One-Year Clinical Comparison of Two Posterior Composite Resins

Fatemeh Maleknejad, Marjaneh Ghavamnasiri, Reza Goharian

Introduction: The aim of this study was to compare a one-year clinical performance of two composites (Ariston PHC with Tetric) in class II cavity preparations.

Materials & Methods: Ninety-six class I and II modified cavity preparations in identical patients were prepared. Metallic matrix was used for restoration of class II preparations. Ariston PHC and Tetric were used for restorations. The clinical criteria consisted of post-operative sensitivity, marginal discoloration, recurrent caries and marginal adaptation that were evaluated after one year.

Results: The Fisher’s exact test, t-test and Chi-square Pearson were used for analysis of data (P ≤ 0.05). There was no significant difference between the two composites regarding post-operative sensitivity and marginal adaptation. Marginal discoloration by Ariston PHC was significantly less than Tetric. Most of this marginal discoloration was observed in proximal margins of class II restorations. There were only two recurrent caries (5.1%) in cervical margins of Tetric restorations. The maxilla and mandible did not have a significant effect on clinical criteria.

Conclusion: There was no significant difference in post-operative sensitivity between the two composites. Marginal discoloration using Ariston PHC was significantly less than that of Tetric. No significant failure was observed when using any of the composites.

Key words: Restoration, posterior composite, clinical comparison.

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The aim of this study was comparison of some of the clinical criteria of Ariston PHC (Vivadent, Schaan, Liechtenstein) and Tetric (Vivadent, Schaan, Liechtenstein) in a one-year period.

Materials & Methods

Forty patients with a mean age of 29 were selected. Ninety-six modified class I and II cavity preparations were performed. Half of cavity preparations were restored with Ariston PHC and the other half with Tetric.

Patients without any wear, extensive caries, parafunctional habits, and pre-operative sensitivity were selected. At least two restorations (Tetric and Ariston PHC) were done for each patient. Cavity preparation measured 0.5-0.75 mm in depth into the dentin and 1 mm in buccal lingual width. The cavosurface margin was not beveled and a conventional liner or base materials were not applied. After completion of cavity preparation and rinsing with water, the isolation was performed with a cotton roll and high volume evacuation. Before etching or application of each dentin adhesive, metallic matrix and an anatomic wooden wedge were applied.

After etching the cavity with 37% phosphoric acid and before using Tetric composite resin, Syntac dentin bonding agent (Vivadent, Schaan, Liechtenstein) was applied according to the manufacturer's instructions. For restoration with Ariston PHC composite resin, cavities were not etched, and Ariston liner (Vivadent, Schaan, Liechtenstein) was applied as a dentin adhesive. After 20 seconds, it was thinned with air and then light-cured for 20 seconds. The layering technique was used for restoration of cavities. After curing of composite resins, occlusal adjustment, finishing and polishing were performed. Clinical criteria have been illustrated in Table 1.

Results

After one year, 78 cases were evaluated which contained equal amounts of Tetric and Ariston.

Within these, 18 cases could not be contacted for follow up examinations and 14 others no longer wished to cooperate. RCT were done for four remaining teeth that had equal amounts of Ariston and Tetric.

The t-test showed that there was no significant difference between the two composite resins with respect to post-operative sensitivity (P = 0.75>0.05).

The Chi-square Pearson correlation co-efficient for marginal discoloration showed that there was a significant difference between these two composites (P=0.015<0.05). This means that marginal discoloration was significantly higher in Tetric restorations (Fig 1, Table 2).

Table 1. Direct clinical evaluation criteria

<table>
<thead>
<tr>
<th>Rating</th>
<th>Aspect</th>
<th>Post operative sensitivity (Spontaneous - thermal - percussion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha (A)</td>
<td>There is no evidence of sensitivity</td>
<td></td>
</tr>
<tr>
<td>Bravo (B)</td>
<td>There is evidence of a mild sensitivity</td>
<td></td>
</tr>
<tr>
<td>Charlie (C)</td>
<td>There is evidence of a severe sensitivity</td>
<td></td>
</tr>
<tr>
<td>Cavosurface Marginal Discoloration</td>
<td>There is no discoloration anywhere on the margin between the restorations and the tooth structure</td>
<td></td>
</tr>
<tr>
<td>Bravo (B)</td>
<td>There is discoloration anywhere on the margin between the restoration and the tooth structure but the discoloration has not penetrated along the margin of the restorative material</td>
<td></td>
</tr>
<tr>
<td>Charlie (C)</td>
<td>The discoloration has penetrated along the margin of the restorative material in a pulpal direction</td>
<td></td>
</tr>
<tr>
<td>Marginal Adaptation</td>
<td>There is no visible evidence of a crevice along the margin into which explorer penetrates.</td>
<td></td>
</tr>
<tr>
<td>Bravo (B)</td>
<td>There is visible evidence of a crevice along the margin into which the explorer penetrates, but the dentin or base is not exposed</td>
<td></td>
</tr>
<tr>
<td>Charlie (C)</td>
<td>There is visible evidence of a crevice along the margin into which the dentin or base is exposed.</td>
<td></td>
</tr>
</tbody>
</table>

Fig 1. The Rate of Marginal Discoloration in Restorations
The Fisher’s exact test showed that there was no significant difference in marginal adaptation between the two materials (P=0.5). Only two Tetric restorations in cervical margins of class II cavity preparations showed recurrent caries (5.1%). However, recurrent caries were not observed in the Ariston group (P>0.05). The t-test showed that there was no significant difference between the maxilla and mandible with respect to post-operative sensitivity, marginal discoloration, marginal adaptation and recurrent caries (P>0.05).

