

REVIEW ARTICLE

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Smile and dental aesthetics: a literature review**Funda Demir, Elif Aybala Oktay, Fulya Toksoy Topcu***Gülhane Eğitim ve Araştırma Hastanesi Restoratif Diş Tedavisi, Ankara Turkey*

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Abstract

The importance of dentofacial appeal in regard to the individual's psycho-social well-being is a proven fact. One of the most important factors that affect people's smiles is teeth. A dental restoration's positive impact on the patient's smile, appearance, self-confidence and overall mental health can not be underestimated. In this review, the relation between smile and dental aesthetics is being addressed together with teeth, gum, face elements, aesthetics criteria and cases.

Keywords: Smile aesthetics, dental aesthetics, aesthetics criteria

Smile and dental aesthetics: a literature review

The importance of dentofacial appeal in regard to the individual's psycho-social well-being is a proven fact. One of the most important factors that affect people's smiles is teeth. A dental restoration's positive impact on the patient's smile, appearance, self-confidence and overall mental health can not be underestimated. In this review, the relation between smile and dental aesthetics is being addressed together with teeth, gum, face elements, aesthetics criteria and cases.

Introduction

Face is the quickest recognized physical section of people. An aesthetical smile has ever been an attractive and desirable element. Accordingly, dentist aims also at increasing the self-confidence of the patient through the aesthetic restoration he/she performs [1].

One of the most significant factors to effect one's smile is the teeth. If an individual is not pleased with the way their teeth looks, they wouldn't want their teeth be seen. Accordingly, they either avoid smiling or they feel the urge to cover their mouths when they smile. The process and

restoration to be performed by the dentist is prominently significant regarding the patient's look and smile and overall psychology and self-confidence [2,3].

It is observed that half of the patients who visit their dentists, do this as they wish to look more beautiful. In a society where aesthetics has an increasing value to it, individuals mobilize their time and resources for the sake of becoming more beautiful [4,5].

In achieving proper smile aesthetics, shape of the face and head, besides, volume, size, ratio, shape, texture, pattern of placement, color of the teeth are important. As for the soft tissues and gums, gingival line, smile width and line, relation between the lower lip and upper-incisor line, dark areas at the corners of the mouth, zenith points and healthy gums are important factors.

Aesthetics In Dentistry

The word aesthetics, originates from Greek word 'aisthesis' (perceive). According to Pilkington aesthetics is the art of making an artwork in a way that it won't disturb the eye, which would mean it would be a successful representation of the nature or in harmony with the nature [6]. Today, for dentistry, this word addresses what is beautiful.

Recognition of basic principles of aesthetics is more important than inspiration and intuition alone. For the first time, in 1947, Lombardi [7] defined dental aesthetics as "visual perception" and addressed it in two aspects of it:

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composition and proportion. According to Rufenacht [8], below are the basic principles of dental aesthetics:

Composition:

In dentistry, composition is addressed in its two aspects but as a whole; dental and dentofacial [9].

Unifying and Diverging Forces:

The elements, which bring together a composition are unifying forces, while the opposite are diverging forces.

Unity:

It is the main concept in making of a composition. Repetition of elements such as shape, color and line bring in unity with a unifying effect.

Symmetry:

It represents the regular pattern in organizing the objects.

Proportions:

Proportion represents the regular pattern between the two objects. According to the concept of golden proportion, which is derived from Pythagorean Theorem, it is held that if a surface is arranged taking basis the golden proportion, this will affect the aesthetic acquisition positively [8]. Proportion between the teeth is determined by "Golden Proportion". This proportion suggests that starting from the middle line and going rearwards, each one of the teeth must appear only as much as %60 of the one in front of it. Only in this way an aesthetical smile can be achieved. According to golden proportion, if the central incisor tooth is at a width of 1.618, then lateral incisor teeth width should be 1, as for the canine teeth it must have a width of 0.618 [Figure 1] [10,11]. As the golden proportion does not reflect exact tooth proportions, the clinician can use it as complementary guide in cases requiring esthetic restorations [12].

