

Frequency of recurrent caries in bitewing radiographies in patients who attended Kerman dental radiology centers, Iran

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Original Article

Abstract

BACKGROUND AND AIM: Recurrent caries is defined as caries in the marginal edges of filled teeth and is the most common reason for restoration replacement. The aim of this study was to evaluation of recurrent caries in amalgam, resin-based restorations and crowns in bitewing radiographies in patients who attended Kerman dental radiology centers, Iran.

METHODS: This cross-sectional study conducted on 3000 bitewing radiographies. Data were gathered by a checklist consist of sex, age, age of restorations (patients reported), and evaluation of radiographies consist of type of restorations, teeth number, existence recurrent caries. Radiographies examination was done by a last year dental student who was trained. Data were analyzed by SPSS software using chi-square and t-tests. $P < 0.050$ was considered significant.

RESULTS: The rate of the recurrent caries was 8.4%. The rate of recurrent caries in amalgam and resin-based composite was 3.1 and 42.5%, respectively. Resin-based composite material had higher recurrent caries with significant difference ($P = 0.001$). There was also significant differences between age of restorations and recurrent caries ($P = 0.030$). Multi-surfaces restorations had more recurrent caries ($P = 0.020$). There was no significant correlation between sex, number of teeth, mandible or maxilla, and recurrent caries.

CONCLUSION: According to the results of this study, resin-based composite, older and complex restorations had a higher rate of recurrent caries.

KEYWORDS: Recurrent Caries; Bitewing; Radiography; Restoration

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Dental caries is a microbial multi-factorial disease that leads to the destruction and loss of tooth mineral structures.¹ This process can change from early lesion to a clinical cavity during 6 ± 18 months in smooth surfaces.² Recurrent caries is defined as caries in the marginal edges of filled teeth.³ Dental plaque accumulation and incomplete caries removal during cavity preparation are factors for recurrent carries development.⁴ Recurrent

caries is the most common reason for restoration replacement.⁵ Kidd et al.⁶ reported that about 75% of restorative treatments are the replacement of existent restorative, and the main reason is recurrent caries. By the same token, other studies also indicate that recurrent caries is the main reason of replacement restoration.^{7,8} In a study by Chestnut et al.,⁹ the frequency of recurrent carries on 4294 Scottish patients in the age 12-13 years was 8%.

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Chrysanthakopoulos¹⁰ showed that recurrent caries was the most common reason for the replacement of old restoration with resin-based restorations. Clinical examination, radiographic pictures and using dental floss are diagnostic methods to detect recurrent caries.¹¹ Bitewing radiography is a reliable method for detecting recurrent caries. It is shown that intraoral bitewings are better than panoramic and extra oral bitewings in the diagnosis of recurrent caries.¹² In addition, there are no differences between digital and analog accuracy in the detection of recurrent caries.¹³ Since dentists spend a significant amount of their time each year replacing failed restorations, and this process has economic cost for patients and as there are not a similar study about the frequency of recurrent caries in Kerman, Iran, the aim of this study was to assess the frequency of recurrent caries in patients referring to Kerman dental radiology clinics.

Methods

In this cross-sectional study, 3000 bitewing radiographies were selected among patients referring to Kerman dental radiology clinics from October 2014 to February 2015. Written consent was obtained from all subjects. A trained last year dental student was appointed to refer to four dental radiology centers (four visits in a week) and evaluate bitewing radiographies. These centers had similar radiographic apparatus. Radiolucencies in filled teeth or crowns were considered to be recurrent caries. If there was any doubt in diagnosis of recurrent caries that radiography was checked by radiologist.

Data were gathered according to upper or lower jaw, number of teeth (molars or premolars), types of restoration [occlusal, mesio-occlusal, disto-occlusal, mesio-occluso-distal (MOD)], types of filling material (resin-based composite and amalgam), vital or root canal teeth, and crown recorded (Figure 1). We also gathered data regarding sex, age, and age of restoration from patients. The age of restoration was recorded based on patients'

report. Radiographies with close contact and defect in processing were excluded. Data were analyzed by SPSS software (version 21, SPSS Inc., Chicago, IL, USA) using chi-square and t-tests. $P < 0.050$ was considered significant. All radiographies were prescribed by dentists. This study was approved by the Ethics Committee of Kerman University of Medical Sciences (ethic code: k/93/478).

