

## CLINICAL PERFORMANCE OF CLASS II COMPOSITE RESINS DIRECT RESTORATIONS RELATED TO RESTORATIVE TECHNIQUE: 12 MONTHS LONGITUDINAL STUDY

Vasile-Denis Mereuță<sup>1</sup>, Sorin Andrian<sup>2</sup>, Gianina Iovan<sup>3</sup>, Claudiu Topoliceanu<sup>4</sup>, Mihaela Sălceanu<sup>5</sup>, Tudor Hamburda<sup>5</sup>, Ștefan Lăcătușu<sup>2</sup>

<sup>1</sup>PhD Student, Discipline of Cariology and Restorative Dentistry, Faculty of Dental Medicine University of Medicine and Pharmacy "Gr. T. Popa" - Iasi, Romania

<sup>2</sup>Prof., Discipline of Cariology and Restorative Dentistry, Faculty of Dental Medicine, University of Medicine and Pharmacy "Gr. T. Popa" - Iasi, Romania

<sup>3</sup>Assoc. Prof., Discipline of Cariology and Restorative Dentistry, University of Medicine and Pharmacy "Gr. T. Popa" - Iasi, Romania

<sup>4</sup>Assist., Discipline of Cariology and Restorative Dentistry, Faculty of Dental Medicine, University of Medicine and Pharmacy "Gr. T. Popa" - Iasi, Romania

<sup>5</sup>Assist., Discipline of Endodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy "Gr. T. Popa" - Iasi, Romania

### ABSTRACT

The aim of the study was to assess the clinical performance of class II composite resins restorations performed using different restorative techniques. **Materials and methods** The study group included 37 patients aged between 18-42 years. A number of 60 class II direct restorations were performed by a single practitioner using adhesive preparation design with margin bevelling and hybrid composite resin Herculite XRV (Kerr) as restorative material. The teeth included in the study were divided in three groups (n=20) accordingly to restorative technique: I. centripetal build-up; II. oblique layering technique; III. horizontal layering technique. The class II composite resins restorations were assessed after 12 months using United States Public Health Services (USPHS) criteria. **Results and discussions** The centripetal build-up technique presented the score A for marginal adaptation in 60%, for marginal discoloration in 70% and for anatomical form in 80% of the restorations. The horizontal layering technique presents the score A for marginal adaptation in 40%, for marginal discoloration in 50% and for anatomical form in 50% of the restorations. The oblique layering technique presented the score A for marginal adaptation in 80%, for marginal discoloration in 90% and for anatomical form in 60% of the restorations. **Conclusions** Statistical differences between groups were found regarding marginal adaptation (oblique layering technique versus horizontal layering technique), marginal discoloration (oblique layering technique versus horizontal layering technique) and anatomical form (centripetal build-up technique versus horizontal layering technique).

**Key words:** composite resin, class II direct restorations, centripetal build-up technique, horizontal layering technique, oblique layering technique

### INTRODUCTION

Academic European of Operative Dentistry considers that acceptance of composite resins restorations among dental professionals, particularly for restoring

posterior teeth, is due to factors as improvement in resin-based composite technology, amalgam rejection, desire of patients for aesthetic restorations and conservative preparation of cavities. The

restorative technique is regarded as a major factor of influence for clinical performance of class II composite resins fillings.

#### **Aim of study**

The study aimed to assess the clinical performance of class II composite resins restorations in posterior teeth related to different techniques used for restoration.

### **MATERIALS AND METHOD**

The study group included 37 patients (age 18-42). The selection criteria were as follows: low cariogenic risk, good hygiene, medium occlusal forces, the presence of one or more proximal carious lesions in molar mandibular teeth and treatment indication for conventional class II cavities. The exclusion criteria were as follows: high cariogenic risk, poor hygiene, high occlusal forces, and bruxism. Written patient consent was obtained at the beginning of the treatment.

60 class II direct restorations were performed by a single practitioner using adhesive preparation design with bevelled margins, restored with a hybrid composite resin (Herculite XRV - Kerr). The teeth included in study were divided in three groups (n=20) accordingly to restorative technique:

- I. Centripetal build-up
- II. Oblique layering technique
- III. Horizontal layering technique

The operating field was isolated using cotton rolls, retraction cord and saliva ejector was used. The cavity preparation was done using tungsten carbide burs. All enamel and cavosurface margins were acid etched and coated with bonding agent according to manufacturer's recommendations. Prior to restoring class II preparation a sectional matrix band (Kerr Hawe) was applied, contoured and firmly wedged to closely adapt the matrix to the gingival margin of preparation and to achieve a degree of tooth separation in order to compensate the matrix width. For each restorative technique, the

increments of composite resin were no more than 2mm. Light curing was done for 40 seconds with (OPM-LED.G., Ritter, 575mW/cm<sup>2</sup>). The orientation of light beam was different accordingly to the specific features of each restorative technique. The contouring and polishing of restorations were accomplished using fine diamond burs, aluminium oxide discs (Sof-Lex Pop-on Discs, 3M Dental), and abrasive strips.

