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Comparative evaluation of single-shade and multi-shade universal composites in anterior restorations

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Abstract:
Accurate shade matching in anterior resin-composite restorations remains challenging, particularly when selecting a single-shade rather than a multi-shade system. Therefore, it is of interest to assess the visual color matching of single-shade and multi-shade composites in Class III and IV restorations. Of 101 patients screened, 90 were enrolled across Neo Spectra ST, Omnichroma and Tetric EvoCeram (n = 30 each). Blinded observers scored the visual match from 0 (excellent) to 4 (major mismatch). Neo Spectra ST produced 15/30 scores of 0–1, while neither comparator produced scores in these categories. These results favored Neo Spectra ST for the reported immediate assessment; long-term color stability was not measured.

Keywords: Anterior restoration, color matching, resin composite, omnichroma, Neo Spectra ST, tetric evoceram

Background:
Resin composites are widely elected as dental restorative materials for being aesthetic, conservative, low cost and for gathering good mechanical properties, which makes them suitable for multiple clinical situations **[1].** The color variability of teeth led manufacturers to fabricate composite systems that include several shades, commonly using the Vita Classical shade guide as reference **[2].** Furthermore, resin composites are available in different opacities, including enamel or translucent shades, which aim to mimic the optical properties of dentin and enamel, being indicated for different areas of the tooth **[3].** The layering technique for resin composite restorations has been proposed since 1980 **[3–5].** In order to simulate the optical properties of natural teeth, this technique involves the use of composites with different chromas and opacities for each layer. Although the layering technique has been proven to show adequate results for color matching, this procedure is much more complex than a regular two- or one-shade technique, requiring higher clinical skills and increased chairside clinical time **[6].** Composite materials and restorative techniques that allow the use of simplified clinical protocols are highly desirable among clinicians in order to reduce chair time and minimize technique sensitivity **[7–9].** Since color selection might be challenging and subject to environmental and operator-dependent variables **[10],** a tendency to simplify shade selection has led to the development of the so-called universal composites **[7].** According to the developers, the main advantage of these composites relies on enhanced color adjustment potential (CAP), defined as a "property that describes and quantifies the interaction between the physical and perceptual components of blending" **[8].** These materials have a universal opacity and VITA shades available, being recommended by developers for use in a single-shade increment that could potentially match different tooth colors **[11].** Recently, a single-shade universal composite that could supposedly match all VITA Classical shades, from A1 to D4, was developed **[7, 12].** Therefore, it is of interest to compare the visual shade-matching performance of single-shade and multi-shade resin composites in anterior Class III and IV restorations.

Materials and Methods:
Study design and sample: This *in vivo* comparative study was conducted in the Department of Conservative Dentistry and Endodontics following ethical clearance. Of 101 patients assessed, 11 were excluded (six did not meet eligibility criteria, three declined participation and two for miscellaneous reasons), leaving 90 participants allocated to three groups (30 per group). The source states random allocation but does not specify sequence generation, concealment or study dates.

Eligibility:
Patients requiring anterior Class III or IV restorations with normal responses to pulp-vitality testing were considered. Teeth with signs or symptoms of pulpal infection or inflammation and cavities not suitable for direct restorations were excluded. Written informed consent was obtained.

Groups:
Group A—Neo Spectra ST Effects multi-shade composite (n = 30); Group B—Omnichroma single-share composite (n = 30); Group C—Tetric EvoCeram multi-shade composite (n = 30). Group labels follow the final source manuscript; source group names should be checked against the original allocation log.

Restorative procedure:
Teeth were cleaned, isolated with a rubber dam and, where needed, floss ligatures. Caries were removed using a diamond bur under water cooling; a bevel was placed where indicated. The source describes 34% phosphoric acid application for 20 seconds, bonding and light curing for 30 seconds. Manufacturer-specific bonding and curing details were not provided. Multi-shade restorations were layered with dentin and enamel shades, whereas Omnichroma was applied without an opacifying blocker.

Visual assessment:
Blinded observers scored the match between tooth and restoration in random order as 0 = excellent match; 1 = very good match; 2 = not so good match; 3 = obvious mismatch; and 4 = huge mismatch. The source does not state observer number, calibration statistics or follow-up interval.

