

Basics of shade selection and importance of laboratory communication restorative dentistry

Introduction

Patients pay a special attention to colour their teeth, and so should we, matching an artificial materials with a natural tooth structure can be challenging. Colour matching done in a systematic approach insures accuracy, consistency, predictable results, that are absolutely important in dental office.

Shade selection

Several systems has been developed to accurately aid recording colour and shade, but still have limitations regarding, fluorescence, opalescence, degree of enamel translucency and its thickness.¹

The classic vita shade

It's based on dividing the colour to three components:²

Hue: Is the colour name as red, yellow, blue

Chroma: Intensity of hue and degree of saturation

Value: Degree of lightness or darkness of an object

The vita classic shade guide consists total of sixteen tabs; four true colors (hue), differentiated by letters A, B, C and D

The manufacturing company of vita classic categorizes the hue as:

- 1) A (Reddish-brownish)
- 2) B (Reddish-yellowish)
- 3) C (Greyish shades)
- 4) D (Reddish grey)

Each hue has different chroma and value levels referred to as numbers 1,2,3,4 (1 high in value and low in chroma, 4 is low in value and high in chroma).¹ Each shade-tab has an opaque backing color, neck color, body color and incisal color.²

Using vita linear guide 3D-master

VITA also introduced the 3D master with a new approach to shade selecting the value of the restorations first using a separate shade guides for the value and having the same Chroma/Hue. After selecting the value the Chroma and Hue is then selected using Chroma/Hue guides and this way is claimed to be easier and can result in a more accurate shade selecting.

General principles of shade taking procedure

Shade selection at the start of the appointment: It is advised to select the shade of teeth at the start of the appointment,² before its dehydrated and after teeth being cleaned from extrinsic stains. Dentist and dental assistant eyes still fresh that can help in confirming the choices. It's wise for dentist and staff to have a color perception test to insure accuracy.³

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Light quality and source: The natural morning-noon time light is the most proper for shade selection, that's why it's advised o place the dental chair facing a window, but not direct sunlight. The use of color corrected fluorescent with color temperature of 6500K.⁴ The quantity or intensity of 1500LUX,⁵ equivalent to four 220W fluorescent tubes at distance of two meters.^{1,6} Confirmation of result with daylight-corrected light sources to avoid Meta merism.¹

The observer: View the patient at an eye level so the most sensitive part of retina is used.² Have a close family member or a friend to help during the process. In difficult color cases the ceramist is invited to help.

Clothing and surrounding colors: Cover patient clothes, dentist and assistant with light blue or gray colors and use natural color gloves, and patient to remove a bright lipstick. Operation room of light blue, gray, paint is advised.

Technique and procedure of shade selection

It's advised that whatever manufacturer product is being used the corresponding shade guide should also be used,⁷ on the other hand I find it easier to get used to one shade guide and mention that to the ceramist. Some dentist finds it helpful to use a custom made shade guide. Teeth as well as shade tabs better be moistened during selection process.

Hue: Hue is the true color of the dentine, so using only four tabs A4, B4, C4, D4 and best match at the middle of the tooth and the middle of tab. The canine being with the highest in chroma can aid in the selection. Repeat two to three times and to stare at a blue card in between to avoid chromatic adaptation (Figure 1).¹

Chroma: Select from the range of 1 to 4 in the same hue, it's advised to select chroma in or less than five second for each trail to help avoid cone fatigue.⁸

Value (an achromatic measure): The vita classic shade guide tabs are arranged from the lighter to darker on a gray scale: B1 A1 B2 D2 A2 C1 C2 D4 A3 D3 B3 A3 [5] B4 C3 A4 C4. The accuracy of value is very important. Incisal area of the tabs should be closest to the tooth selected, and parallel to long axis of tooth.⁷ Select value with squinted

eyes,⁸ decreased amount of light enters the eyes so the retinal rods are activated to differentiate degree of lightness or darkness.⁹ The value closest to the teeth to be matched can be from a different hue, the lighter one is preferred.



Figure 1 A4, B4, C4 and D4 set to be closest to tooth during selecting the hue.

Special characterizations:

- Translucent zones location recorded.
- Presence of mamelons.
- Fracture and stain lines.
- Hypo calcification areas and proximal discolorations.
- Surface texture and luster
- Surface texture such as developmental lobes, ridges and fine surface detail.⁹
- Luster can be as (high, medium, low)
- Contour, flatness or convexity.
- A darker shade used to register the prepared abutment when using all ceramic restoration.

Information Recording and Communication to the Dental Laboratory

General patient information

- Patient name and gender
- Age
- Race
- Lip length (medium, short, long) as this will effect smile line.

Shade distribution chart

A paper sketch of a tooth divided to three areas (incisal, middle, cervical)

- Hue of dentine as selected at middle 1/3 gingival and interproximal discoloration
- Color specific areas and distribution of shades (cervical, body, incisal)
- Chroma intensity.

- Value of enamel overlaying the dentin.
- Special characteristics drawn on the shade distribution chart:
- Translucency and its distribution (incisal, incisal and proximal or very thin translucent layer)
- White spots and stain areas.
- Fracture lines.
- Surface texture, degree of luster and glaze needed.

Digital photographs

- Preoperative Facial and Dentofacial photograph at rest and full smile.
- Dental photograph with selected hue and chroma tabs with different light sources. A black and white photograph can be taken for value accuracy when there is a need to match to existing restorations.
- After preparation of teeth a dental photograph of the prepared stumps helps the ceramist to mask unwanted dark shades and stains (Figure 2).



Figure 2 Tabs aligned on the same plane with teeth being matched.

Other methods for shade matching

The use of electronic scanning devices as:

- Spectrophotometers
- Colorimeters

Colorimeters deliver more information about hue, chroma and value than spectrophotometers and enable the ceramist to compare the image captured and the finished restoration.⁷

Type of restoration required

- Choice of material and substructure
- Finish line, porcelain, metal, shoulder or chamfer.
- Metal free restorations the shade of prepared abutment is indicated.
- Width to length ratio, proximal contact and margin design.
- Next stage, metal try-in or biscuit bake.

Impressions

- a. Preoperative study casts
- b. An accurate impression postoperatively
- c. Face bow record to transfer jaw relation

Conclusion

Shade selection is very important stage of prosthetic work and direct bonding restorations; it should be given special attention and appropriate time. A systematic approach for shade selection insures covering all aspects, can save time and effort. The difference between the natural teeth and the ceramics by layers, degree of translucency, opacity and the way colors are reflected, makes the process of shade selection and manufacturing of prosthetic restorations more skill demanding to achieve harmony and aesthetically attractive results. Communicating the information collected to the dental laboratory is essential for favorable results; we should save no effort to do so using the traditional methods and the new ones offered by technological advancements.

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Conflicts of interest

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