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# COMPARATIVE STUDY BETWEEN THE EFFECT OF CLASS II AMALGAM AND COMPOSITE RESTORATIONS IN POSTERIOR TEETH ON PERIODONTAL TISSUES HEALTH

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## *ABSTRACT*

**Aim of the study:** To investigate and compare the effect of class II amalgam and composite restorations on periodontal tissues health.

**Materials & Methods**: The gingival index, plaque index, probing depth and clinical attachment level of one hundred teeth (50 restored by class II amalgam filling and 50 restored by class II composite filling) were included in the present study. One hundred teeth were classified into two groups as follows: Group I: involved 50 teeth restored by class II amalgam filling. Group II: involved 50 teeth restored by class II composite filling. The data was analyzed comparing both groups. The descriptive statistics included the mean, range and standard deviation for both groups.

**Results:** Our results showed that there is statistically significant decrease in GI, PPD and CAL scores of amalgam group compared to composite group. Whereas there is no statistically significant in PD scores between both groups

**Conclusions:** Class II composite restorations appear to be associated with periodontal breakdown more than class II amalgam restoration.

## INTRODUCTION

Dental restorations and periodontal health are inseparably interrelated. The type of restoration, the adaptation of the margins, the contours of the restoration, the proximal relationships and the surface smoothness have a critical biological impact on the gingiva and the supporting periodontal tissues[1]. Dental restorations therefore play a significant role in maintaining periodontal health Maintenance of a healthy periodontium is fundamental for the long term success of class II dental restorations. So, class II restorations may affect the periodontal health if the distances between the junctional epithelium and supracrestal connective tissue attachment aren't respected, or if there is insufficient space to maintain the health of the interproximal tissues,

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leading to gingival inflammation, connective tissue attachment loss and bone resorption[2].

Dental amalgam containing mercury has been condemned because of its toxicity and hence to be damaging of harmful to the general health. It must be clear that many sensational, confusing and misleading reports have been published. Today there is evidence that dental amalgam in the oral cavity does not harm anyone's health [3]. For those who are condemning amalgam there an abundant number of alarming reports taking into consideration the biologic effects of resin composites: methacrylate allergy for dentists and dental technicians, the three-finger-syndrome due to contact with liquid resin, allergic reactions at the level of the airways and breathing problems caused by dust particles (esp. composite particles after polishing procedures) have been described. It can be concluded that dental amalgam is not more toxic than resin composite in light of both patients' and dental care providers' health. Recent investigations demonstrated higher than expected health risks with resin composites [4].

Healing of the gingival tissue is mandatory before applying the restorative dental treatment, mainly if the cervical margin of the obturation must be placed subgingivally [5]. In order to protect and maintain the health status of the gingival tissues, the following methods can be applied: rubber dam, wedges, matrices, retraction cord, and local removal of excessive gingival tissues (by help of solutions, electrical cauterization, LASER, etc.) or surgical alteration of gingival architecture [6]. In order to achieve an adequate restorative treatment, maintenance of adequate dental anatomy should be taken into account, by achieving correct occlusal, proximal, vestibular, oral and cervical anatomy [7]. Existing plastic restorations, if inadequate, might be remodeled and polished, if by this manner they can be improved. Gingival trauma should be minimal, in every clinical procedure of the restorative treatment[8].

The two direct dental restorative materials most commonly used today are silver-mercury amalgam and resin-based composite[9]. The survival of dental amalgam restorations is twice as high as for composite fillings: polymerization shrinkage, deficient marginal adaptation, higher wear rates, defective contact points leading to food impaction, insufficiently converted composite at the bottom of the cavity are problems that cannot be underestimated when using resin-composite [10]. This does not imply that there is no weakness for amalgam: the need for retentive cavities at the cost of healthy tooth substance, weakening of the tooth's strength by cutting through the tooth crown's ridges, the risk of fracture of remaining tooth substance (mostly buccal and lingual surfaces) as the result of the cavity design, and the lack of adhesion between amalgam and tooth substance [11]. Retaining a tooth's strength by the replacement of amalgam by resin-composites is not always the correct solution. In this respect, it can be questioned whether it is not appropriate to repair failing (extensive) amalgam restorations as to replace them with resin-composites [12]. Research in this respect has demonstrated that dentists still are not convinced of this treatment option. Restoring a tooth in its original build-up or structure and function within the oral cavity is the basis of the biomimetic principle: the use of composite appears to be more obvious than restoring with amalgam[13]. Dental restorations and periodontal healthcare closely related: periodontal health is needed for the correct functioning of all restorations while the functional stimulation due to dental restorations is essential for periodontal protection [14]. In the present study we compare the effect of class II amalgam and composite restorations on periodontal tissues health.

## MATERIALS AND METHODS

The gingival index, plaque index, probing depth and clinical attachment level of one hundred teeth (50 restored by class II amalgam filling and 50 restored by class II composite filling) were included in the present study.

The criteria of inclusion include tooth having class II amalgam or class II composite filling in posterior teeth, no overhanging restorations, and tooth is vital and the restorations were done from 6 months to 3 years ago. The exclusion criteria include smoking, pregnancy, history of systemic diseases and those who had periodontal surgery.