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Statistical analysis:
The source specifies SPSS version 25, chi-square analysis of categorical scores and a Kruskal–Wallis test for ordinal scores. The reported p-value was 0.001; the raw dataset and test output were not supplied for verification.

Results:
Ninety patients were included in the analysis, with 30 patients in each group. Neo Spectra ST achieved excellent or very good color matching in 15 (50.0%) restorations. Corresponding scores were absent in the Omnichroma and Tetric EvoCeram groups. In the Omnichroma group, 16 (53.3%) restorations were scored as an obvious mismatch and three (10.0%) as a huge mismatch. Tetric EvoCeram received 19 (63.3%) scores of 2 and 11 (36.7%) scores of 3. The source reports a statistically significant between-group difference ($p = 0.001$), but this value has not been independently recalculated. The reported median scores (Neo Spectra ST 1.5; Omnichroma 3; Tetric EvoCeram 2) are consistent with the frequency distributions in Table 1. Statistical significance still requires verification against the source analysis.

The distributions of ordinal scores are shown in Table 1 and Figure 1, while group median scores are reported in **Table 2. Table 1 and Figure 1** is visual-score distribution showed that 15 of 30 Neo Spectra ST restorations were rated excellent or very good (three score-0 and 12 score-1), compared with zero in the other groups. Omnichroma yielded 16 obvious and three major mismatches (19/30 scoring 3–4). Tetric EvoCeram had 19 not-so-good and 11 obvious matches (all 30 scoring 2–3). These proportions reflect one clinical rating interval and should not be extrapolated to long-term behavior; the source's global $p = 0.001$ requires confirmation from its original analysis. **Table 2** reported median mismatch scores were 1.5 for Neo Spectra ST, 3 for Omnichroma and 2 for Tetric EvoCeram (lower indicates better visual matching). These medians follow the same ordering as the individual score distributions in **Table 1.** A Kruskal–Wallis test provides one overall p value for the three-way comparison, not a separate identical p value for each material; original test output should be used to verify the stated global value.

Table 1: Distribution of visual color-matching scores by composite group

Group (n = 30)	Score 0	Score 1	Score 2	Score 3	Score 4	Reported p
Neo Spectra ST	3 (10.0%)	12 (40.0%)	12 (40.0%)	3 (10.0%)	0	0.001*
Omnichroma	0	0	11 (36.7%)	16 (53.3%)	3 (10.0%)	0.001*
Tetric EvoCeram	0	0	19 (63.3%)	11 (36.7%)	0	0.001*

**p value reproduced from the final source; a single global comparison p value should be reported after statistical verification.*

Table 2: Median visual color-matching scores reported for the three composites

Group	Reported median score	Reported Kruskal–Wallis p
Neo Spectra ST	1.5	0.001*
Omnichroma	3	0.001*
Tetric EvoCeram	2	0.001*

