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The comparison of secondary caries between class I amalgam and class I composite restoration

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ABSTRACT

Introducion: Secondary caries or recurrent caries is a lesion which is observed under or around the margins or surrounding walls of an existing restoration. Amalgam has been the restorative method of choice for many years due to its low cost, easy application, strength, durability, and bacteriostatic effects. he need for restorative materials that bear similarity with natural tooth tissue such as composite resins, has increased.The aim of this study is to comparison the occurrence of secondary caries on class I amalgam and class I composite restoration. **Methods:** The type of research was descriptive study in which 100 samples of each class I amalgam and class I composite from department of conservative dentistry, faculty of dentistry, Rumah Sakit Gigi dan Mulut were taken. The proportion of secondary caries in both amalgam and composite restorations was analysed. **Results:** The result showed that the proportion of secondary caries on amalgam was 0,38 and composite was 0,19, and then was analysed with two-sample z test. There were significant differences between proportions of secondary caries on class I amalgam and the proportion of secondary caries on class I composite restorations. **Conclusion:** There is a difference between the proportions of secondary caries on class I amalgam and class I composite restorations where the proportion is higher in amalgam restorations compared to composite.

Keywords: Class I, composite, amalgam, secondary caries.

INTRODUCTION

Caries is a progressive dissolution of inorganic tissue of dental hard tissues mediated by dental plaque. The caries process is a ubiquitous, natural phenomenon. The progression of caries can be controlled by a variety of dental restorations.[1] The most popular restorations used in Indonesia are amalgam and composite. Amalgam, which is an alloy made by mixing mercury with a silver-tin dental amalgam alloy, has served as dental restorative for more than 175 years, beginning as early as 1820 in Europe and then in the United State by 1830. Amalgam has been the restorative method of choice for many years due to its low cost, easy application, strength, durability, and bacteriostatic effects. However, nowadays the usage of amalgam has been declining due to aesthetic reason and harmful effects of mercury. Most amalgam restorations can be expected to serve clinically for 10 to 12 years.[2,3,4]

The need for restorative materials that bear similarity with natural tooth tissue such as composite resins, has increased. Composite has evolved to be restorative material since it is insoluble, aesthetic, insensitive to dehydration,

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inexpensive, as well as easy to manipulate. One study by in 2003 evaluated more than 100 dental composite fillings and they found an average life span of 7.8 years for composite fillings.[5]

Even though both restorations have good properties, there are studies that show these two restorations having chances of developing secondary caries. Secondary caries can be defined as dental caries developing at the margin of a restoration, and its diagnosis is the same as primary caries. It is often called as recurrent caries. The study of 600 Dutch showed the main reason for scoring class I, III/IV, or V restorations as unsatisfactory was the presence of secondary caries (56.8%, 51.8%, and 90.1%, respectively) for both amalgam nd composite restorations.[6,1]

Through author's own experience as a co-assistant dentistry student in Rumah Sakit Gigi dan Mulut (RSGM) Bandung, many patients that came for treatment due to failed composite and amalgam restorations, were mostly secondary caries cases. Some of them already suffered from irreversible pulpitis that required further endodontic treatment. Based on aforementioned reasons, the author aims to conduct a research to compare secondary caries in composite and amalgam restorations among Rumah Sakit Gigi dan Mulut patients. The purpose is to assess and compare the proportion of secondary caries on class I amalgam and class I composite restoration.

METHODS

The type of research done is descriptive with surveying technique on outpatients from Conservative Dentistry Installation, Rumah Sakit Gigi dan Mulut (RSGM), Faculty of Dentistry, Universitas Padjadjaran, Bandung. In this research, two populations that were used are: N1 as the total number of teeth in patients who came to the Conservative Dentistry Installation of RSGM Bandung that had been restored with class I amalgam, and N2 as total number of teeth in patients who came to the Conservative Dentistry Installation of RSGM Bandung that had been restored with class I composite.

The sample was collected from each population with the inclusion criteria being the teeth must be restored by amalgam or composite or both dated to one year ago: n1(100 restorations of amalgam) and n2 (100 restorations of composite). How to detect/asses the secondary caries ? Instruments used in this survey were basic dental instrument, as follows sharp explorer, mouth mirror, tweezers, rinsing cup, small towel, dental chair, stationery, mask, gloves, examination paper. Materials used in this survey include alcohol 70%, cotton, water, cotton pellet, cotton roll. Ethical clearance No

RESULTS

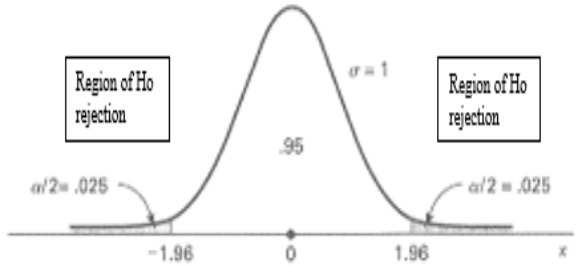
Table 1 shows that from 100 amalgam restorations examined, there were 38 occurrences of secondary caries. Whereas from 100 composite restorations examined, there were 19 occurrences of secondary caries. Therefore, there is higher proportion of secondary caries in class I amalgam compared to class I composite.

