BLENDING THE SHADE TO NATURAL: COLOR SCIENCE IN ESTHETIC DENTISTRY

Ratan Upadhyay[1], A.P. Nirmal Raj[2], Madhurima Sharma[3], Vinay Chandela[4], Pratik Bumb[5], Dhiren Shah[6]

Post Graduate[1456] Professor & Head[2] Professor[3]

1-6 Department of Prosthodontics and crown & bridge, Teerthanker Mahaveer Dental college and Research Centre, Moradabad, Uttar Pradesh, India

Abstract: Shade selection is a day to day task in the life or every dental practitioner. This article aims at highlighting the basic yet important points to be taken care of while carrying out the process of shade election. Shade matching requires application of the knowledge of optical properties of natural teeth along with the use of available shade tabs in a well illuminated dental operatory. This article also gives a gist of automatic or objective shade selection systems available in the market, while elaborating the steps necessary for using the regular shade matching tabs.

Key Words: Shade, Optical Properties, Visual Perception.

INTRODUCTION

For every clinician, shade selection is an imperative aspect to master in today's high demanding aesthetic dentistry.[1] Knowledge of optical properties of teeth and dental materials, visual perception and phenomenon of vision in humans are critical areas in selecting the shade.[8] In addition to this, a clinical environment which is less straining to the eyes and which creates less visual fatigue is of great help[1]. These factors combined with the recent technological advances and newer shade selection systems will make the aesthetic rehabilitation a big success.[2]

Understanding the phenomenon of vision and the importance of replicating the optical properties of teeth in a restoration should always be stressed upon so that the recent technological advances can be used to the fullest.[3]

To conclude the optimum use of setting up the internal clinical environment and utilising the above mentioned properties should be inculcated for a near perfect aesthetic rehabilitation.[6]

LIGHT CONDITIONS

Daylight incandescent light and fluroscent light are the most common light sources[10].The light under which any shade matching is to be done should be spectrally balanced between 380nm-780nm.[1] (as depicted in fig 1)
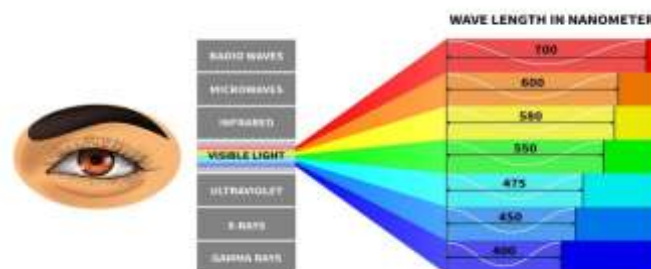

Figure 1

Color temperature should be 5500K and CRI should be >90[9]. Atleast two different light sources should be used for matching the shade.[1]

COLOR

The knowledge and understanding of the three dimensions of color are very important for implementation in aesthetic dentistry.[9] Color has 3 dimensions keeping in mind the Munsell color system that are Hue,Value amd chroma.[2]

Hue is the name given to a color .Value is the lightness or darkness of the color and chroma is the degree of saturation of the color.[7]

The operatory walls and cielings should have a high value and low chroma to be less straining to the eye.[3] Neutral grays should be used for patient clothing and staff clothing. Looking at a blue napkin helps to desensitize our eyes from one particular shade.[3]

SHADE SELECTION SYSTEMS

Shade selection systems are of two types - subjective and objective

Subjective are the conventionally used shade guides and objective systems are the recent technology based shade selection system.[3]

Most commonly used shade selection systems are the Vita Classical and VITA 3d MASTER GUIDE.

Figures 2

Figure 3

Group A is reddish-brown, Group B is reddish-yellow Group C is gray, and Group D is reddish-Gray.[3]The vita classical A1-D4 shade guide(as depicted in figures 2 &3) was introduced in 1956 and is based on 4 groups of hue. Many dentists have preferred using this shade guide since the shade selection is easier using the 16 shades given in this system. In this arrangement,

Figure 4

The vita 3D master guide consists of 26 shades (figure 4). The shade guide helps in determining the shade through 5 levels of lightness (VALUE) first .After the lightness is selected selection of CHROMA has to be done from the three available saturation of colors[3]. Last step is determination of HUE whether the selected tooth shade is more (L) i.e Yellow or (R) i.e Red.[3]

Few points to follow for shade selection in the dental operatory[3]:

• Teeth to be matched must be clean (as shown in fig 5).

• Remove bright colors from the field of view.

• Tooth shade should be determined in daylight or under standardized daylight lamps (not operation lamps).

• Walls should be colored in neutral gray as far as possible.

• Lipstick   and other bright jewellery should be removed before shade matching

• Shade matching should always be done before starting the procedure so that the eye doesn't get strained by looking at the same tooth.

Figure 5

• To desensitize the color cells of the eye, after 5 seconds the operator should look at a blue napkin to restart the shade matching process.

AUTOMATIC SHADE SELECTION SYSTEMS

The objective or automatic shade selection systems are primarily of three categories colorimeters, spectrophotometers, and digital imaging devices.[3]

Automatic shade selection systems are also known as objective shade selection systems.

Few examples of the available systems are mentioned here in this article.

Shade eye NCC-colorimeter

Shade eye NCC has a handheld probe which is of 3mm diameter. It is held against the tooth and the activation button is pushed, light is emitted from the borders or periphery of this probe and it hits the tooth. The light that is reflected back from the tooth is collected on the centre of the probe. This area has detectors that closely match the three observer functions via infrared signal; the data is transmitted to the docking unit. Porcelain samples are stored in the memory and the data that is closest to the sample is then presented. There is a readout which is generated then which shows the tooth number, the closest Vita lumin shade and specific enamel and body   powders.

Figure 6

Figure 7

Figure 8

CONCLUSION

The challenge of a modern dentist to fulfil the patient's demand of a restoration specially in the anterior region requires good knowledge of the physiologic process of human vision and colorimetry. A dentist should always try to replicate and apply the properties of fluorescence, opalescence, translucency and opacity to the restoration to mimic natural tooth structure as much as possible.

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FIGURE LEGENDS:

Figure: The range of wavelengths that the human eye can see.

Figures 2& 3: Dental shade matching tabs (vita classical A1-D4)

Figure 4: Vita 3D Master Shade Guide.

Figure 5: Showing shade matching being done before the procedure of tooth preparation starts.

Figure 6: Shofu's shade eye NCC

Figure 7: Vita easy shade - spectrophotometer

Figure 8: Shade scan and shade vision-digital imaging devices.

Corresponding Author:

Dr. Ratan
PG Student
TMDC&RC, Moradabad