

IDENTIFYING THE REASONS FOR RE-TREATMENT OF RESTORED TEETH WITH COMPOSITE AND AMALGAM

Zarei M,¹ Babaei J²

1. Resident, Department of Cosmetic & Operative Dentistry, Babol Dental University, Babol, IRAN.
2. Pharmacist, Toxicologist, Valiasr Hospital Research office, Tehran, IRAN.

ABSTRACT

Aim: The re-treatment of existing restorations is one of the basic needs of the treatment that causes physical, mental and financial damages. The purpose of this study is to investigate the prevalence of reasons for failure and the re-treatment of restorations, which leads to more precision in prevention of these causes and special attention during the patients' call.

Materials & Method: This study is an observational descriptive cross-sectional study with non-probability sampling. The study population consisted of patients referred to the restorative ward of one of the medical centers of Tehran province in 2016-2017, who were prescribed retreatment of previously done amalgam or composite restorations. The cause or reasons for prescribing the treatment were recorded in the information form with the examination and the opinion of the faculty members of that department.

Results: In amalgam and composite restorations, the most common cause of replacement of restorations is secondary caries. The second most common cause for class I and V amalgam restorations is marginal ditching, in and class II amalgam restorations is overhang. In class I and V composite restorations is loss of repair; in class II restorations is interdental contact and in class III and IV composite restorations is the lack of color coordination.

Conclusion: Secondary caries is the most common cause of re-treatment of restored teeth with amalgam or composite. Other reasons for treatment failure should be considered during restoration of teeth and their periodic evaluation.

Key words: Failure, Replacement, Amalgam, Composite.

Introduction

Restorations not only eliminate tooth decay but they also become destroyed normal tooth structure and require replacement.¹ So the repair or replacement of previous restorations alone are one of the main needs' for treatment.² According to studies conducted, at each dentist visit, one third of the existing restorations should be replaced.^{3,4} Currently, 50% of patients' fees are paid to replace previous restorations,⁵ while in 2008, the cost of dental care in US alone is estimated at \$ 93.1 billion.² When restorations are replaced, an increase in the size of the cavity, a weakening of the remaining tissue of the teeth, and more repair and vulnerability will be expected.¹ Unfortunately, it is believed that when a restoration is replaced, there will be the same defects that affected the first restoration.¹

Appropriate restorative treatments are achieved in a biologic framework that includes the materials, methods and principles of restorative dentistry.^{1,6} A dentist who does not consider the biologic, chemical, and physical criteria of the tooth tissue can lead to early failure, loss of crown integrity, recurrent caries, or even pulmonary necrosis, resulting in the need for root canal treatment or crown.^{1,6} The secret of the success of the treatment plan is to determine the problem or the problems involved in planning for treatment.⁶

Based on the study by Klausner *et al.* (1985) at the University of Michigan, with the aim of determining the longevity of amalgam restorations and the major causes of treatment failure,⁷ it was found that of 5,511 restorations placed by 191 respondents, 46% were due to primary caries and 54% were due to amalgam replacement. The most common cause of replacement of restorations were stated as secondary caries, followed

by weak margins, fracture of the teeth, Isthmus fracture, and other reasons. Also, based on the study by Freidi *et al.* (1991), in which the method of sending a questionnaire to individuals to determine the number of restorations and the replacement rate of composite restorations was used,⁸ it was concluded that the main cause of replacement of permanent teeth restorations in fillings of less than 4 surfaces were secondary caries and then color change; while, the greatest cause of failure was the re-treatment in primary teeth and filling with 4 surfaces, teeth fracture, Isthmus, and so on. Also, in another study in Germany, conducted by Freidi *et al.* (1991),⁹ the results were reported as such that the most common cause of replacing amalgam restorations was secondary caries regardless of restoration size, tooth type (primary or permanent) and age group. Restoration fracture in primary teeth and restorations with 3 or 4 surfaces, marginal gap in permanent teeth and restorations with one or two levels were the second major cause of replacement of restorations. In the study by Mjor *et al.* (1992), they reported that secondary caries and then color change and fractures of restorations are the most common causes of treatment failure.¹⁰ These researchers in another study conducted in 1992, stated the secondary caries; weak margins and restoration fracture as the main causes.¹¹

The above studies and the results obtained show the importance of this subject from different aspects. Considering these and also because there is little information about the causes of treatment failure in the country, this study was conducted with the aim of investigating the frequency of reasons for retreatment of teeth restored with amalgam and composite in patients referred to the restorative ward of one the medical centers of Tehran province in 2016-2017.

