

Shade selection and communication

This article offers practical tips for selecting accurate shades and communicating with dental laboratories for fabricating indirect restorations.

Background

While the colour of a fixed dental restoration may not impact its biological success, it frequently plays a crucial role in the patient's overall acceptance of the restoration. Achieving total colour reproduction between fixed dental restorations and natural teeth is an impossible task. Despite this, the goal is often to make a believable restoration for most lighting situations encountered. Precise shade selection of the target tooth being matched, together with clear communication of this assessment to the dental laboratory, are crucial for successful results.

Shade selection

Visual assessment of shade utilising commercially available shade guide systems is the most frequently used method in dentistry.¹

Tips:

1. Shade selection must be carried out before any operative procedure, tooth isolation or impression making. Such procedures cause dehydration and increase the opacity of the enamel, such that teeth may appear brighter.
2. Anything present on the patient that will greatly influence shade selection should be identified. Lipstick or other make-up should be removed. If the patient is wearing bright clothing, it should be draped with a neutral-coloured patient bib.



FIGURE 1: Light-correction device (Smile Lite; Smile Line GmbH, Germany) being used to create ideal lighting conditions and an appropriate colour temperature of 5,500°K (natural daylight) during shade assessment.

3. Shade selection should occur during daylight, in the middle portion of the day with northern exposure sunlight, and lastly, on a day that is slightly overcast.² To ensure practicality and avoid the interference of surrounding colours in the dental surgery, a dedicated light-correction device can be used for shade selection (Figure 1). These devices correct for varying light conditions such as time of day, season of the year, and different types of light sources present in the dental surgery.

4. The patient should be in an upright position at eye level when the shade is selected to ensure that the teeth are viewed under similar conditions to those in daily life. Additionally, at eye level, the most colour-sensitive part of the dentist's retina is utilised.

5. Shade guides were initially developed to meet the requirements for prosthetic denture teeth rather than encompassing the variety of natural tooth colours. Contemporary shade guides based on the colour space of natural teeth, such as the VITA Linearguide 3D Master, are best employed (Figure 2A). First, the value (the relative lightness or darkness of a colour) of the tooth being matched is determined by selecting one of six 'M' groups tabs (0M2 to 5M2) present on the dark grey holder (Figure 2B-2C). Lastly, the chroma (intensity or saturation of the dominant colour) and hue (dominant colour) are chosen by matching the tabs present on the light grey holder with the group corresponding to the initial value selection (Figure 2D-2E).

6. Shade tabs should be held and aligned with the target tooth so that light reflects off the shade tab in a similar manner (Figure 2F). It is important not to view the comparison for more than five to seven seconds at a time to avoid fatiguing the cones of the retina. Looking at a contrasting colour (such as a blue patient bib) between comparisons will relieve eye fatigue and sensitise the eye to the colour being observed.

7. Quickly reduce the number of potential shade tabs and select the best matches for incisal, body, and cervical regions.

8. The level of translucency/opacity of the target tooth is assessed and observed. This is critical in aiding the material selection process. A matt black contrastor can be placed behind the teeth. This can be helpful to visualise the translucencies and nuances of the enamel (Figure 3).



