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## **Radiographical evaluation of alveolar bone destruction associated with overhanging interproximal amalgam filling**

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### **Abstract**

**Aim & Objective:** The aim of our study is to evaluate the alveolar bone loss due to overhanging of amalgam restorations interproximally and to compare with the control intact side of the same tooth by using orthopantomograph.

**Materials and Methods:** 156 overhanged interproximal amalgam fillings were detected by using orthopantomograph in which alveolar bone destruction was calculated and compared with the control normal intact side of the same tooth and clinical attachment level was measured clinically.

**Results:** The alveolar bone loss was higher in female while clinical attachment level was higher in male, but statistically it is non-significant. According to our study mandibular teeth had higher bone loss and clinical attachment level than maxillary teeth. The percentage of overhanging interproximal amalgam was more in mandibular first molars, the alveolar bone loss and clinical attachment level increased with overhang filling compared to control surface and the difference was statistically significant.

**Conclusions:** Over hanged fillings should be avoided to maintain the periodontal health and prevent more destruction.

**Keywords:** Overhang amalgam, alveolar bone loss, attachment level, orthopantomograph

### **Introduction**

Overhanging of amalgam filling is defined as an extension of restorative material beyond the confines of a cavity preparation. There are so many etiological factors associated with the progression of periodontal disease which includes bleeding on probing, gingivitis and bone loss [1].

Faulty cavity preparation with improper adapted filling and in some cases anatomical variation in tooth surfaces contribute to poor restoration with overhang, which makes it difficult to place a wedge and matrix band to fully adapt to the gingival margin [2, 3]. Amalgam overhangs causes plaque accumulation, caries, and periodontal disease. The main etiology of gingival inflammation is due to bacterial plaques along with the contributing factors such as calculus, overhang, orthodontic therapy, smokeless tobacco, radiation therapy, iatrogenic factors, and the materials used in restoration [4, 5].

Overhanging interproximal amalgam filling leads to accumulation of plaque which result in a change in the ecologic balance of the gingival sulcus region resulted in changes in the associated microflora similar to those observed in chronic periodontitis. So, increased proportions of gram-negative anaerobic rods, particularly black pigmented bacteriodes were observed [6]. Therefore, overhang restorations not only increase plaque mass, but also increase the specific periodontal pathogens in the plaque.

Proximal overhangs cause increased accumulation of plaque and also decrease the access of proximal cleaning devices, such as tooth picks and inter dental tooth brushes. Many authors have concluded that there is more periodontal attachment loss and inflammation associated with teeth with overhangs than those without overhanging [7]. 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. The main reasons for the breakdown of fillings are so many, which includes faulty margins of the restorations, fractures of fillings, or secondary caries. Assessment of alveolar bone level in periodontitis is very important in determining prognosis and treatment plan. Many researchers were measured the

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Proximal bone height adjacent to class II amalgam restorations with and without overhangs and compared to the bone height adjacent to homologue intact tooth surfaces (control surface of the same tooth) or to the contra-lateral teeth without overhanging amalgams and demonstrate the alveolar bone necrosis closed to the over hanged amalgam restoration in the proximal box of teeth. Orthopantomographs were recommended for the assessment of alveolar bone height or bone loss. An advantage of Orthopantomographs is decrease in radiation exposure in comparison to intra-oral radiography. Orthopantomographs provides full mouth image so there was no need for taking multiple intraoral films, save times, and the digital software program provide resolution, contrast and angular measurements. The aim and objective of present study was to report the prevalence of overhang amalgam restorations and to measure the clinical attachment level and alveolar bone loss in overhang surface with comparison to the control intact surface of the same tooth by using digital panoramic radiography.

### Materials and methods

In this study, up to 1000 patients attended at Department of dentistry in government medical College, Rajnandgaon (Chhattisgarh, INDIA)

Inclusion criteria include Maxillary and Mandibular posterior teeth except third molars were evaluated for the presence of overhanging interproximal amalgams fillings. The vertical distance from cemento-enamel junction to the apical most part

of crestal bone was calculated using the digital software and bone loss was considered when it was more than 2 mm from the cemento-enamel junction (CEJ).

For Clinical attachment level 5mm or deeper pocket depth were considerate and patients diagnosed with chronic periodontitis were selected. The clinical and radiographical measurements were calculated for overhanging inter proximal amalgams tooth surface and then compared with the normal control intact surface of the same tooth. All the measurements were in recorded in mm. All data were collected and analyzed using SPSS software program.