The clinical parameters of class II composite resins restorations were assessed at an interval of 12 months using United States Public Health Services (USPHS) criteria by two trained clinicians. In case of disagreement the final decision was made after reevaluation. The recorded data were processed using statistical test Kruskal-Wallis.

### **RESULTS AND DISCUSSIONS**

The graphs presented in the next figures presents the scores for Ryge criteria at an interval of 12 months for direct restorations performed using centripetal build-up technique, horizontal layering technique and oblique layering technique (Fig. 1-5).

The centripetal build-up technique presented the score A for colour match in 80% of the restorations, for marginal adaptation in 60%, for marginal discoloration in 70%, for anatomical form (proximal) in 80% and for surface texture in 60% of the restorations. The horizontal layering technique presented the score A for colour match in 70%, for marginal adaptation in 40%, for marginal discoloration in 50%, for anatomical form (proximal) in 50% and for surface texture in 70% of the restorations. The oblique layering technique presented the score A for colour match in 70%, for marginal adaptation in 80%, for marginal discoloration in 90%, for anatomical form (proximal) in 60% and for surface texture in 70% of the restorations. 10% of the restorations using centripetal build-up

technique and 20% of the restorations using horizontal layering technique were associated with score C for marginal adaptation and marginal discoloration. The restorations performed using horizontal layering technique presented poor results regarding anatomical contour of proximal surface and contact point (20% scored C).

Statistical analysis was performed using Kruskal-Wallis test to compare restorative techniques regarding the criteria of marginal adaptation, marginal discoloration and anatomical form (Tables 1.a-b., 2).

Statistical differences between groups were found regarding marginal adaptation (oblique layering technique versus horizontal layering technique;  $p=0.028$ ), marginal

discoloration (oblique layering technique versus horizontal layering technique;  $p=0.005$ ) and anatomical form (centripetal build-up technique versus horizontal layering technique;  $p=0.029$ ).

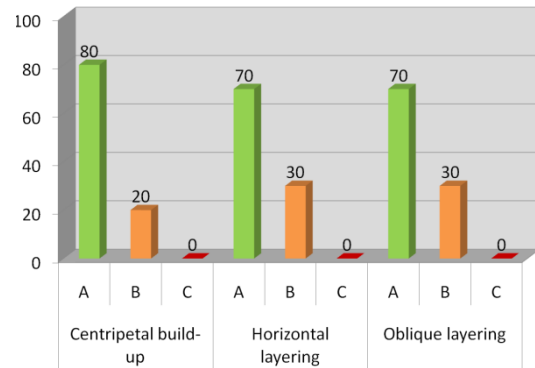


Fig. 1. Colour match

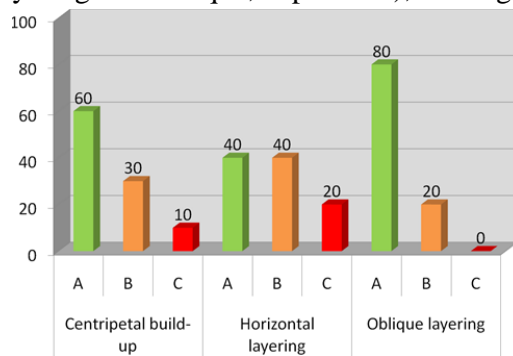


Fig. 2. Marginal adaptation

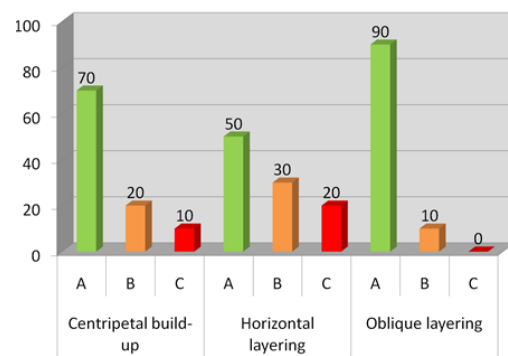


Fig. 3. Marginal discoloration

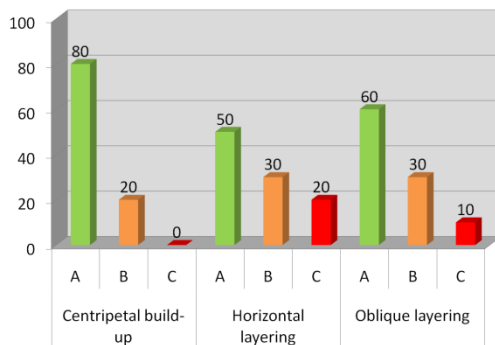


Fig. 4. Anatomical form (proximal)

