COMPARING METAL AND TRANSPARENT MATRICES IN PREVENTING GINGIVAL OVERHANG WITH DIFFERENT RESIN MATERIAL IN CLASS II RESTORATIONS – AN SEM STUDY

Shetty Dinesh*, Shetty Priyadarshini*, Sakri Mohan*

Abstract

Transparent matrices and reflective wedges are difficult to adapt, thus their ability to prevent gingival overhang was compared in this study with metal matrices and wooden wedges.Class II MOD cavities were prepared and randomly divided into six groups. Group I microhybrid composite, Group II flowable composite liner and Group III compomer. In above 3 groups metal matrices and wooden wedges were used. Group IV microhybrid composite, Group V flowable composite liner and Group VI compomer. In above 3 groups transparent matrices and light reflecting wedges were used. Specimens were filled with respective resin composite material, using corresponding matrix and wedge.Percentage of gingival overhang was determined under SEM.The result showed greater overhang formation in transparent matrix group compared to metal matrix group as transparent matrices are difficult to adapt to the teeth .

Keywords : Overhang, Matrices, Wedges, SEM.

Introduction

With introduction of resin composite, esthetics in dentistry took a newer dimension. Although still a newer form of restorative material compared to amalgam, the amount of research and development over the last 40 years has been considerable. Currently, resin composite has a wide range of use in dentistry from class 1 to class V cavities, for splinting and to the extent of retrograde filling.

Gingival overhang is a problem frequently while restoring proximal cavities. The amount of excess material that builds up gingivally depends on the materials and technique used. Wide varieties of matrix retainers and bands are available to counter this problem. Metal matrices and wooden wedges when used for resin restoration has disadvantage that curing has to be done from occlusal direction leading to polymerization shrinkage occlusally thus creating microgap between resin and gingival seat[1]. Transparent matrices and reflective wedges are more favourable as gingival curing is possible thereby shrinkage is towards gingiva thus reduces microleakage at the gingival margins.

Transparent matrices and reflective wedges by their nature are found to be highly unstable and it is difficult to adjust them to the natural anatomic shape of the tooth this may lead to gingival overhang during restorative procedure[2]. Gingival overhang has been implicated in wide range of complication including secondary caries and periodontal disease and is of great clinical significance.[3]

Thus, the aim of this study was to evaluate whether transparent matrices and reflecting wedges or metal matrices and wooden wedges resulted in formation of greater overhangs when different resin restorative materials are used to restore class II cavities.

* Dept of Conservative & Endodontics, RDC, Loni

Address for correspondence:

Dr Dinesh Shetty, Senior Lecturer, Department of Conservative & Endodontics, Rural Dental College, PIMS, Loni, District-Ahmednagar, Maharashtra-413736,India

E-mail: drdinesh_s@hotmail.com

Materials and Methods

Sixty freshly extracted, non carious human molars and premolars were collected, scaled and stored in normal saline. Standardized class II MOD cavities were prepared with straight fissure diamond point of diameter 0.8mm in a high speed turbine. Cavities were 3mm in width buccolingually, depth of pulpal floor was 2mm, width of gingival seat was 1mm and gingival margins proximally were located 1-1.5mm above the cementoenamel junction as shown in (Fig:1.)

Fig: 1 Prepared tooth

Each tooth was mounted between two artificial teeth in a dental stone to simulate the geometric configuration of the approximal site. (Fig:2.)

Fig: 2 Prepared tooth mounted in dental stone

All cavities were dried with oil free compressed air followed by etching with 35% weight orthophosphoric acid gel for 15 seconds, rinsed with water for 15 seconds and excess water was very briefly blown away, leaving glistening hydrated surface. The cavities were then covered with a single bond adhesive agent and cured for 20 second with a light curing unit. The specimens were randomly divided into 6 groups according to type of restorative material and matrix used as shown in Table 1.