Materials & Method

This study was a descriptive cross-sectional study and its technique is observation. The sampling method was non probability sampling. The required information was obtained through direct referral to patients who had referred to the restorative ward of one of the medical centers of Tehran province and were prescribed the re-treatment of restored teeth with amalgam or composite. Reasons for re-treatment and other information were recorded through a questionnaire and examinations in an information form that was previously prepared. Data collection was carried out alternately in 2016-2017. Patient examination was performed with the help of a sickle probe, intra-oral mirror, dental floss and radiography under sufficient light. The data from the information form were transferred to the SPSS ver.11.0 software and statistical analyzes were carried out.

Results

During the course of the study, 400 restored teeth that were prescribed to be treated were examined, out of which 257 teeth (64.2%) were related to females and 314 teeth (37.8%) were related to males. Table 1 shows the distribution of samples based on the age.

Age categories	Number	Percent
0-10	0	%0
10-20	56	%14
20-30	147	%37
30-40	72	%18
40-50	81	%21
50-60	35	%9
60-70	5	%1

Table 1: Distribution of samples based on the age group.

Of the total samples, 285 teeth (70.02%) had amalgam restorations and 132 teeth (32.5%) had composite restorations. Among amalgam restorations, 102 restorations (38.4%) were in maxilla and 175 restorations (63.4%) were in mandible. In amalgam restorations, the highest number of samples in terms of G.V. Black classification were in class II, class I and class V, respectively, and most of them were two-surface, one-surface, three-surface and more than three-surface, respectively.

Among the composite restorations, 95 cases (78.3%) were in maxilla and 32 (34.6%) were in mandible. Also, 93 composite restorations (75.11%) were anterior and 34 composite restorations (28%) were posterior. Most

composite restorations were in class V, class II, class IV, class III and class I, respectively, and the two-surface restorations accounted for the largest number which were followed by one-surface, three-surface, and more than three-surface composites, respectively. Diagram 1 and Diagram 2 also describe the frequency distribution of composite restorations.

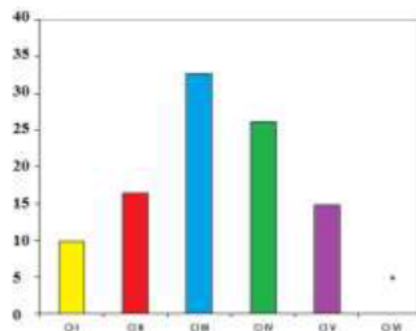


Diagram 1: Frequency distribution of restored teeth with composite based on G.V. Black classification.

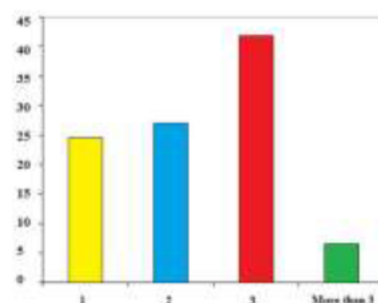


Diagram 2: Frequency distribution of restored teeth with composite based on the number of surfaces.

The most common cause of re-treatment of amalgam restorations was secondary caries (52.4%). Other causes of prescribing the re-treatment of amalgam restorations were overhang (17.1%), inappropriate margins (7.5%), chipped edge (6.9%), inappropriate interdental contact (5.5%), loss of restoration (5.9%), mass fracture (6.1%), teeth fracture (3.2%) and the gap between tooth and bottom of restoration (0.45%), respectively (Diagram 3).

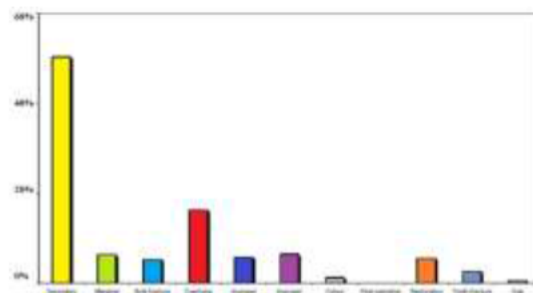


Diagram 3: The frequency distribution of the reasons for re-treatment of teeth restored with amalgam.