One hundred teeth were classified into two groups as follows:

Group I: involved 50 teeth restored by class II amalgam filling.

Group II: involved 50 teeth restored by class II composite filling.

The following parameters will be evaluated for every tooth

1- Gingival Index (GI) described by Löe and Silness 1963 [15].

2- Plaque Index (PI) described by Silness and Löe 1964 [16].

3- Probing pocket depth (PPD) according to Ramfjord, 1967 [17].

4- Clinical attachment loss (CAL) according to Ramfjord, 1967 [17].

The PPD and CAL measurements were carried out at six sites for every tooth (mesiobuccal, midbuccal, distobuccal, mesiolingual, midlingual and distolingual) using UNC manual probe. The mean score in millimeter for individual tooth was calculated by summing the scores of each site and dividing by the total number of sites. Two periodontists examine all sites and the overall Kappa score of 0.96 was achieved for intra-examiner variability and 0.90 for inter-examiner variability.

The recorded data were compiled and entered in a computer using Statistical Package for Social Sciences (SPSS) version 20.0 software (Chicago, IL, USA). One way ANOVA and Chi-square tests were used for comparisons. A p-value of less than 0.05 was considered as statistically significant. The data was analyzed comparing both groups. The descriptive statistics included the mean, range and standard deviation for both groups.

**The clinical sheet form for the present study**

| **Name** | | | | | | |
|---|---|---|---|---|---|---|
| **Age** | | | | | | |
| **Tooth no.** | | | | | | |
| **Type of restoration** | | | | | | |
| **GI** | | | | | | |
| **PI** | | | | | | |
| **PPD** | **Buccal** | | | **Oral** | | |
| | **MB** | **MID B** | **DB** | **MO** | **MID O** | **DO** |
| **CAL** | **Buccal** | | | **oral** | | |
| | **MB** | **MID B** | **DB** | **MO** | **MID O** | **DO** |

## RESULTS

The study evaluated the GI, PI, PPD and CAL among 50 restored class II amalgam filling (group I) teeth and 50 restored class II composite filling (group II) teeth. The age range in both groups was between 18-40 years with average age 26.5 years. Since there was uneven distribution of gender, data was not analyzed according to the gender.

(Table 1) describes the minimum, maximum and mean scores along with the standard deviation for GI, PI, PPD and CAL. The mean of the GI score in the composite group (1.58) was higher than that of the amalgam group (1.24). The mean GI score of (1.58) in the composite group was even higher than the mean (1.41) of the overall combined groups. Similarly, the PI mean score of the composite group (1.73) was higher than that of the amalgam group (1.57) as well as the mean PI score of the overall group (1.65). ALSO, the mean of the PD score in the composite group (2.85) was higher than that of the amalgam group (2.66). The mean PD score of (1.58) in the composite group was even higher than the mean (2.735) of the overall combined groups. Similarly, the CAL mean score of the composite group (1.86) was higher than that of the amalgam group (1.52) as well as the mean PI score of the overall group (1.685).

Our results showed that there is statistically significant decrease in GI, PPD and CAL scores of amalgam group compared to composite group. Whereas there is no statistically significant in PD scores between both groups (table 2 & figure 1).

Table (3) shows one way ANOVA of mean GI, mean PI, mean PPD and the mean CAL in the amalgam and composite group. In all the variables there was a statistically significant difference, $p < 0.05$ between the composite and the amalgam group.

TABLE (1) Shows the average (mean) scores of gingival index GI, plaque index PI, Probing pocket depth PPD and Clinical attachment loss CAL.

| | | GI | PI | PPD | CAL |
|---|---|---|---|---|---|
| Group I class II amalgam filling | N | 50 | 50 | 50 | 50 |
| | Minimum | 0.91 | 1.29 | 1.75 | 0 |
| | Maximum | 2.15 | 2.43 | 3.50 | 2.53 |
| | Mean | 1.24 | 1.57 | 2.66 | 1.52 |
| | Std. Deviation | 0.45243 | 0.21248 | 0.36570 | 0.27530 |
| Group II class II composite filling | N | 50 | 50 | 50 | 50 |
| | Minimum | 0.98 | 1.35 | 1.93 | 0 |
| | Maximum | 2.64 | 2.81 | 4.21 | 3.05 |
| | Mean | 1.58 | 1.73 | 2.85 | 1.86 |
| | Std. Deviation | 0.35371 | 0.20527 | 0.42682 | 0.25480 |
| Total | N | 100 | 100 | 100 | 100 |
| | Minimum | 0.91 | 1.29 | 1.75 | 0 |
| | Maximum | 2.64 | 2.81 | 4.21 | 3.05 |
| | Mean | 1.41 | 1.65 | 2.735 | 1.685 |
| | Std. Deviation | 0.40307 | 0.208875 | 039626 | 0.26505 |

