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Case Report

SMALL PINS AND LARGE RESTORATIONS: A CASE REPORT

Tejolatha B.[1], Nandakumar K.[1], *Sasidhar Reddy V.[2], Sandeep S.[1] and Sirisha Devi K.[1]
[1]*Department of Conservative Dentistry and Endodontics, Meghana Institute of Dental Sciences, Mallaram, Nizamabad, Telangana*
[2]*Department of Oral & Maxillofacial Surgery, Meghana Institute of Dental Sciences, Mallaram, Nizamabad, Telangana*
**Author for Correspondence*

ABSTRACT
The pin retained amalgam is a vital adjunct to the general practitioner in the case of badly decayed or broken down teeth. 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. The present case reports present the innovative technique that outlines the reconstruction of severely damaged, posterior teeth with missing functional cusps.

Keywords: *Dental Amalgam; Pin-retained Amalgam; Self-threading Pin, Varnish and Zinc Phosphate Base*

INTRODUCTION
Dental amalgam has been used for more than 150 years in hundreds of millions of patients around the world. Dental amalgam is a mixture of metals, consisting of liquid (elemental) mercury and a powdered alloy composed of silver, tin, and copper. 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 (Bharti *et al.*, 2010).
Traditionally, more extensive restorations on teeth were performed using non-adhesive techniques. Since Markley's first report on the pin retention of amalgam in 1958, much research has been done on this topic. Moffa *et al.*, (1969) 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 (Outhwaite *et al.*, 1979; Garman *et al.*, 1980).
Auxiliary retentive provisions, in the form of pins are often required for restoration of mutilated and broken tooth, especially in young patient's in which pulp chamber is relatively large, dentinal tubules are comparatively immature and gingival lines are still high. 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 (Plasmin *et al.*, 1998).

CASES
A 40-year-old female patient visited the Dept. of Conservative Dentistry and Endodontics, Meghana institute of dental sciences, Nizamabad, Telangana state with the chief compliant of food lodgement in left lower back teeth region since 3 months. She gave a past history of getting teeth filled two years ago. No past history of pain was noted in the region of complaint. The medical history of the patient was noncontributory. Her dental history revealed the presence of tooth colored and amalgam restorations.
On clinical examination, a large occlusal cavity was noted in the lower left second molar (Figure-1) and with a thin distal wall. 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 large occlusal cavity which was close to the pulp, with no signs of apical involvement (Figure-2).