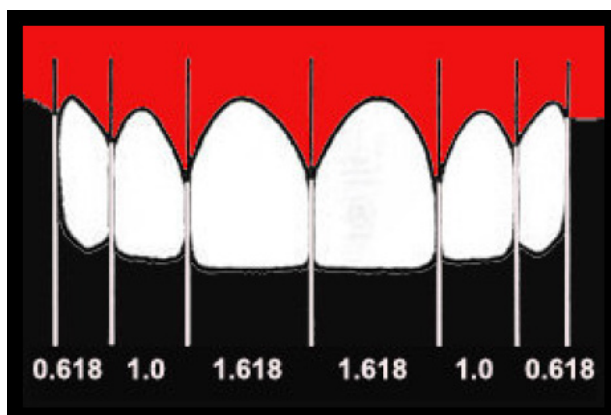


Figure 1. Golden Proportion [10]

Lines, Planes, Forms and Colors:

Lines: In a harmonious dentofacial composition, the lines which spread vertically must be parallel to longer axis of the teeth; the horizontal lines must be parallel to the

imaginary parabolic line passing through buccal tubercles of the rear teeth and incisor line of the fore teeth, and besides, to the lower lip in smiling position [8].

Planes: Visually limited areas on composition. Longer ones of the lines, which are formed on the plane, cause the corresponding characteristics be more dominant.

Forms: Areas which have definite borders. They consist of three basic shapes; triangle, square and circle. All other shapes are modification of such. Lines, angles and colors may change the way the forms are perceived. Each one of the forms have its internal distinct features and this creates a subjective effect depending on the perception of the observer. Some researches prove that perception changes depending on gender, some other researchers propose that central teeth are indicators of age, lateral teeth are of gender, and canine teeth are of personality [Figure 2] [8].

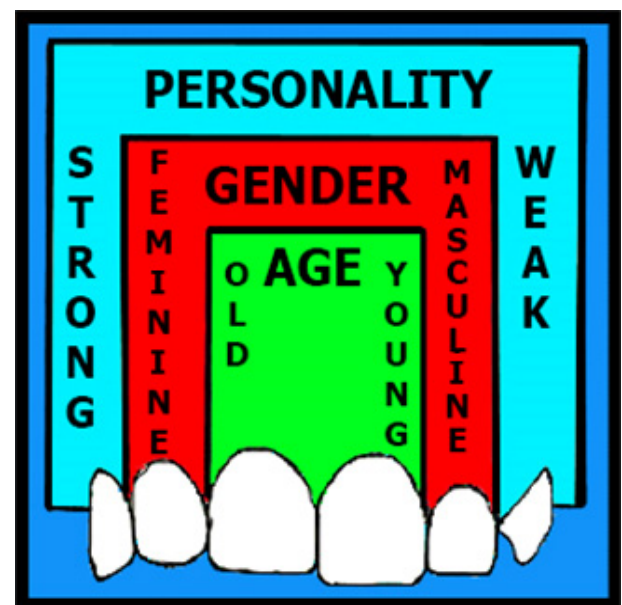


Figure 2. Different Perceptions of the Teeth Forms [8]

Color: It is the interpretation of the visible wavelength of the light which is reflected to our eyes. Human eye can perceive the light within a certain range of wavelength. Our eye perceives three aspects of color, which are tone (hue), density (chroma), brightness (value).

Balance (Stability, Equilibria):

It is achieved when opposing forces are adjusted correctly. In a dentofacial composition, it is very important to achieve this balance between the left and right sides of the mid-line.

Dominance:

Shapes and colors of the central teeth gain a dominant role in dental composition. Lateral and canine teeth; with their

color, shape and complementary effects create the aesthetical composition.

Idealism:

Idealism is to study the routine without characterizing and changing it.

Variety:

Variety, is an alternative way of achieving what is considered to be “ideal”, which is far from an artificial look with your teeth.

