Smile and its components - A review

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Abstract
The orthodontic profession has always been in pursuit of ideal dentition. The former emphasis on dental and skeletal components is still valid, but greater attention to the soft tissue aspects of orthodontics is now required. Even though patients come to us mainly to improve their smiles, the orthodontic literature contains more studies on skeletal structure than on soft-tissue structure, and the smile still receives relatively little attention. So, the purpose of this article is to review the major components of the smile and discuss their impact on orthodontic diagnosis and treatment planning.

Keywords: Smile, smile arc, buccal corridor, black triangle

Introduction
In orthodontic treatment, esthetics has traditionally been associated with profile enhancement. Both the Angle classification of malocclusion and the cephalometric analysis have focused attention on the profile, without considering the frontal view [1]. Even though patients come to us mainly to improve their smiles, the orthodontic literature contains more studies on skeletal structure than on soft-tissue structure, and the smile still receives relatively little attention. So, the purpose of this article is to review the major components of the smile and discuss their impact on orthodontic diagnosis and treatment planning.

Smile Analysis
Smile can be differentiated into two main types:
• A posed smile is the voluntary expression made when introduced to someone, or when taking a passport size photograph or orthodontic record. A posed smile is repeatable.
• A spontaneous smile, by contrast is involuntary, natural, and driven by emotions [2].

Components of Smile
1. Lip Line

The lip line is the amount of vertical tooth exposure in smiling—in other words, the height of the upper lip relative to the maxillary central incisors. As a general guideline, the lip line is optimal when the upper lip reaches the gingival margin, displaying the total cervicoincisal length of the maxillary central incisors, along with the interproximal gingivae [3, 4]. A high lip line exposes all of the clinical crowns plus a contiguous band of gingival tissue, whereas a low lip line displays less than 75% of the maxillary anterior teeth. Dental professionals have been conditioned to see a “gummy smile” as undesirable, but some gingival display is certainly acceptable, and is even considered a sign of youthful appearance [5]. With aging, there is a gradual decrease in exposure of the maxillary incisors at rest and, to a much lesser degree, in smiling. This steady decline in maxillary tooth exposure at rest is accompanied by an increase in mandibular incisor display.
2. Smile Arc

![Fig 2: Smile arc](image)

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 [6]. The curvature of the incisal edges appears to be more pronounced for women than for men, and tends to flatten with age. In an optimal smile arc—described as “consonant”—the curvature of the maxillary incisal edges coincides with or parallels the border of the lower lip in smiling [7]. In a “nonconsonant” smile arc, the maxillary incisal edges are either flat or reversed relative to the curvature of the lower lip [6].

3. Upper Lip Curvature

![Fig 3: Upper lip curvature](image)

The upper lip curvature is assessed from the central position to the corner of the mouth in smiling. It is upward when the corner of the mouth is higher than the central position, straight when the corner of the mouth and the central position are at the same level, and downward when the corner of the mouth is lower than the central position [1,3]. (Fig. 4)

![Fig 4: Upper lip curvature. A. Upward. B. Straight. C. Downward](image)

4. Lateral Negative Space

![Fig 5: Lateral negative space](image)

The transverse dimension of the smile is also referred to as “transverse dental projection”. Lateral negative space is the buccal corridor between the posterior teeth and the corner of the mouth in smiling [8] (Fig. 6A). Although the prosthodontic literature describes a smile lacking buccal corridors as unrealistic-looking and denture-like, orthodontists refer to buccal corridors as “negative” spaces to be eliminated by transverse maxillary expansion (Fig. 6B).

![Fig 6: A. Patient with lateral negative space. B. After rapid palatal expansion](image)

5. Smile Symmetry

![Fig 7: Smile symmetry](image)

Smile symmetry, the relative positioning of the corners of the mouth in the vertical plane [3, 8], can be assessed by the parallelism of the commissural and pupillary lines. Although the commissures move up and laterally in smiling, studies have shown a difference in the amount and direction of movement between the right and left sides [1]. A large differential elevation of the upper lip in an asymmetrical smile may be due to a deficiency of muscular tonus on one side of the face (Fig. 8). Myofunctional exercises have been recommended to help overcome this deficiency and restore smile symmetry [1]. An oblique commissural line in an asymmetrical smile can give the illusion of a transverse cant of the maxilla or a skeletal asymmetry.

![Fig 8: Patient with asymmetrical smile due to deficiency of muscle tonus on one side of face.](image)

6. Frontal Occlusal Plane

![Fig 9: Occlusal frontal plane](image)

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 differential eruption of the maxillary anterior teeth or a skeletal asymmetry of the mandible [9] (Fig. 10). This relationship of the maxilla to the smile cannot be seen on intraoral images or study casts, and smile photographs can also be misleading. Therefore, clinical examination and digital video documentation are essential in making a differential diagnosis between smile asymmetry, a canted occlusal plane, and facial asymmetry [10, 11]. Having the patient bite on a tongue blade or a mouth mirror in the premolar area during the clinical examination is a good way to recognize an asymmetrical cant of the maxillary frontal occlusal plane.
global, growing patient, severe crowding, or delayed migration of the gingival tissue \[1\] (Fig. 14). The gingival margins can be leveled by orthodontic intrusion or extrusion or by periodontal surgery, depending on the lip line, the crown heights, and the gingival levels of the adjacent teeth \[15\].

Fig 10: Patient with canted occlusal frontal plane and unilateral posterior gingival smile.

7. Dental Components

A pleasant smile also depends on the quality and beauty of the dental elements it contains and their harmonious integration. Dental components of the smile include the size, shape, color, alignment, and crown angulation (tip) of the teeth; the midline; and arch symmetry \[1\]. The dental midline is an important focal point in an esthetic smile \[1\]. 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 \[1\]. The parallelism between the maxillary central incisor midline and the facial midline is more important than the coincidence between the dental and facial midlines. A mild midline discrepancy is acceptable as long as the interproximal contact area (connector space) between the maxillary central incisors is vertical. Other factors that can disturb the continuity of the dental composition include midline diastemas and a lack of interproximal contacts \[1\].

8. Gingival Components

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 \[1\] (Fig. 13). The space created by a missing papilla above the central incisor contact point, referred to as a “black triangle”, may be caused by root divergence, triangular teeth, or advanced periodontal disease. Orthodontic root paralleling and flattening of the mesial surfaces of the central incisors, followed by space closure, will lengthen this contact area and move it apically toward the papilla \[12\]. The gingival margins of the central incisors are normally at the same level or slightly lower than those of the canines, while the gingival margins of the lateral incisors are lower than those of the central incisors. Gingival margin discrepancies may be caused by attrition of the incisal edges, ankylosis due to trauma in a

Conclusion

In summary, an optimal smile is characterized by an upper lip that reaches the gingival margins, with an upward or straight curvature between the philtrum and commissures; an upper incisal line coincident with the border of the lower lip; minimal or no lateral negative space; a commissural line and occlusal frontal plane parallel to the pupillary line; and harmoniously integrated dental and gingival components. These concepts of smile esthetics are not new, but are too often overlooked in orthodontic treatment planning. The eight components of the smile should be considered not as rigid boundaries, but as artistic guidelines to help orthodontists treat individual patients who are today, more than ever, highly aware of smile esthetics.

References

10. Ackerman MB, Ackerman J. Smile analysis and design