Color Science and Shade Determination

Determination of the proper shade of restorations to match natural dentition continues to be one of the most perplexing and frustrating problems in dentistry. Shade determination can be accomplished by either visual assessment or instrumental analysis. Visual color determination involves the comparison of the patient's tooth color with a set of color standards such as a shade guide. This is the most frequently followed method of shade selection. However, visual color determination has been found to yield unreliable and inconsistent results. Inconsistencies may result from many factors such as lighting conditions, experience of the clinician, fatigue of the human eye, and physiologic variables such as color blindness. Moreover, color perception tends to be variable among different age groups. Furthermore, color defects have been reported to be sex linked, with women being more consistent than men. Shade matching ability also varies between individuals and can vary within the same individual. Furthermore, commercially available shade guides do not cover the color range that exists in the natural dentition.

As a result of the subjective nature of color perception, instrumental colorimetric techniques have been introduced to achieve objective and quantitative shade determination. However, colorimeters are designed for flat surfaces and suffer from edge loss. Because natural teeth are polychromatic, translucent and have curved surfaces, instrumental color assessment of teeth is not error proof. Accordingly, errors associated with shade duplication are common with both visual and instrumental shade assessments. This lecture will give an insight about the basic knowledge of color science and application of this knowledge in clinical practice.