Perspective and Illusion:

Perspective, is the art of reflecting three dimensional objects onto a two dimensional surface as per the rules of mathematics and optics. As the observer moves away from the observed objects, they will appear smaller and visually different than reality. The object in the foreground will appear larger than the object in the background. Teeth are arranged in an array from the fore to the rear, and in the mouth, with a proper perspective. Golden proportion concept is created taking this effect as its basis. As for the illusion, by means of changing the surface, color, shape, light and contour of the objects, it will make them be perceived as they are meant to.

Some little illusions, can change the look of the teeth significantly. For instance, of the two teeth whose crown lengths and widths are the same, the one with darker color will be perceived to be shorter. The one with lighter color is perceived to be larger and to be relatively in the fore-front. Of the two teeth which are of the same crown length, narrower one will be perceived to be longer. The teeth positioned to the tongue side shall appear smaller. Reflection of the light will change depending on the

surface form of the teeth. Teeth with convex surfaces, are perceived to be smaller when compared to flat surface teeth. The teeth with flat surfaces shall be perceived to be closer, larger and bigger. Labial contour and coloring on the gingival trio will make the teeth appear shorter than it is [13,14].

If the mesio-labial and disto-labial canals of the teeth are close to each other than the teeth are perceived to be narrower than they are. To make the teeth appear longer than they actually are, incisor sides of the restoration are applied decalcification marks and vertical lines. Horizontal lines, which are made by restoration make the teeth appear shorter [13,14].

Widening the vertical contact areas of the teeth with long crowns, and an arrangement of narrow proximal gaps, make the incisor teeth be perceived to be wider and shorter [13,14].

Main Subjects Of Consideration When Creating An Aesthetical Smile

Face Aesthetics:

In the making of an aesthetic smile, face and facial muscle structures must definitely be considered.

“Rule of three” suggests that, the face is addressed in three equal parts; upper limit is “trichion” point (ideal hair line), connection point between middle and upper trio is at “nasion” point, connection point between mid and lower trio is at sub-nasal and its lower limit is “menton” point. Ideal position of the incisal plane, when the lower trio of the face (from sub-nasal to menton) is divided into three areas, is at the meeting point of upper and middle trio [Figure 3][15].

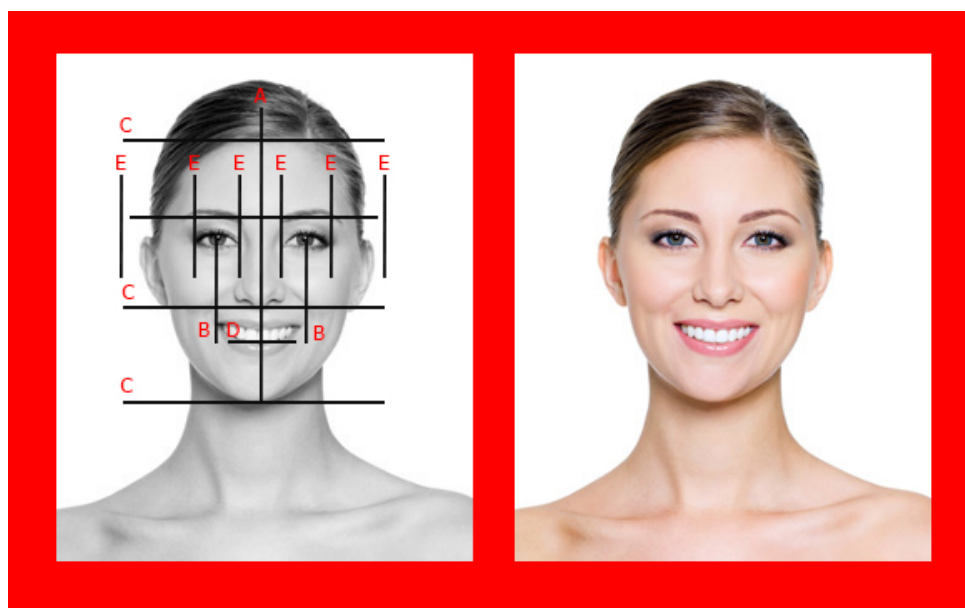


Figure 3. Proportions of an aesthetical and ideal face

In resting position, upper lip must be positioned to make 2 mm of incisor section of the fore-upper teeth appear and in the moment of smile, incisor line must be parallel to lower lip.

