

# Overhanging Amalgam Restorations by Undergraduate Students

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## ABSTRACT

**Objective:** To determine the frequency of overhanging margins in amalgam restorations done by undergraduate students at Fatima Jinnah Dental College Hospital, Karachi.

**Study Design:** Observational study.

**Place and Duration of Study:** Department of Operative Dentistry, Fatima Jinnah Dental Hospital, Karachi, from January to June 2009.

**Methodology:** Patients aged 20 - 45 years attending the Department of Operative Dentistry requiring class-II restorations were included in the study. Whereas, third molars, overlapped proximal surfaces, teeth adjacent to edentulous spaces and pregnant females were excluded. One hundred and fifty patients were selected randomly aged between 20 - 45 years requiring class-II restorations. Posterior Bitewing radiographs were taken and 1600 surfaces were examined. Restorations were done by undergraduate students at Fatima Jinnah Dental College Hospital, Karachi. Chi-square test was utilized to analyze the relationship between location and surface of overhang.

**Results:** Overhanging amalgam restorations were common in the restorations done by undergraduate students (58%). The occurrence of overhangs was more frequent on the distal surfaces (56%) Although the association of amalgam overhangs with the surfaces of the teeth was significant ( $p < 0.0001$ ), overhangs were not significantly associated with the location of the teeth ( $p < 0.063$ ).

**Conclusion:** Overhanging restorations were present in approximately 58% of all proximal amalgam restorations done by undergraduate students.

**Key Words:** *Overhanging amalgam margins. Dental amalgam. Class-II restoration. Bitewing radiograph.*

## INTRODUCTION

Faulty dental restorations and prostheses are common causes of gingival inflammation and periodontal destruction.<sup>1</sup> Thorough examination for overhangs, using both clinical and radiographic assessments, is the most reliable way of diagnosing overhanging margins.<sup>2</sup> An amalgam overhang is defined as an extension of amalgam restoration beyond the confines of a cavity preparation. From various studies, it is apparent that such overhangs are alarmingly common.<sup>3</sup> Overhanging margins provide ideal locations for the accumulation of plaque and result in a change in the ecologic balance of the gingival sulcus region, thereby causing an increase in the amount of disease-associated organisms.<sup>4</sup> Proximal overhangs do not only cause increased accumulation of plaque, they also decrease the access of proximal cleaning devices, e.g, tooth sticks, interdental toothbrushes.<sup>5</sup>

It is generally difficult to examine the contact points and areas on the posterior teeth for the detection of carious

lesions or overhanging restorations with conventional clinical examination methods. Bitewing radiographs have been reported to detect more proximal lesions and inadequate restorative treatments of filled surfaces as compared to clinical examination alone.<sup>6</sup>

Amalgam overhangs can have many detrimental effects on the patient's oral health. Surfaces with proximal restorations presenting overhangs, because of increased plaque accumulation may be expected to show greater occurrence of secondary caries than proximal restored surfaces without overhangs.<sup>7</sup> Studies have shown that there is more periodontal attachment loss and inflammation associated with teeth with overhangs than those without them.<sup>8</sup> The effect of an overhanging restoration is to exaggerate these responses by increasing the plaque retention and potentially results in increased rate of destruction of the periodontal tissues.<sup>9</sup>

Although overhanging restorations are one of the major causes of failure of the amalgam restorations, however, very few local studies have been carried out regarding their occurrence. It was, therefore, the aim of this study to determine the occurrence of proximal overhangs in class-II amalgam restorations done by final year dental students.

## METHODOLOGY

This study was carried out over a period of 6 months, from January till June 2009 on patients attending the

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Department of Operative Dentistry, Fatima Jinnah Dental Hospital, Karachi, requiring restorations. One hundred and fifty patients aged between 20 - 45 years were selected by purposive convenience sampling for this study. Third molars, overlapped proximal surfaces and teeth adjacent to edentulous spaces and pregnant females were excluded. The sample size was calculated online at 'openepi.com' with 95% Confidence Interval. A total of sixteen hundred (1600) proximal surfaces were examined, of which 150 surfaces were restored with amalgam by final year students. After completion of the procedure, the quality of the restoration was assessed by taking bitewing radiographs.

Personal information related to the medical and dental history of the subjects was obtained by a questionnaire. Posterior bitewing radiographs were taken with Kodak Ekta speed films utilizing paralleling technique at 70 Kvp and 7 mA using a digital X-ray unit (SIEMENS® Heliodont). The exposure time was 0.20 seconds.

Clinical and radiological examination were carried out by two different evaluators to remove bias under standardized conditions using a constant light source. The inter-examiner reliability was high with Cohen's Kappa value of 0.6. Radiographs were observed on an X-ray viewer in a dark room.

All subjects signed an informed consent about the study. They were explained about the radiation safety of a bitewing X-ray. They were also informed that they would undergo treatment by undergraduate students under supervision and were not charged for the additional postoperative radiograph. The data were analyzed using Statistical Package for Social Sciences (SPSS) Version 17. Descriptive statistics such as mean and standard deviation was computed for age. Chi-square test was utilized to assess the association between the location of the teeth and the prevalence of overhanging surfaces.

### RESULTS

One hundred and fifty patients aged between 20 - 45 years, with mean age of 32.8 ± 6.90 years, were included in this study. Among them, 81 (54%) were males and 69 (46%) were females respectively.