Table 1: Showing specimen divided into 6 different groups

Group n=10	Restorative material	Type of matrix	Type of wedge
1	Micro-hybrid composite	Metal	Wooden
2	Flowable composite liner	Metal	Wooden
3	Compomer	Metal	Wooden
4	Micro-hybrid composite	transparent	Reflective
5	Flowable composite liner	transparent	Reflective
6	Compomer	transparent	Reflective

As shown in Table, each group corresponding matrix band and wedges were used and teeth were filled with respective restorative material. (Fig:3,4.) Proximal box of the teeth were filled first followed by occlusal. In case of metal matrices and wooden wedges curing was done from occlusal direction while in transparent matrices and reflective wedges first layer was cured from gingival direction.

Fig: 3 Tooth with metal matrix and wodden wedge

Fig: 4 Tooth with transparent matrix and reflective wedge

After restoration the gingival restorative margins on both sides of all the restored teeth were examined by SEM in 200x magnification. The total length of the restorative margin in millimeter and the length of margin exhibiting excess material in millimeters were measured. From the above two readings, the percentage of margin that exhibited gingival excess was determined for each individual tooth. (Fig: 5-11)

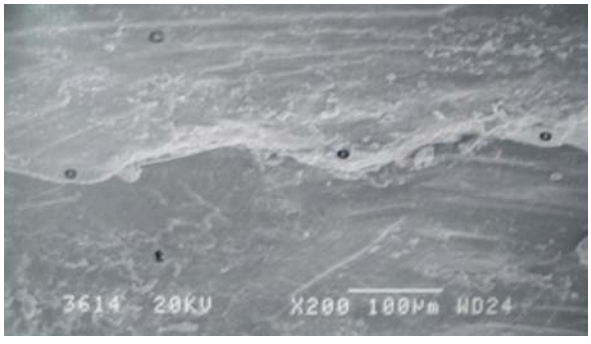

Fig: 5 SEM of gingival tooth interface showing overhang in group I

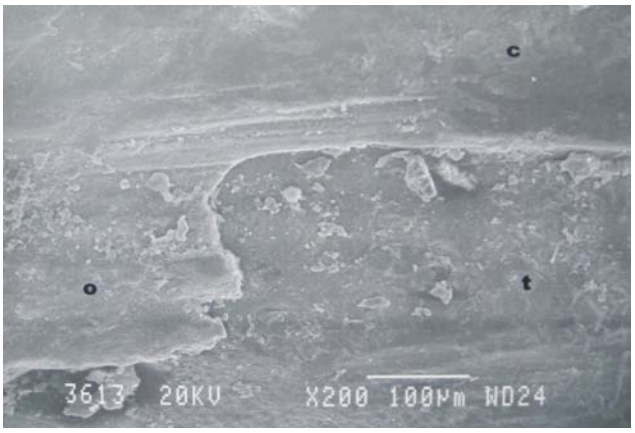

Fig: 6 SEM of gingival tooth interface showing overhang in group II

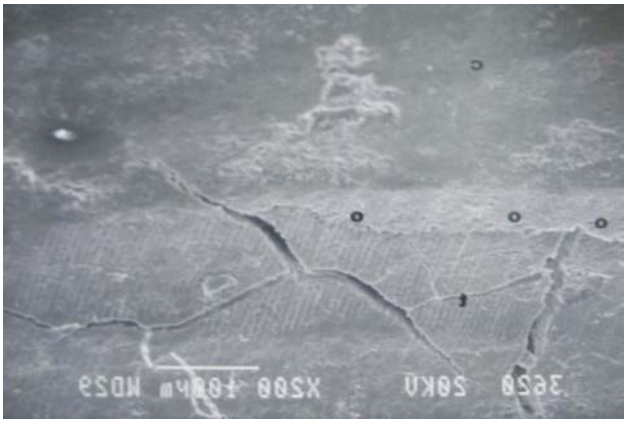

Fig: 7 SEM of gingival tooth interface showing overhang in group III

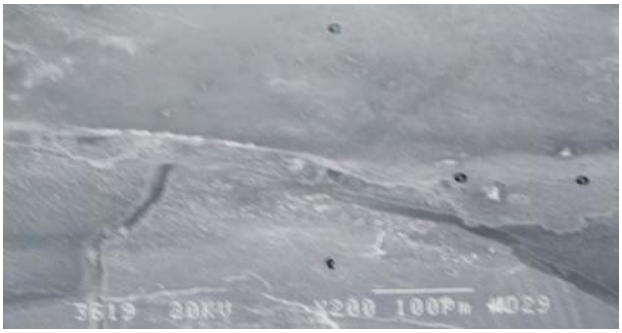

Fig: 8 SEM of gingival tooth interface showing overhang in group IV

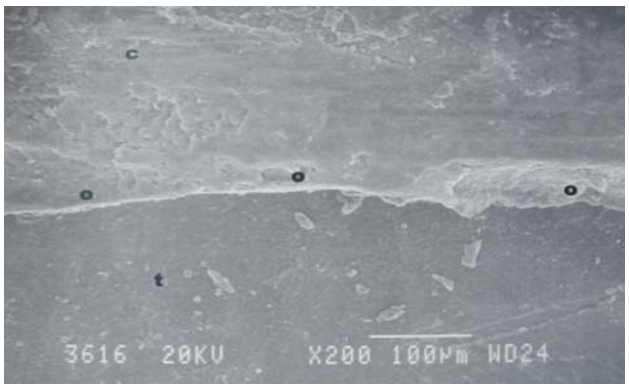

