Variables and factors that may affect smile design: A mini review

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Abstract

With evolution of dentistry in the field of esthetic dentistry, and the patient needs for more esthetic appearance and optimum smile, thorough studies have been done in the esthetic zone to address the factors that attribute in the smile design. This mini review article goes through the smile element from smile design, facial esthetic, dentogingival esthetic, and lip length. This review found that some of these elements are directly related or relatively related or maybe not related to smile design.

Keywords: Esthetic zone, lip length, smile design, smile line

Introduction

The Merriam-Webster dictionary defines beauty as the qualities in a person or thing that provides pleasure to the senses or the mind when viewed. Qualitative beauty is nurtured from the inside; however, physical beauty can be constructed. In general, proper alignment, symmetry, and proportions of the face are the standard esthetic principles to evaluate facial beauty.[1]

Does dental esthetic play an important role in facial beauty? From a research, a group of patients ranked the teeth and eyes as the most important features of a beautiful face in a recent study that involves self-evaluation by those involved.[2] The eyes and mouth draw the most initial attention when viewing ones’ face because objects in depth are the first to draw attention in any figure observed. However, different colors have different visual weightage, and this will create different perceptions. The overall white color of the teeth will draw the attention from the eyes because of its higher visual weightage compared to the other darker colors.[3]

According to Garber and Salama, the smile is a voluntary facial expression indicating happiness, pleasure, and greeting.[4] The smile is also a unique gesture to the human race, unlike the much similar species, the primates.[5] Not only does it represent the human race, a smile is more than a form of communication which influences personality and individual performance in jobs and daily activities. Ultimately, an attractive smile boosts first impressions in human-to-human relationships, which in turn, enhance acceptance and blending into the society, and the total whole being.[6]

Stereotypically, individuals with malocclusion are often judged to be less socially attractive and the poor dental esthetics have been associated with lack of self-esteem.[7] Hence, it is undeniable that dental esthetics is a crucial element in facial beauty as well as psychosocial well-being.

The Smile Design

Smile design or rather, dental facial esthetics, was first defined in terms of macro and micro elements. The interrelationship between face, lips, gingiva, and teeth are classified under macro esthetics. More to that, the macroelement also takes into consideration the perception of the interrelationships so...
that they are pleasing. Minor esthetics, whereas, deals with the esthetics of a single tooth, including the color and tooth form. The dental facial esthetics then became more analytical, and Rufenach often classified smile analysis into facial esthetics, dentofacial esthetics, and dental esthetics, in which the micro and macro elements are included as well. Recently, a more comprehensive classification was given with five components of esthetics:

1. Facial esthetics (total facial form and balance)
2. Oral-facial esthetics (maxillomandibular relationship to the face and the dental midline to the face in relation to the teeth, mouth, and gums)
3. Oral esthetics (labio, dento, gingival: The relationships of the lips to the arches, gingiva, and teeth)
4. Dentogingival esthetics (the relationship of gingiva to the teeth collectively and individually)
5. Dental esthetics.

**Facial esthetics**

Evaluation facial esthetics is the first in smile analysis and designing. Facial analysis includes evaluation of form and balance, with an emphasis of proper alignment, symmetry and proportion of face, and how they may be affected upon treatment. Examination of the face can be divided into horizontal and vertical dimensions, with certain measurements of a so called “ideal face.”

Classically, the horizontal dimension of an ideal face is equal to the width of five eyes. Furthermore, the width of the face should be equal to the distance between the eyebrows and chin.

As for the vertical dimension of the face, the balance of facial thirds is evaluated. The facial thirds must ideally be equal, in which the distance from the forehead to the eyebrow line, from the eyebrow line to the base of the nose and from the base to the base of the chin, must be of approximate height. Another vertical dimension analysis would be by diving the full face into two parts, where the midline is at the eye level. The lower part of the face, from the base of the nose to the chin can also be divided into two parts, where the upper lip forms the one-third and lower lip to chin forms the other two-thirds. The overall shape of the face is also analyzed from the frontal aspect. It can be square, tapering, square tapering or ovoid.