In composite restorations that were re-treated, the reasons for retreatment of composite restorations were secondary caries (54.5%), color discrepancy (29.4%), falling and loss of restoration (7.2%), inappropriate margins (5.7%), inappropriate interdental contact and marginal overhang, sensitivity after repair and existence of bubbles (each 1.25%), respectively (Diagram 4).

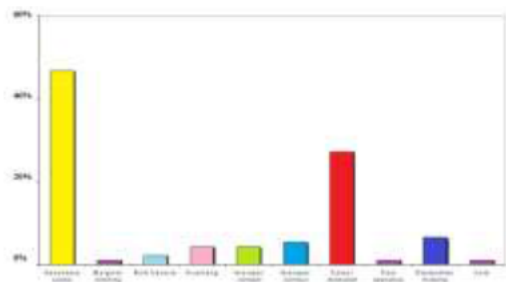


Diagram 6: The frequency distribution of the reasons for re-treatment of teeth restored with composites.

In Table 2 the frequency distribution of causes leading to replacement and repair of amalgam and composite restorations are shown. Finally, 260 teeth (95.2%) out of 285 teeth restored with amalgam were replaced and the rest (6.2%) were repaired. Of 145 teeth repaired with composite and prescribed retreatment due to some reasons, 121 restorations (84.5%) were replaced and 25 restorations (17.2%) were repaired.

Type of Restoration	Composite	Amalgam	Composite	Amalgam
Reasons to cure Type of Restoration	Repair	Replace	Repair	Replace
2 ^o Caries	6	80	8	166
Marginal Ditching	0	2	2	20
Bulk Fracture	2	2	1	17
Overhang	3	5	6	50
Improper Contact	5	3	0	20
Improper contour	6	4	1	21
Colour Dismatch	7	43	0	4
Postoperative Sensitivity	0	2	0	0
Restoration Missing	0	12	0	16
Others	2	0	0	12

Table 2: Frequency distribution of reasons leading to repair and replacement of amalgam and composite restorations.

Discussion

This study showed that secondary caries in amalgam restored teeth are the most common cause of retreatment, and many studies have also reported this cause as the most common cause of failure in amalgam restorations.^{7, 11, 12} Although, in studies by Oginni and Olusile (2002) and Frost (2002), tooth fracture has been

identified as the most common cause of replacement.^{13, 14}

Based on the results of this study, marginal ditching is the second leading cause of re-treatment in class I and class V amalgam restorations.

This result is also consistent with reports of a number of studies.^{11, 15, 16} In class II amalgam restorations, after the secondary caries, overhang is at the subsequent level. While only one of the available foreign references has mentioned this factor as the third most common cause of failure of amalgam restorations.¹⁷ In the only available domestic study conducted by Asmry Sa'dabad and Zamanian (2000), overhang and then recurrence of caries were reported as the most common cause of failure of amalgam restorations.¹⁸ This shows the need to emphasis more on preparation of the correct cavity, the correct application of the matrix and wedge, the precise reconstruction of the physiological and anatomical margins. Elderton (1976) contribute the high percentage of amalgam failures to neglect or unawareness about restoration implanting technique.⁴

The high percentage of teeth fracture and mass fracture of amalgam in three-surface cavities emphasizes that in the large cavities where amalgam should be replaced, changes in the cavity should be made so that all tissues that cannot adequately withstand the chewing forces are removed and proper form and size of restoration would be provided.⁷

Post-treatment sensitivity in amalgam restorations is rarely mentioned as the cause of re-treatment of restored teeth,¹¹ which is also confirmed by the results of this study.