Fig: 9 SEM of gingival tooth interface showing overhang in group V

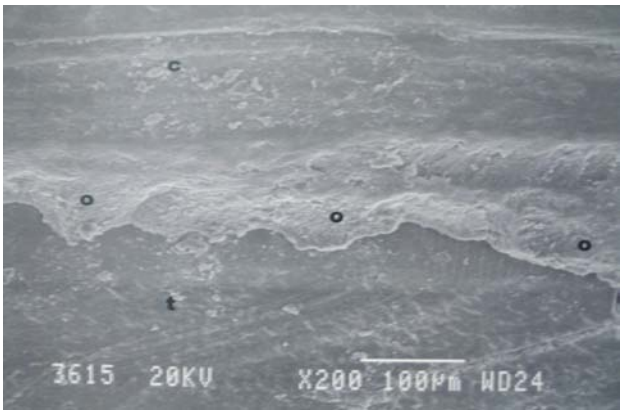

Fig: 10 SEM of gingival tooth interface showing overhang in group VI

Results

Percentage of overhang in various groups are as follows:

Table 2 : Percentage of overhang in various groups

Group	I	II	III	IV	V	VI
% gingival over-hang	31.8	38	29.2	66	76.5	59.4

Statistical analysis was done using ANOVA and MANN WHITNEY U TEST. Analysis revealed that percentage of gingival over hang among the groups in which transparent matrices and reflective wedges (groupIV, V and VI) were used was significantly greater than the groups in which metal matrices and wooden wedges were used (group I, II and III). Among groups I, group II and group III the difference in percentage of gingival overhang was not statistically significant. Among group IV, groupV and group VI the difference in percentage of gingival overhang was not statistically significant.

Among resin restorative materials, flowable composite liner showed the greatest overhang followed by microhybrid composite and compomer. No restorative margin was free of gingival overhang.

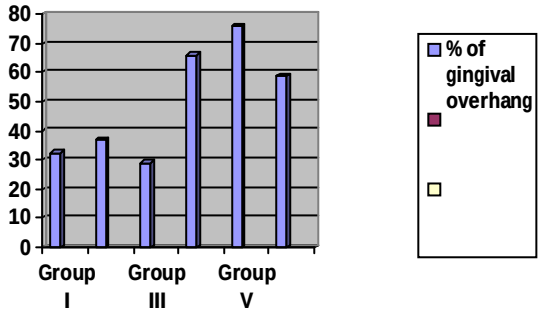

Fig: 11 Percentage of gingival overhang in various groups

Discussion

Ideally, dental restorations should be adapted to the remaining tooth tissue in such a way that the junction between filling material and tooth is not discernable[4]. Marginal defects such as overhang and deficiencies along any section of a restoration provide retention site for plaque accumulation and this may lead to secondary caries[5]. Such deficiencies or excesses are more likely to occur at interproximal cervical margin were there is often limited access and visibility.