These evaluations are required to determine the type and depth of treatment needed to produce desired esthetic changes. At times, orthodontic treatment would be considered when restorative treatment is not able to produce the desired results, especially in cases where the facial thirds are not equal.

**Oral-facial esthetics**

The oral-facial esthetics is the level dealing with the maxilla-mandibular relationships to the face. A basic analysis of the lateral profile is done to determine an individual’s lateral profile, which can be straight, concave, or convex.

The dental midline of the face in relation to the arches, gingival and teeth is also evaluated at this stage. Dental midline is an imaginary line that separates the two central incisors. It is a key factor for dental esthetic evaluation. Facial midline is an imaginary line running through the center of the face and philtrum of the lips, dividing the face into left and right sides. The more symmetrical the facial midline, the more inherently harmonious and beautiful the face is. Dental midline, on the other hand, seeks beauty through diversity. Ideally, the facial midline is also perpendicular to the horizontal lines. Dental and facial midline should collinear in an ideal situation.

**Buccal corridor**

Buccal corridor, also known as negative space is a dark space develops between maxillary and mandibular when smile approaches laugh causing the jaws to separate. Lay people tend to prefer broad smile with a minimal buccal corridor. However, broad smile without any buccal corridor can be perceived as fake. The teeth are silhouetted against the dark space due to the color contrast, missing teeth and diastema becomes conspicuous by disrupting the harmony of the dark space. The buccal corridor is important because a well-formed dark space increases the attractiveness of the smile and provides better appearance of the oral region. A few examples of situations which can alter the silhouette including gold, fractured anterior teeth, inharmonious pontics, malpositioned or missing teeth, and the appearance of the tongue.

**Dentogingival esthetics**

This section deals with the relationship of gingiva to the teeth, as a whole or individually, from gingival scalloping to the gingival height in relation with individual teeth. Literature of this scope found that the gingival heights relative to the central, lateral, and canine are in the up-down-up fashion, and are considered
Dental esthetics

Last but not least, the final step in smile analysis deals with the macro and micro dental esthetics, both inter- and intra-tooth. Evaluation of dental esthetics includes choosing tooth shapes based on facial characteristics of the patient. Patient with longer face should ideally be matched with a rectangular tooth, whereas, patients with a square face will most probably match teeth with 80% width-to-length ratio.

Length of the teeth is also taken into consideration. In general, maxillary central incisors measures 10-11 mm in length, lateral incisors are 1-2.5 mm shorter than the central, and canines being slightly shorter than the central incisors by 0.5-1 mm.

Inter-tooth relationship is usually based on the golden proportion and position of the tooth length. The golden proportion is the relationship between beauty in nature and mathematics. In a simplified way, the beauty proportion can be explained with the, where it is a proportion between a larger and a smaller part. If the ratio between B and A is a gold proportion, it means that B is 1.618 larger than A. The width of central incisors should be in golden proportion with the lateral incisors, and the width of lateral incisors should also be in golden proportion to the canines, same goes to the width of canine to first premolar.

Lombardi mentioned that the entire human figure can be described in terms of proportionate sizes of the various parts. When discussing about the size of the teeth, it is always necessary to consider the element of proportion. The relationship of width to length of a tooth is important because, if two teeth are of the same width and different lengths, the longer tooth will appear to be narrower.

According to the rule of thirds, the face is divided equally into three equal segments, which is from the trichion to nasion, nasion to subnasal, and subnasal to menton. The lower portion is subsequently divided into thirds.

In an ideal condition, the height of central incisors should be 1/16 the height of the face from trichion to chin while the width of central incisor is 1/16 of the interzygomatic width. DH Ward believes that the golden proportion has limitation as the lateral incisor appears too narrow, causing the canine to appear as not prevalent enough. Preston found out through a research that the golden proportion was only found in 17% of the casts of patients in his studies. The recurring esthetic dental (RED) proportion states that the proportion of successive widths of the teeth as viewed from the frontal should remain constant as one move distally. The RED proportion can be determined by the dentist as long as he is consistent while moving distally.

