Research Article

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Shade Selection – Path Towards Smiling Face

Yesh Sharma*

Assistant Professor, Department of Conservative Dentistry and Endodontics, Pacific Dental College and Hospital Udaipur, India.

***Corresponding Author**
Yesh Sharma, Dental College and Hospital Udaipur, India.

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Abstract

The selection of an accurate tooth shade has always been a challenging task for dental practitioners in restoring the natural appearance of teeth. Various factors can influence shade selection, such as different lighting conditions, clearness and opaqueness of teeth, eye fatigue, aging and colour vision problems. It is imperative to have a sound knowledge about the concept of shades and its selection protocol for obtaining good esthetics outcomes. To attain the best esthetics, four elementary contributing factors are essential: exact position, shape, surface texture and shade. The current analysis focuses on several features of shade, sensitivity of shades, optical properties of the teeth, visual and innovative instrumental techniques for shade selection, protocols for shade selection and factors affecting dental shade selection.

Keywords: Chromascop, Vita Easyshade Compact, Clear Match System

1. Introduction

Currently, aesthetic dentistry rotates around three mainstays: application of composite resins and ceramics; adequate bonding with dental structures; and finally, restoration of aesthetically pleasing look . In cosmetic dentistry, clinical success for dentists is to choose the accurate shade of a tooth colour, then select and apply the most closely matched quality material, and finally, communicate precisely with the lab technicians to achieve good aesthetic results [1,2].

In the last few years, the conception of beauty and aesthetic restoration sensibility of teeth has increased and been extensively improved among both dental practitioners and patients. It is necessary for dentists to provide an aesthetic restoration of a tooth that perfectly matches with the natural teeth of a patient [3] . However, due to the availability of a wide range of natural tooth shades, it has now become a challenging task for dental practitioners to provide an accurate counterpart to adjacent teeth shade between natural teeth and prosthesis [4].

2. Principles of Shade Selection In Dentistry

a. Patients should be viewed at eye level to engage retina
b. The shade should be checked under different types of lighting after the initial shade is selected in natural daylight. The shade is then confirmed under fluorescent and incandescent lighting
c. Teeth should be cleaned before matching is done
d. At the beginning of the patient visit, shade comparison should be initiated
e. Any cosmetics such as lipstick should be removed, and bright-coloured clothing should be draped
f. The procedure of shade matching should be done quickly
g. After comparison, rest should be given to the eye by focusing on a gray–blue surface as this helps re- sensitize and balance the sensors in our eye [5].

3. Colour Triad

In shade determination, understanding the colour triad is crucial, which consists of the light source, the object, and the observer.

3.1. Light Source

The surface colour appearance of an object depends on the quality of colour illumination. Natural light is the ideal light source. Different light sources give different colours.
a. The object: Object has the capability to alter colour of the light. When the object absorbs radiating visible light, colour appears
b. The observer: When the visible light enters the eyes, it pass through transparent area of cornea and crystalline lens, and then the image is focused on the retina. The iris, which dilates or constricts depending on the level of illumination, regulates the quantity of light entering the eye [6,7].

4. Three-Step Shade-Matching Procedures

The sequence of lightness, chroma, and hue is followed first during the selection of shade. Then, the tab which is closest or an appropriate combination is chosen. If there is no perfect match, a lighter shade is selected, to which extrinsic correction is done [8].

1. Dentist position: The dentist's eye should be at the level of the patient's tooth that is the line of vision perpendicular to the surface. The viewing distance should enable a viewing angle of not <2°.
2. Tab placement: The tab to be positioned parallel to the tooth being matched. It should not be behind the teeth as it will appear darker nor in front as it will appear lighter .
3. Time length and pauses: Each shade-matching trial should be restricted to about 5 s with an interval by observing a blue card in between [9].

5. Shade Distribution Chart

A rough sketch of a tooth drawn onto paper is divided into incisal, middle, and cervical third. The value of enamel, the hue of dentine, and colour-specific areas are determined. White spots, stain areas, fracture lines, and distribution of translucency are drawn onto the chart. The degree of lustre, glaze, and surface texture is also noted down [10].

6. Squint Test for Restricting Light

The squint test enables shade selection by restricting the light entering the eye. It is performed by bringing the eyelids closer and then looking at the shade guide and the natural tooth. The colour that fades from view first is the one that is least conspicuous in comparison with the tooth colour [11]. There are two types of shade selection methods. The conventional method and the use of colour measuring instruments

6.1. Visual shade guides

The conventional method of shade selection is the use of visual shade guides which are the most famous and convenient way in selecting tooth shades. They are cost-effective and readily available; they also proficiently match the colour of the dentition with a standardized reference shade guide [12,13].

