

Smile in Orthodontics: Review

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Abstract: Aristotle said "Beauty is a greater recommendation than any letter of introduction". A statement that is true nowadays where attractive people have a much better chance of being successful. Dentists and orthodontists can greatly contribute to enhancing patient's smile, appearance, and subsequently self-confidence. The increase in adult orthodontic treatment demand over the last few years, children and adolescents still comprise the majority of the orthodontic patient population. Within this younger population, there has been a shift from traditional treatment goals, such as ideal occlusion and cephalometric standards, to include goals embodying principles of micro-esthetics and soft tissue harmony. It is important for orthodontists to make every effort to develop a harmonious balance that will produce the most attractive smile possible for each patient treated.

Keywords: smile enhancement, smile arc, smile designing.

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I. Introduction

Patients expectation from orthodontic treatment has evolved over the years to include smile esthetics as an important compound.^[1] Smile plays an important role in facial expression and appearance, studies with photographs denote that higher intellectual and social abilities were attributed to individuals with esthetic smile.^[2] These concepts of smile esthetics are not new but are too often overlooked in orthodontic treatment planning.^[3]

Creating an esthetic smile requires an understanding of the principle that manage the balance between teeth and soft tissues^[4] Although ideal occlusion should be the primary functional goal of orthodontics, the esthetic result is also critical for patient satisfaction and therefore necessary to the overall treatment objectives. Hence, orthodontic treatment must incorporate various esthetic elements to achieve desirable results.

The most important esthetic goal in orthodontics is to achieve a balanced smile which can be best described as an appropriate positioning of teeth and gingival scaffold within the dynamic display zone; hence, it is reasonable to analyze smile as important criteria for diagnosis and orthodontic treatment planning. Currently, a pleasant smile, mainly influenced by the beauty monetary standard imposed by the media, is characterized by the presence of perfectly aligned and leveled dentition in the dental arch.^[5]

Smile analysis is part of a seventh cranial nerve analysis and allows dentists to recognize positive and negative elements in each patient's smile. Depending on the type of malocclusion, facial shape of the patient and mechanics adopted, orthodontic intervention can prove either beneficial or harmful to smile esthetics. Thus, it is reasonable to regard smile analysis as an important tool for diagnosis and orthodontic treatment planning.^[6]

Historical Aspects

The study of frontal facial form dates back to the Egyptians, who depicted ideal facial esthetics as the golden proportion. This concept has been described extensively in classical art and orthodontic literature. **Edward Angle** emphasis on occlusion led him to teach that optimal facial esthetics always coincided with ideal occlusion and that esthetics could essentially be disregarded because it took care of itself. Furthermore, the early concepts of esthetics revolved largely around the patient's profile, and it was believed that, once the "ideal" tooth-jaw positions were achieved, then the soft tissues would fall in line. This focus on the profile was because the lateral cephalogram has long been the lynchpin of orthodontic treatment planning.^[7]

Golden Proportions

The definition of the laws of harmony and beauty were a constant preoccupation with the ancient Greeks. The divine proportion has been attributed to Pythagoras, and its esthetic values were stressed by **Luca Pacioli** in his book Divine Proportione illustrated by **Da Vinci**. The application of the divine proportion to

dentistry was attributed to Lombardi and then developed by **Levin** using calipers that open at a constant divine proportion between the larger and smaller parts, **Levin** observed that in esthetically pleasing dentitions viewed from the front the width of the central incisors in the golden proportion to the lateral incisor which is in golden proportion to the anterior part of the canine.

He also demonstrated that the width of the negative space is in golden proportion to one half of the width of the anterior segment. The buccal corridor is said to be in golden proportion to the anterior smile. It is a key factor in the harmony of a smile. From these observations, he developed a grid to test the validity of this statement, in the grid the incisors are quoted within a large range of width. The use of this grid helps the dentist determine what is esthetically wrong with the anterior proportional dentition.

Smile Classification^[8]

Smiles are classified as the social smile and the enjoyment smile. The social smile is a voluntary, static facial expression, unstrained. Due to moderate muscular contraction of the lip elevator muscles the lips part, and the teeth and sometimes the gingival scaffold are displayed. The enjoyment smile is involuntary. It results from maximal contraction of the upper lip elevator and lower lip depressor muscles causing full expansion of the lips, with maximum anterior tooth and gingival display. A smile can also be classified into three types of smile depending on the exposure of tooth and gingival.^[9]

Muscles Anatomy of Smile

Nasolabial fold is the keystone of the smiling mechanism and five muscles effectively control smile. The muscles of expression are located around the mouth, they are the depressor angulorum, the depressor labii inferioris, the zygomaticus major, the zygomaticus minor, and the levator labii superioris. All these muscles, specifically the zygomaticus muscles are involved with smiling; they pull the orbicularis oris upward. These muscles are innervated by the various branches of the facial nerve.

Smile is formed in two stages. In the first stage, the levator muscles contract and raise the upper lip to nasolabial fold. In the second stage, the levator labii superioris, zygomaticus major, and buccinator muscles raise the lips even more superiorly. The final stage is often characterized by the appearance of squinting. It represents the contraction of the periocular musculature to support maximum upper lip elevation through the fold.^[10]

Components of Smile

The principles of smile design require an integration of esthetic concepts that harmonize facial esthetics with the dental facial composition and the dental composition.^[11] Various components of a balanced smile are lip line, buccal, smile arc, upper lip curvature, smile symmetry, frontal occlusal plane, dental components, and gingival components.

