Research Article

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Selective Mirror Image Layering & Editing (S.M.I.L.E.) - Proposing a new digital tool for diagnosis, treatment planning & patient education. Part I: The handedness of a smile

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ABSTRACT

Background: Human beings are bilaterally symmetrical. A smile is symmetrical but usually due to various adaptive mechanisms there are minor imbalances even in those smiles that look normal or aesthetically appealing. This two part article attempts to highlight the factors behind esthetic cognition and the lack of it or a degree of aesthetic blindness unless trained to observe. An emphasis is made on side specific aesthetic dominance which could be referred to as esthetic handedness.

Keywords: Aesthetics, Symmetry, Esthetic handedness, Cognition, S.M.I.L.E., Smile designing.

INTRODUCTION

Aesthetic perception is a conditioned reflex fine-tuned by various cultural and social influences. Just as a child learns to speak in a particular language, we evolve from a state of being almost aesthetically handicapped to a stage where we are able to perceive the difference between what is considered acceptable and not acceptable. Symmetry creates less of a visual disturbance than asymmetry. It can be compared to musical harmony as against the cacophony of noises in busy traffic. But then again, true symmetry may seem monotonous if there is no break in the continuity. Evolution has always favoured symmetry. Human beings are bilaterally symmetrical but with a certain degree of handedness – just as we are right or left handed, one side of our body is stronger and much naturally one of these sides is more aesthetically appealing. The author proposes that one must give the patient an option to choose between esthetic alterations that lie as a balance between these aesthetic extremes. The visualization of these esthetic halves is made possible by using mirror imaging in photographic software.

DISCUSSION

According to Hegel,"*Beauty cannot be an exact science*". It is often said that beauty lies in the eyes of the beholder. In a broader sense, esthetics is a phenomenon tempered by intellect. The process of perception is by an organization of sensory data processed by the intellect the end result being developed in combination with the results of prior experiences or beliefs that are subconsciously interpreted.[1] In his book 'Emotional Design' Donald Norman points out the differences in perceived utility value when products are designed with or without symmetry as being culturally dependant and further stresses on a strong interrelationship between cognition or interpretation and affect which is an underlying emotional selection process. Put simply it is about a balance between understanding and evaluation that is learnt by experience.[2]

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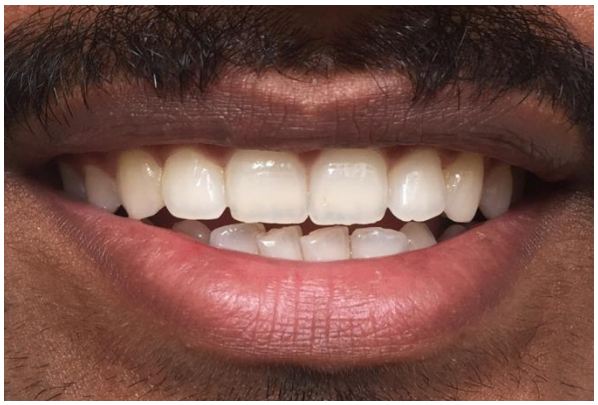

Fig 1: Original smile.

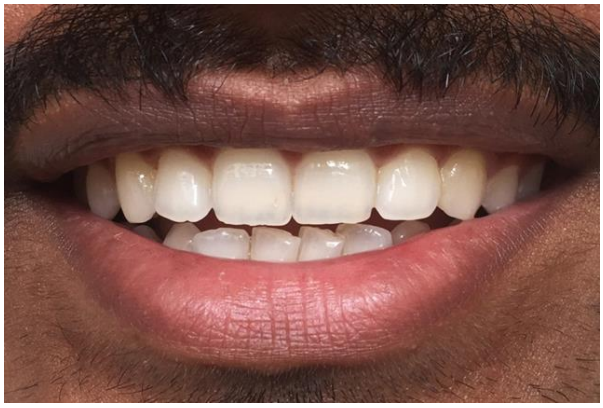

Fig 2: Horizontally Inverted Mirror Image Smile.