In this study, secondary caries was the most common reason for re-treatment of restored teeth with composite. This corresponds to the result of the majority of references.^{8, 10, 19, 20-26} However, Fross (1996) introduced mass fracture and Frost (2002) introduced teeth fracture as the most common cause.^{14, 20}

According to the present study, in class I and V cavities and in general one-surface cavities, the loss of restoration, and in II and CI, inappropriate interdental contact are the second most common cause after secondary caries. While in most of the present references, these cases are less prevalent, which suggests the need for more attention to the technique of using sticky substances to dental tissues.^{2, 6} Due to the fact that the secondary caries and the failure of the restoration material occur more in composite than amalgam² the use of composite in posterior restorations in class I and II cavities has some limitations.¹⁰ Today, the use of tooth-colored materials has increased and this has been exacerbated by the development of denting bonding agents.^{8, 16} Various reports have been published

on the initial placement of the tooth-colored restorative materials, especially the composite than amalgam material. Friedl *et al.* (1995) reported an application of composite in 20% posterior teeth during a study.⁸

According to the results of this study, 10.6% of restorations involving occlusal surface of the posterior teeth, 17.1% of class I and 6.8% of CI II restorations, which were prescribed to be re-treated, were previously repaired with composite.

Changes in color are also common problems in composite restorations,¹⁰ and were the second common cause in re-treatment of III CI and IV CI restorations in the present study. This has been also confirmed by the other studies.^{8, 10, 21, 22} Color change may be due to the contraction of the restorative material during the polymerization, the mismatch of margins, the component type of composite material, incomplete technique and the presence of bubbles.⁸ Van Noort and Davis (1993) by studying the restorations done by self-cure composites noted the color inconsistency and then secondary caries as the most common causes of composite failure.²⁸

Post-treatment sensitivity has also decreased as a reason for re-treatment of restoration compared to the past, which can be due to the improvement of materials and methods.²⁹ The low frequency of these factors in the present study is also stated.

However, in addition to factors such as the treatment plan, cavity preparation, how to use the restorative material, and its characteristics, isolating the area and skills in controlling the oral hygiene play a role in restoration success; Acquiring information about the reasons for placement and replacement of restorations is essential for preventing future failures. Such information will also bring economic returns in the long run.⁷

If re-treatment is necessary, repair of existing restoration due to less iatrogenic losses is preferable to its replacement.²⁸⁻³⁰

Conclusion

Secondary caries is the most common cause of re-treatment of restored teeth with amalgam and composite. The second most common cause of replacement in class I and V amalgam restorations is marginal ditching and in class II is overhang. In class I and V composite restorations, after secondary caries, the cause was restoration missing, in class II cavities was inappropriate interdental contact, and in class III and IV cavities was lack of color coordination.

Considering the reasons for the failure of restorations that are more common in any type of restorative material, classification and number of restoration

surfaces, is necessary when placing the restorations and more attention should be paid to identifying them at each turn of patients' call. Also, there should be an emphasize on the need to determine and implement specific and special criteria for the diagnosis and treatment of possible defects, in particular primary and secondary caries, the development and application of specific and special criteria for replacing and if possible to repair the restoration and improvement of the skills of dentists.

Reference

1. Baratieri LN, Monteiro Junior S, de Andrada MA. Amalgam repair: A case report. *Quintessence Int* 1992;23(8):527-531.
2. Roberson TM. Introduction to operative dentistry. In: Roberson TM, Heymann HO, Swift EJ: Student art and science of operative dentistry. 4th Ed. St. Louis: The C.V. Mosby Co. 2002; Chap 1: 1-3.
3. Lavelle CL. A cross sectional longitudinal survey into the durability of amalgam restorations. *J Dent* 1976;4(3):139-143.
4. Elderton RJ. The causes of failure of restorations: A literature review. *J Dent* 1976;4(6):257-267.
5. Meskin LH, Dillenberg J, Heft MW, Katz RV, Martens LV. Economic impact of dental service utilization by older adults. *J Am Dent Assoc* 1990; 120(6):665-668.
6. Schwartz R, Summitt J, Robbins J. Fundamentals of operative dentistry. *J Dent* 2001; 29:402-410.
7. Klausner LH, Green TG, Charbeneau GT. Placement and replacement of amalgam restorations: A challenge for the profession. *Oper Dent* 1987;12(3):105-12.
8. Friedl KH, Hiller KA, Schmalz G. Placement and replacement of composite restoration in Germany. *Oper Dent* 1995;20(1):34-8.
9. Friedl KH, Miller KA, Schmalz G. Placement and replacement of amalgam restoration in Germany. *Oper Dent* 1994;19(6):228-32.
10. Mjor IA, Toffenetti F. Placement and replacement of resin-based composite restorations in Italy. *Oper Dent* 1992;17(3):82-85.
11. Akbuga-Ozel B, Aksel G, Kilicli E, Muratoglu M, Kavalci CK, Gulalp B *et al.* Metoclopramide-induced acute dystonic reaction misinterpreted as conversion disorder and seizure. *Eur J Gen Med* 2017;14(4):122-124.
12. Burke FJ, Cheung SW, Mjor IA, Wilson NH. Restoration longevity and analysis of reasons for the placement and replacement of restorations provided by vocational dental practitioners and their trainers in the United Kingdom. *Quintessence Int* 1999;30(4):234-42.