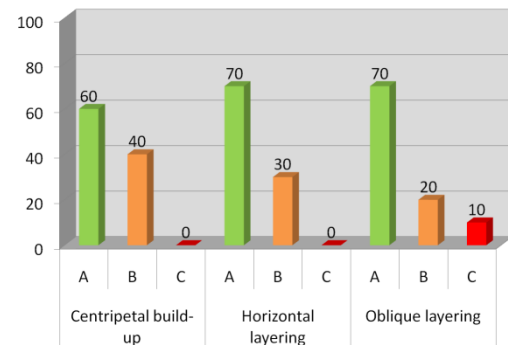


Fig. 5. Surface texture

Ranks			
	Restorative techniques	N	Mean Rank
Marginal_adaptation	Centripetal build-up	20	29.60
	Oblique layering	20	25.60
	Horizontal layering	20	36.30
	Total	60	
Marginal_discoloration	Centripetal build-up	20	30.50
	Oblique layering	20	24.20
	Horizontal layering	20	36.80
	Total	60	
Anatomical_form	Centripetal build-up	20	24.90
	Oblique layering	20	31.40
	Horizontal layering	20	35.20
	Total	60	

Test Statistics <sup>a,b</sup>			
	Marginal_adaptation	Marginal_discoloration	Anatomical_form
Chi-Square	4.913	8.031	4.900
df	2	2	2
Asy mp. Sig.	.086	.018	.086

a. Kruskal Wallis Test

b. Grouping Variable: Restorative\_techniques

**Table 1.a-b. Kruskal-Wallis Test (marginal adaptation, marginal discoloration, anatomical form)**

Marginal adaptation	Centripetal build-up/Oblique layering	p=0,4	ns
	Centripetal build-up/Horizontal layering	p=0,191	ns
	Oblique layering /Horizontal layering	p=0,028	s
Marginal discoloration	Centripetal build-up/Oblique layering	p=0,103	ns
	Centripetal build-up/Horizontal layering	p=0,195	ns
	Oblique layering /Horizontal layering	p=0,005	s
Anatomical form	Centripetal build-up/Oblique layering	p=0,137	ns
	Centripetal build-up/Horizontal layering	p=0,029	s
	Oblique layering /Horizontal layering	p=0,433	ns

**Table 2. Statistical comparison between restorative techniques (marginal adaptation, marginal discoloration, anatomical form)**

## DISCUSSIONS

The complexity of some oral variables like occlusal stress, pH and temperature changes makes simulation of oral conditions difficult [1]. The conditions simulated in vitro studies vary considerably from those in vivo. Therefore, only clinical studies may be determinant in assessing specific restorative techniques [2].

Several studies have been focused on the influence of restorative technique on marginal adaptation and marginal discolorations in cervical area and accuracy of proximal contact point reconstruction. The loss of integrity at the level of interface between restoration and dental tissues is considered the major reason for direct restorations replacement (marginal fracture, secondary dental caries, pulp inflammation). The poor reconstruction of proximal contact point results in initiation of periodontal inflammation. The oblique layering technique prevents the microleakage of the cervical interface because this technique uses a special way for light-curing of the first two oblique layers (buccal-cervical, lingual-cervical) placed in the initial stage. The horizontal

layering technique is considered a technique easy-to-use however it has a major disadvantage related to the poor cervical marginal sealing because of the shrinkage location determined by the specific light-curing of the horizontal layers from occlusal direction. The centripetal build-up technique allows perfect reconstruction of proximal contact point and good results regarding marginal sealing of cervical areas. The results of in vitro and in vivo studies suggest that it would be better to use either centripetal build-up or oblique layering technique in class II composite resin restorations [3-10].

## CONCLUSION

Our study support the results of previous studies regarding clinical performances of class II composite restorations performed with different restorative techniques. Statistical differences between groups were found regarding marginal adaptation (oblique layering versus horizontal layering), marginal discoloration (oblique layering versus horizontal layering) and anatomical form (centripetal build-up versus horizontal layering).

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