Table 1. Distribution of Secondary Caries Class I Amalgam and Class I Composite Restorations

Population	Sample	G 0	G 1	Proportion of secondary caries
Amalgam	100	62	81	0,38
Composite	100	81	19	0,19

Two-sample z test was used to analyze the difference between the proportion of secondary caries on class I amalgam and class I composite restorations. Two hypotheses were used: H0 (There is no significant difference between the proportion of secondary caries on class I amalgam and class I composite restorations) and H1 (there is a significant difference in the proportion of secondary caries on class I amalgam and class I composite restorations).

Condition to reject the null hypothesis was if Zcalculated value fell beyond the region of accepted – Z1-¤/2 and Z1-¤/2, the values taken from Table Z with confidence level (1 - ¤)100%. From Table Z, the value was -1.96 < Z <1.96 at 95%



Picture 2 Region of Rejection for Hypothesis

confident level . The value of Zcalculated = 3.01 and it fell on the region of rejection of H0 (Picture 2). Thus H0 was rejected, meaning that there is a significant difference between the proportion of secondary caries on class I amalgam restorations and the proportion of secondary caries on class I composite restorations.

DISCUSSION

Research was done on patients that came to the Conservative Dentistry Installation, Rumah Sakit Gigi dan Mulut Bandung, and then all 100 samples taken each from class I amalgam and class I composite restorations were assessed for possible occurence of secondary caries. Proportion of secondary caries on class I amalgam restorations was 0,38, whereas for composite was 0,19. The results showed that amalgam restorations had higher number of secondary caries occurrence than composite restorations. A two-sample z-test analysis revealed significant differences between the proportions of secondary caries on class I amalgam and class I composite restorations.

Navy Dental Corps' study about restoration placement and replacement and longevity of failed restoration in 2003 showed that 15% of amalgam and 10% of composite replacement of restoration were due to secondary caries. Another study in United Kingdom showed that 28% of amalgam and 15% of composite restorations were replaced because of secondary caries. These studies have the same result with this research, which is how amalgam restorations have higher occurrence of developing secondary caries than composite restorations.

Some failures of amalgam restorations are unavoidable due to inadequacies in the properties of amalgam. Corrosion is the progressive destruction of a metal, and excessive corrosion can lead to increased porosity, reduced marginal integrity, as well as loss of strength and release of metallic products into oral environment.

Initially, corrosion products seal the tooth restoration and prevent bacterial leakage as in addition to their anti-cariogenic property. Long term corrosion on tooth-restoration interface may result in marginal ditching leading to the plaque stagnation, which then would cause secondary caries. Besides, selection of amalgam that has superior properties is important.

High-copper amalgam has lower creep value and higher strength than low-copper amalgam, and it also reduces the chances of secondary caries development. Furthermore, technique and manipulation play a role in development of secondary caries. Poor matrix adaptation causes proximal overhang, while incorrect ratio causes dimensional changes in amalgam. Poor condensation of amalgam can result in porosity of the amalgam, and together with the presence of excess mercury, can also result in derivation of the strength of amalgam, thus increasing the potential for marginal leakage, corrosion and plaque accumulation that consequently cause secondary caries.[7,8]

However, the result of this research is different which suggested lower secondary caries risk and slower progression of a lesion around amalgam restorations than around resin ones. concluded that the overall risk of failure due to secondary caries was 3.5 times higher in composite restorations than in amalgam restorations.[9]

This can be explained by polymerization shrinkage which causes gap between restorations and tooth surface when manipulating composite materials. Gap formation is a result of forces of polymerization shrinkage of composite material being greater than the initial early bond strength of material to dentin.

Furthermore, composite do not have intrinsic defense mechanisms against caries attack, unlike amalgam. Hence, once a gap is formed, microleakage will occur, which can quickly lead to spread of secondary caries.[10] Treatment of the secondary caries depends on an accurate diagnosis, which should include bitewing radiographs to observe any demineralized area surrounding the restoration. Clinicians should consider repairing and refurbishing any localized defect at the restoration margins rather than performing a total replacement.

However, if secondary caries is diagnosed, a further consideration should be made as to whether the lesion is a halted or an active one. As for the latter one, condition of fracture, food impaction and repairing and refurbishing cannot be performed, replacement of the restoration is indicated. Repairing, refurbishing and replacement are important because they prevent the de-

fect from restorations for plaque stagnation that further complicate the development of secondary caries.[10,11]

CONCLUSION

There is a difference between the proportion of secondary caries on class I amalgam and class I composite restoration, and that is the proportion itself is higher on amalgam compared to composite.

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