Cunningham and Michael R. have studied the physical beauty of persons in a mathematical frame. Their study included 50 women, more than half of whom were finalists at beauty contests, and study results are as follows [16].

- 3/10 : Proportion of eye-width to overall face,
- 1/5 : Proportion of chin length to overall face,
- 1/10 : Proportion of the distance between the eyebrow and eye, to vertical length of the face,
- <5% : Proportion of the area covered by nose, to overall face,
- 1/2 : Proportion of the mouth width measured between commissure to overall face.

Gums Aesthetics:

Color of the attached and relaxed gums, is defined as pink (dry rose color). However the color of the gums can vary between the persons, depending on skin pigmentation. Relaxed gums wrap around the facial and lingual dental surfaces like a lacework. Even when the teeth are at their best possible state and alignment, if the gums is unhealthy, hyperplasia or asymmetry it won't seem aesthetical [17]. When the gums appear (2-3mm) more than normal, it is called 'gummy smile' which means "high smile line" incidence. 'Gummy smile' can be treated through interdisciplinary operations.

Zenith point, is the most apical point of clinic crown. Literature has reported that under normal anatomic conditions, the location of the zenith point for the maxillary central incisors is 1mm distal to the midline or long axis of the tooth and is located at the midline for the lateral incisors and canine [18]. Closing the diastema, implant application, correction of distal or mesial positions of the teeth, Zenith points gain significance [Figure 4][19,20].

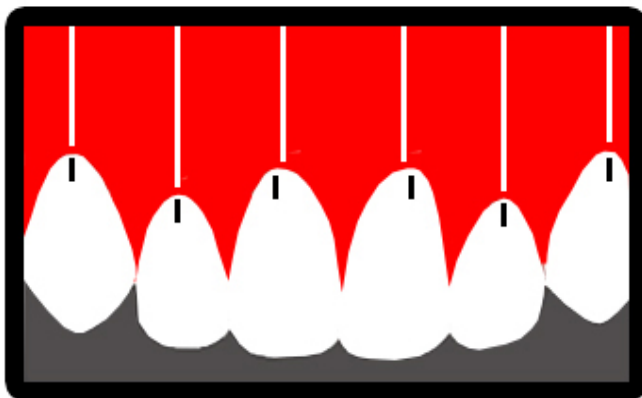


Figure 4. Zenith Points

Micro-aesthetics:

Consists of the factors which make the teeth look realistic. Real teeth can be addressed in three different categories in regard to their shapes [21].

Square teeth: Characteristically, the teeth are formed in compliance with the shape of the face. The teeth with the largest contact surface are square teeth. As the teeth have a vertical, distinct and a uniform curve, it appears wider, lighter in terms of color and closer.

Triangle teeth: Despite its wide crowns, cervical region is distinctly narrow. Canine teeth have distinct corners. While the incisor region has mesial contacts, distal contacts are in the middle of the distal face. Facial surface is irregular.

Oval teeth: Mid-back is distinct and thick, side-backs are quite thin. Their surfaces are often convex. Contact surfaces of oval teeth are close to incisor side.

Macro-aesthetic:

These are the principles which allow all the teeth array on the arch to present an aesthetical look [22]. Dentist's achieving an aesthetical look, depends on his/her success in bringing together the teeth-which differ in shape and size at every patient- with soft tissues (gums, width between commissure, thickness of lips) facial character and dynamics, meanwhile adapting their relationship to one another [9].

Mid-line: Mid-line is the starting point of a treatment to create a beautiful smile [23].