Lip line

The lip line is the amount of vertical tooth exposure in smiling.^[12,13] The amount of in smiling tooth exposure depends on the following six factors. Upper lip length, lip elevation, vertical maxillary height, crown height, vertical dental height, incisor inclination and are arbitrarily classified as low lip line, middle lip line, or high lip line.^[14] An average lip line exposes the maxillary teeth and only the interdental papillae. A high lip line exposes the teeth in full display as well as gingival tissues above the gingival margins. A low lip line displays no gingival tissues when smiling. In most cases, the lip line is acceptable if it is within a range of 2 mm apical to the height of the gingiva on the maxillary centrals.

Buccal corridor or lateral negative space

The buccal corridor is more commonly referred by orthodontists as lateral negative space. Its defined as the distance between the maxillary posterior teeth (especially the premolars) and the inside of the cheek,^[15] It appears as a black or dark space. In transverse dimension of the smile is also referred to as "transverse dental projection." Fresh and Fischer demonstrated that the presence of buccal corridors added the illusion of a natural dentition, whereas its absence gave the patient an artificial appearance. The orthodontist's eye for beauty is an important factor in creating appropriately sized buccal corridors. In smiling, the width of the mouth increases by as much as 30%, therefore, an excessive transverse lip extension in smiling would produce a wider buccal corridor.^[16] The buccal corridor is influenced by dental structures and soft tissue structures rather than underlying skeletal structures.

Smile arc

The smile arc is the relationship between a hypothetical curve drawn along the edges of the maxillary anterior teeth and the inner contour of the lower lip in the posed smile. The smile arc is defined as the relationship of the contour of the incisal edges of the maxillary anterior teeth relative to the curvature of lower lip during a social

smile. On the basis of this relationship, smile lines are of three types: Consonant smile arc, Straight smile arc, and Reverse smile arc.

Since the smile arc depends on occlusal plane inclination and second order crown angulations in the upper anterior teeth, there are some limitations to the achievement of this ideal smile arc on every patient. A reasonable objective is to prevent a flat or reverse smile arc and to obtain some degree of curvature that resembles, one found in the lower lip.^[17]

Types of smile	
High smile	The smile in which complete cervicoincisal length of the maxillary incisors and the band of gingival is visible is called as high smile
Average smile	The smile in which 75%-100% of the maxillary incisors is visible is called as average smile
Low smile	In this type of smile about less than 75%, of maxillary incisor is only visible
Gummy smile	There can also be a category of excess gingival exposure called as gummy smile. This anatomical feature is defined by peck and peck as gingival smileline

Upper lip curvature

It refers to the curvature of the upper lip formed while smiling, its often observed in the frontal view and evaluated on the curvature from the middle of the vermilion of the upper lip to the lateral commissures. It is mainly directed by an individual's muscular anatomy and dento skeletal morphology. It is straight when the corner of the mouth and the central position are at the same level, upward when the corner of the mouth is higher than the central position, and downward when the corner of the mouth is lower than the central position.^[18]

Smile symmetry

It is the relative positioning of the corners of the mouth in the vertical plane; it can be assessed by the parallelism of the commissural and pupillary lines.^[19] An esthetic smile harmony forms from the teeth, the gingival scaffold, and the lip framework. Smile symmetry is one of the miniesthetic components of dentofacial analyses, and a symmetric smile is considered more attractive, impaired symmetry in smiles could be due to the presence of a skeletal asymmetry. An assessment of smile symmetry before orthodontic treatment or orthognathic surgery is considered important for evaluating treatment outcomes.^[20,21]

Frontal occlusal plane

The frontal occlusal plane is represented by a line running from the tip of the right canine to the tip of the left canine. A transverse cant can be caused by the differential eruption of the maxillary anterior teeth or a skeletal asymmetry of the mandible.^[22]

Dental components

Dental components of the smile include the size, shape, color, alignment, and crown angulation (tip) of the teeth; the midline; and arch symmetry.^[23] The dental midline is an important focal point in an esthetic smile. A practical and reliable method of locating the facial midline, which normally coincides with the dental midline, is to use two anatomical landmarks: Nasion and the base of the philtrum, known as the "cupid's bow," in the center of the upper lip. A line drawn between these two landmarks not only locates the facial midline but also determines its direction. The parallelism between the maxillary central incisor midline and the facial midline is more important than the coincidence between the dental and facial midlines.

Gingival components

Esthetic enhancement of smile requires prior quantification of gingival component of smile. The gingival components of the smile are the color, contour, texture, and height of the gingivae. Inflammation, blunted papillae, open gingival embrasures, and uneven gingival margins detract from the esthetic quality of the smile.^[24] Maxillary central incisors and the central papilla, because of their location in the midline and being the most prominent, are first noticeable in appearance. Hence, visibility of central papilla, adjacent teeth, and gingival display and their association with the smile line are considered to be the key esthetic factors in smile of any individual.

The exposure of the teeth during smile varies from person to person; concomitantly amount of gingiva in a smile also varies. To design a smile we need to determine the amount of part to be exposed along with the exposure of the teeth. Framing the teeth, within the confines of the gingival architecture, has a tremendous impact on the esthetics of the smile. A gummy smile is as unesthetic as a patient with a severe recession. The impact on the beauty of a smile from an uneven gingival contour height can be dramatic, and although the

position of the zenith of the gingival tissue seems like a small detail, it can greatly influence the axial inclination and emergence profile of the teeth.^[25,26]

II. Conclusion

In our modern competitive society, a charming smile can open doors and knock down barriers that stand between us and a fuller, richer life. It must be understood that there is no universal “ideal” smile. The most important esthetic goal in orthodontics is to achieve a “balanced” smile. The components of the smile should be considered not as rigid boundaries but as artistic guidelines to help the orthodontist to treat individual patients. It is important for orthodontists to make every effort to develop a harmonious balance that will produce the most attractive smile possible for each patient being treated.

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