**Table I:** Frequency of overhang present according to tooth distribution.

Tooth number	Frequency (%) of tooth distribution	Frequency (%) of overhang present	Frequency (%) of overhang absent	p-value
Upper right first molar	21 (14%)	15 (71%)	6 (28%)	0.063
Upper right second molar	22 (14.7%)	16 (72%)	6 (27%)	
Upper left first molar	24 (16%)	13 (54%)	11 (45%)	
Upper left second molar	18 (12%)	13 (72%)	5 (27%)	
Lower left first molar	17 (11%)	7 (41%)	10 (58%)	
Lower left second molar	19 (12.7%)	6 (31%)	13 (68%)	
Lower right first molar	15 (10%)	10 (66%)	5 (33%)	
Lower right second molar	14 (9.3%)	7 (50%)	7 (50%)	
Total	150 (100%)	87 (58%)	63 (42%)	

Significance level  $p < 0.05$ , according to Chi-square test.

**Table II:** Frequency of overhang according to tooth surface.

Surface of teeth	Frequency (%) of overhang present	Frequency (%) of overhang absent	p-value
Mesial overhang	31 (35%)	0 (0%)	0.0001
Distal overhang	56 (64%)	0 (0%)	
Total	87 (58%)	63 (42%)	

Significance level  $P < 0.05$ , according to Chi-square test

Overhangs were most frequently seen in the upper right and left second molar (72%) followed by upper right first molar (71%) and upper left first molar (54%) respectively. However, the frequency of overhangs was 58% which was not statistically significant ( $p=0.063$ , Table I). Out of 150 surfaces restored with amalgam, 64% had overhangs present on distal surface of the molars and 35% on the mesial surface ( $p < 0.0001$ ); 42% of the surfaces exhibited no overhangs (Table II).

### DISCUSSION

The overhanging amalgam restoration would enhance accumulation of dental plaque below the ledge caused by the overhang, resulting in caries and periodontal disease. In the present study, the prevalence of interproximal amalgam overhangs was found to be 58% on the mesial and distal surfaces of the molars in all the four quadrants while 42% of the surfaces did not show any overhangs. Many previous studies have shown similar results. Kells and Linden,<sup>6</sup> have documented in their study that 57% of the patients had at least one amalgam overhang. Similarly, Krister and Svensson<sup>7</sup> also showed the prevalence of amalgam overhangs to be 64%.

Brunsvold and Lane<sup>10</sup> discussed that overhanging restorations pose a significant concern as their prevalence has been estimated to be 25 - 76% for all restored surfaces. Sikri and Sikri<sup>11</sup> found this prevalence to be 64.12% whereas Coxhead *et al.* documented 62% overhangs in amalgam restored surfaces.<sup>12</sup>

In this study, overhangs were more common in maxillary molars (65%) than mandibular molars (34%). This finding could be due to the reason that there is a difficulty in operative access due to indirect view by the operator, especially at an undergraduate level while restoring the maxillary molars. Many of the previous

studies show similar findings. Svensson also found maxillary overhangs to be more frequent than mandibular ones.<sup>6</sup>

The relationship between teeth location and the prevalence of overhangs was not significant ( $p < 0.063$ ). It may be attributed to a relatively smaller sample size obtained from a dental college where all procedures are expected to be closely supervised by dental faculty. This was one of the limitations of the study that it was carried out in one teaching hospital only for a short period of time and, therefore, the sample size was not very large. Multi-centers could be included to assess the clinical skills of different student batches. The prevalence of overhanging amalgam margins found by this study (34%) was lower as compared to several other studies.<sup>13</sup>

Overhangs on distal surface were significantly higher ( $p < 0.0001$ ) than mesial surface. It may also be attributed to the fact that there is better clinical visibility and access on the mesial aspect as compared to the distal surfaces of the posterior teeth.

A similar study was carried out by undergraduate students in a teaching hospital at Saudi Arabia where the prevalence of amalgam overhangs was found to be 52.9%, which is quite close to these results. It has been shown earlier that a marginal overhang is the most common cause of amalgam restoration failure.<sup>14</sup>

While studying the prevalence of overhangs in extracted teeth, Than *et al.* reported, in their clinical study on 240 extracted teeth, over 60% prevalence of overhangs.<sup>14</sup> Gilmore and Sheihan on the other hand have reported contrary to prevalence reports. They could report 33% overhangs when bitewing radiographs of 1976 civilians were viewed.<sup>15</sup> Hence, the prevalence varied between 30 - 60% in different studies.

Trivedi documented the alarming prevalence of overhanging restorations (64.12%) and clearly indicated the relationship of overhangs with periodontal diseases.<sup>16</sup> Therefore, overhang removal is highly recommendable.<sup>17</sup> It is advisable to replace the whole of faulty restoration rather than removing the overhang only.

The overhangs are largely iatrogenic, caused by poor operator skill and exacerbated by unusual dental morphology. The students should be closely supervised to avoid the occurrence of iatrogenic overhangs. The dental profession has an ethical obligation to recognize the need for improvement at the undergraduate level to gain skills, so that future generations of dentists are better able to cope with overhanging margins.

A large number of all restorations in use, in adults, are made of amalgam especially in a low socioeconomic country such as Pakistan. This makes the knowledge about overhanging restoration margins of interest also in the future.<sup>18</sup>

## CONCLUSION

This study identified a high frequency of interproximal amalgam overhanging restorations done by undergraduate students.

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