Amalgam repair: a case report

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Through the report of a clinical case, the feasibility and advantages of repair and recontouring of complex amalgam restorations are discussed. In this patient, the kind of alloy used for the fractured restoration and the age of the restoration were known factors. Additional mechanical retention was prepared in both the “old” amalgam and the dentin, and the repair was made with a high-copper alloy. The bond at the repair site was stable at the 2.5-year recall examination. (Quintessence Int 1992;23:527–531.)

Introduction

Contrary to long-standing beliefs, restorations do not “cure” dental caries, and they also fail and require replacement.1 It is believed that a practitioner spends 50% of his or her time replacing defective restorations.2 The main causes of replacements and restorations are secondary caries3 and marginal degradation.4–9 Nevertheless, a greater degree of occlusal “ditching” does not result, necessarily, in a greater degree of secondary caries.10–13

It is also believed that most practitioners, when replacing a restoration, will, in good faith, offer the patient another restoration presenting, as a rule, the same deficiencies that affected the first.1

Replacing a restoration means a 0.2- to 0.5-mm increase in the size of the cavity3 and, thus, a weakening of the dental remnant. As restorations are inserted and replaced, cavities enlarge1 and both teeth14 and restorations15 become more fragile. Few teeth will withstand successive restoration replacements without requiring endodontic treatment and/or a prosthetic crown.16

The criteria followed to determine the need for replacement of a restoration are, as a rule, subjective,3 resulting in a greater than necessary number of replacements.17 This is especially true with amalgam restorations, particularly considering that ditched margins and marginal degradation (looked on by some authors4,18 as clinical signs of failure and, sometimes, held erroneously responsible for the replacement) are problems inherent to amalgam restorations.19–21

A change in attitude is needed, to keep restorations under control and establish stricter criteria to apply to those restorations that should eventually be replaced, recontoured, or repaired. Mjör and Espevik22 and Eriksen et al23 have defined a few indications to allow more objective decisions regarding the need to replace, repair, or recontour amalgam restorations.

Amalgam repair, as defined by Barbakow et al,24 is the removal of part of an already existing amalgam restoration, whereby a “cavity” is prepared inside that restoration. The majority of such a restoration is judged to be clinically acceptable and is allowed to remain, and the cavity is restored with new amalgam.

Recontouring is defined as the reshaping and polishing of an already existing amalgam restoration to improve marginal quality, remove periodontal irritants, and establish a better functional occlusion. Both the repair...
and recontouring of amalgam restorations have been advocated by numerous authors.\textsuperscript{22-30} This paper presents a complex amalgam restoration for which both repair and recontouring were performed.

Case report

A 37-year-old dentist fractured, 6 days before presentation, the distolingual cusp of her maxillary left first molar (Fig 1). At clinical and radiographic (bitewing) examination, the supragingival fracture amplitude, the good quality of restoration margins, and the absence of secondary caries were observed. The patient told us the restoration had been placed about 12 years ago, and was able to provide the name and address of the treating dentist.

Taking into consideration the characteristics of the fractured restoration and the patient's dental awareness, we proposed repairing and recontouring, instead of replacing, the restoration. She was receptive to the suggestion, and, informed consent having been secured, the procedure was scheduled for 2 days later. The practitioner who had placed the original restoration, exactly 13.5 years earlier, was contacted and he revealed the type of the alloy he had used, a high-copper alloy.

On the patient's return, the tooth was first cleaned and anesthetized, and the operative field was isolated by means of a rubber dam. The fractured cusp area was prepared using a high-speed, smooth cylindrical bur, and then a No. 330 carbide bur was used to prepare an "amalgapin" hole (Fig 2). This hole was prepared next to the enamel-dentin junction, to the depth of a No. 330 carbide bur. The hole also received a cavosurface chamfer, for which a No. 5 spherical smooth bur was employed. At the occlusal surface of the restoration, a small box was prepared, and additional retentive grooves were created at the lingual amalgam surface.

Next, a matrix was adapted, and the restoration was repaired with an alloy similar to that employed 13.5 years before (Fig 3). The first portion of amalgam to be placed into the cavity had a higher ratio of mercury (7:5), and the next two portions were considerably drier (5:5). Ten minutes after the cusp was rebuilt, the matrix and rubber dam were removed and the occlusion was checked.

Three days later, the patient returned for finishing and polishing of the repaired restoration (Fig 4). Immediate results (after polishing) revealed no apparent distinction between the original restoration and the repair executed. The only difference between the original restoration and the repaired restoration was a substantive improvement of the marginal quality after recontouring.