Results

This cross-sectional study was conducted on 3000 bitewing radiographies. In this study, 4297 restorations were evaluated. The age range of participants was 18-46 years with the mean age of 35.12 ± 11.63 years. The age range of restoration was 3-12 years with the mean age of 4.67 ± 2.17 years. The number of filled teeth with amalgam and resin-based composite was 3698 and 280, respectively. In addition, 319 restorations were crown and 359 (8.4%) restorations had recurrent caries. The rate of recurrent caries in amalgam and resin-based composite was 3.1% and 42.5%, respectively. The frequency of recurrent caries according to type of restorations and teeth is shown in figure 1.

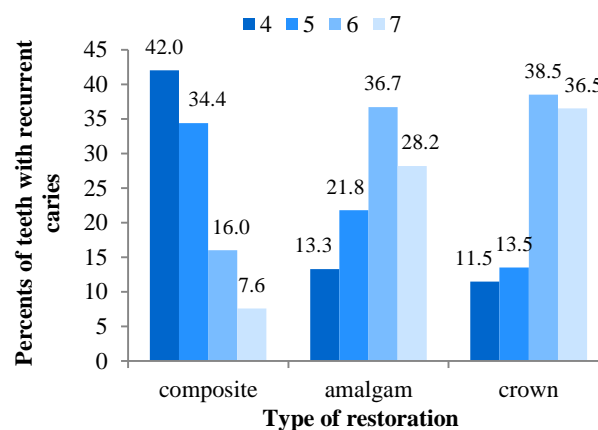


Figure 1. Percents of recurrent caries according to type of restorations and teeth

Table 1 shows the frequency of recurrent caries according to the type of restoration. There were significant differences between different types of restorations and recurrent caries ($P = 0.001$).

Table 1. Correlation between type of restoration materials and recurrent caries

Type of restoration	Number of total restorations	Number of recurrent caries	Percentage of recurrent caries	P
Amalgam	3598	188	5.2	0.001
Composite	280	119	42.4	
Crown	320	52	15.5	

There was not a significant difference between sex and the frequency of recurrent caries ($P = 0.190$). The frequency of recurrent caries was higher in two and three surfaces of restoration than one surface restorations, with significant differences, $P = 0.020$ (Table 2). 182 (51.0%) of recurrent caries were in maxilla and 177 (49.0%) were in mandible. There were no significant differences between two arches ($P = 0.230$). Older restoration showed higher recurrent caries. Significant correlation was found between the age of restoration and recurrent caries ($P = 0.030$).

Discussion

In this study, we used bitewing radiographies to assess the frequency of

recurrent caries in patients. Kamburoglu et al. showed that intraoral bitewing has the more accuracy to detect recurrent caries in comparison to extraoral bitewing and panoramic radiography.¹² Fitzgerald et al.¹³ expressed that bitewing had an accuracy of 59% for amalgam in the diagnosis of recurrent caries. In another study, the accuracy rate of bitewing in the diagnosis of recurrent caries for amalgam and composite restorations was 51 and 68%, respectively.¹⁴ Based on similar studies bitewing radiographies in the diagnosis of recurrent caries in this study is acceptable.^{12,14,15}

In this study, the rate of recurrent caries was 8.4%. This finding is similar to a study by Otto and Rule¹⁶ in which recurrent caries was 10%.