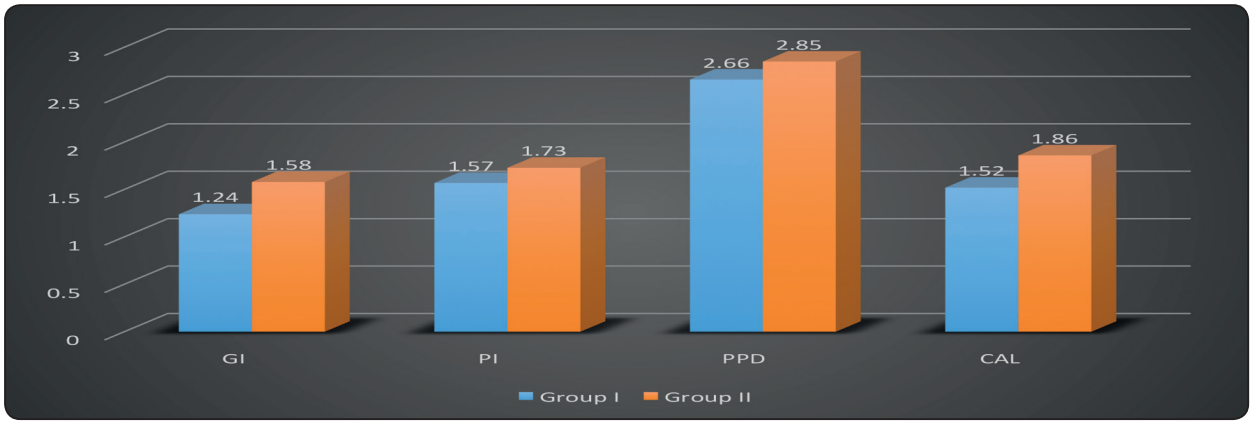


Fig. (1) Shows graphical comparison of mean GI, PI, PPD and CAL in group I (amalgam filling) and group II (composite filling).

TABLE (2) Shows the mean ± SD of mean GI, PI, PPD and CAL in group I (amalgam filling) compared group II (composite filling).

| | **Group I** | **Group II** | **P** |
|---|---|---|---|
| **GI** | 1.24± 0.45243 | 1.58±0.35371 | <0.05 |
| **PI** | 1.57±0.21248 | 1.73±0.20527 | >0.05 |
| **PPD** | 2.66±0.36570 | 2.85±0.42682 | <0.05 |
| **CAL** | 1.52±0.27530 | 1.86±0.25480 | <0.05 |

TABLE (3) Shows one way ANOVA of GI, PI, PPD and CAL with respect to the amalgam and composite group.

| **One Way ANOVA** | | | | | | |
|---|---|---|---|---|---|---|
| | | Sum of Squares | df | Mean Square | F | Sig. |
| **GI** | Between groups | 6.173 | 1 | 6.173 | 8.954 | 0.008* |
| | Within groups | 55.745 | 98 | 0.585 | | |
| | Total | 61.918 | 99 | | | |
| **PI** | Between groups | 5.732 | 1 | 5.732 | 15.324 | 0.001* |
| | Within groups | 43.269 | 98 | 0.476 | | |
| | Total | 49.001 | 99 | | | |
| **PPD** | Between groups | 7.345 | 1 | 7.345 | 5.216 | 0.011* |
| | Within groups | 47.294 | 98 | 2.468 | | |
| | Total | 54.639 | 99 | | | |
| **CAL** | Between groups | 6.386 | 1 | 6.386 | 6.284 | 0.014* |
| | Within groups | 51.340 | 98 | 1.364 | | |
| | Total | 57.726 | 99 | | | |

**** Significant at p < 0.05***

## DISCUSSION

In this retrospective clinical study that was designed to evaluated the GI, PI, PPD and CAL among 50 restored class II amalgam filling (group I) teeth and 50 restored class II composite filling (group II) teeth. The results showed that there is statistically significant decrease in GI, PPD and CAL scores of amalgam group compared to composite group. Whereas there is no statistically significant differences in PD scores between both groups. These results indicated that class II composite restorations have more negative effect on periodontium compared with class II amalgam. Our results were consistent with those described by many comparative studies [18-21]. However, other studies concluded that class II amalgam restorations was more injurious to periodontium compared to other restorative materials [22,23].

Our results may be attributed to the surfaces of composite resin was found to be altered upon exposure to saliva, with the deposition of a carbon-nitrogen-rich conditioning film [24]. Also, failure rates and higher risk of secondary caries are associated with resin composite than with amalgam restorations[25,26]. On the other hand, marginal deterioration of composite restorations remains problematic and is the major reason for the short lifetime of these adhesive restorations[27,28].

Currently, direct composite restorations are only indicated when patients have excellent oral hygiene, due to the greater adherence of plaque that occurs on this type of materials [29]. The higher probability of having more plaque adhesion on resin-based materials than in amalgam, calls for even more detailed instructions that have to be given to the patient, regarding oral hygiene, when these materials are selected [30].Thus, a flawless restoration placement and, simultaneously, appropriate oral hygiene, have a positive effect increasing the longevity of restorations and decreasing their need of replacement [31,32].

## CONCLUSIONS

Within the limitation of this study it concluded that Class II composite restorations appear to be associated with periodontal breakdown more than class II amalgam restoration.

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