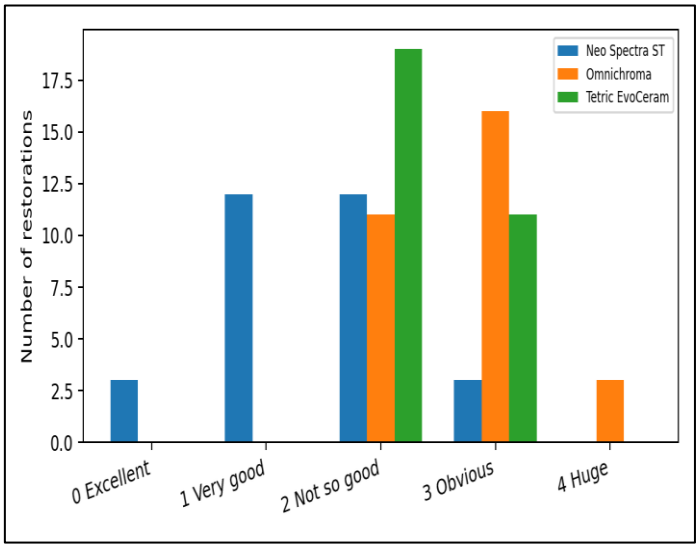


Figure 1: Visual-score distribution across composite groups

Discussion:
The evolution of aesthetic dental materials aims to simplify restorative procedures while enhancing visual outcomes. Unishade and multishade resin composites exemplify this objective, offering broad clinical applicability through advanced optical mechanisms **[13, 14]**. Omnichroma utilizes smart chromatic technology, relying on spherical fillers to generate structural color through light scattering, thereby eliminating the need for conventional pigments. This technology enables the material to adapt to all 16 shades of the VITA Classical shade guide **[13]**. Neo Spectra ST incorporates SphereTEC® filler technology, in which submicron glass fillers are spray-granulated into spherical, prepolymerized filler particles. These particles produce a ball-bearing effect that improves handling, adaptation, sculptability, polishability, mechanical strength and chameleon-like shade blending. In the present study, the multishade composite Neo Spectra ST showed acceptable aesthetic results, while Tetric EvoCeram and Omnichroma also exhibited favorable visual shade-matching outcomes. The differences among the materials were statistically significant, with the findings showing agreement with previously reported comparative studies **[15, 16]**. The color adaptation of unishade and multishade composites depends significantly on restoration thickness and the underlying tooth shade. Thicker composite layers may enhance shade blending in lighter teeth but may not effectively mask darker underlying structures **[14, 17]**. Omnichroma demonstrates better color adaptation in lighter

shades, particularly A1 and A2. However, in through-and-through defects or restorations involving darker backgrounds, an additional blocking material may be required to achieve satisfactory masking and aesthetic integration **[13]**. Surface gloss and smoothness are important determinants of the aesthetic quality and clinical performance of resin composite restorations. Both unishade and multishade composites demonstrate favorable polishability and wear resistance. Nevertheless, their surface characteristics and aesthetic appearance may deteriorate over time following repeated exposure to acidic or alcoholic beverages **[18]**. In the present study, the visual shade-matching performance of the tested restorative materials followed the order: Neo Spectra ST (multishade) > Tetric EvoCeram > Omnichroma (single-shade). This finding suggests that the multishade composite Neo Spectra ST demonstrated comparatively superior visual shade matching under the evaluated conditions. Although unishade composites simplify restorative workflows by reducing the need for multiple shade selections, they may require additional blockers or opaque layers in darker or deeper cavities to optimize aesthetic outcomes **[18]**. Therefore, appropriate case selection remains essential. Clinicians should consider the underlying tooth shade, cavity dimensions, restoration thickness and anatomical location before selecting a unishade or multishade restorative material. Further *in vivo* studies involving larger sample sizes and extended follow-up periods are necessary to establish the long-term clinical performance and color stability of these restorative materials. Continued advancements in filler technology and nanostructuring may further improve their optical properties, shade adaptability and clinical versatility **[14–17]**. Importantly, the findings of the present study are limited to visual shade matching at the time of evaluation and do not establish differences in restoration longevity, surface durability, patient satisfaction, or long-term clinical performance. Furthermore, because the assessment timing and intraobserver and interobserver reliability were not clearly described, the findings should be interpreted cautiously. Standardized color-assessment protocols, objective colorimetric measurements and examiner reliability testing would strengthen future investigations and improve the clinical applicability of the results. Additional comparative reports should be interpreted according to whether shade matching was assessed visually or instrumentally. Khayat, da Silva *et al.* and Ebaya *et al.* provide related evidence on single-shade restoration performance and optical behavior, and are cited here as references **[19–21].** Forabosco *et al.* synthesized clinical and laboratory comparisons; they observed more favorable instrumental shade matching for multi-shade materials, whereas clinical findings for single-shade systems were often acceptable **[22].** Bhat *et al.* evaluated in-vitro color matching and color stability **[23].** Sonaje *et al.* assessed material solubility rather than immediate shade matching **[24],** and Yang *et al.* identified effects of material translucency and background shade on measured optical properties **[25].** El-Rashidy *et al.* found that aging protocols affected the color and gloss of single- and multi-shade composites **[26].** Fulzele *et al.* reported 12-month outcomes for anterior Omnichroma restorations compared with a separate multi-shade system, emphasizing that clinical performance may differ by comparator and assessment time **[27].**

Conclusion:

Neo Spectra ST showed the most favorable immediate visual shade match in this sample. Tetric EvoCeram ranked second, followed by Omnichroma on the reported ordinal ratings. Longer follow-up with calibrated observers and instrumental color assessment is required.

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