At the 18-month recall, slight differences between the old restoration and its newly introduced repair were visible (Fig 5), but the interface of the repair and the original restoration was almost imperceptible. No secondary caries was observed, and the patient reported no sensitivity.

Discussion

Amalgam restorations frequently fail and require replacement.\textsuperscript{1} Failure is most often attributed to marginal degradation and/or ditched margins; nevertheless, until recently, secondary caries was held responsible for the majority of such replacements.\textsuperscript{1} Marginal degradation and ditched margins are inherent to amalgam restorations,\textsuperscript{3} their degree depending on the operator,\textsuperscript{31,32} the cavity preparation,\textsuperscript{15} the type of alloy used,\textsuperscript{33} the tooth,\textsuperscript{18} and the patient.\textsuperscript{33} Secondary caries, in contrast, is usually related to dietary habits and oral hygiene. Fracture of the dental remnant and/or restoration can also constitute a determining factor for the replacement of amalgam restorations.\textsuperscript{1} Replacement of restorations requires an additional sacrifice of healthy dental structure\textsuperscript{3} and should be avoided whenever possible.

Replacement of the restoration in this patient would undoubtedly have required a greater expenditure of time and money and would have been more traumatic to the pulp and dental remnant. Since the restoration did not present any deficiencies other than fracture and poor surface texture, repair and recontouring were chosen instead of replacement.

Recontouring and repairing an already existing amalgam is, sometimes, a necessity and an advantage in daily practice.\textsuperscript{28-34} The integrity of the interface of the "old" and "new" amalgams becomes important for the success of the restoration. Several studies have examined the strength of such a bond, but results have varied considerably. Three independent studies\textsuperscript{29,35,36} have concluded that the bond strength of repaired amalgam is less than half that of control specimens. On the other hand, two other studies\textsuperscript{30,37} have reported the strength of this kind of bond to be close to that of controls.

A controversy also exists regarding the effects of the age of the amalgam that undergoes repair. Some
Fig 1 Maxillary left first molar with distolingual functional cusp fracture. Note the quality of the restoration margins.

Fig 2 Hole prepared at the fractured cusp base area and box prepared on the occlusal surface (distolingual cusp) of the restoration.

Fig 3 Immediately after the repair, the difference between old and new amalgam can be clearly seen.

Fig 4 Restoration immediately after finishing and polishing. Note how the marginal quality of the old restoration has been improved. Also note the virtual absence of differences between old and new amalgam.

Fig 5 Restoration 18 months after repair and recontouring.

Fig 6 Restoration 2.5 years after repair.
authors\textsuperscript{34,36-38} have found the age of the original amalgam to have no influence on the strength of the union, whereas other studies\textsuperscript{29,39} have shown a stronger union to exist when repair is more recent.

Besides the difference in age between amalgams at repair interfaces, another variable potentially affecting the degree of union strength is the surface treatment accorded the old amalgam. "Wetting“ of the old amalgam surface with a mercury-rich amalgam, before the repair, seems to increase union strength\textsuperscript{28-29,33,38} as does roughening of the surface of the old amalgam.\textsuperscript{34}

The repair technique employed in this patient conformed to principles proposed by Terkla et al\textsuperscript{29} and practiced by Cowan\textsuperscript{34}—that is, wetting the old amalgam with an amalgam that is rich in mercury. This practice seems to have favored condensation of amalgam inside the additional retentive grooves prepared in dentin and in the old amalgam, seemingly contributing to the quality of the union.

Hibler et al\textsuperscript{36} demonstrated the strength of old and new amalgam bond not to be influenced by the kind of alloy used. In this clinical case, both the alloy and the age of the fractured restoration were known, and the results 2.5 years after repair can be considered very good. At the recall examinations, only slight differences could be observed between the old and new amalgam (Figs 5 and 6). Deficiencies could also be perceived in the contour of the restoration, particularly in the embrasures, both before and after repair (Figs 1 and 6). Nevertheless, this deficiency has not contributed to any restoration-associated disease. In fact, it has been long accepted that poor contour of restorations does not lead to recurrent caries, as long as adequate control of dental plaque is maintained.

Notwithstanding the good results achieved short term, it is necessary to keep this type of restoration under observation, because short-term results are not always predictive of long-term results. A recall program should be proposed to the patient, to permit observation of the aging of the repaired amalgam.

Conclusions

It is possible, in well-selected cases, to repair amalgam restorations without any harm to either tooth or patient. Repair saves healthy dental tissue and chair time. In addition, through recontouring, it is possible to improve the shape, the function, and the quality of the restoration margins.

References

23. Eriksen H, Bjertness E, Hansen B: Cross-sectional clinical study of quality of amalgam restorations, oral health and pre-


