THE EVALUATION OF REASONS FOR REPLACEMENT OF AMALGAM AND COMPOSITE

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Abstract

Amalgam and composite restorations take prime place in restorative dental practices. Over time, restorations are replaced for various reasons. This study aimed to evaluate the reasons for restoration replacement of patients presenting at Dicle University, Dental Faculty, Restorative Dentistry Clinic.

The study comprised 705 patients (402 female, 303 male) who presented at the dental clinic for routine dental treatment. Without taking gender into consideration, patients aged 15-80 who were determined to have amalgam and composite filling problems were included in the study. The patients were allocated to 5 groups according to age: Group 1, 16-25 years, Group 2, 26-35 years, Group 3, 36-45 years, Group 4, 46-55 years, Group 5, 56 years and over. The failure of the fillings was diagnosed from clinical and radiological evaluation results. The age, gender and reason for the replacement of the restoration were recorded for all patients.

The obtained data was evaluated with Student's t test and a difference was determined between the age groups. Of 705 restorations, 378 (53.62%) were amalgam and 327 were composite (46.38%). When the reasons for replacement of restorations were examined the primary reason was secondary caries (30.78%), followed by fracture of the restoration (17.6%) and overflowing filling (15.46%).

A significant difference was found between the age groups in terms of the parameter of reason for restoration replacement ($p < 0.05$). To determine between which age groups this difference was more significant, the Tukey HSD test was applied as a multiple comparison test.

The most significant reason for replacement of amalgams and composites was found to be secondary caries. The factor of gender had no effect on the reasons for replacement of the restoration. Failure of the restoration was seen to be greater in the 16-25 age group.
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Introduction

Several studies have demonstrated that a large number of patients referring to restorative dentistry departments have faulty restoration, therefore such a procedure would expect to have a significant effect on tooth integrity in the population.

Number of studies have been conducted on the reasons for restorations and their replacements in various countries. Information on the reasons for placement and replacement of restorations provide valuable insight into pattern of provision of dental care in different parts of the World.[1-4] Moreover, this findings would provide useful guidance on treatment planning and future material development.

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Over the past decade, there are indications of a shift away from the use of amalgam, principally because of public concern about mercury and dental amalgam and partly because patients' assessment of dental aesthetics appears to indicate that a proportion of the population are unhappy with the colour of the restorations in their teeth. Posterior composite restorations have evolved over many decades and the materials and techniques available now are greatly improved and have gradually become an "all-round" restorative material, including placement of these materials in stress-bearing areas of the dentition.[9]

To date, reasons for amalgam restoration renewal have not shown much change.[10] However, previous studies have reported the most significant reasons for composite restoration replacement to be secondary caries and fracture of the restoration.[11,12]

Thanks to rapid developments in dentine bonding systems and composite resins, aesthetic, functional and conservative restorations can be made which affect only the enamel and remain away from dentine tissue.[13,14] Therefore patients and dentists have come to prefer composite restorations close to the tooth colour. However, amalgam has continued to be the material of choice form molar and premolar restorations because of its superior physical properties, ease of application and low cost.[15]

Some studies which have researched the clinical life of amalgam and composite restorations have found the clinical lifespan to be similar in both restorations[16,17] and some researchers have reported amalgam to have a longer clinical life than composite.[18-21]

The clinical life of restorations which have been made have shown variations according to age, oral hygiene, susceptibility to decay, occlusion, factors which may affect the patients such as the physician's skill and experience, and the materials and techniques used.[22,23]

Restorations should be checked regularly and repaired or replaced when necessary. It should not be forgotten, however, that every time a filling is changed the cavity is widened by a mean 0.6mm.[24] Taking the quality, form and extent of the remaining restoration into account, repair may be an alternative. Thus both loss of tooth tissue is kept to a minimum and costs are lower. However, when several techniques have failed, a restoration should certainly be replaced.[25]

The aim of this study was to research the reasons for replacement of restorations and the effects of age and gender on those reasons at the Restorative Dentistry Clinic of Dicle University Dental Faculty.

