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Evaluation of an anatomic dual-laminate composite resin shade guide

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ABSTRACT

Background: Color assessment in aesthetic dentistry is one of the most challenging steps for direct restorative treatment. Shade selection tools should be able to mimic closely the materials and layering technique used in the final restoration, hence the development of prefabricated anatomic dual-laminate shade guides.

Objective: This study aims to compare different shade selection techniques and determine the suitability of a prefabricated anatomic dual-laminate shade guide and its best mode of use compared to a conventional guide and a layered custom guide.

Materials and methods: CIELab coordinates of different shade guides were assessed: Vitapan Classical (tab A2; Vita); Miris2 prefabricated anatomic dual-laminate shade guide, enamel WR tab on top of dentine S3 tab and nothing in-between (M2air) or glycerin gel (M2gly) or water (M2w); custom shade guide using prefabricated silicon moulds, Miris2 enamel WR composite resin moulded directly on dentine S3 pre-polymerised base (M2cus). The average values were obtained to calculate ΔE and compare the different shade selection techniques. Additional samples and measurements were made to compare Vitapan Classical shade tabs A1, A2 and A3 and all possible combinations of Miris2 and establish the closest matching shade ($\Delta E \leq 3.3$).

Results: High ΔE values were found (6.51–9.11) when comparing M2air to Vita, M2gly M2w M2cus. Differences appeared acceptable (ΔE 2.09–2.99) between Vita, M2gly and M2w and M2cus. Seven combinations of M2 were found to match Vita tab A1 and A2 and three Miris2 combinations for Vita A3 ($\Delta E \leq 3.3$).

Conclusions: The use of Miris2 prefabricated anatomic dual-laminate shade guide with interposition of water or glycerin between the enamel–dentine tabs demonstrated acceptable ΔE values when compared to Vitapan Classical and custom guides. A chart for matching Vita shades with various combinations of Miris2 enamel/dentine shades was produced to assist the clinician in obtaining acceptable restorations.

Clinical significance: The prefabricated anatomic dual-laminate shade guide is as efficient as a custom shade guide, facilitating clinical steps and saving material when doing composite resin restorations.

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1. Introduction

Although composite resin restorations present a very mimetic behaviour and chameleon effect on the tooth structure, color assessment in aesthetic dentistry still one of the most challenging steps due of the need to match the shade of the composite resin with a variety of shades and effects of a natural tooth. It is generally agreed that imperceptible composite resin restorations can be effectively obtained using a natural incremental layering with various shades of enamel and dentine-like materials.[1–3] Therefore, it is expected that the shade selection process and the shade guide itself should follow these principles. Yet, 58% of dental educators complain about the mismatch between the shade guides and the composite resin.[4] This discrepancy was tentatively explained by the fact that the shade guide is not made with the same material and thickness as the restoration.[5,6] In addition, the color space of current dental shade guides is limited as they fail to represent the full spectrum of color found in natural teeth.[7–13] Another limitation of those shade guides could be the fact that some guides have tabs made with single monolithic (bulk) shades for both enamel and dentine, other have individual tabs for enamel and dentine or a single combination of enamel/dentine layers.

As a result, striving clinicians and dental technicians often use their own layered custom guides, fabricated with the material itself. Some manufacturers (Tokuyama, Japan) even provide prefabricated moulds to facilitate the fabrication of custom guides. However, the process may be time-consuming and uses material. Hence the development of a prefabricated anatomic dual-laminate shade guide (e.g. Miris2, Coltène Whaledent Inc., Cuyahoga Falls, Ohio, USA; Inspiro, Edelweiss DR, Zug, Switzerland) in which the selected enamel tab is ''nested'' over the dentine sample. This new approach enables the combination of different shades of enamel and dentine with immediate comparison with the tooth structure. It also allows obtaining direct visual comparison of tooth structure with the enamel sample, the dentine sample and the enamel/dentine combination in a single observation (Fig. 1a and b). The manufacturer recommends blending the enamel/dentine tabs with glycerin gel or water. It is not known, however, whether this technique is able to faithfully reproduce the actual optical behaviour of the corresponding layered restoration (enamel and dentine in direct contact).