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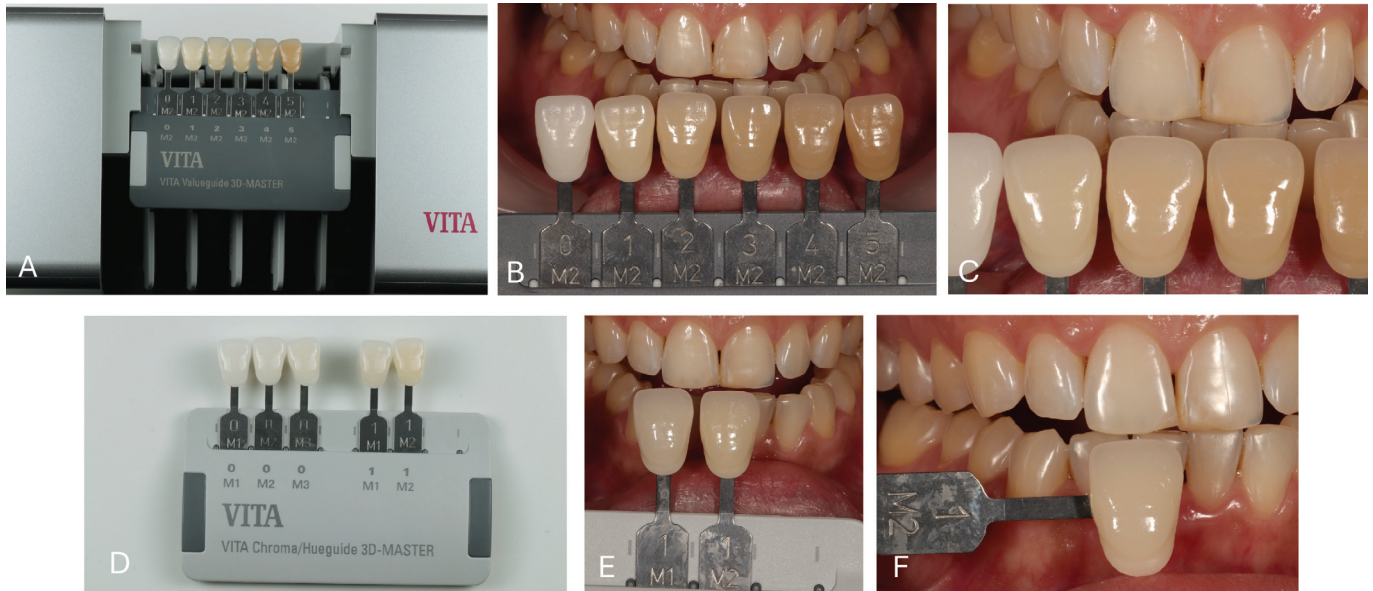


FIGURE 2: (A) VITA Linearguide 3D Master shade guide system (VITA Zahnfabrik GmbH, Germany); (B-C) Value group selection. (D-E) Chroma and hue selection. (F) Optimal positioning and alignment of the shade tab in relation to the target tooth for accurate matching.



FIGURE 3: (A) Black photographic contrastor (Flexipallet Smile Lite; Smile Line GmbH, Germany); (B) Positioning the contrastor behind the teeth enables the observation of translucencies, craze lines, and other subtle details in the enamel.

9. The presence of any further characterisation such as surface texture, gloss, craze lines, or staining should also be assessed.

10. Lastly, special consideration should be given if tooth preparation is required. The shade of the prepared tooth substrate will influence the final shade of the indirect restoration if an all-ceramic material is used. Commercially available dentine stump shade guides can be used to record the shade of the prepared tooth.

Shade communication

Following visual shade assessment, the following information must then be summarised and communicated to the dental laboratory:

- the shades selected;
- the translucency/opacity level observed;
- the presence of any specific characterisations on the target tooth; and,
- the substrate shade.

Communication of the above information is largely done by a combination of:

- a written description of the visual assessment that took place;

- an annotated line drawing prescription or annotated intra-oral photographs showing different shade distributions and demarcations; and,
- intra-oral photographs taken with shade tabs.

Tips:

1. Important considerations in the selection of a camera system include the ability to take repeatable macro images as well as the ability to reproduce accurate colour. Photographs captured with a digital single-lens reflex (DSLR) or mirrorless camera using a macro-lens easily satisfy this requirement. This is especially important in challenging anterior cases (Figure 4A, 4B).

2. The colour of light from a camera-mounted flash can vary due to different environmental factors. To control the colour-processing algorithms on cameras and achieve accurate colour representation, it is necessary to apply the correct white balance setting on the camera. This is critical for the area of photographic shade communication. The typical white balance setting for shade taking is generally considered to be 5,560K. Alternatively, a photograph can be taken with the presence of a calibrated grey card (Figure 4C). Photographic editing software may be used to adjust known references