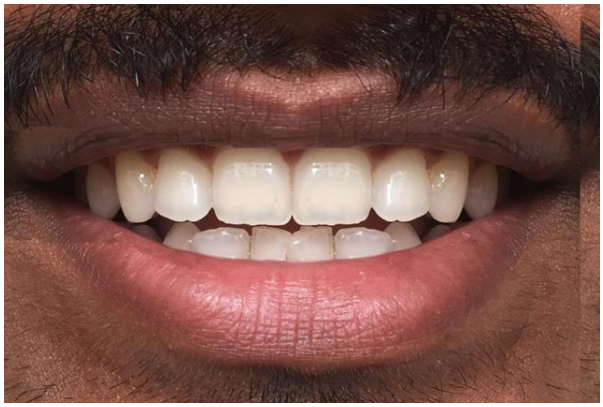

Fig 3: Composite Image using S.M.I.L.E (Left + Left Mirror).

Visual perception is a prerequisite for aesthetic appreciation. Vision is possible only if the eye can differentiate. This is possible only if there is contrast. The relationship between objects made visible by contrasts is called a composition. Of interest to the dentist are the dental composition, dentofacial composition and the facial composition. The prime requisite for a composition is unity that

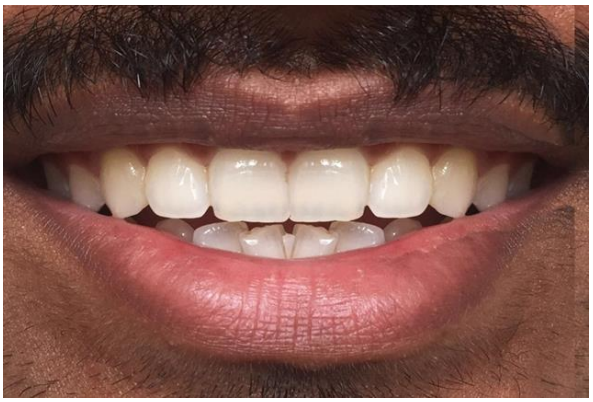

Fig 4: Composite Image using S.M.I.L.E (Right + Right Mirror)

will give the different parts of the composition the effect of a whole. Therefore, for a sense of aesthetic balance there should be unity in the dental composition, the dentofacial composition, and as a whole in the facial composition making all three compositions interlinked in their esthetic significance. When one considers beauty of an individual as in a passport photograph one is taking into account all three aspects with a lesser individual emphasis of the dental composition on the overall esthetic effect.[1] If one perceives a smile, a second diluting factor is the fact that a smile is considered a calming positive emotional display irrespective of whether the person is dentate or edentate. So unlike mathematically analysing the symmetry of teeth on an articulator one must take into account these surrounding structures as they have a contributing effect to our perception.

Esthetics perception is almost a reflex but with deeply ingrained cultural and social influences and insights from past exposure. Put another way esthetic perception is not truly innate. For a newborn baby it is his or her mother who is the most beautiful person wherein beauty is more of an emotional attribute. Evaluation of beauty based on symmetry or proportions or a composition requires training over a period of time that either comes naturally much like wisdom or is taught much like the principles of teeth setting in prosthodontics or components of ideal occlusion in orthodontics.[3,4,5] For all practical purposes a student of first year BDS would not be able to identify esthetic flaws that a second year or intern can on account of specific training.

The dentist mainly has control over the dental composition with a limited amount of influence over the dentofacial and therefore the facial compositions. One of the prime concerns of esthetics is symmetry. According to Furtwanger (1964), " *Symmetry refers to the regularity in the arrangement of forms or objects*". According to Rufenacht there are two kinds of symmetry: 1) Horizontal or running symmetry, and 2) radiating symmetry. Horizontal symmetry occurs when a design contains similar elements from left to right in a regular sequence. Radiating symmetry is a result of the design of objects extending from a central point and the right and left sides are mirror images. Radiating symmetry has variety in the unity of the composition due to segregating forces, which bring life and dynamism to a composition. Cohesive forces refer to arrangements following a definite form as seen in horizontal symmetry and this is usually psychologically predictable and comfortable, tending to be monotonous.[1]

The teeth that play a major aesthetic role in the dental composition are chiefly the teeth that are visible. These invariably comprise of the anterior teeth(incisors & canines) although certain smiles might have a display of teeth posterior to the canine. Depending on the individual situation the dentist is either called upon to replace or modify these visible elements to satisfy the requirements of function and esthetics.

