded amalgam technique, a dentin bonding system is used in conjunction with a viscous resin liner. The viscous liner physically mixes with the amalgam and forms chemical as well mechanical union to enhance the amalgam's retentiveness to tooth structure. Bonded amalgam restorations seem to offer many advantages like its substantial ability to retain amalgam without compromising tooth structure, a reduction of initial postoperative sensitivity, microleakage and reduction of cusp flexure. Though there are controversies regarding the outcome of bonded amalgam restorations regarding its adaptability to the tooth structure and microleakage, still various studies...