### Results

About 9999 posterior teeth which includes maxillary and mandibular premolars, first and second molar from 1000 patients. The mean age of the patients was 35-45 years. Only 3555 posterior tooth was filled and only 95 over hanged inter proximal amalgam fillings were detected. In present study Alveolar bone level for over hanged inter proximal amalgam fillings was greater as compared to alveolar bone level for normal intact surface of the same tooth and the differences were statistically significant. Cases were more in mandible compared to maxilla in our study. Clinical attachment level for over hanged inter proximal amalgam fillings was greater as compared to clinical attachment level for normal intact surface of the same tooth and the differences were statistically significant( Table 1).

**Table 1:** Comparative analysis of all groups

	Maxilla	Mandible	Male	Female
	Mean & Standard deviation	Mean & Standard deviation	Mean & Standard deviation	Mean & Standard deviation
Alveolar bone level - overhang	1.92 & 0.923	2.24 & 1.265	2.235 & 1.256	1.869 & 1.013
Alveolar bone level – intact surface	4.34 & 1.386	4.41 & 1.511	4.614 & 1.608	4.133 & 1.45
Clinical attachment level - overhang	1.53 & 1.086	1.79 & 1.06	2.546 & 1.563	1.453 & 0.765
Clinical attachment level - intact surface	2.32 & 1.265	2.81 & 1.256	3.678 & 1.564	3.541 & 1.064

### Discussion

Inter proximal over hanged amalgam fillings had a destructive effect on periodontium. Our study concludes that the bone loss increases with over hanged inter proximal amalgam fillings and the differences was statistically significant. Markkanan *et al* reported average bone loss is 1.2 mm when examined 315 OPG. Seventy five per cent of the patients had at least one amalgam overhang and 37 per cent had three or more overhangs visible on the radiographs [8]. About of the restored teeth had detectable amalgam overhangs. 42 per cent of these overhangs filling teeth had bone levels which were greater than 2 mm. The mean bone level-ACJ distance for the control surfaces of the teeth with overhangs was 1.46 mm. Panoramic, bitewing and periapical radiography and probing for measurement of the marginal bone level were compare for 237 sites of 23 patients. Probing was done before and during flap surgery, the measurements represented the true value while the radiographical methods were underestimated the bone loss. The underestimation of the bone loss ranged from 13% to 32% in orthopantomogram, 11-23% in bitewing and 9-20% in periapical radiographs. The results of the present study showed non-significant differences between Clinical attachment level and bone loss measurements done by digital panoramic radiograph and this may be due to modern digital device used and its software program that used to perform the measurements. In 1998, Parsell, *et al.* use digital radiography in two phase study [9].

The first phase by comparing the bone loss of accepted filling surface with control surface of the same tooth. While the second phase was done by comparing researchers, Kadhim, *et al.* the bone loss associated with overhang filling surface with control normal surface of the same tooth. They found significant differences between the two phases and the bone loss was statistical significant with overhang filling [10]. These results were in agreement with the results of the present study. Gedik, *et al.* conducted a study on 21 patients with age ranged between 18-59 years [11]. They measured the bone loss associated with over hanged amalgam fillings by periapical, bitewing and orthopantomograph in addition to measurement of clinical attachment level. They reported that bone loss increase with overhang filling and the bitewing film was more accurate to measure the bone level, but on other hand the differences between clinical measurements and those obtained by orthopantomograph were statistically not significant. Kasaj, *et al.* performed a study on 500 orthopantomograph for patients with age ranged between 20-80 years, they conclude that overhang filling was destructive for tooth supporting structures and the bone loss increased with age [12]. The prevalence of overhang was 59.7% and more frequently happened in upper molar with bone loss about 0.8 mm. Many authors compared the bone loss associated with overhang filling in 28 digital bitewings with another bitewing films for the contra lateral 28 normal teeth without overhang [13]. They found a significant difference between their

measurements and the bone loss increased with overhang fillings. Recently in 2017, a study was conducted by Saberi, *et al.*, on 60 patients with 90 overhang fillings defects<sup>[14]</sup> They measured the probing depth, surgical measurements for bone loss with radiographical measurements using digital caliper on OPG and compare the results. They found a strong correlation between probing depth and surgical measurements and high degree of correlation between surgical and radiographical results.

### Conclusion

The prevalence of overhang filling was decreased to about 4.6%. Orthopantomograph accepted as a method for measuring alveolar bone loss. Alveolar bone loss is more in first molars of mandibular jaw. Overhang interproximal amalgam fillings are predisposing factor for gingivitis, alveolar bone loss and destruction of tooth periodontium.

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