13. Fındık S, Görkemli H. Villoglandulary papillary adenocarcinoma co-existing with high-grade squamous intraepithelial lesion; arising from an endocervical polyp. *Eur J Gen Med* 2017;14(4):119-121.
14. Frost PM. An audit on the placement and replacement in a general dental practice. *Prim Dent Care* 2002;9(1):31-6.
15. Owens BM. Initial placement and replacement of amalgam restorations: A retrospective review. *J Tenn Dent Assoc* 1996;76(4):37-9.
16. Qvist J, Qvist V, Mjor IA. Placement and longevity of amalgam restoration in Denmark. *Acta Odontol Scand* 1990;48(5):297-303.
17. Palotie V, Vehkalahti M. Reasons for replacement and the age of failed restorations in posterior teeth of young Finnish adults. *Acta Odontol Scand* 2002;60(6):325-9.
18. Effect of Saadabad-B, Chamani-e-A: Study of the prevalence of failure causes in amalgam restorations. End of the letter, Doctor of Dentistry, Faculty of Dentistry, Babol University of Medical Sciences, 1997-1998 academic year.
19. Mjor IA, Shen C, Eliasson ST, Richter S. Placement and replacement of restorations in general dental practice in Iceland. *Oper Dent* 2002;27(2):117-23.
20. Fross H, Widstorm E. Factors influencing the selection of restorative materials in dental care in Finland. *J Dent* 1996;24(4):257-62.
21. Wilson NH, Burke FJ, Mjor IA. Reasons for placement and replacement of direct restorative materials by a selected group of practitioners in the United Kingdom. *Quintessence Int* 1997;28(4):245-8.
22. Mjor IA, Moorhead JE. Selection of restorative materials, reasons for replacement, and longevity of restorations in Florida. *J Am Coll Dent* 1998;65(3):27-33.
23. Burke FJ, Wilson NH, Cheung SW, Mjor IA. Influence of patient factors on age of restorations at failure and reasons for their placement and replacement. *J Dent* 2001;29(5):317-24.
24. Deligeorgi V, Wilson NH, Fouzas D, Kouklaki E, Burke FJ, Mjor IA. Reasons for placement and replacement of restorations in student clinics in Manchester and Athens. *Eur J Dent Educ* 2000;4(4):153-9.
25. Burke FJ, Cheung SW, Mjor IA, Wilson NH: Reasons for the placement and replacement of restorations in vocational training practices. *Prim Dent Care* 1999;6(1):17-20.
26. Cardoso M, Baratieri LN, Ritter AV. The effect of finishing and polishing on the decision to replace existing amalgam restorations. *Quintessence Int* 1999;30(6):413-8.
27. Deligeorgi V, Mjor IA, Wilson NH. An overview of reasons for the placement and replacement of restorations. *Prim Dent Care* 2001;8(1):5-11.
28. van Noort R, Davis LG. A prospective study of the survival of chemically activated anterior resin composite restorations in general dental practice: 5-years results. *J Dent* 1993;21(4):209-15.
29. Browning WD, Dennison JB. A survey of failure modes in composite resin restorations. *Oper Dent* 1996;21(4):160-6.
30. Penning C. Repair and revision 1. Repair or replacement of amalgam. *Ned Tijdschr Tandheelkd* 2001;108(246-9).

Corresponding Author

Dr.Maedeh Zarei

Resident,
Department of Cosmetic & Operative Dentistry, Babol
Dental University,
Babol, IRAN.
Email Id: - dr.babaei1981@yahoo.com.