Mid-line can practically be determined by anatomical points. Midline is on the line which connects nasion and philtrum which is the center of upper lip indentation [9].

Contact surface/line direction of the upper-central teeth must be aligned with mid-line. If contact surface/line direction of the central teeth is not in line with the mid-line; it must be made to be so [24]. Contact surface/line direction of the upper-central teeth have an angular overlapping with the mid-line, aesthetics shall deteriorate. Mandibular central teeth can slightly deviate from the mid-line which is does not matter much [9].

Incisal proximal gaps: Size and volume of the incisal proximal gaps should increase starting from the mid-line, to the lateral [25]

Gingival proximal gaps: Gingival side of the gap between two teeth is called gingival proximal gap. For an aesthetical look, gingival proximal gap must be full with gums [26].

Contact points and surfaces: For an aesthetical look, teeth contact surfaces must adhere to 50-40-30 rule. This rule suggests that, contact surface of the mid-incisor teeth are as long as 50% of the vertical length of incisor teeth. Contact

surface between lateral teeth and mid incisor teeth, must be as long as %40 of the mid-incisor teeth length, and the contact surface length between lateral and canine teeth must be as long as %30 of mid-incisor teeth length [9, 26].

Axial Incline: The imaginary line drawn from the middle of the incisal line to the middle of the gums contour is called 'axial incline'. Axial incline increases towards lateral [9].

Color: Color can be defined as the psycho-physical response of an individual to the interaction between an object and light energy [27,28]. Color perception occurs when the light or reflection of light from object is transmitted to brain through the eye.

Teeth color can be determined in computer environment by the aid of dial plate/scales, spectrophotometric measurements and digital images. So as for the color be determined in standard digital figures, Munsell and CIE Lab scales can be used [27,29].

The Factors Which Determine the Color of the Teeth: Teeth are polychromatic, they don't include a single color. 4 factors which determine the color of a healthy tooth [30]:

- Tooth enamel color,
- Dentin color tone,
- Enamel transparency,
- Enamel thickness.

Tooth color is determined as a result of the interaction between the light and the tooth [31,32]. Color of a tooth is best represented by the middle section of the teeth [33,34].

The teeth with clear enamel shall reflect the color of the dentin below it and it will look brown-yellowish. The teeth with opaque enamel, look grey most of the time. Color of teeth will become darker depending on ageing, accumulation of different ions and molecules, and as a result of the endodontic surgery operations. Also, formation of secondary or tertiary dentin as well as the pulpa stones, cause changes in the color of the teeth.

Incisal region color is often transparent and its color changes due to the darker color of mouth cavity [33,34]. Cervical dental color will be effected by gums color reflection [35-37].

From the mid-line to lateral; a distinct change of color is observed in colors of the teeth. Brightest and whitest teeth in the mouth are upper-middle incisor teeth [38].

Amount of visible teeth: For aesthetics of a smile, the amount of the teeth which can be seen at various lip sections is very important.

- "EM" Position: Patient will be made to say "EM" and the patient will relax her lips and the location of minimum teeth sight will be noted. At young persons,

upper-incisor sides can be seen about 2-4mm [39]. To obtain a younger look for the person; "EM" position must be considered.

- "I" Position: So as to find out the maximum spread of the lips, the patient will be made to pronounce a well-stressed and strong letter of "I" [40].

- Inter-commissural line (the line between the commissures): When an imaginary line is drawn between the two commissures; %75 of the fore-front incisor teeth of adolescents remain under this line during a smile, sometimes %100 remains under this line [41].

- Buccal Gap: Desirable situation is that the teeth fill the space between the lips. During a smile, when upper chin is narrow dark gaps behind the canine teeth effect smile aesthetics negatively.

- Smile Line: Desirable look is when the imaginary line drawn through the front teeth incisor line is parallel to lower lip [42] and vertical to mid-line [43].

Conclusion

In achieving smile aesthetics, dental elements, facial elements, gums related factors and physical elements should be evaluated collectively. Treatments should be applied in a unified frame.

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