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COMPARATIVE S.E.M. OBSERVATION OF CLASSICAL AND BONDED AMALGAM RESTORATIONS

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INTRODUCTION: Dental amalgam has passed the "time test" for over 150 years as a strong, durable and relatively inexpensive restorative material. However, recently, a strong wave of "anti-amalgamists" is trying to rid amalgam because of disadvantages including microleakage, lack of adhesion to tooth structure or sensitivity. Amalgam bonding agents and new amalgam alloys were developed to address these concerns. In this study we compared the SEM images of the amalgam-tooth structure interface in different types of classical and bonded amalgam restorations.

METHODS: Freshly extracted non-carious premolars and molars were collected and stored in distilled water. Each tooth was prepared as followed: ideal class I cavities preparations were performed using a water-sprayed, high-speed handpiece with new diamond-coated burs. Each cavity was cleaned and dried. We used two types of alloys: Lojic+ (SDI Australia) – a single composition spherical alloy, and Ultracaps+ (SDI Australia) – an admix alloy of spherical and irregular particles. For each alloy type we prepared a "witness" tooth: amalgam was triturated with Ultramat2 amalgamator (SDI Australia), according to manufacturer's instructions, and then condensed into the prepared cavity using a double-ended amalgam carrier and amalgam plugger. After carving to anatomic contour, the amalgam was left for 24 hours in distilled water for final setting and than burnished.

OptiBond Solo Plus (Kerr) single bottle bonding agent was used for amalgam bonding in the test sample. The bonding agent was applied according to manufacturer's instructions, prior to amalgam condensation. All teeth were then vertically sectioned into 3 mm thick halves with water-cooling, using a precision cutting instrument with a diamond disc. After cleaning, the samples were stored in distilled water and examined in various magnifications under the scanning electron microscope.

RESULTS: Different areas of the specimens were observed under the S.E.M. in various magnifications. It was noticed that, at lower rate of magnification, there were no significant differences between classical and bonded amalgam, regardless of the alloy type used. At higher rate of magnification we can see that the teeth restored with unbonded amalgam ("witness" specimen) had more spaces and artifacts at the amalgam-tooth structure interface, spaces that are filled with bonding agent in the case of test specimens (fig.1).

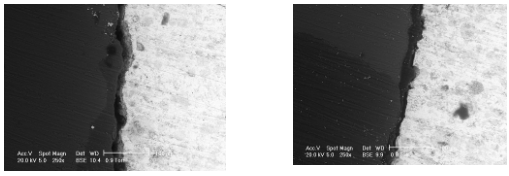

Fig. 1: Unbonded (left) and bonded (right) amalgam fillings (magnification 250X).

DISCUSSION & CONCLUSIONS: Studies have shown that the resultant retention with amalgam bonding is equal to or superior to the traditional means of mechanical retention[1]. Also, a reduction in sensitivity and a more conservative cavity preparation can be achieved when amalgam is bonded to a tooth[2]. Studies to examine the efficacy of single-bottle bonding agents for use in amalgam bonding have been made[3,4].

In this study, interfaces of teeth restored with bonded amalgam based on different types of alloy, using a single-bottle bonding agent, were observed under the S.E.M.. The photomicrographs show that tooth restored with unbonded amalgam had more spaces and artifacts at the amalgam-tooth structure interface than the tooth restored with a bonded amalgam.

Further research must be done to verify the sealing abilities and bonding strength of the different single-bottle bonding agents when used in amalgam bonding in association with different types of amalgam alloys.

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