Material and Methods

The study comprised 705 patients who presented at Dicle University Dental Faculty, Restorative Dentistry Clinic for routine dental treatment. Approval for the study was granted from Dicle University Medical Faculty Non-Interventional Ethics Committee (Ethics Committee Approval No 608, 11.06.2012). Without taking gender into consideration, patients aged 15-80 who were determined to have amalgam and composite filling problems were included in the study. The patients were allocated to 5 groups according to age: Group 1, 16-25 years, Group 2, 26-35 years, Group 3, 36-45 years, Group 4, 46-55 years, Group 5, 56 years and over (Table 1).

Age Groups		N	%
Group 1	16-25 years	342	48.5
Group 2	26-35 years	162	23.0
Group 3	36-45 years	105	14.9
Group 4	46-55 years	75	10.6
Group 5	56+ years	21	3.0
Toplam		705	100.0

Table 1. Distribution of the groups acccording to age

Within the context of the study, only voluntary patients who had been previously informed about the research were included. The diagnosis of failure of the amalgam and composite fillings was made from the results of clinical and radiological evaluations by 3 separate physicians with at least 3 years' experience. Age, gender and reasons for restoration replacement were recorded for each patient. The reasons for restoration and criteria are given in Table 2.

Reflector light, air drying, routine panoramic radiographs and when necessary, bite-wing and periapical radiographs were used during the examinations. The data obtained were

evaluated by Student's t test and differences between the age groups were determined.

Reason for replacement	Replacement Criteria
Secondary caries-0	Presence of decay related to the restoration
Mismatch of edges, filling overflow-1	Clustering appearance of the interface on bite-wing radiographs
Restoration fracture-2	Loss of material of the fragments
Tooth fracture-3	Loss of tooth tissue neighbouring the restoration
Loss of restoration-4	Patient history and empty cavity
Colour of filling, Change in material-5	Inspection, aesthetic dissatisfaction and request for renewal
Occlusion wear-6	Wear of the restoration and tooth, dentine sensitivity
Pain and sensitivity-7	Patient history, clinical examination

Table 2. Reasons for restoration replacement and replacement criteria

Results

The 705 patients were 402 female (57%) and 303 male (43%). Of the 705 restorations, 378 (53.62%) were amalgam and 327 (46.38%) were composite. Group means and standard deviations according to the age groups of the males and females are shown in Table 3.

	Gender	N	Mean±SD	Std. Deviation
Age	Female	402	29.07	11.121
	male	303	30.78	12.479

Table 3. Group means and standard deviations according to the age of all patients

The clinical diagnosis of secondary caries was the most common reason (30.8%) reported for the replacement of amalgam and composite followed by restoration fracture (17.2 %). Poor anatomic form was observed in 15.5 % of the replaced restorations. Occlusion wear (2.87%) and tooth fracture (5.95%) was seldom the cause for replacement of any type of restoration. Restoration replacement was most

commonly performed in 16-25 years (48.5)

No statistically significant difference was determined between the groups in respect of age according to the Student's t test ($p>0.05$). Two way analysis variance was then applied to the age groups. According to these results, no statistically significant difference was determined in terms of gender for reasons for restoration replacement ($p>0.05$). When the parameter of reasons for replacement was examined, a significant difference was determined between the age groups ($p<0.05$). To determine between which age groups this difference was more significant, the Tukey HSD test was applied as a multiple comparison test. The primary reason for replacement of restoration was determined to be secondary caries (Table4).

Reason for replacement of restoration		N	%
0-	Secondary caries	217	30.78
1-	Poor anatomic form	109	15.46
2-	Restoration fracture	121	17.16
3-	Tooth fracture	42	5.95
4-	Loss of restoration	63	8.93
5-	Colour of filling, Change in material	69	9.78
6-	Occlusion wear	21	2.97
7-	Pain and sensitivity	63	8.93
Total		705	100.0

Table 4. Reasons for replacement of restoration, distribution and percentages

Discussion

The aim of this study was to research the reasons for replacement of restorations and the effects of age and gender on those reasons at the Restorative Dentistry Clinic of Dicle University Dental Faculty.

The study comprised 705 patients; 402 female (57%), 303 male (43%). The mean age of female patients was 29 years and the mean age of male patients was 30.7 years and these mean ages of patients were observed to be close. The number of female patients was greater than that of male patients. This may be due to a greater prevalence of cavities in females due to females paying more attention to dental aesthetics and oral hygiene than males.