### Discussion

This study using two new composites, evaluated some clinical criteria which had been defined by previous studies. 23,29,31 Modified cavity preparations have been described for posterior composite restorations, 27 because more conservative outline forms lead to less exposure of resin restoration to functional stress as well as better marginal adaptation. 1

Isolation could be performed by different methods. Collins, 23 in an eight-year clinical study on posterior composites, used rubber dam for isolation of teeth. Geurtsen and Scholer, 44 in their four-year clinical study claimed that marginal bevel had no effect on marginal adaptation. 44,45 Vap 28 claimed that the layering technique for restoration of Ariston is better than the bulk technique because of a suitable depth of cure.

Polymerization shrinkage of composites and microleakage can cause an immediate inflammatory reaction in pulp. 18,19,36 Ariston liner is a one-step monomer adhesive, but Syntac is a two-step self-etching adhesive. 1 In two recent studies, dentin adhesives were classified according to their clinical application mode and the resultant mechanism of adhesion to tooth substrate. 1,36 According to this classification Ariston is a one-step monomer adhesive and Syntac is a two-step self-etching adhesive. In our study, only before Syntac application, etching with 37% phosphoric acid was done. The post-operative sensitivity in Tetric restorations was higher than Ariston which was not statistically significant and could have been due to demineralization of dentin and the opening of orifice of tubules, which could increase post-operative sensitivity. 1

A new research has shown that if cavities could be sealed well, toxicity by etching agents and hydrophilic monomer of dentin adhesives would not have any effects on pulp dentin complex and the most important factor for inflammation of pulp is microleakage. 38 Other studies in contrary with this study have shown that post-operative sensitivity is higher in maxillary restorations than mandibular ones, because the dentin of maxillary teeth has more tubules and must bear chewing forces. In other words, mandibular teeth have more sclerotic dentins and the body of the mandible absorbs a part of this load. 39,40 In this study, after one year only one failure (2.6%) with respect to loss of marginal adaptation was observed. Marginal adaptation in composite restorations was related to some factors such as type of dentin adhesive, restoration technique and accuracy in finishing restoration. 15 Two previous studies have suggested beveling of margin for increasing the marginal adaptation. 41,42 But Dietrich et al. 34 and Voss et al. 33 claimed that marginal bevel had no effect on marginal adaptation.

Geurtsen and Scholer 44 in their four-year clinical study claimed that the most important problem in posterior composite restorations is marginal discoloration. Classification of discoloration is based on penetration of dye into the pulp. 33,35,45 In our study, statistical analysis showed that marginal discoloration in Tetric restorations was significantly higher than Ariston (38.5% against 10.3%), but this discoloration was superficial; and generally in both groups it was seen in proximal margins of class II composite restorations. Marginal discoloration in this area probably was due to pooling of adhesive between the matrix and walls of proximal boxes, especially in Tetric restorations because of its dentin bonding agent was a self etching adhesive. 36 Cehrelı and Altay 34 concluded that after 3 years, marginal discoloration significantly increased but it was still superficial and could be removed by polishing, similar to that of our study. The least marginal discoloration has been observed in hybrid composites. 23 In a five-year clinical study by Kohler

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**Table 2. Results of one-year clinical evaluation of restorations (observations are in %):**

<table>
<thead>
<tr>
<th>Oscar, A: Alpha, B: Bravo, C: Charlie</th>
<th>Spontaneous Thermal Percussion</th>
<th>Marginal Discoloration</th>
<th>Marginal Adaptation</th>
<th>Caries</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C A B C A B C A B C A B C A B C</td>
<td>A B C A B C A B C A B C A B C</td>
<td>A B C A B C A B C A B C</td>
<td>A B C A B C A B C</td>
<td></td>
</tr>
<tr>
<td>Tetric</td>
<td>89.7</td>
<td>10.3</td>
<td>0</td>
<td>74.4</td>
</tr>
<tr>
<td>Ariston PHC</td>
<td>92.3</td>
<td>7.7</td>
<td>0</td>
<td>74.4</td>
</tr>
</tbody>
</table>

S= significant (P<0.05)
NS= not significant
et al\textsuperscript{26} 12.5% failure of restoration had been due to marginal discoloration.

In this study, similar to one recent study recurrent caries was evaluated by probing in occlusal margins and radiography in cervical margins.\textsuperscript{22} After one year, two cases (5.1%) of recurrent caries were discovered in the cervical margin of Tetric restorations. However, it seems that a one-year evaluation is not enough for Ariston PHC with respect to its gap management property. Collins et al\textsuperscript{23} claimed that the most important factors for failure of posterior composite restorations are recurrent caries and bulk fracture. Kohler et al\textsuperscript{26} observed 12% recurrent caries in class II restorations after five years, while in our study 5.1% recurrent caries were observed after one year. It is thought that a long term clinical research is required to prove the actual survival rate of new posterior composites.

**Conclusion**

After one year in this clinical study it was observed that:

1. There was no significant difference in postoperative sensitivity between the two composites.
2. Marginal discoloration using Ariston PHC was significantly less than that of Tetric.
3. Most of marginal discolorations were superficial.
4. There were only two cases of recurrent caries in cervical margins of Tetric restorations.
5. Type of arch did not have an effect on survival rate of clinical criteria.
6. No significant failure was observed when using any of the composites.

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**References**