However, a research date back in 1998 shows that the golden proportion did not seem to exist, which the result is accordance with the studies conducted by Mahshid et al. and Ali Fayyad et al. The RED proportion on the other hand is not constant as the ratio increases as one move distally.

Smile Line

Smile line is defined as the position of the lower border of the upper lip during smile and thereby determines the display of tooth or gingiva at this hard and soft tissue interface. In general, a smile can be classified broadly into posed and unposed smiles. A forced and voluntary smile is produced during a posed smile, and it is considered reproducible and static. On the other hand, an unposed smile is observed during joy and emotion. It is non-sustainable, involuntary, and dynamic. Posed smile can be further divided into strained and unstrained. A strained smile will produce maximum upper lip elevation.

There are also authors who explained the genesis of a full smile in two stages. The first stage of smile involves smiling with upper lips raised to the nasolabial fold. The second stage occurs when the lip and nasolabial fold is further elevated by the levator labii superioris, zygomaticus major, and superior muscles of the buccinator, which ultimately results in squinting of the eyes.

Smile line was classified by Tjan et al. into high, average and low. High smile line shows the entire cervico-incisal length of maxillary anterior teeth and an adjoining band of gingiva. An average smile, whereas, reveals 75-100% of the maxillary anterior teeth and the interproximal gingival only. Finally, a low smile line shows <75% of the upper anterior teeth, without any display of gingiva. Lip contact should be evaluated from the position of lips in rest position, as well as the range of lip mobility when smiling. These determine the amount of tooth structure and gingival tissue being revealed during the comparison between the repose and full smile positions. Tjan et al. mentioned that an “optimum smile” is the one that displays full clinical crown of the six maxillary anterior teeth and also the premolars from frontal view. Smile line is considered as acceptable if it is within the range of 2 mm apical to heights of gingival of maxillary centrals.

Ackermann et al. also defined smile arc, as the relationship between the curvature of the maxillary anterior teeth and the curvature of the upper border of the lower lip. The smile arc is classified into: Consonant, the curvature of the maxillary incisal edges is parallel to the curvature of the lower lip upon smiling; and non-consonant, the curvature of the maxillary incisal edges is not parallel to the curvature of the lower lip upon smiling. The non-consonant smile arc can be sub-classified into flat and reversed type.

Both the smile line and smile arc varies in different age groups. Tjan et al. also mentioned that the average smile should have parallel incisal curve of maxillary teeth and inner curvature of the lower lip. Several studies also showed that
females are 2.5 times more prevalent to high smile line, whereas males are more of low smile lines.\cite{22}

**Lip Length**

The two highly mobile fleshy folds that surround the orifice of mouth are nothing but lips. They can either be thin or full, wide or narrow, even short or long. Inclination of the teeth is one of the factors causing excessively prominent or recessive lip. For example, individuals who are completely edentulous generally has receded lips, causing the increased prominence of the nose and chin. The lips usually meet in a straight line or are curved toward the corners either in an upward or downward direction at rest. The short upper lip usually causes incompetent lips that always curves upward, remains open and produces an acute angle at the corner of the mouth.\cite{5}

Fonseca mentioned that normal upper lip length for females range from 18.0-22.0 to 20.0-24.0 mm in males.\cite{25} A study by Miron et al. showed that upper lip length was 3.1 mm shorter in woman than in men.\cite{26} Exposure of gingival architecture and dental components are affected by several lip factors. These variables are like upper and lower lip muscle mobility, lip strength and also lip vertical length. They complement other factors such as skeletal relationship in producing variable gingival and dental display by altering the position of the smile line.\cite{6}

There are studies which proved that subjects with high smile line have shorter lip length compared to low smile line subjects.\cite{26}

**References**

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