

Remembering the Titan: A Case Report

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ABSTRACT

The pin retained amalgam is a vital adjunct to the general practitioner in the case of badly decayed or broken down teeth. Self-threading pins, however, have been shown to produce cracks or crazing in the dentin and enamel, if they are not placed properly. Just as the pins help in binding the amalgam to the tooth

structure, they also help in binding the weak tooth structure to the amalgam. In selected clinical cases, these advantages can be used for extensive restorations. This case report presents an age old clinical 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

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 [1].

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 the self-threading pins and they concluded that the self-threading pin was the most retentive one in dentin and amalgam [2, 3].

Several clinical studies have demonstrated that high-copper amalgams can provide a satisfactory performance for more than 12 years [4]. Plasmins et al., evaluated the long-term survival of multisurface restorations and found that the extent of amalgam restoration had no influence on the survival rate [5].

CASE REPORT

A 38-year-old female patient visited the Dept. of Conservative Dentistry and Endodontics, J.S.S. Dental College and Hospital, Mysore, Karnataka, with the chief complaint of a dislodged restoration and food lodgement in right upper back teeth region since 1 month. She 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. Her dental history revealed the presence of tooth coloured and amalgam restorations.

On clinical examination, a distocclusal temporary restoration in the right maxillary second premolar with a fractured palatal cusp was noted [Table/Fig-1]. The tooth was asymptomatic and no pain could be elicited. The tooth responded positively to the thermal and electric pulp testing. Her 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.

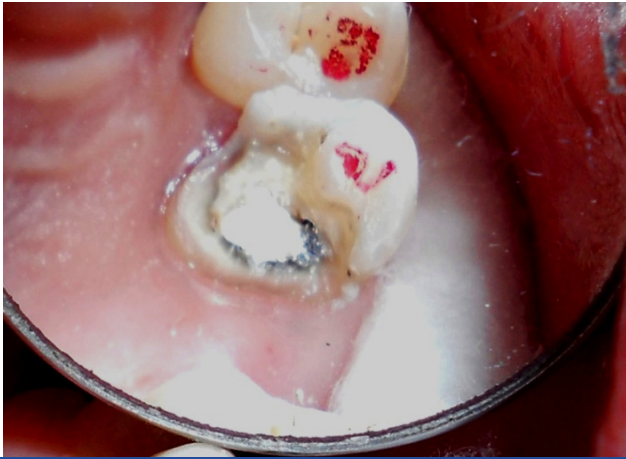
As the fracture line was supragingival and as it had not invaded the biological width, a pin retained silver amalgam restoration was planned. The patient's informed consent and necessary ethical clearance were obtained.

The procedure was started with the removal of the temporary restoration, followed by caries excavation and elimination of the weak enamel margins [Table/Fig-2]. A gingival seat was then created all along the reduced palatal cusp and a proximal box was prepared on the distoproximal aspect, with a definite step which separated the two. 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 and a cove on the palatal axial wall, to facilitate the placement of the 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 palatal gingival seat, 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



[Table/Fig-1]: Pre-operative radiograph of tooth #4, with temporary restoration in place



[Table/Fig-2]: Pre-operative occlusal view of tooth # 4, after removal of temporary restoration



[Table/Fig-3]: Threaded pin inserted into palatal a gingival seat



[Table/Fig-4]: Post-operative view after amalgam restoration and polishing



[Table/Fig-5]: Post-operative radiograph of tooth # 4 with pin retained restoration in place

inserted into the pin hole by using a contra-angled handpiece at a speed of 500 rpm [Table/Fig-3]. The Tofflemier matrix band and the retainer were adapted around the prepared tooth. Silver amalgam was first condensed into the slot and into the cove around the pin, 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 [Table/Fig-4] followed by a post-operative photograph [Table/Fig-5].

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 [6]. McDaniel et al carried out a survey, which revealed that the leading cause of the failure among the cuspal-coverage amalgam restorations was the 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 [7].

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 the 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 [8].

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 [9].

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 structures. Pins do not obviate the need for the 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 [10]. 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 [11].

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. A cove is placed, to provide a sufficient bulk of amalgam all around [11].

The tensile strength of dental amalgam is approximately 17% of its compressive strength. Clinically, the tensile or the transverse strength, or both, may be of greater significance than the compressive strength

(Mahler 1958; Rodriguez and Dickson 1962; Mahler and Mitchem 1964). Pins which are positioned with long axes which are parallel to the tensile stresses do not result in any significant decrease in the tensile strength (Going and others, 1968) [11].

A posterior tooth needs one to four pins. In the event where a proximal wall is only partly missing, a pin should still be used if the reduced cusp is centric-bearing [11]. As seen in the report, the functional cusp (palatal cusp) in the maxillary premolar was replaced with a single 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 [10]. 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 (Cecconi and Asgar, 1971) [11].

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 [12,13].

Yet, amalgam continues to be the best bargain in the restorative armamentarium because of its durability and technique insensitivity. Amalgam will probably disappear eventually, but its disappearance will be brought about by a better and more aesthetic material, rather than by concerns over health hazards. When it will disappear, it will have served dentistry and patients well for more than 200 years.

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.

The newer high copper single composition alloys offer superior properties, but they may not offer a good seal as the older amalgams. Amalgam can be continued to be used as a material of choice if aesthetics is not a concern.

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FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Submission: **Nov 30, 2011**
Date of Peer Review: **Jan 02, 2012**
Date of Acceptance: **Jan 12, 2012**
Date of Publishing: **May 01, 2012**