Table 2. Correlation between variables and recurrent caries

Variables	Number of recurrent caries	Percentage of recurrent caries	P
Sex			
Men	168	46.9	NS
Women	191	53.1	
Type of restoration materials			
Amalgam	188	5.2	0.001
Composite	119	42.4	
Crown	52	15.5	
Type of filling			
Class 1	39	10.8	0.020
MO	105	29.2	
DO	114	31.7	
MOD	101	28.1	
Root canal therapy			
Yes	177	49.2	NS
No	182	50.7	
Type of teeth			
4	81	22.5	NS
5	89	24.7	
6	108	30.0	
7	81	22.5	
Age of restorations			
1-4 years	73	20.3	0.030
5-8 years	112	31.1	
8 and more	174	48.4	

NS: Not significant; S: Significant; MO: Mesio-occlusal; DO: Disto-occlusal; MOD: Mesio-occluso-distal

Chestnut et al.⁹ also found a 10% rate for recurrent caries in their study. In a similar vein, Davari et al.¹⁷ also reported a 15% rate for recurrent caries on CL II amalgam restorations failure at dental school in Yazd, Iran. Jaber Ansari and Valizadeh Haghi¹⁸ also showed the rate of 26% for recurrent caries. The difference in percentages could be related to differences in the patient population, caries susceptibility, oral hygiene, diet, and study design. It is shown that cusp fractures and recurrent caries are the most common factors for amalgam restorations failure.¹⁹

In one study regarding the placement or replacement of filling, it was shown that the reason for replacement of filling with resin-based composite was recurrent caries in 43% of cases.²⁰ In our study, recurrent caries in composited filling was significantly higher. This finding is in line with other studies in which significant differences were observed between types of restoration material and recurrent caries.^{6,21} The same finding was also found in a study by Jaber Ansari and Valizadeh Haghi,¹⁸ in which composite fillings had significant higher recurrent caries. They studied recurrent caries in posterior teeth. Resin-based composite is the most common aesthetic alternative to dental amalgam. Moderate to large posterior composite restorations have higher failure rates, more recurrent caries, and increased frequency of replacement.²² Simecek et al.²³ showed that the number of resin-based composite restorations requiring replacement was significantly higher than amalgam restorations.

Some authors have suggested that differences between longevity of composite and amalgam may be more operator-related rather than material-related.²⁴ Factors such as patient's caries risk, tooth position, patient habits, number of restored surfaces, the quality of the tooth-restoration bond, and the ability of the restorative material can have an impact on a sealed tooth-restoration interface.²² In this study, recurrent caries was higher in proximal surfaces of restoration.

This finding is in congruence with the study of Jaber Ansari and Valizadeh Haghi¹⁸ in which recurrent caries was significantly higher in MOD restorations.

Laccabue et al.²⁵ showed that when restorations increased from a single occlusal surface to additional surfaces, a significant higher caries risk status was seen in elevating replacement rates for both amalgam and composite restorations. It may be due to proximal overhang which can lead to periodontal problems and recurrent caries. It may also avoid the use of wedges and contouring of matrix bands by dentists and patients cannot clean the contact of restoration properly. In this study, there was a significant correlation between the age of restorations and recurrent caries, older restorations had more recurrent caries. Bernardo et al.²⁶ in a 7 years evaluation of amalgam and composite restoration found that recurrent caries was the main factor of treatment failure. Chrysanthakopoulos²⁰ reported the mean age of composite restorations were 4 years. In this study, recurrent caries was seen in 14.5% of crowns. Behr et al.²⁷ showed that in the first 5 years of crown restoration, recurrent caries was 1.3%. This difference can be due to the differences between types of restorations or the age of restorations.

Conclusion

Based on the findings of the present study, the frequency of recurrent caries in amalgam, resin-based composite, and crown restoration was 8.4%. The rate of recurrent caries in amalgam and resin-based composite was 3.1 and 42.5%, respectively. Resin-based material composite, older restorations and complex restorations had higher rate of recurrent caries.

Regular follow-up visits especially in high-risk patients and meticulous removal of caries lesions during restorative procedures are recommended. We also suggest oral hygiene instruction to the patients, especially in crown and two or more surfaces restorations by dentists.

Conflict of Interests

Authors have no conflict of interest.

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