Case Report

Figure 1: Diagnostic image

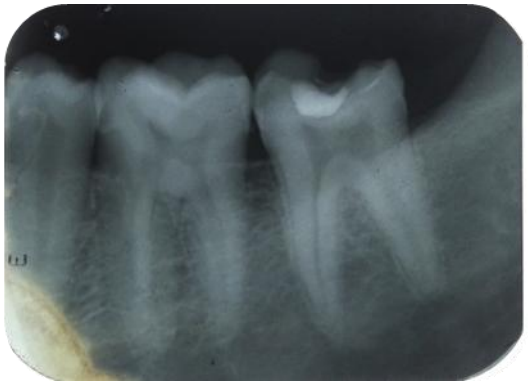

Figure 2: Diagnostic radiograph

Figure 3: Buccal pin placeement

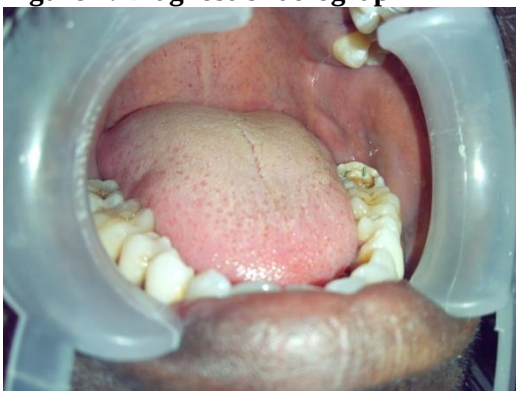

Figure 4: Lingual pin placement

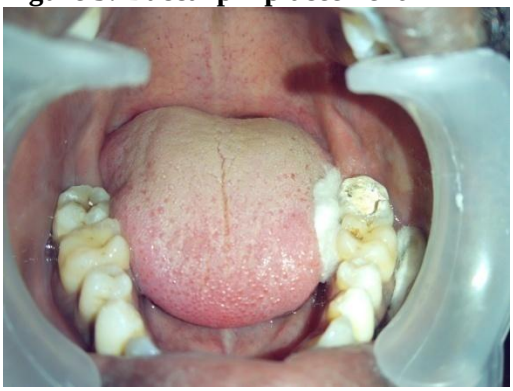

Figure 5: Zinc phosphate base application

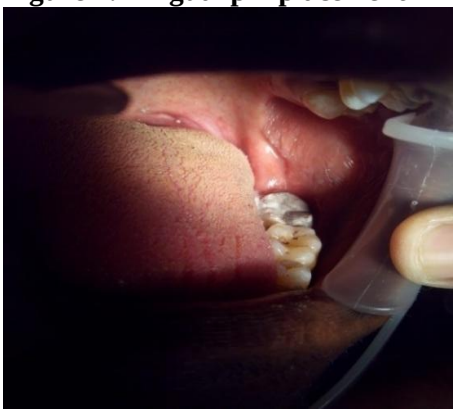

Figure 6: Amalgam restoration

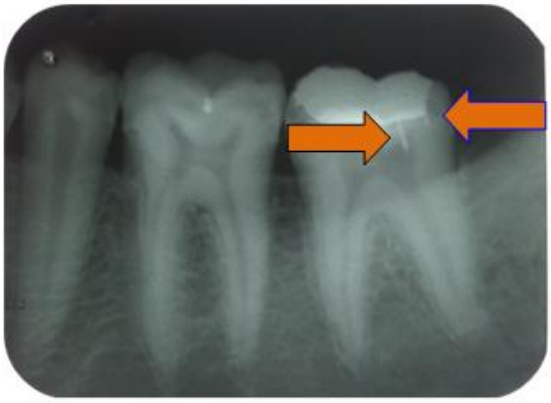

Figure 7: Post operative radiograph

As there was sufficient remaining dentin thickness, a pin retained silver amalgam restoration was planned. The patient's informed consent and necessary ethical clearance were obtained. The procedure was started with caries excavation and elimination of the weak enamel margins. A flat pulpal floor was established using inverted cone bur.

Next, a pin channel was prepared at a depth of 2 mm by using a customized drill on the pulpal floor at buccal side, 0.5 mm within the dentinoenamel junction (DEJ). A threaded pin of 0.76 mm diameter was inserted into the pin hole by using a contra-angled handpiece at a speed of 500 rpm (Figure-3). A similar pin channel preparation and pin insertion was done on the lingual aspect (Figure-4). A RVG radiogragh was taken to evaluate the pins orientation. Cavity varnish and a Zinc Phosphate cement base were placed (Figure-5). Silver amalgam was condensed into the cavity and around the pin. Later it was gradually built-up, followed by pre-carve burnishing, carving, checking of the occlusion and post-carve burnishing (Figure-6). The finishing and polishing were done the next day followed by a post-operative radiograph (Figure-7).

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, cusp-covered amalgam restorations (Smales and Hawthorne, 1996). 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 (McDaniel *et al.*, 2000).

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 (Deliperi and Bardwell, 2006).

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 (Liebenberg, 2000).

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 (Mondelli and Vieira, 1972). 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 (Mozer and Watson, 1979).

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 (Mozer and Watson, 1979).

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).

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 (Mozer and Watson, 1979). 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 (Mozer and Watson, 1979). 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). 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 (Shafiei *et al.,* 2010; Kaur *et al.,* 2011). 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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