REASONS FOR THE FAILURE OF CLASS I AND II AMALGAM RESTORATIONS

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ABSTRACT

The purpose of the study was to investigate the reasons for the failure of Class I and II amalgam restorations in patients presenting at the Operative Department of Fatima Jinnah Dental College and Hospital. A sample of 100 patients was clinically evaluated to assess the reasons for the failure of amalgam restorations. Information regarding the patients’ age, gender, presenting complaints, and reasons for the failure was collected for conducting this study. Results revealed that the most common reason for the failure and replacement of amalgam restorations was secondary caries, followed by inadequate resistance form. It was concluded that the prevailing reason for the failure of restoration is secondary caries which may be as a result of incomplete caries removal and non-retentive cavity preparations.

Key Words: Amalgam failures, restorations, Secondary caries, Class I, Class II cavities, Resistance form.

INTRODUCTION

Amalgam restorations have been successfully used for restoring posterior teeth, extending from small fillings to large pin retained restorations, provided that the cavity preparation is according to the principles of cavity design. The most common reasons for preferring to use it are its convenient application, superior mechanical properties, less technique sensitivity and higher survival time for complex restoration. It also has good resistance to wear and excellent load bearing properties. Low copper amalgam, copper enriched, spherical and admixed are amongst the more commonly used types of amalgam restorative material available. In the low copper variant, the compound is subject to corrosion resulting from gamma two (tin-mercury) phase leading to the rapid breakdown of amalgam. However, when the copper enriched alloy is used, the 12% of copper content (or greater) leads to less corrosion as compared to the low copper option. All amalgam variants are brittle and have low edge strength. The amalgam material must have sufficient bulk, usually 1.5mm to 2.0mm, depending upon the position of usage and 90 degree or greater margin configuration. Tooth preparation must allow amalgam to possess the uniform thickness for strength and produce a 90 degree butt-joint form at the margin and be mechanically retained in tooth. The Amalgam is used in posterior restorations because of its convenient application, superior mechanical properties, and excellent load bearing properties and resistance to wear.

Secondary caries may be defined as a carious lesion alongside an existing restoration, crown or sealant, implying that a primary carious lesion was restored but the lesion reoccurred at the junction of restoration and tooth and may progress under the restoration. This condition usually indicates that microleakage is present along with other conditions conducive to caries development. A survey of literature reveals that secondary caries is one of the most common reasons for the failure of restoration. In addition, the second most common cause for restoration failure was fractures which include marginal ridge fracture, bulk/isthmus fracture and tooth fracture. In another study, even a very small overhang may lead to accumulation of plaque followed by bacterial ingression, and ultimately leading to development of a recurrent carious lesion. Radiographic investigation was also done on prevalence of secondary caries in teeth with
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Secondary caries has been reported by many papers to take place in areas of plaque stagnation, most likely in gingival walls of class II restorations. These areas are the most difficult cases to diagnose. The rationale of this study is to investigate reasons for failure of Class I and II amalgam restorations, in patients presenting at the OPD of a teaching hospital.

METHODOLOGY

This cross-sectional study was conducted in the Department of Operative Dentistry at Fatima Jinnah Dental College and Hospital in 2013. 100 patients were examined whose chief complaint was of dislodged filling. Consecutive purpose sampling was used. Patient consent was taken by informing them about this study and signing on a consent form. Teeth with Class I and II amalgam restorations that were placed at least 6 months ago by final year students, and were found to have faulty restorations were included in this study. However teeth that had undergone endodontic treatment were excluded. The examination of the patient involves the sequential assessment for all restorations for evidence of recurrent caries, dislodgement of the restorations, marginal ridge fracture or fracture of the tooth. Visual examination was done using proper light, dental mirrors and thorough air drying using a triple sy-
Tactile examination was performed using dental floss as well as using a probe interdentally; moreover radiographic examination including periapical and bitewings were taken for each patient, to explore the defects e.g, secondary caries and overhanging fillings in the proximal areas of teeth under the restorations. This Data was collected using a questionnaire by trained and calibrated operators, and all the evaluation was done by one operator, and calculated and compared using statistical software (SPSS) version 17.