Artificial teeth are selected based on their size, form and colour. Of importance are the Dynesthetic Theory and Dentogenic Concept .[6,7,] Apart from symmetry it is also important to consider proportion. Of importance is the Golden Proportion (Pythagoras).[8] Dentofacial composition established in conformity with the golden proportion will achieve a reliable, aesthetic result. Final arrangement of anterior teeth or the modification of existing natural teeth is done satisfying requirements of function and aesthetics. When aesthetics is considered, the final result strongly depends on the dentist's perception of aaesthetics and also on suggestions given by the patient either based on pre-extraction records, like photographs, in the edentulous or based on the patient's perception of the visible result as against what the patient expects. It is often stated that irregularities are essential to esthetics and that an asymmetric symmetry should exist in artificial teeth arrangements.[9,10]

This is based upon the assumption that the majority of natural dentitions one comes across possess irregularities therefore conditioning our perception. With an ever increasing demand for perfection seen nowadays along with an increased patient awareness of the role of teeth in beauty, most young adults have already opted for orthodontic treatment if only for the reason of seeking a more esthetically appealing alignment of their natural teeth. Patients usually want or appreciate a final result that has as few irregularities as possible. Thus the average natural dentition one comes across has less irregularities either naturally or on account of some form of dental treatment. The average conditioned perception or expectation of what is considered an esthetic arrangement is also bound to be influenced. Visual learning leads to perceptual learning. There is an association of a degree of discomfort with higher degrees of esthetic perfection as in the comparison of a dim lit room with a bean bag to sit on versus an artistic room brightly lit with a bright white theme and angular furniture. There is a comfort zone associated with the not so perfect. When this is applied to a smile , minor imperfections that can blend in are usually the secret of appealing complete dentures by way of characterization.

It now lies in the hands of the dentist to modify or replace teeth first and foremost satisfying functional requirements. Now instead of imposing his own perceived notion of esthetics on to the patient or similarly leaving it to the patient alone to decide, it normally would be advantageous to take a third opinion if not more. When a friend or relative of the patient, or a colleague or assistant of the dentist is not at hand , it would be helpful to have an evaluation record of the existing arrangement of teeth be it for initial diagnostic purposes or for modification of the treatment planned. This would also work as a record with regard to informed consent should any aesthetically oriented treatment be opted for like digital smile designing.

The Side Specific Aesthetic Dominance or 'Handedness' of aesthetics is readily apparent if one prepares composite images made from mirror images of a smile .[11,12] The concept of Selective

Mirror Image layering & Editing (SMILE) is proposed as a simple method by which multiple options are available for diagnostic evaluation & treatment planning or modification. It forms a powerful motivational and educational tool for patients enabling a better understanding and a true interaction with the service provider, the dentist. There are often differences in opinion as related to aesthetic perception or the proposed and preferred outcome between a trained dentist and a layperson (the patient).[13,14,15,16] Having a set of digital simulations enables work flow along with informed consent. SMILE is performed by layering a mirror image of the patient's original smile over the original smile and by using the erase function to erase one half of the smile it allows the underlying mirror image half to show through. This composite image is blended producing a final result that for example has the left half of the smile along with the left mirror image and the right half of the smile with the right mirror image. When one compares the original smile with these two extreme composites it is very obvious where the aesthetic dominance points and deviance points lie. The process can be easily performed using a smartphone with Adobe Photoshop Express used for basic tweaking of the brightness and contrast, cropping and horizontal flipping. Subsequent editing of layers and blending is performed in Adobe Photoshop Mix. (Figs. 1 to 4)

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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