Overhanging dental restorations has been consistently found to promote periodontal disease, evaluated by degree of gingivitis, pocket depth, clinical and radiological attachment levels[6]. Restoration in themselves and especially those with marginal overhangs have been shown to retain more plaque compared to intact tooth surface, a fact which has been presented as an explanation for detrimental effects of restoration on periodontal status.

Overhanging margins on to the tooth surface and marginal excesses are relatively easy to identify in amalgam, but this is more difficult with posterior composite restorations. More over amalgam overhangs may be removed during carving, without damaging the tooth structure when the material is still plastic. By contrast, composite are very hard immediately following polymerization and removal of the interproximal flash excess must be carried out with rotary instruments which have potential to damage the tooth tissue[7]. Thus overhang in composite restoration becomes more significant when related to health of the tissue.

Wide variety of matrices and wedges are available to be used in posterior restorations. Earlier opaque matrices and wedges were used but recently transparent matrices and light reflecting wedges are more preferred for posterior composite restoration. Advantage of these matrices and wedges are that gingival curing is possible as they are translucent. When proximal composite increment is cured from gingival direction, the polymerization shrinkage vectors will run more precisely at a right angle towards the gingival floor of proximal box as laterally reflecting wedge will reflect the light interproximally. Thus it improves the marginal adaptation of the restoration.

Numerous type of transparent matrix system is now available. Examples are Hawe adapt sectional matrix system, Hawe supermat, Hawe supercap and Hawe lucifix matrix system. Hawe lucifix system was selected for this study as is has integrated fixing device, traditional matrix holder which is normally too heavy for transparent matrix band is no longer needed, and it can be adjusted to individual tooth requirement by gingival or occlusal clipping.

However, few disadvantages have been noticed using transparent matrices. With respect to adaptability, metal matrices are superior in that they can be better precontoured and firmly applied to tooth surface[8]. Further transparent matrices are used with reflective wedges these are very stiff and lack the ability of wooden wedges to adapt themselves to the natural anatomic tooth contour.

The present study result revealed that overhang was less in group I, group II and group III (metal matrices and wooden wedges) compared to group IV, group V, group VI (transparent matrices and reflective wedges) and the difference was statistically significant. The result suggest that transparent matrices are difficult to adapt compared to metal matrices which can be better precontoured and firmly applied to the teeth. Reflective wedges which are used with transparent matrices are very stiff and lack the ability of wooden wedge to adapt them to natural anatomic tooth contour. As a result, reflective wedges make contact to the matrix place on tooth at only one point. This may permit the development of large gaps between matrix and the tooth at the critical cervical cavity margin and can generate substantial overhang formation during filling procedures.

Results showed overhang formation had particular relation in each of metal and transparent matrices group. Overhang formation in Group II> group I>group III and group V>group IV>group VI but the difference was not statistically significant. Thus overhang formation was greater in flowable composite liner group compared to microhybrid composite group which was greater to compomer group. All these materials differ in viscosity, lower the viscosity, more will be its

ability to penetrate the gap between matrix band and tooth[9]. Definitive relationship can be cited between the viscosity of resin and the overhang.

Conclusion

On basis of the procedure performed and results obtained it can be concluded that transparent matrices and reflective wedges results in greater overhang compared to metal matrices and wooden wedges. This result should be taken into account when selecting these matrices and wedges for proximal resin restorations.

Among resin restorative materials, flowable composite liner showed the greatest overhang followed by microhybrid composite and compomer. No restorative margin was free of gingival overhang.

Refernces

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