RESULT

For the study, a sample of 100 patients both male and female were examined, of which 43 (42.6%) were males and 58 (57.43%) were females as shown in Fig 1. With the sample age ranging from 10 years to 70 years it was deemed prudent to divide the range into sub-ranges of 10 years each. The mean age of the sample is 40.04±2, shown in Fig 2. The most common failure and replacement of the restorations was found in the ages ranging between 30 years to 39 years (35%) followed by 40 years to 49 years (26%). Around 42 (42%) patients registered complaints of dislodged fillings, 19 (19%) of food impaction, 6 (6%) of pain, 18 (17.8%) of sensitivity and 15 (15%) had a fractured tooth (Fig 4). Both Class I and Class II surface fillings were included of which Class I aggregates 35% (35 patients) and Class II aggregates 65% (65 patients). The most common reason for the replacement of amalgam restorations due to failure was identified to be secondary caries which was observed in 51 patients (51%). This is followed by failure due to non-retentive cavity preparation/ inadequate resistance form which was recorded in 19 patients (19%). It was observed in 15 patients (15%) that the amalgam filling was fractured. In 6 patients (6%) marginal gap was observed whereas 5 patients (5%) presented an overhang (Fig 5).

DISCUSSION

This study revealed that secondary caries is the main reason for the failure of amalgam restorations in both Class I and II cavities which were placed six months ago. Of the two types of aforementioned cavities Class II was found to be the most commonly failed restoration, which accounts for 66.99% of the patients, followed by 33.01% of the 34 patients with Class I restorations. Secondary caries was found to be present underneath previous done restorations15 that could be due to incomplete removal of carious lesions. Therefore it is very important to pay special attention during any restorative procedure for thorough removal of the lesion. Literature has revealed that secondary caries is one of the most common reasons for the failures.16,17 The second most common cause of restoration failure that leads to replacement of the restoration is due to inadequate retention, because of non-retentive cavity preparations. The reasons for the failure particularly in Class II could be due to sharp axio-pulpal line angle or shallow cavity depth which collectively forms an inadequate resistance form in 19% of the patients in this study.

The third reason which leads to the failure in Class II cavity design is due to the fracture of the restoration which may be as a result of isthmus fracture or marginal ridge fracture. Due to improper cavity design with recurrent caries underlying amalgam restoration leading to fracture of the restoration. Marginal ridge fracture could happen if marginal ridge is left too high, overzealous carving, axio pulpal line angle not rounded in class-II preparations. In a study18 conducted in Pakistan, around 47% of the restorations underwent failure due to bulk fracture in 27% cases. In this study primary reason was found to be bulk fracture 4.6% and marginal ridge fracture was noted to be 1.3%. However in this study, besides secondary caries, inadequate resistance form and fractured restorations, the other causes that lead to failure and require its replacements include 6% with marginal gap whereas 5% presented with overhang. However when this result was compared with other studies which were conducted on prevalence of overhanging restorations, around 34% were represented as overhanging restorations. It is generally accepted that overhanging restorations contribute to gingival inflammation due to their retentive capacity for dental plaque. Proximal overhang leads to periodontal disease and secondary caries that might be avoided by the use of wedges and contouring matrix band.

In a study conducted in Pakistan on replacement of amalgam restoration, showed that the secondary caries accounted for the highest percentage of restoration failure amongst other reasons like marginal ditching in 22.38%, fractured fillings in 11.42% and fractured teeth in 3.80%. Another survey19 which was also done in Pakistan showed that recurrent caries was present underneath previous restoration. Class II restorations failure was greater than Class I accounting 55%, showing similarity with our study in which class II is 65% as shown in Fig 3.

Another survey20 conducted by a dentist, in 2012, concluded that 20 to 24% of the restoration failure occurred because of secondary caries followed by fracture in 10% of cases.

It is of utmost importance to emphasize to the students to remove the carious lesion properly during cavity preparation and make cavity according to principles of cavity design by maintaining proper resistance form. This would not only help in preventing the development of new lesions under previous done restoration, but also prevent fracture of the restoration, thereby preventing future restoration failure.
CONCLUSION

From the above discussion it was concluded that the major reason for the amalgam restoration failure leading to its replacement was from secondary caries. The second most common reason was noted to be a failure was due to inadequate resistance form followed by fracture whether isthmus, bulk or marginal ridge fracture. Hence looking at the literature, so far the most common reason for the failure and replacement of the restoration was found to be secondary caries, which shows compliance with this study.

REFERENCES


CONTRIBUTION BY AUTHORS

2. Fauzia Mujeeb: Helped in data collection and took part in discussion.
4. Tasleem Hossein: Supervised the whole project.