For many years, in many developed

countries, the majority of time of dental practice has been given to the replacement of old restorations.[1,26] In a study in England which included dental practitioners, it was reported that replacement of existing restorations comprised 60% of restorative interventions.[26] In another study conducted in a student clinic in the same country, this rate was determined as 52%.[1] In Germany, amalgam restoration replacements were reported as 52.8% and composite restoration replacement as 49.4%.[4,15] (4,10). In the current study, patients were selected at random, the indications for restoration replacement were applied and the restoration was replaced.

Differing results may arise from studies because of age restrictions. In a study by Kroeze, the criteria of age between 20-44 years was evaluated. It was reported that patients aged below 20 years of age or over 44 years had fewer restorations so these age groups had a lower rate of failures than other age groups.[27] In the current study, the patients were allocated to 5 different age groups of 16-25 years, 26-35 years, 36-45 years, 46-55 years and 56 years and above. The group with the most replacements of restorations was found to be Group 1 (342 restorations (48.5%). The group with the fewest restorations was Group 5 (21 restorations, 3%). This result shows that young patients have a greater failure of restorations and with increasing age, fewer restorations are replaced. This is consistent with findings of the study by Kroeze.[27]

In the current study, a statistically significant difference was found between Groups 1-2 and 2-3 in terms of reasons for replacement (p<0.05). This shows a change in reasons for replacement together with age.

In the current study, the main reason for replacement of composite and amalgam restorations was found to be secondary caries (30%, 217 restorations). The percentage of secondary caries has been reported as 28-5% - 70% in literature [28,29] and so the findings of the current study conform with this range. Studies in Germany, Italy and England have similarly shown secondary caries to be the primary reason for replacement of both amalgam and composite restorations.[3,4,15,26]

Secondary caries can be prevented by the techniques applied to primary decay. The use of amalgams strengthened with fluoride has been recommended as prophylaxis against secondary caries, although in some studies it has been reported that in compression of these amalgams there is a significant reduction in strength and increased corrision. By determining decay in the early stage with advanced diagnostic techniques, remineralisation can be achieved without replacement of the restoration.[30] However, it should not be forgotten that decay neighbouring a restoration may become recidivist decay. Secondary caries and recidivist decay cannot always be separated. Therefore care must be taken to keep distant from primary decay, not to leave decay in the cavity and to apply the restoration in a controlled manner.

In a 5-year study researching the clinical life of amalgam and composite restorations, it was reported that 10.8% of amalgam restorations were replaced and 14.9% of composites.[31] (28). In a study by Simecek et al a need was determined for replacement in 356 (31.2%) of 1140 composite restorations and 1730 (27.3%) of 6341 amalgam restorations.[32] Bernardo et al applied 1748 amalgam and composite restorations to 472 children aged 8-12 years. At the end of the 7-year study, the clinical life of amalgam restorations (94.4%) was reported to be longer than that of composite restorations(85.5%).[21]

In the current study, the second reason for replacement was fracture of the restoration (17.6%, 121 restorations) and the third was overflow of the filling (15.46%, 109 restorations). These were followed by tooth fracture, loss of restoration, colouring of the filling, occlusion wear, pain and sensitivity. When the reasons for failure were examined, there were many factors from the patient to the physician, from the restorative materials used to the techniques applied, from nutritional and parafunctional habits to oral hygiene. A study by Joksad et al (31) showed widespread failure of restorations was extremely low in patients who attended regular check-ups and followed recommendations. Regular check-ups will affect the prognosis of the restoration as small errors can be eradicated and the survival rate of the restoration will be extended.

In the current study, the factor of gender was seen not to have any effect on the reasons for replacement, which is consistent with the findings of a study by Burke et al.[23] This result leads to there being no necessity for gender-appropriate dental practices and treatment programmes in our country.

Conclusion

The primary reason for replacement of amalgam and composite restorations at Dicle University Dental Faculty, Restorative Dentistry Clinic was found to be secondary caries. Gender had no effect on the reasons for replacement. The failure of restorations was seen to be greater in young patients (16-25 years).

When the time and economic losses were evaluated which lead to restoration repair and replacement, unwanted failures may occur even with care taken during the first application. Protective treatment approaches and programmes, oral hygiene education and regular check-ups will extend the life of restorations.

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