

# Restoration of Tooth with Pin Retained Amalgam - A Case Report

## Abstract

A pin retained amalgam restoration may be defined as a type of complex amalgam restoration requiring the placement of one or more pins in the dentin to provide adequate resistance and retention forms. Pins are used whenever adequate resistance and retention forms cannot be established with slots, locks, or undercuts only. The pin-retained amalgam is an important adjunct in the restoration of teeth with extensive caries or fractures. Not only the pins help in binding the amalgam to the tooth structure, they also help in binding the weak tooth structure to the amalgam. This case report presents the innovative technique that outlines the reconstruction of severely damaged, posterior teeth with a missing functional cusp.

## Key Words

Dental amalgam; pin-retained amalgam; self-threading pin

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## INTRODUCTION

Dental amalgam is one of the most versatile restorative materials, which constitutes approximately 75% of all the restorative materials which are used by dentists. The combination of a reliable, long-term performance in load bearing situations, the low technique sensitivity, the self-sealing property and the longevity of dental amalgam is unmatched by those of other dental restorative materials.<sup>[1]</sup> Since Markley's first report on the pin retention of amalgam in 1958, much research has been done on this topic. In 1969, Moffa *et al.*, reported on the retentive properties of three different pin designs in dentin and amalgam. They noted that, 2 mm was the optimal retentive pin-in-dentin/pin-in-amalgam length for self-threading pins and they concluded that the self-threading pin was the most retentive one in dentin and amalgam.<sup>[2,3]</sup>

## CASE REPORT

A 25-year-old male patient visited the Department of Conservative Dentistry and Endodontics, Mullana Dental College and Hospital, Ambala, with the chief complaint of a fractured restoration and food lodgement in right lower back teeth region since 1 month. He gave a past history of getting a tooth filled two years ago. No past history of pain

was noted in the region of the complaint. The medical history of the patient was non-contributory. His dental history revealed the presence of tooth coloured and amalgam restorations. On clinical examination, temporary restoration in the right mandibular first molar with a fractured mesial and distal cusp was noted. The tooth was asymptomatic and no pain could be elicited. The tooth responded positively to thermal and electric pulp testing. His radiographic examination revealed the presence of a temporary restoration which was close to the pulp, with the evidence of secondary caries, with no signs of apical involvement.

## Case Report Dentistry Section

A pin retained silver amalgam restoration was planned. The patient's informed consent and necessary ethical clearance was obtained. The procedure was started with the removal of the temporary restoration, followed by caries excavation and elimination of the weak enamel margins. A gingival seat was then created all along the reduced distal cusp and a proximal box was prepared on the distoproximal aspect, with a definite step. Cavity varnish and a Zinc Phosphate cement base were placed, followed by the preparation of a slot on the gingival seat of the distoproximal box, to facilitate the placement of the



Fig 1: Pre-operative radiograph of 46



Fig 3: Pin placed in the disto-proximal aspect



Fig 5: Silver Amalgam restoration in 46 after finishing and polishing



Fig 2: RVG -showing placement of amalgam pin



Fig 4: Silver Amalgam restored in 46 before finishing and polishing



Fig 6: RVG showing silver amalgam restoration in 46

pin and the condensation of the amalgam around it. Next, a pin channel was prepared at a depth of 2 mm by using a customized drill on the distal cusp, 0.5 mm within the dentinoenamel junction (DEJ). Cavity varnish was applied and a threaded pin (Filpin, FILHOL Dental, UK) of 0.76 mm diameter was inserted into the pin hole by using a contra-angled handpiece at a speed of 500 rpm. The Tofflemier matrix band and the retainer were adapted around the prepared tooth. Silver amalgam was first condensed into the slot and it was gradually built-up, followed by pre-carve burnishing, carving, checking of the occlusion and post-carve burnishing. The finishing and polishing were done the next day (Fig. 1 - Fig. 6).

## DISCUSSION

Traditionally, amalgam has been the material of choice for the restoration of the direct cuspal-coverage of the posterior teeth. Smales *et al.*, found

a 66.7% survival rate after 10 years for large, cuspal-covered amalgam restorations.<sup>[6]</sup> McDaniel *et al.*, carried out a survey, which revealed that the leading cause of the failure among the cuspal-coverage amalgam restorations was tooth fracture. They assumed that the main reason for the failure was a too conservative tooth preparation; they recommended the replacement of the weak cusps with large amalgam restorations.<sup>[7]</sup> Polymerization shrinkage is a major concern during the placement of the direct, posterior, Resin Based Composite (RBC) restorations. As compared to the similar amalgam restorations, the placement of a direct RBC restoration takes 2.5 times longer due to a complex sequence which is included in the incremental techniques (Roulet, 1997). Patients with para-functional habits are not the ideal candidates for similar treatments. If a conventional, continuous, fast-curing technique is adopted, the bonding

interface may remain intact, but microcracks may develop just outside the cavosurface margins due to the stress of polymerization shrinkage.<sup>[8]</sup> Conversely, alternative, indirect methods for restoring the severely destroyed molars and the premolars with tooth coloured and cast metal restorations are also available but, the operative procedures for these are more complex and time consuming and they come at higher costs.<sup>[9]</sup> The cardinal principles for the cavity preparation for a pin-retained amalgam restoration are, firstly, the conservation of the remaining tooth structure and secondly, the removal of all carious/ weakened tooth structure. Pins do not obviate the need for cavity preparation, but they rather complement the features of the cavity design. Pins by themselves incorporate stresses in the tooth structure. Hence, a judicious blend of minimal pins and cavity features are ideal, to have the maximum of the retention and the resistance features. For an ideal retention, the existing facial and lingual walls should be parallel rather than converging occlusally.<sup>[10]</sup> The approximal areas of the tooth should contain boxes with retention grooves, whenever practical. Additional retention may be provided by placing slots and dovetails in the remaining tooth structure. The area that has to receive a vertical pin should be flat and perpendicular to the long axis of the tooth, and it should present a zone of dentin which is sufficiently wide for the placement of a pin. In general, any area which is designed to receive a pin should be reduced enough to allow a pin length of 2.0 mm and an amalgam covering of at least 0.5 mm around the pin and 2.0 mm occlusal to the pin. The position of a pin depends on several factors, first of which is the internal morphology of the cavity. Secondly, the external morphology of the tooth must be considered. Thirdly, the anticipated bulk of the amalgam must be considered, since the pins which are placed in areas of greater bulk are less likely to weaken the amalgam. Finally, the anticipated points of the occlusal load must be considered, since a vertical pin which is positioned directly below an occlusal load weakens the amalgam significantly. The prediction that the amalgam would not last until the end of the 20th century was wrong. Conversely, recent studies have concluded that the combined amalgam-composite cusp coverage restoration showed acceptable clinical performance over a period of time. Yet, amalgam continues to be the best bargain in the

restorative armamentarium because of its durability and technique insensitivity.

## CONCLUSION

Amalgam restorations have served the dentistry profession well and they will continue to do so in the years to come. In terms of longevity, they are probably superior to composite resins, especially when they are used for large restorations and cusp capping. Amalgam can be continued to be used as a material of choice if aesthetics is not a concern.

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