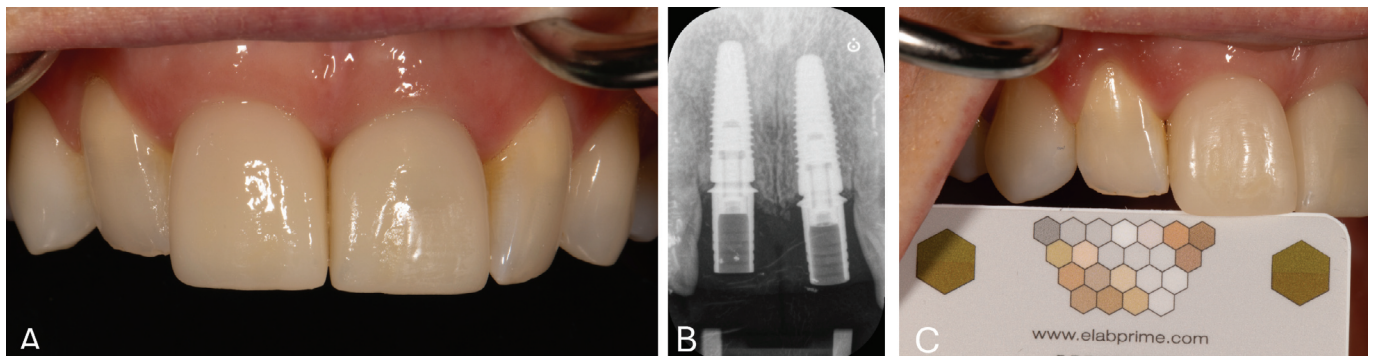


FIGURE 4: (A) Two maxillary central incisors lost to dental trauma with provisional implant restorations in situ ready for permanent restoration fabrication. (B) Periapical radiograph of provisional restorations and implants. (Surgical work courtesy of Dr Mark McLaughlin, periodontist.) (C) Photograph of target tooth to be matched (maxillary lateral incisor) with the presence of a calibrated grey card.

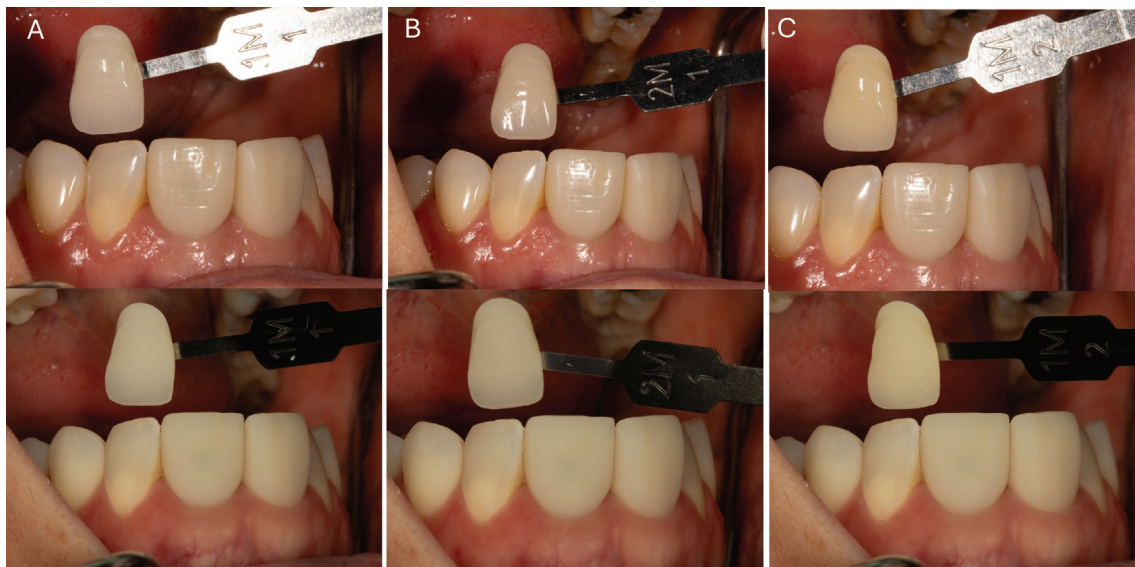


FIGURE 5: Reflected and polarised photographs of target tooth to be matched with shade tabs for each of the three distinct colour zones within a tooth – incisal (A), body (B) and cervical (C).



FIGURE 6: (A) Final screw-retained layered ceramic implant crowns on custom abutments. (B) Fitted restorations demonstrating believable shade matching. (C) Smile view highlighting well-integrated aesthetics. (D) Post-fit periapical radiograph. (Laboratory work courtesy of Mr Vlad Antanasoae (Oxford, UK)).

within the image for calibrating unknown image components, yielding an accurate image for on-screen viewing.

3. The polychromatic effects of teeth should be identified and photographed with shade tabs for each of the three distinct colour zones within a tooth – incisal, body and cervical. These photographs are then repeated with a cross-polarisation filter. This provides an easy method to record the appearance of teeth in the absence of specular surface reflections. This allows the dentist and technician to easily read the different zones of shade demarcations present on teeth (Figure 5), allowing the fabrication of well-integrated and aesthetically pleasing restorations (Figure 6).

References

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2. Chu SJ, Paravina RD, Sailer I, Mieszkowski AJ. *Color in Dentistry: A Clinical Guide to Predictable Esthetics*. Hanover Park (IL): Quintessence Publishing; 2017.