6.2. Vita Classical Shade Guide

Based on the hue, 16 tabs are arranged into four groups and within the groups corresponding to the chroma. Since there are some limitations with Vita classical shade guide, Vita 3D-Master shade guide is the most commonly used among the commercially available shade tabs. It provides superior and standardized colour differences figure 1.

Figure 1: Vita Classical Shade Guide

7. Vita Toothguide 3D-Master

It comprises 26 tabs separated into five groups depending on the lightness of the color. The numbers (1, 2, 3, 4, and 5) in front of the letters represent the group number and lightness level; a lower number indicates a higher lightness. The numbers (1, 1.5, 2, 2.5, and 3) below the group number represent the level of the chroma; the more chromatic tabs are indicated by larger numbers. Three bleaching shades (0M1, 0M2, and 0M3) indicate more lightness, three levels of chroma, and middle hue Figure 2.

Figure 2: Vita Tooth guide 3D-Master

8. Chromascop

Chromascop uses a numbering system to identify shades. It is organized into groups depending on the hue (100 = white, 200 = yellow, 300 = orange, 400 = gray, 500 = brown) and within the groups as chroma increases from 10 to 40 Figure 3.

Figure 3: Chromascop

9. Recent Advances In Shade Selection

9.1. Colorimeters: Filter colorimeters typically use 3/4 silicon photodiodes with spectral correction filters that closely simulate the standard observer functions. These filters act as analogue function generators that restrict the spectral characteristic of the light that hits the detector surface Figure 4.

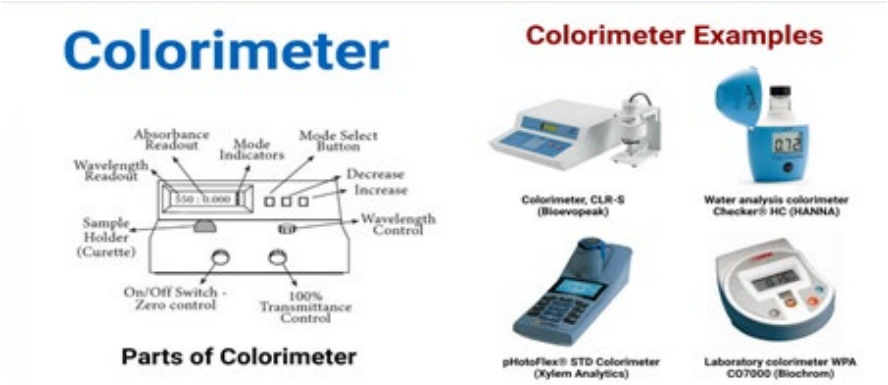

Figure 4: Colorimeters

a. Shofu's Shade Natural Color Concept (NCC) Chroma Meter: Shofu's Shade NCC Chroma Meter was introduced in the 1990s. It is fabricated by a handheld probe of 3 mm in diameter Figure 5.

Figure 5: Shofu's Shade Natural Colour Concept (NCC) Chroma Meter

b. Vita Easyshade Compact: Vita Easyshade Compact is a contact type spectrophotometer (SP), handy, cordless, cost-effective, and battery-driven. This device has a digital SP and attaches the LED fiberoptic light source. This device can measure areas up to 5 mm in diameter, and no digital images are produced Figure 6.

Figure 6: Vita Easyshade Compact

c. Shade Scan: This was the first system in which digital color image was combined with colorimetric analysis. This system was introduced by Cynovad. It is made up of a handheld device with a color LCD screen, data station, seven flashcards (16 MB each), and software. In shade scan, a handheld display and shade map is available Figure 7.

Figure 7: Shade scan

d. Clear Match System (Smart Technology, Hood River, Oregon): This system uses high-resolution digital image software to properly balance the digital color data and compares it with a shade tab. The color data is shared with the lab via email, including a black and white standard with every photograph Figure 8.

Figure 8: Clear Match System (Smart Technology, Hood River, Oregon)

e. Spectro Shade: Another SP developed for clinical usage is the Spectro Shade, an imaging SP. The device's design is very difficult and very expensive compared to other instrumental systems used for shade selection. This system is the only system, which mixes digital color imaging with SP analysis. SPs are traditional devices used in dentistry for measuring color in dentistry, whereas spectroradiometers are newly introduced instruments designed to create the most accurate and detailed color measurements Figure 9.

Figure 9: Spectro Shade

10. Conclusions

The accurate assessment of a tooth color and shade can be possible by applying a number of techniques and using devices containing visual analysis with shade guides, colorimetry, spectrophotometry and computer exploration of digital images, as they are very useful and appropriate tools for the measurement of tooth color and shade and are considered as a quality control for the restoration of teeth.

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