The purpose of this study was first to compare, using the CIELab (*Commission Internationale de L'éclairage*) coordinates, the different shade selection techniques and determine the acceptability of the innovative prefabricated anatomic dual-laminate shade guide and its best mode of use compared to a conventional guide and a layered custom guide (enamel/dentine). Second, CIELab coordinates of Vitapan Classical shades A1, A2 and A3 (VITA Zahnfabrik GmbH, Bad Säckingen, Germany) were compared to all possible combinations of Miris2 enamel and dentine shades. The null-hypothesis was that no difference would be found between the various combinations of shade guides and that several combinations of enamel and dentine shades of Miris2 can be used to match a single Vitapan Classical shade.

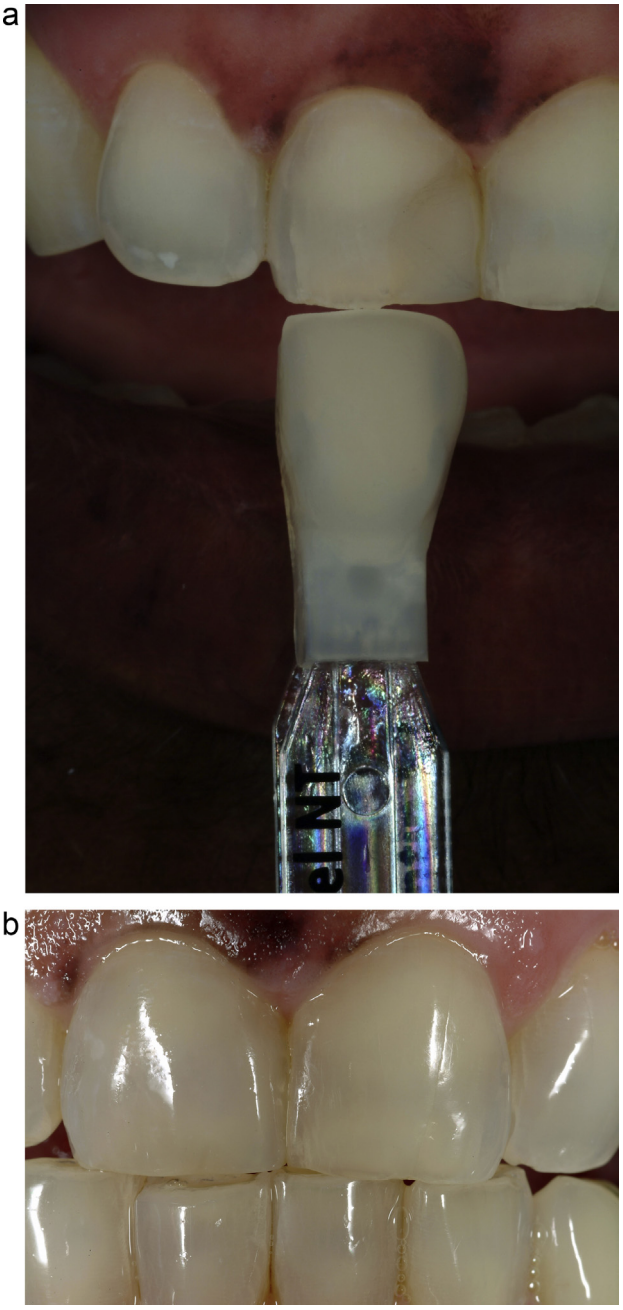

Fig. 1 – Shade selection using the Miris2 dual-laminate shade guide and cross-polarisation filter (Polar_eyes, Photomed, Van Nuys, CA, USA). Note the detailed information that can be used as a result of the dentine and enamel layers within the shade tab (a). Postoperative situation following replacement of mesio-incisal restoration with Miris2 on the right central incisor (b).

2. Materials and methods

2.1. *Specimen preparation*

The color assessment was performed with different shade guides: Vitapan Classical (tab A2; group Vita); Miris2 prefabricated anatomic dual-laminate shade guide, enamel WR tab on